11 00 039 Check compression of all cylinders

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

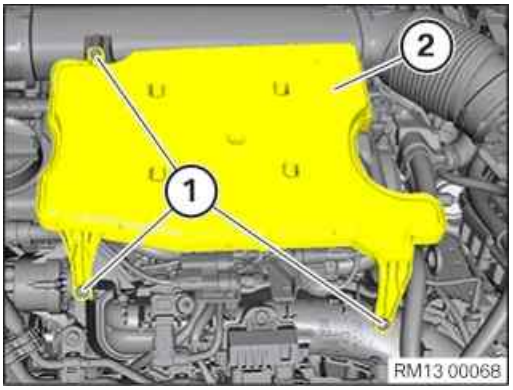
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

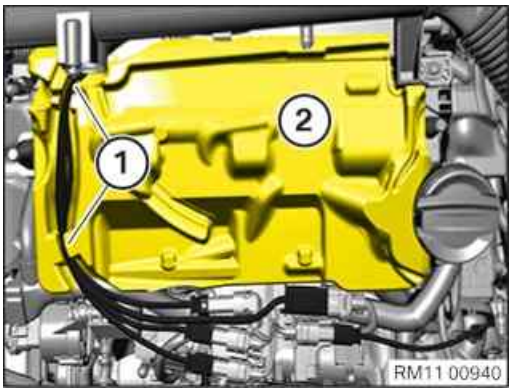
- Unclip the acoustic cover from the marked areas towards the top.

2 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

3 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

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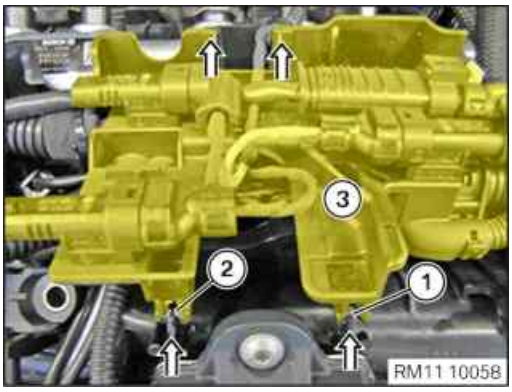
4 – Removing the cable clips from the intake plenum



- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

5 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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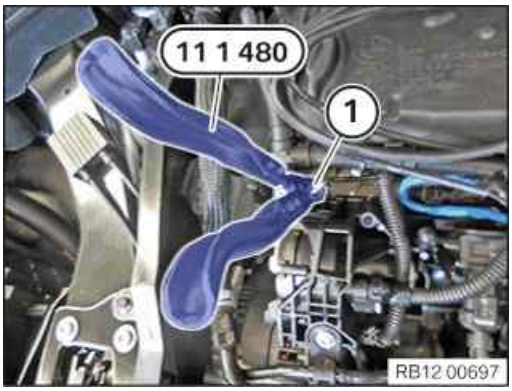
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

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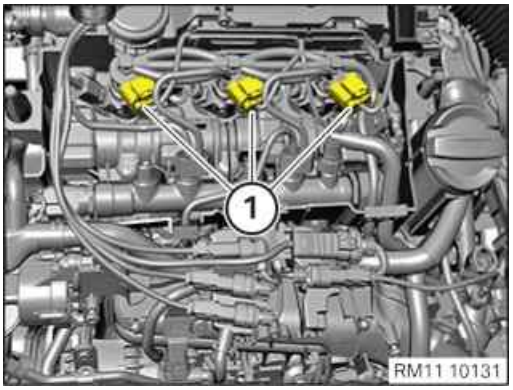
MAIN WORK

6 – Check compression



- Unlock all connectors (1) and disconnect them from the injectors.

  This prevents injection.

- Screw special tools **0 496 146 (11 8 880)** and **0 493 129 (11 0 235)** into the bore holes of the individual cylinders.
- Connect an approved battery charger.

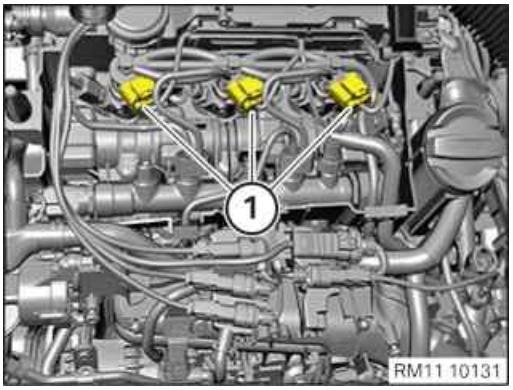
  The charger ensures constant battery voltage.
- With vehicles with manual gearbox: Ensure that no gear is engaged.
- Start engine.
- Check compression pressure and compare with the setpoint value.

  The number of engine revolutions for the compression check must be identical at each cylinder.

Compression pressure setpoint value

min. 16 bar

- Remove special tools **0 496 146 (11 8 880)** and **0 493 129 (11 0 235)**.



- Attach all connectors to the injectors.

  The connectors must lock audibly.

POSTPROCESSES

7 – Install glow elements

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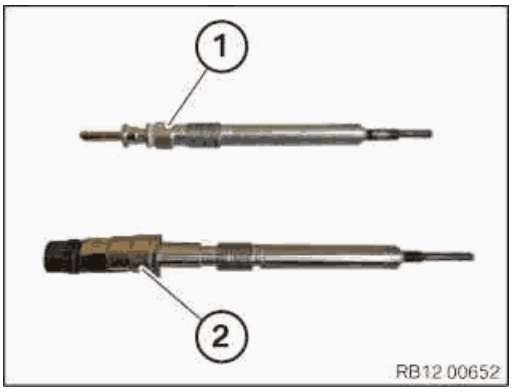
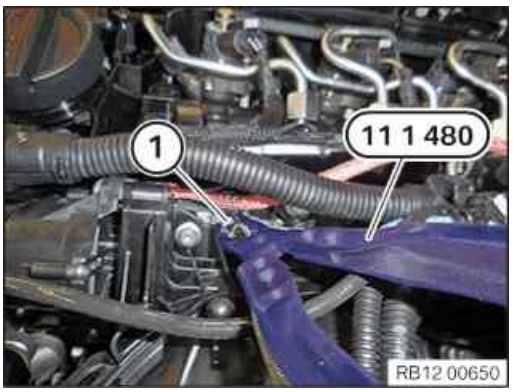


- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

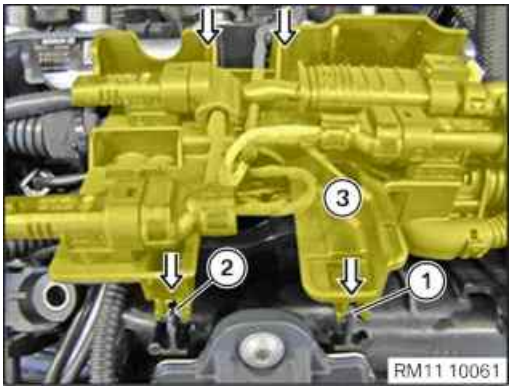
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

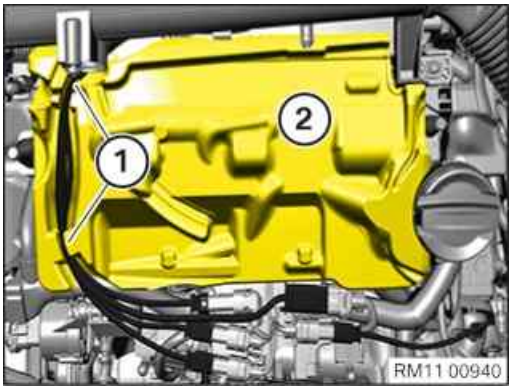
  The connector (1) must engage audibly.

8 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

9 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

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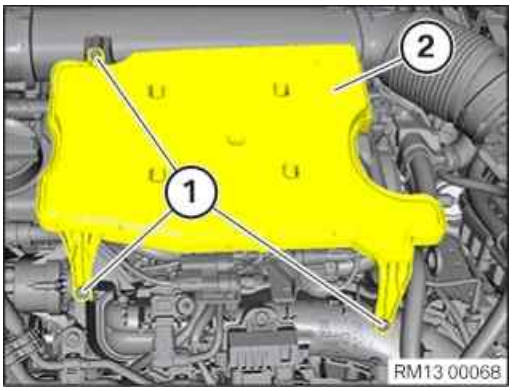
10 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

11 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Glow elements to cylinder head Used in step 7

Glow element		Tightening torque	13 Nm

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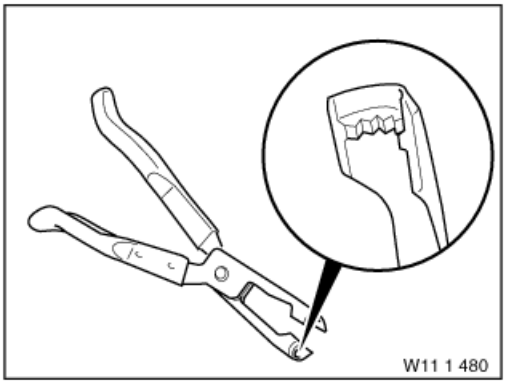
Resonator to manifold and clean air pipe			Used in step 10
Screw TS6	Renew screw.	Tightening torque	5 Nm

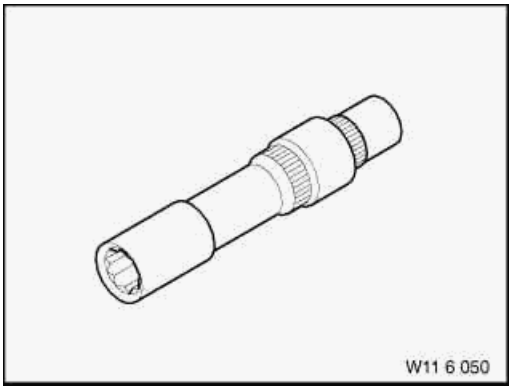
Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common	Used in step 5
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 491 068 (11 6 050) Socket wrench insert



Common	Used in step 5 7
Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

0 496 146 (11 8 880) Adapter

Common	Used in step 6
Usage	For compression testing.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 493 129 (11 0 235) Sensor

Common	Used in step 6
Usage	(Test probe, screw-in) For measuring "absolute compression" at all cylinders, engine: S14, S38, S50B30, S50B32, S50US, S52US, S54, S85
Included in the tool or work	0 490 613
Storage location	
Replaced by	
In connection with	
SI-Number	

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Overview Technical Data

Compression pressure setpoint value	Used in step 6
	min. 16 bar

Links

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	5

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11 00 039 Checking compression of all cylinders (B37C)

Special tools required:

- 11 8 880
- 11 0 235

Necessary preliminary tasks:

- Remove all glow elements.

Warning!

On vehicles with manual gearbox:

There must be no drive position engaged during the starting operation.

Important!

To prevent the injection system from injecting, it is necessary to disconnect the injection system plug connections.

Screw in special tools11 8 880 and 11 0 235 .*Note:*
The compression check on all cylinders must have a constant battery voltage. If necessary, connect an auxiliary battery or charger.

The number of engine revolutions for the compression check must be identical for each cylinder. (The measuring result could be falsified.)

Technical data.

Required follow-up work:

- Install glow elements
- Check function of DDE, erase fault memory if necessary

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00 Danger of injury if oil comes into contact with eyes and skin

Danger of injury!

Contact with eyes or skin may result in injury!

Possible symptoms are:

- Impaired sight
- Irritation of the eyes
- Reddening of the skin
- Rough and cracked skin

Protective measures/rules of conduct:

- Wear safety goggles.
- Wear oil-resistant protective gloves.
- Observe country-specific safety regulations.

First aid measures:

- Eye contact: Immediately flush eyes with lots of water for at least 15 minutes. In the case that it is available, use an eye wash bottle. If eye irritation persists, consult a doctor.
- Skin contact: Wash off with soap and water immediately. If irritation persists, consult a doctor.

  Note: Do not use solvents/thinners.

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00 Danger of poisoning if oil is ingested/absorbed through the skin

Danger of poisoning!

Ingesting oil or absorbing through the skin may cause poisoning!

Possible symptoms are:

- Headaches
- Dizziness
- Stomach aches
- Vomiting
- Diarrhoea
- Cramps/fits
- Unconsciousness

Protective measures/rules of conduct:

- Fill oil in appropriately marked containers only.
- Do not fill oil in containers meant for drinking out of. (bottles for beverages, glasses or cups)
- Observe country-specific safety regulations.

First aid measures:

- Do not induce vomiting.

  If the person affected is still conscious, he/she must rinse out their mouth with water, drink plenty of water and consult a doctor immediately.

  Do not administer anything to an unconscious person via their mouth; place them in a stable position on their side. Call the emergency doctor immediately.

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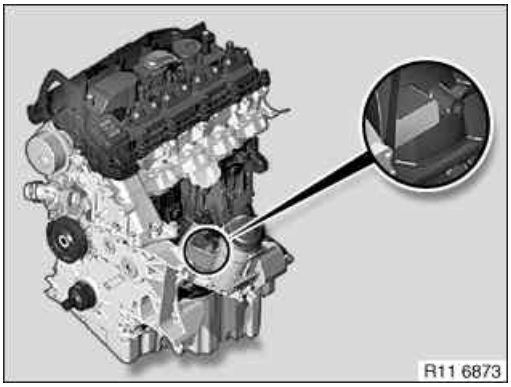
Engine identification

Engine number at the marked surface.

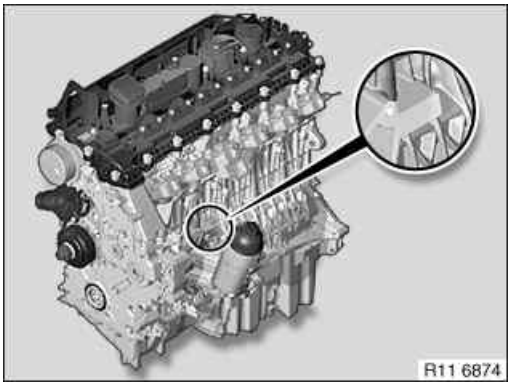
Replacement drives are already assigned a number containing the identification and engine number at the factory.

The old drive number must be imprinted for replacement crankcases.

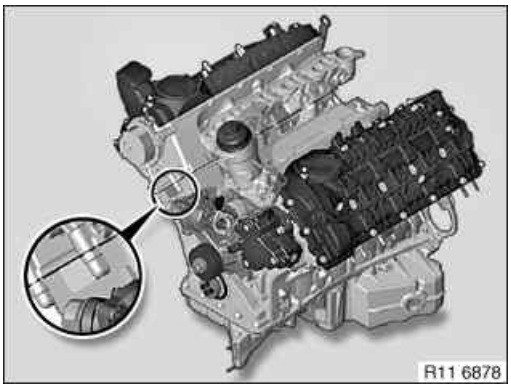
Magnesium crank cases feature a label, the engine number does not need to be embossed.



M47 / M47TU / M47T2



M57 / M57TU / M57T2



M67 / M67TU

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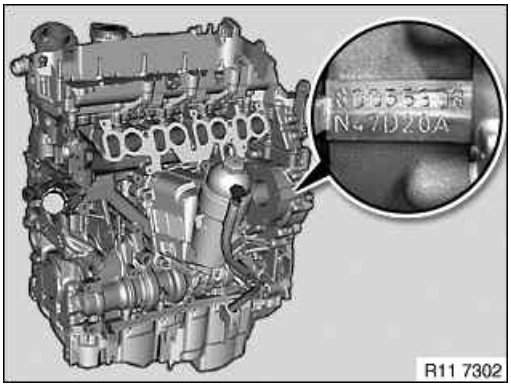
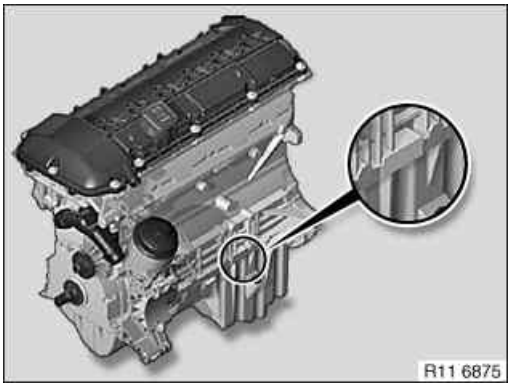
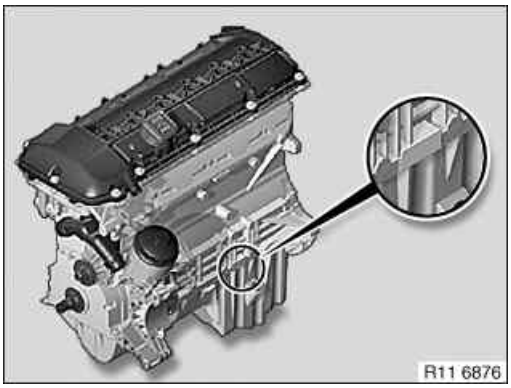


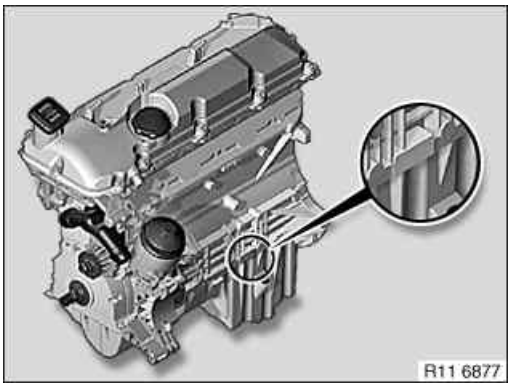
N47 / N47S / N47C / N47T / N57 / N57S / N57T



M52 / M52TU



M54



M56

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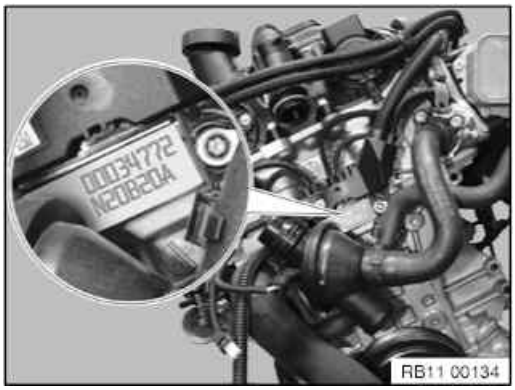
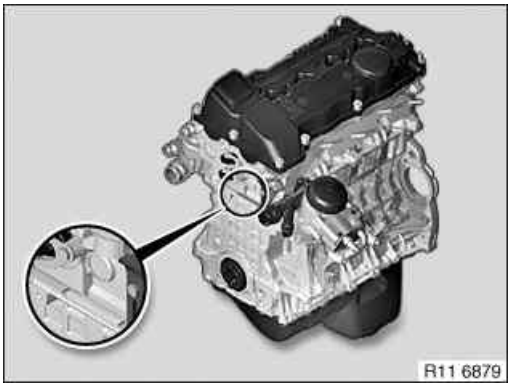
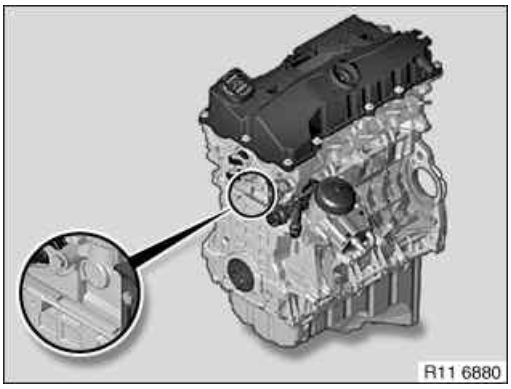


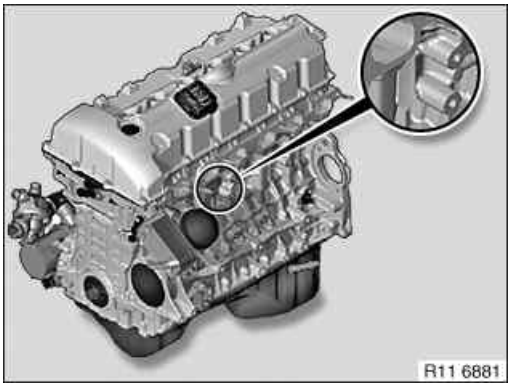
N20 / N26



N40 / N45 / N45T / N43



N42 / N46 / N46T



N51 / N52 / N52K / N52T / N53 / N54 / N55

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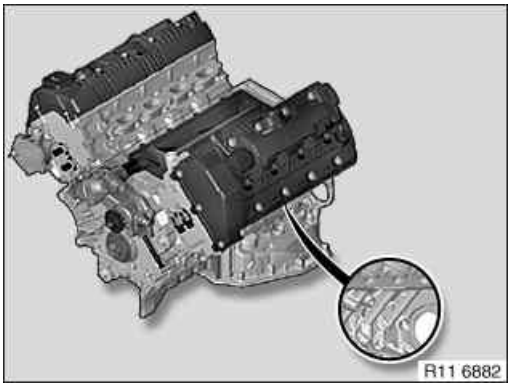
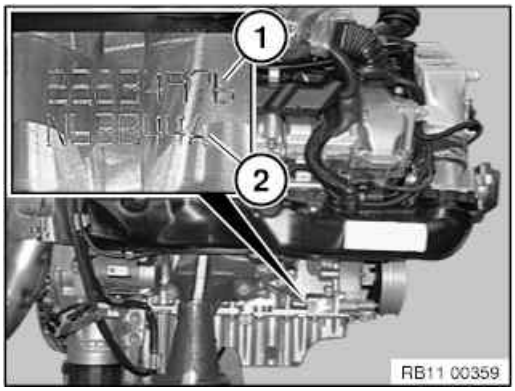
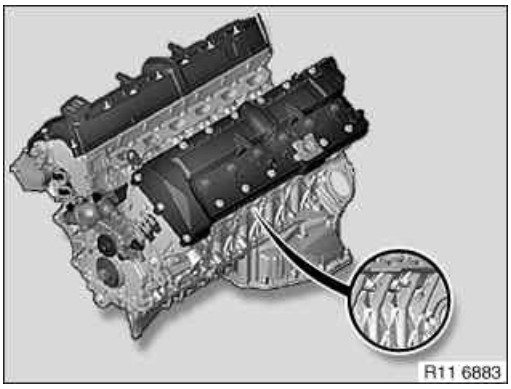


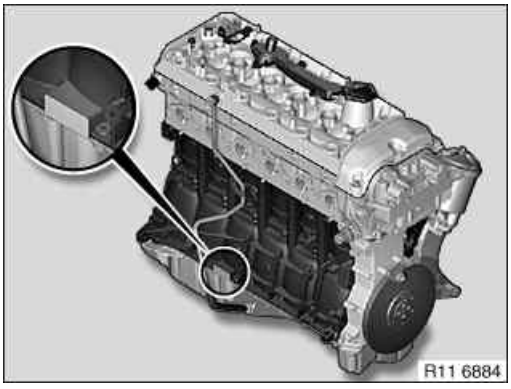
N62 / N62TU



Position (1) engine number.
PositionÂ (2) engine code letters.
N63, N63O1. N63O2
S63
N74, N74O1,
S63T0 to engine number 2001 0052 on right side cyl. 1-4.
S63T0 from engine number 2001 0053 on left side cyl.l 5-8.
E72 Vehicles must be imprinted on the left side cyl. 5-8.



N73



S54

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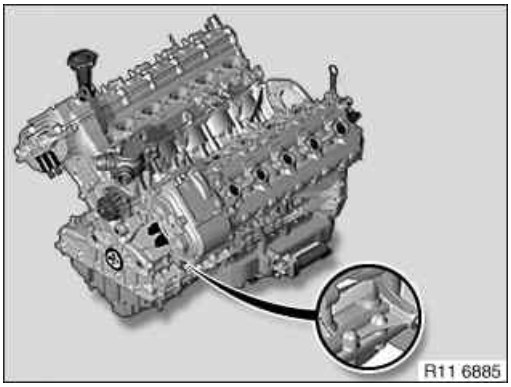
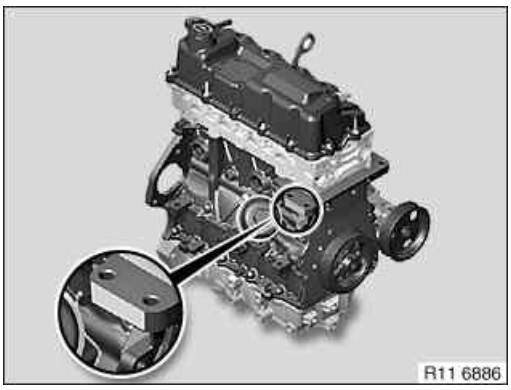


S85 / S65

S55



W10 / W11

W16

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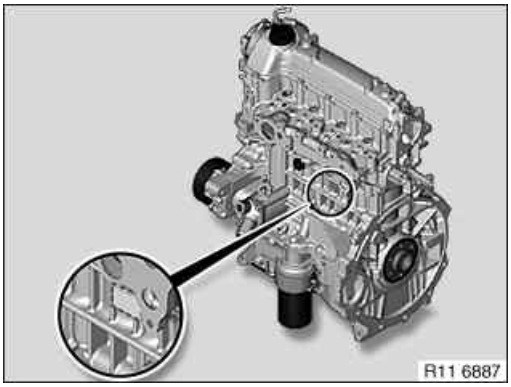

W17

W20

N12 / N13 / N14 / N16 / N18

B37 / B38**A** / B47 / B48**A**
in the area of the oil sump

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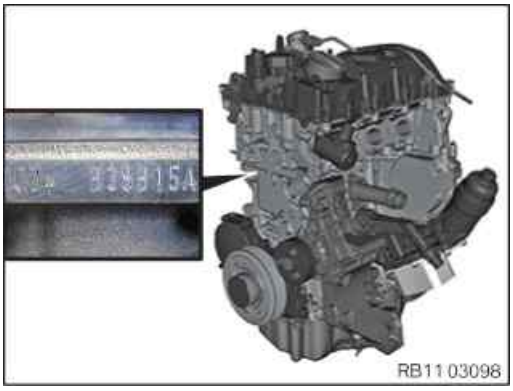
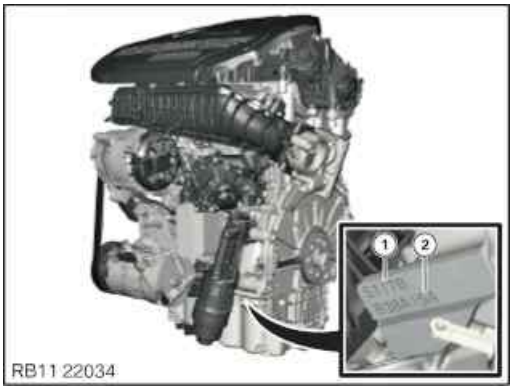
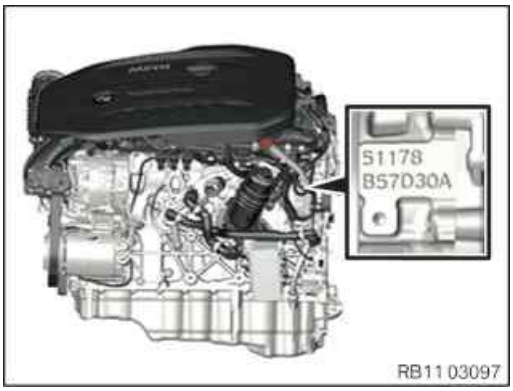


B38**B** / B48**B**



B38



B57

B58

Assemble engine.

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11 00 ... Engine oil change (B37C)

Warning!

Risk of scalding!

Carry out work on the vehicle only when wearing oil- and heat-resistant protective gloves incl. forearm protection, face guard and protective apron.

Attention!

Carry out engine oil service only when the engine is at operating temperature.

Observe the exact engine oil filling capacity.

Overfilling the engine with engine oil will result in **engine damage**.

Attention!

Risk of damage!

When working on the engine oil, coolant or fuel circuit, it is essential always to protect the alternator against dirt contamination.

Cover alternator with suitable materials.

Recycling:

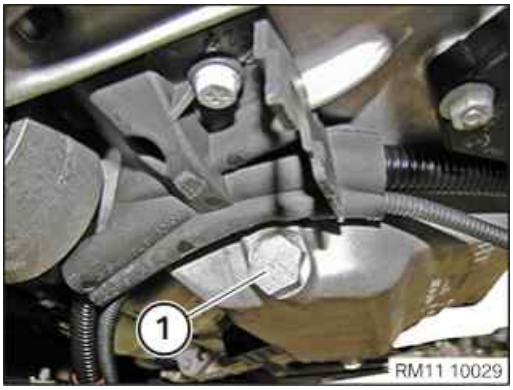
Catch and dispose of drained engine oil in a suitable collecting vessel.

Observe country-specific waste disposal regulations.

Necessary preliminary tasks:

- Opening the oil filler cap
- Open service cap in the underbody protection

Removal:



Open oil drain plug (1) and drain engine oil.

Drain the engine oil.

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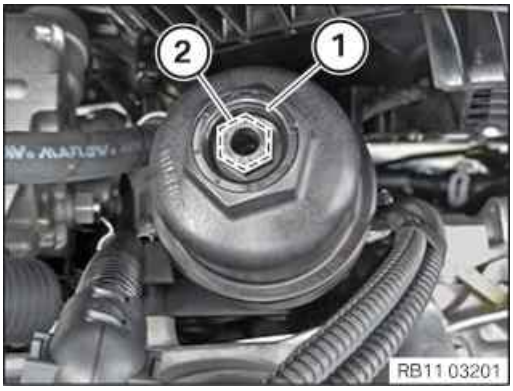
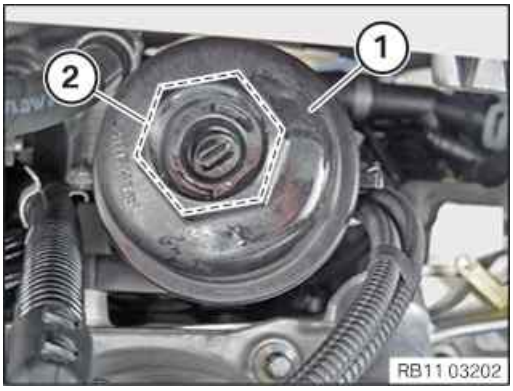
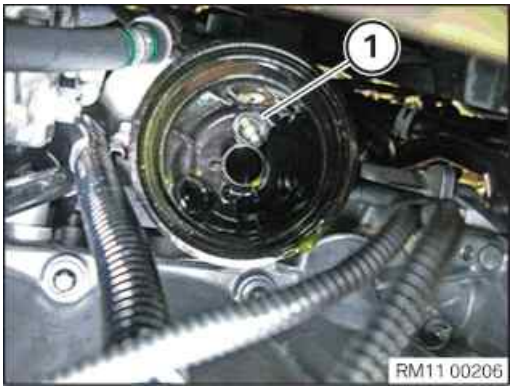


Unscrew the oil drain plug (1) at the hexagon head (2).
Drain the engine oil.

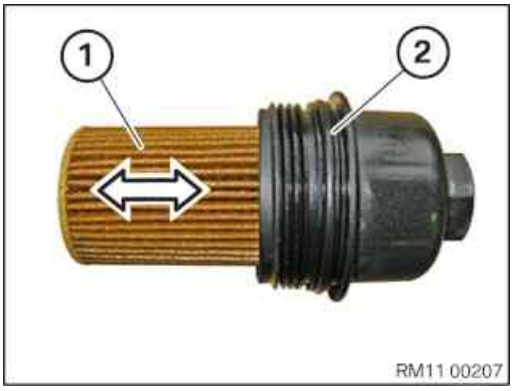


Undo oil filter cover (1) at hexagon head (2).

Installation:



Check the freedom of movement of the non-return valve (1).



Renew oil filter (1).
Parts: Oil filter (1).
Ensure that the oil filter (1) engages audibly.
Renew O-ring (2) and coat with engine oil.
Parts: O-ring (2).

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Renew the bolt with the o-ring (1).

Parts: Bolt with O-ring (1).

Wet the O-ring (1) with engine oil.

It is imperative that you clean the threads (1) prior to installation with original BMW brake cleaner (part number: 83 19 2 365 214)!

Any engine oil must be completely removed from the thread!

Attention!

Risk of damage!

The elastomers (o-rings) must not have contact with the brake cleaner!

Remove the brake cleaner completely and blow-dry with compressed air as needed.

Join the oil drain plug (1).

Mount the oil filter cover (1) and tighten it at the hexagon head (2).

Tightening torque: 11 42 1AZ.

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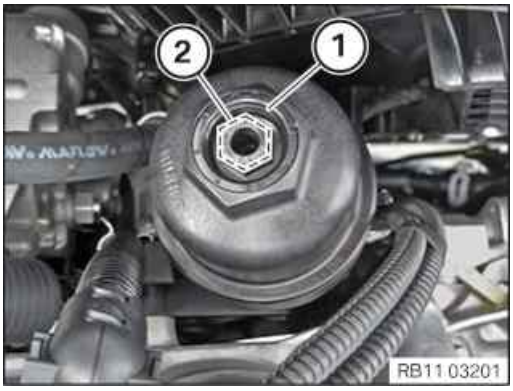
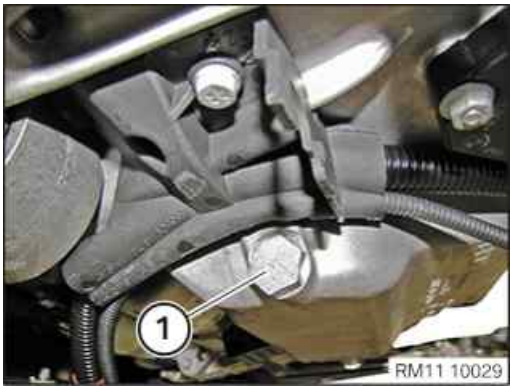


Tighten the oil drain plug (1) at the hexagon head (2).

Tightening torque 11 42 6AZ.



Replace sealing ring of oil drain plug.

Parts: Sealing ring.

Tighten oil drain plug (1).

Tightening torque 11 13 1AZ.

Note:
Pour in engine oil.

Close oil filler cap .

Start engine and run at idle until oil pressure indicator light goes out.

Switch off engine.

Check oil filter cover (1) and oil drain plug of oil sump for tightness.

Assemble engine.

Checking oil level:

- Park vehicle on a horizontal surface
- Wait for five minutes and check the oil level by means of the oil dipstick when the engine is at operating temperature
- Top up engine oil if necessary

Required follow-up work:

- Close the service cap in the underbody protection

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11 00 300 Engine oil consumption measurement

Attention!

This procedure for measuring oil consumption may not be used for the S 85 due to the oil pan design.

Many complaints about oil consumption are caused by the oil level being measured using the wrong method.

The oil consumption should be measured after a distance of 7,500 km at the earliest, as the process of running in the engine will not have been essentially completed and the engine oil consumption stabilised until this distance has been covered.

Engine oil consumption that may occur in an engine can only be determined by the customer on the basis of the refilled engine oil quantity. As soon as the engine oil level falls below the MAX mark on the dipstick, many customers top up the engine oil without paying attention to a number of basic rules, such as the vehicle must be standing on level ground, a certain period of time must be left to allow the oil to flow back to the sump. In such cases, the available container sizes (e. g. 1-litre can) make it easy to top up above the MAX mark. Too much added engine oil is damaging to the engine and is consumed more quickly due to the splash effect.

It is therefore recommended to allow the engine oil level to the MIN mark and only then to add the required engine oil quantity. The distance between the marks is equivalent to approx. 1.0 to 1.5 litres.

The procedure for checking the oil level is given in the Owner's Handbook for the vehicle concerned.

The service delegates will only deal with claims made under warranty if exact measurements by weighing are available (see below).

Measuring oil consumption by weighing:

To assess a warranty or goodwill claim, only the following oil consumption measurement method by weighing can be accepted (this must have been carried out by a BMW contractual partner):

Note:

The engine must not leak any oil.

Engine oil may only be drained off when the engine is at its normal operating temperature. The engine oil temperature must be at least 90 °C and read off on the diagnosis system.

Preparation:

1. Eliminate any leaks and traces of oil before measuring the engine oil consumption.
2. Allow the engine to run at idling speed for 5 minutes, during which the engine oil temperature must not drop below 90 °C.
3. Unscrew the main flow oil filter cover (the engine oil will flow back into the oil sump from the oil filter housing).
4. Unscrew the oil drain plug.
5. Allow the engine oil to drain off for 15 minutes.
   If necessary, remove the fan/fan cowl.
6. Turn the engine once through 360 degrees by the vibration damper.
7. Allow the engine oil to drain off for 15 minutes.
8. Retighten the primary flow oil filter.
9. Pour in the specified engine oil quantity for the engine type in question (with filter change).
10. Drive the vehicle for a distance of at least 1,000 km/500 miles. Increasing the mileage will produce significantly better measuring results.
    Measurement procedure:
11. Check the engine for leaks; if the engine is not tight, the examination will not be meaningful.
12. Prepare the measuring container to be able to capture the oil quantity.
13. Allow the engine to run at idling speed for 5 minutes, during which the engine oil temperature must not drop below 90 °C.
14. Unscrew the main flow oil filter cover (the engine oil will flow back into the oil sump from the oil filter housing).
15. Unscrew the oil drain plug.
16. Allow the engine oil to drain off for 15 minutes.

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If necessary, remove the fan/fan cowl.

17. Turn the engine once through 360 degrees by the vibration damper.
18. Allow the engine oil to drain off for 15 minutes.
19. Weight the **amount of drained engine oil**. (Engine oil has a density of about 0.86 g/cm³ at room temperature.)

$$\text{Engine oil consumption} = \frac{\text{Amount of oil added (cm³) - amount of oil drained off (g): 0.86 g/cm³}}{\text{mileage reading when draining - mileage reading when adding engine oil}}$$

Example:

Volume of oil added at mileage reading 44,800: 4.000 cm³

Weight of oil added at mileage reading 45,900: 2.700 g

$$\text{Engine oil consumption} = \frac{\text{4.000 cm3 - 2.700 g : 0.86 g/cm³}}{\text{45,900 km - 44,800 km}} = 0.78 \text{ cm³/km}$$

0.78 cm³/km = 0.78 l/1,000 km

Test certificate for engine oil consumption:

Vehicle data: _____

BMW (type): _____

Chassis number: _____

Added oil quantity (in ccm): _____ ccm at kilometre reading:_____

less drained off oil quantity (in g) : 0.86 (g/ccm) _____ ccm at kilometre reading:_____

=> oil consumption: _____ ccm => mileage: _____ km

Oil consumption [l/1000 km] =

_____ *[ccm] oil consumption* _____ [km] mileage

Oil consumption after balancing out: _____ l/1000 km

Oil grade: _____

Oil grade: _____

Viscosity: _____

Cause of damage: _____

_____ _____

Dealer address Signature

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11 00 ... Engine oil consumption measurement

Procedure for engine oil consumption measurement, see following documents:

- Engine oil consumption measurement (all without S85)
- Engine oil consumption measurement (only S85 with one oil drain plug)
- Engine oil consumption measurement (only S85 with two oil drain plugs)
- Record on oil consumption measurement

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11 . . . . . Equipment recoding special tool number of the transverse member for fixing the engine in the installation location

Equipment recoding from 00 0 200 to 00 6 0 000

Designation	Special tool new	Special tool previous
Cross-member, previous	---	00 0 200
Cross-member, new	00 6 000	---
Mounting bridge	00 6 001	00 0 201
Spindle with hook	00 6 002	00 0 202
Extension	00 6 003	00 0 203
Adapter support	00 6 004	00 0 204
Extension	00 6 005	00 0 205
Chain with hook	00 6 006	00 0 209
Set of supports	00 6 010	00 0 206
Set of supports	00 6 020	00 0 207
Set of supports	00 6 030	00 0 208
Connector	00 6 031	---
Profile strip (2 x)	00 6 032	---
Supports (4 x)	00 6 033	---
Set of supports	00 6 040	---
Profile strip	00 6 041	00 0 451
Supports (2 x)	00 6 042	00 0 452
Supports, short (2 x)	00 6 043	---
Set of supports	00 6 050	---
Profile strip (2 x)	00 6 051	---
Supports, short (2 x)	00 6 052	---
Supports, long (2 x)	00 6 053	---
Support, long	00 6 060	---
Supports (2 x)	00 6 070	---

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11 00 ... Handling components after flood damage

Flood damage can occur if the permissible fording depth of a vehicle is exceeded. Ingress of water can cause damage to the engine (water shock) or components.

Because dirt particles generally enter into the component with the water (e.g. starter motor, wiring harness), the components need to be thoroughly inspected.

Residual moisture in the components leads to corrosion (increased contact resistance in the component), which can lead to a component failure at a later time.

If water ingress into the electrical components cannot be ruled out, it is recommended to replace the component to ensure correct functioning through the vehicle lifetime.

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11 00 590 Installing the exchange engine (B37C)

Special tools required:

- 11 8 030
- 2 288 380

Attention!

Do not remove transportation retainer (adapter) of high pressure pump without special tool.

Risk of damage to timing chain drive.

Necessary preliminary work:

- Remove engine with gearbox.
- Remove transmission.
- Remove high pressure pump.
- Remount flywheel.

Attention!

Do not remove transportation retainer (1) without special tool 11 8 030 .

Remove protective cap (1) on oil sump.

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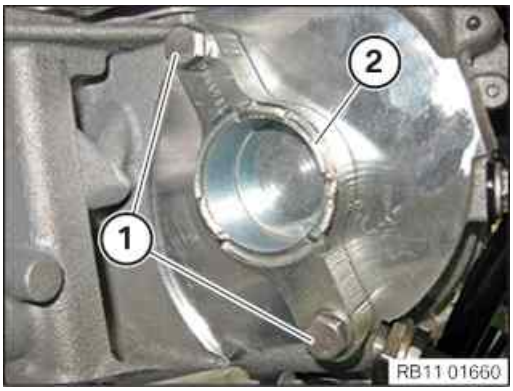
Attention!

On vehicles with manual gearbox, an additional bore hole that can be confused with dowel hole is located in front of dowel hole.

The special tool 2 288 380 must be able to be pushed into the oil sump up to the offset.

Disconnect crankshaft with special tool 2 288 380 .

Screw in special tool 11 8 030 .



Release screws (1) from the transportation retainer (2).

Attention!

The special tool 11 8 030 remains in the timing case.

Central bolt (1) remains in camshaft sprocket.

Remove central bolt (1).*Note:*
The central bolt (1) is supported on special tool 11 8 030 until the transportation retainer is pressed out.

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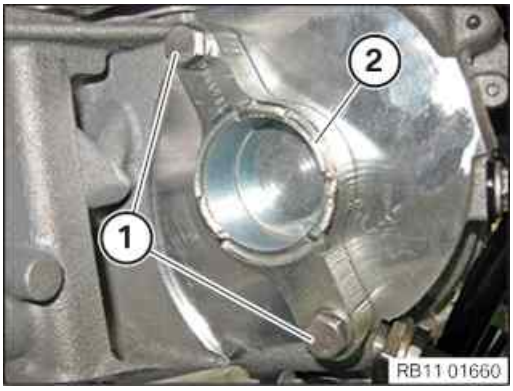
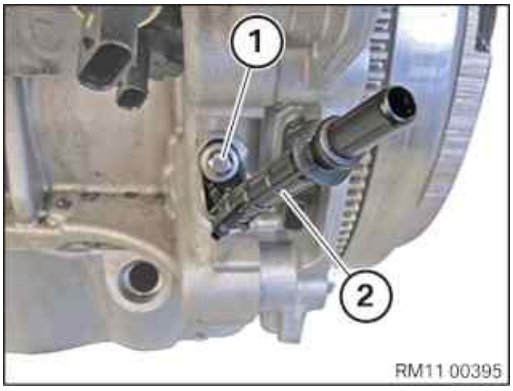


Remove transportation retainer (2).

Install high pressure pump.

Remount transportation retainer (1).



Attention!

Risk of damage!

Non-compliance may cause the brake servo to fail!

Do not dismantle non-return valve (2) into separate components!

Before installing non-return valve (2), check if the installation opening in the crankcase is clear and clean.

Release screw (1).

Remount non-return valve (2).

Parts: Replace O-ring.

Tighten screw (1).

Tightening torque: 11 00 2AZ.

Required follow-up work:

- Remount all assemblies and sensors
- Position exchange engine on table lift with workshop crane
- Fit transmission.
- Install engine with transmission.

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Mounting engine on assembly stand (B37C)

Special tools required:

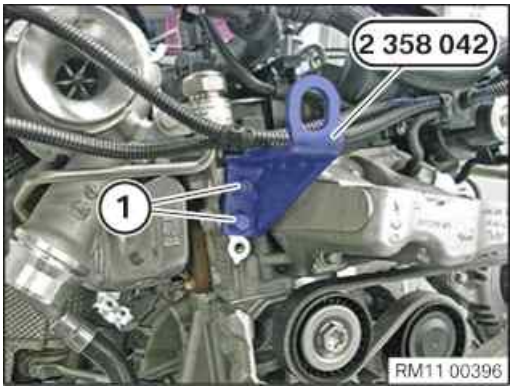
- 2 358 042
- 00 2 300
- 00 2 320
- 2 288 357
- 11 9 030
- 11 0 070

Important!

Follow manufacturer's instructions.

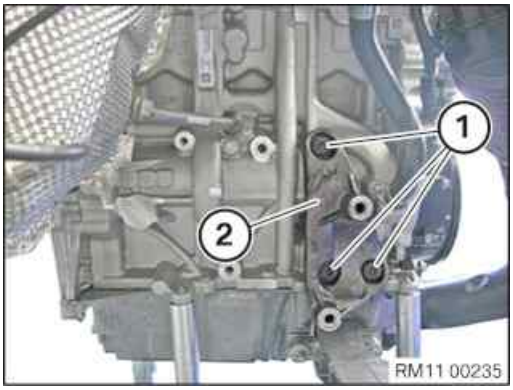
Necessary preliminary tasks:

- Remove engine with transmission.
- Remove transmission.



The securing eye 2 358 042 is to be fastened with the screws (1).

Tightening torque: 11 00 4AZ.



Release screws (1).

Remove adapter plate (2).

Installation note:

Tightening torque: 11 11 4AZ.

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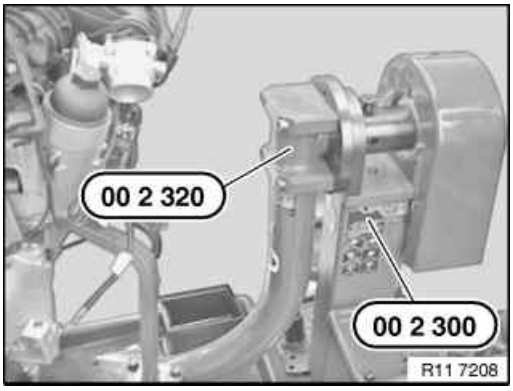
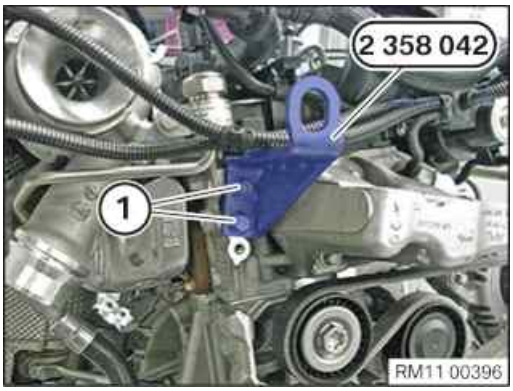
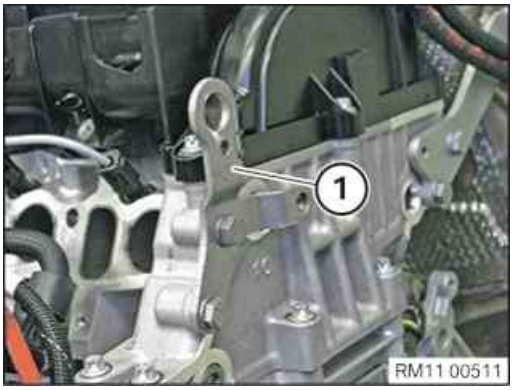


Prepare special tool 00 2 300 together with special tool 00 2 320 (00 2 321).

Prepare special tool 2 288 357 together with special tool 11 9 030 .



Note:
Attach engine lifter to securing eye 2 358 042 .



Note:
Attach engine lifter to the available securing eye (1).

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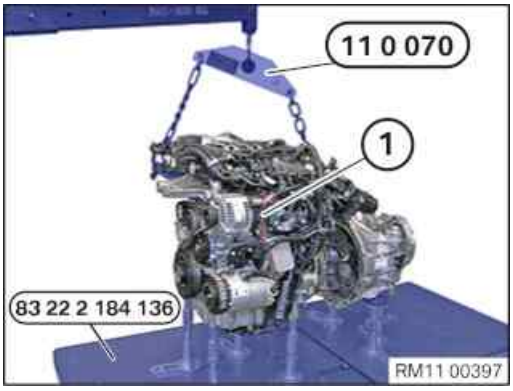

Lift engine (1) with workshop crane and special tool 11 0 070 from table lift (83 22 2 184 136).

Lift engine with workshop crane onto assembly stand.

Bolt special tools 11 9 030 and 2 288 357 to engine.

Tightening torque: 11 11 4AZ.

Fix special tool 11 9 030 to assembly stand 00 2 300 .

Tightening torque: 11 11 5AZ.

Required follow-up work:

- Suspend engine from workshop crane.
- Remove engine from assembly stand.
- Place engine on table lift with workshop crane.
- Attach transmission.
- Install engine with transmission.

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11 00 ... Overview of consumables (Electronic Parts Catalogue)

1.0 Sealing compound for **injection**.

	Repair instructions (engine)	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples
1.1	S55, S65, S85	Loctite 171000 primer	83 19 7 515 683	For hardening Loctite 193140 sealing compound
1.2	S55, S65, S85	Loctite 193140 liquid sealing compound	83 19 0 439 030	Sealing between crankcase upper and lower halves
1.7	W20	Dow Corning liquid sealing compound	07 58 0 397 777	Sealing between crankcase upper and lower halves Sealing of oil sump

2.0 Sealing compound for **application**.

	Designation in repair instructions	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples
2.1	M41, M47, M47TU, M47T2, M50, M51, M52, M52TU, M54, M57, M57TU, M57T2, M60, M62 N12, N14, N16, N18 N20, N26 N40, N42, N45, N45N, N46, N46N, N43, N47, N47top, N47C N47D1 N51, N52, N52N, N53, N54, N55, N57, N57T, N62, N62TU, N63, N63O1 N73, N73H, N74 S14, S38, S50, S52, S54, S62, S65, S85	Drei Bond 1209 liquid sealing compound	07 58 9 062 376	For sealing junction points on crankcase
2.2	N12, N13, N14, N16, N18, N20, N26, N40, N42,N43, N45, N46, N51, N52, N53, N54, N55 W10, W11, W16,	Loctite 5970 liquid sealing compound	83 19 0 404 517	Sealing between crankcase upper and lower sections.
2.2	N47top, N47D1, N47C1 N57D1 N57S1, B32 ,B36 ,B37 ,B38 ,B42 ,B46 ,B47 ,B48 ,B57 ,B58	Loctite 5970 liquid sealing compound	83 19 0 404 517	Timing case cover sealing, oil sump, coolant pump, component carrier.
2.3	N12, N14, N16, N18 W16	Loctite 648 liquid sealing compound	07 58 9 067 732	Sealing between the seal plug and crankcase
2.4	N12, N13, N14, N16, N18 W16	Loctite 121078 liquid sealing compound	83 19 2 223 765	Sealing between cover sleeve and crankcase

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3.0 **Cleaning agent**.

	Designation in repair instructions	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples
3.1	N12, N13, N14, N18, N20, N26, N45, N46, N45T, N46T, N43, N51, N52, N52Kp, N52TU, N53, N55, N63, N63S, N63 Hybrid, N63O1, N63O2 N73, N74 B37, B38 B47, B48, B58	Cold cleaner (chlorine free)	83 19 0 026 956	Cleaning assemblies, washing engine
3.2	M47, M47T1 M47T2, M57 M57T1, M57T2 N47 K/U/O/T 0/1 N47C	Universal cleaner	83 19 2 360 981	Clean intake pipe.
3.3	All	Brake cleaner	83 19 2 365 214	Clean.

4.0 Lubricant for **application**.

	Designation in repair instructions	Designation, Electronic Parts Catalogue	Part number, Electronic Parts Catalogue	Application examples
4.1	N12, N13, N18, N20, N26, N42, N46, N46TU, N51, N52, N52KP, N52TU, N55, N62, N62TU, N63O0, N63O1, N63O2, N73 S55, S63T0 B38, B48, B58	Lubricating grease Longtime PD1	83 19 2 160 340	For greasing the splined shaft on actuator drive/gearing of intermediate shaft.
4.2	M47, M47TU, M47T2, M57, M57TU, M57T2,	High-temperature assembly paste	83 23 0 309 003	For greasing the thread on the exhaust turbocharger.
4.3	N12, N13, N14, N16, N18 N20, N26, N40, N42, N45, N45TU N46, N46TU, N43. N51, N52, N52Kp, N52TU, N53, N54, N55. N62, N62TU, N63O0, N63O1, N63O2 N73, N73H, N74. S63T1, S65, S85. B38, B48, B58	High temperature paste	83 19 2 158 851 83 19 2 158 852	For greasing the threads on the oxygen sensors.

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4.4	N47, N47O1 N47C1, N47T N47D1 N57 N57D1 N63O0, N63O1, N63O2 S63, S63T0	Copper paste	81 22 9 400 794	For greasing the double hex head bolt on the exhaust turbocharger. For greasing the central bolt on the VANOS gear.
4.5	M47, M47TU, M47T2 M57, M57TU, M57T2 N47, N47O1 N47C1, N47T N47D1 N57 N57D1	High-temperature grease (UrethynE2).	83 23 0 441 070	For greasing the injectors or injector shafts. Solenoid valve and piezo injector.
4.6	N47T0, N47T1 N57T0, N57T1, N57S1 B47T0,	Assembly paste	83 29 9 407 778	For lubricating the O-rings of the pressure pipes. Multistage turbocharging assembly.
4.7	W20	Assembly paste, grease	No longer greased.	For greasing the torsion splined shaft.
4.8	N63O1, N63O2	Assembly paste, grease	83 23 9 407 778	For greasing the central bolt on the crankshaft.
4.9	W20	Assembly paste, grease	83 23 9 407 778	Grease O-ring on alternator.

5.0 lubricant for **filling**

	Designation in repair instructions	**Designation, Electronic Parts Catalogue**	**Part number, Electronic Parts Catalogue**	**Application examples**
5.1	M47, M57	Exhaust turbocharger additive	83 19 2 362 168	For filling the exhaust turbocharger after the renewal.
5.2	B32, B36, B37, B38, B42, B46, B47, B48, B58	Exhaust turbocharger additive, petrol MSP	83 19 2 457 276	For filling the exhaust turbocharger after the renewal.

6.0 Lubricants to loosen locked **screw connections.**

	Designation in repair instructions	**Designation, Electronic Parts Catalogue**	**Part number, Electronic Parts Catalogue**	**Application examples**
6.1	M47, M47TU, M47TU2, M57, M57TU, M57TU2. N47, N47C, N47D1, N57, N57D1, N57S1 W16, W17, B37, B47, B57	Brunox lubricating grease	83 23 0 418 567	For releasing the glow elements.
6.2	E89 F10, F11.	Brunox lubricating grease	83 23 0 418 567	For releasing and tightening the screw connection of the rubber mounts.

7.0 **Leak detection spray and contact spray**

	Designation in repair instructions	**Designation, Electronic Parts Catalogue**	**Part number, Electronic Parts Catalogue**	**Application examples**

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7.1	Petrol: N13, N20, N26, N54, N55 B38, B48, B58 Diesel fuel: M47, M47TU, M47TU2, M57, M57TU, M57TU2. N47, N47C, N47D1, N57, N57D1, B37, B47	Leak detection spray	83 19 9 407 861	Check charge air path for tightness. Example: leakage on charge air hose or charge air cooler.
7.2	S55	Contact spray	81 22 9 400 208	For cleaning and protecting of electrical plug connections.

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11 00 050 Removing and installing engine

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for

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any return shipments. Always package removed components straight away.

- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

PRELIMINARY WORK

1 – Drawing off the air conditioning

- See additional information.

2 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

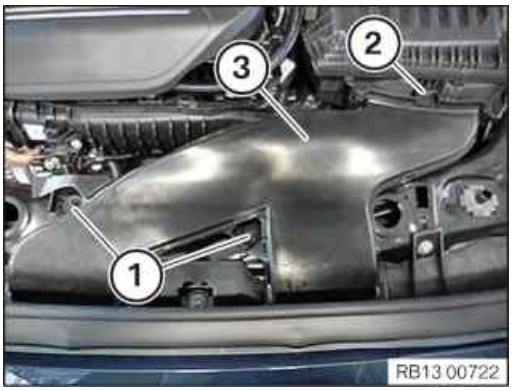
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

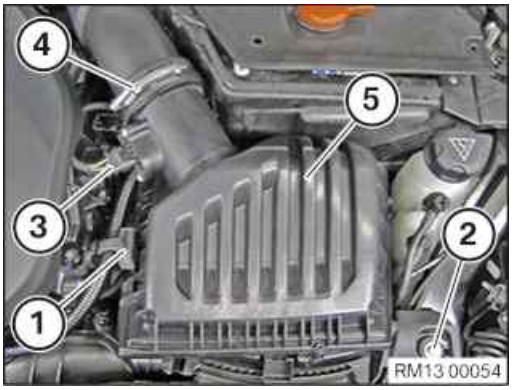
- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

5 – Remove cross connection

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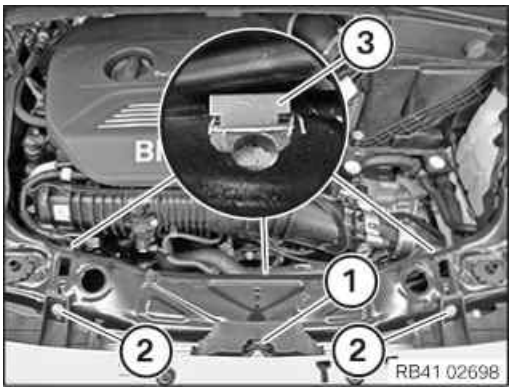
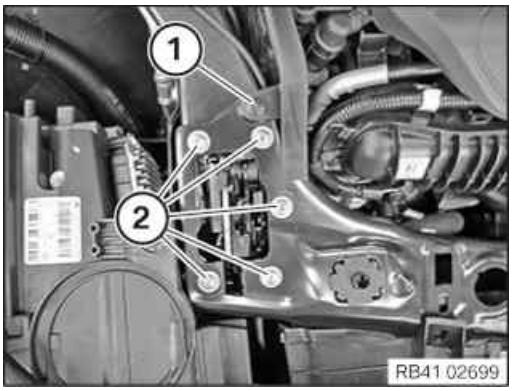
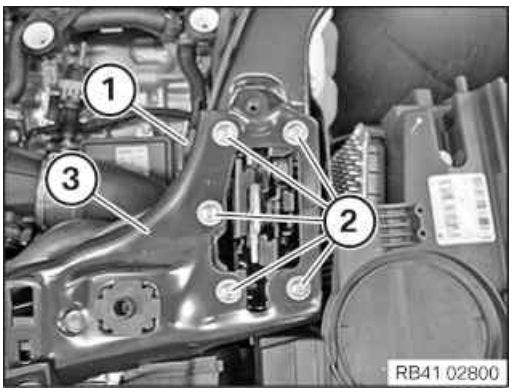


- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

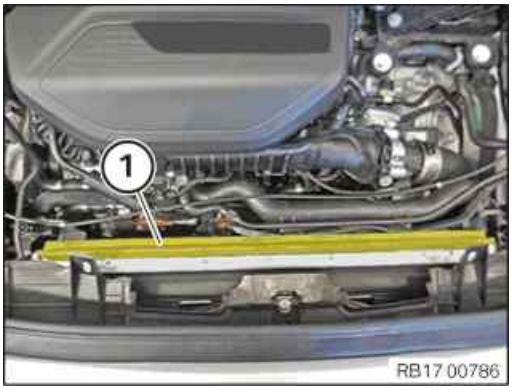
6 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed out and remove the sealing (1) from the radiator.

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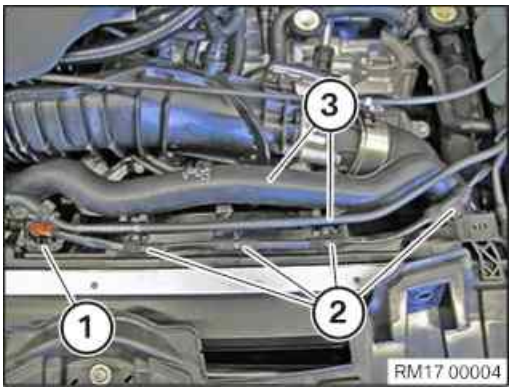
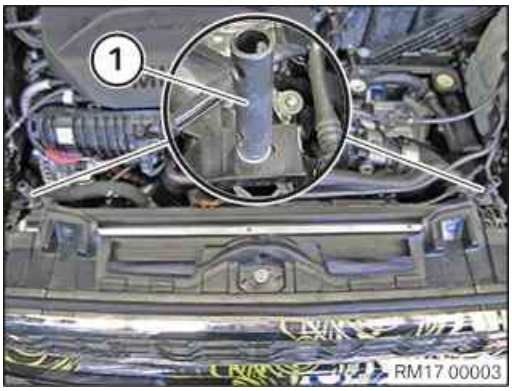
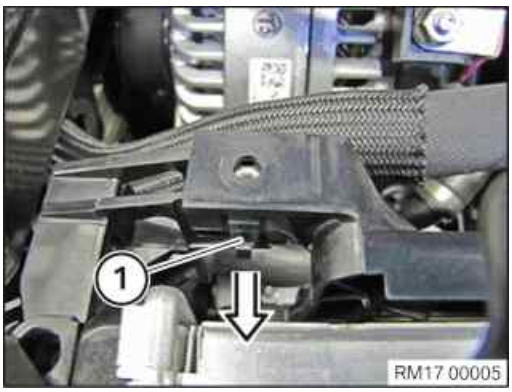


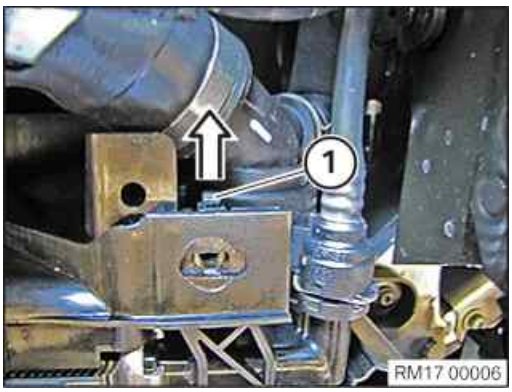
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



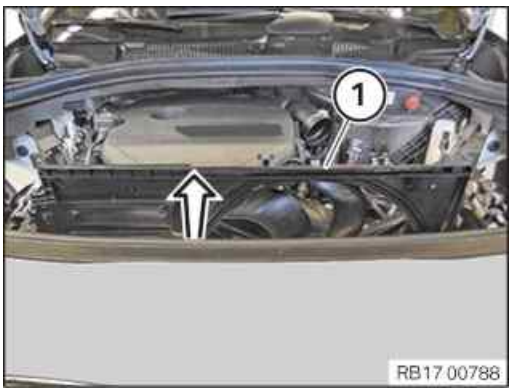
- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



- Guide out fan cowl (1) in direction of arrow and remove.

7 – If installed: Removing rear underbody protection

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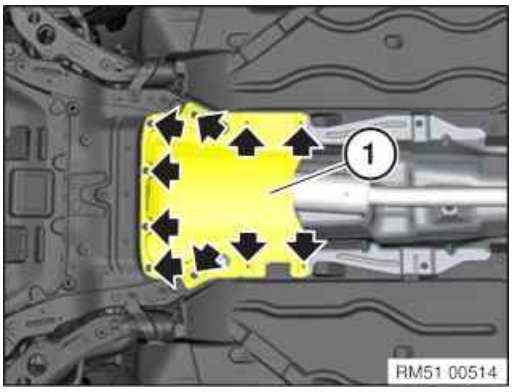
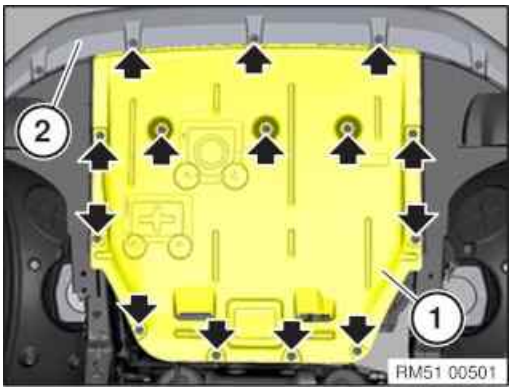


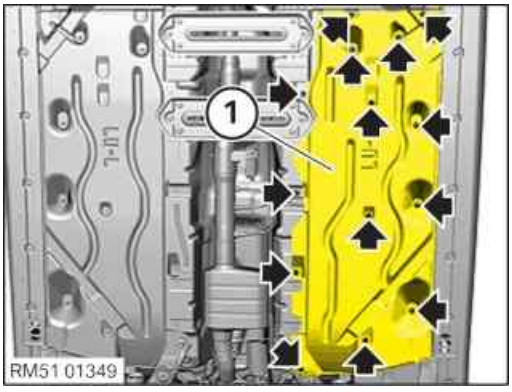
- Remove screws (arrows).
- Remove the rear underbody protection (1).

8 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

9 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

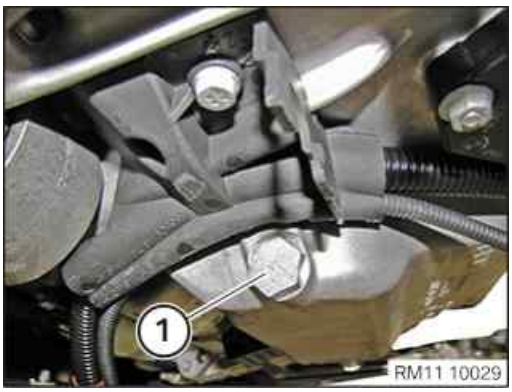
10 – Releasing the oil drain plug

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel.
Observe country-specific waste disposal regulations.

- Release oil drain plug (1).
- Drain engine oil.

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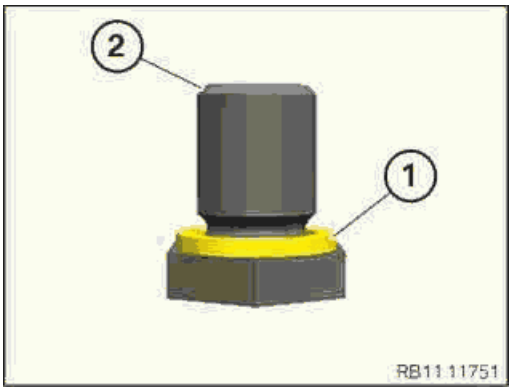
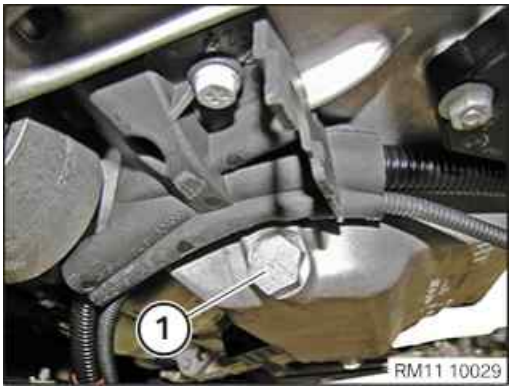
11 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring

- Guide in the sealing ring (1) on the oil drain plug (2) and install.



- Renew the sealing ring.

  Parts: Sealing ring

- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

12 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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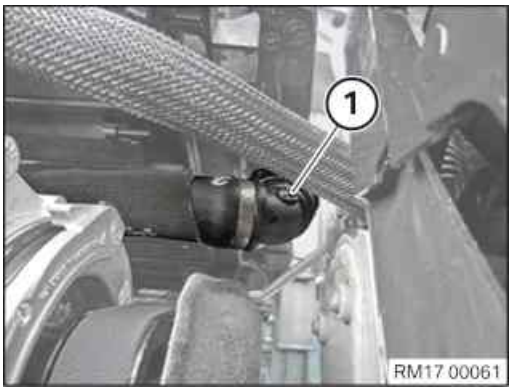
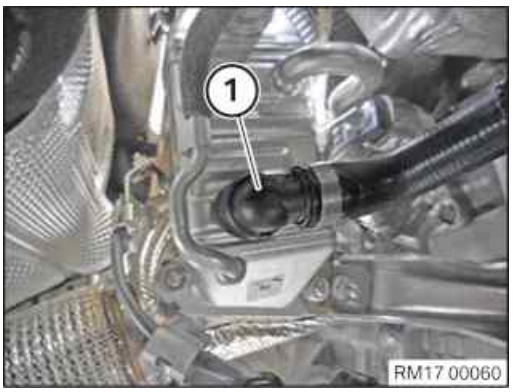
- Loosen sealing cap (1).

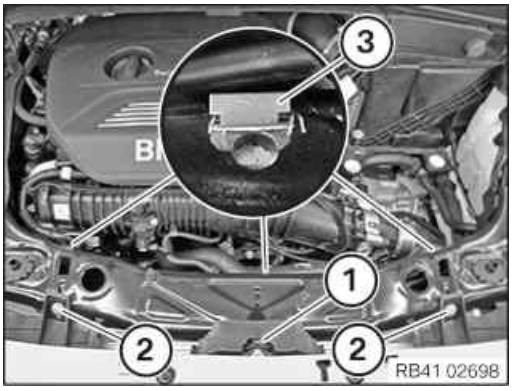


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

13 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

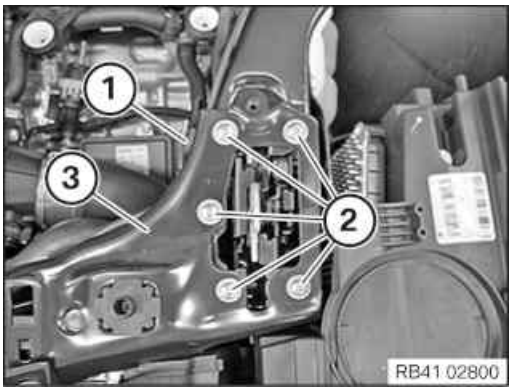
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.



- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

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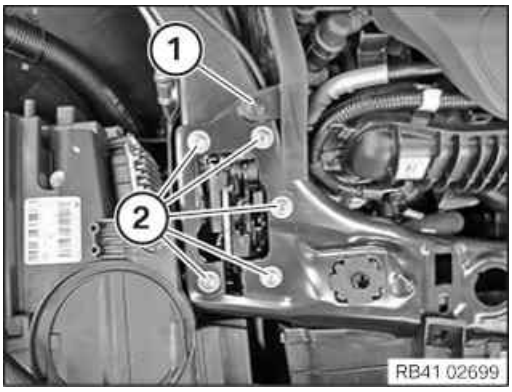


- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

14 – Remove vehicle battery

WARNING

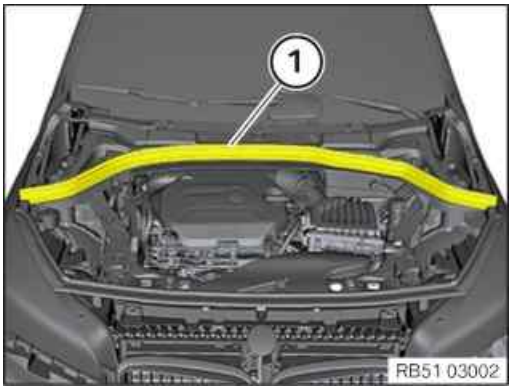
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

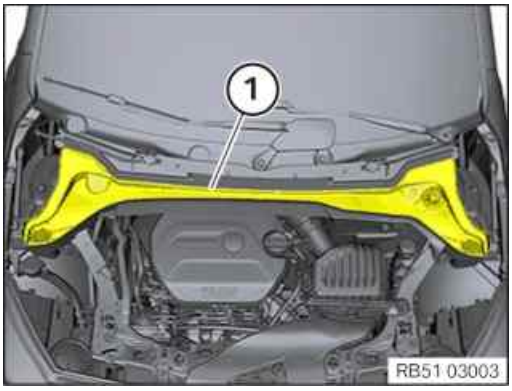
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.

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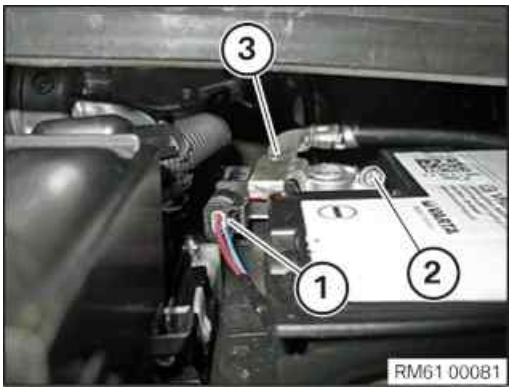
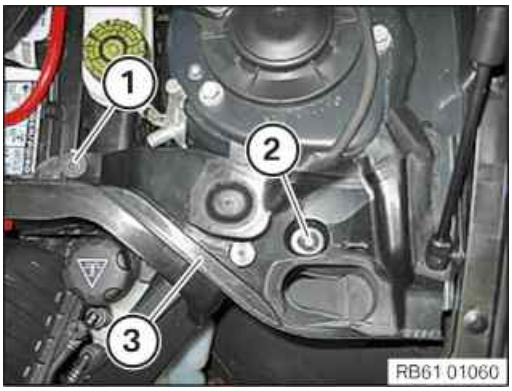
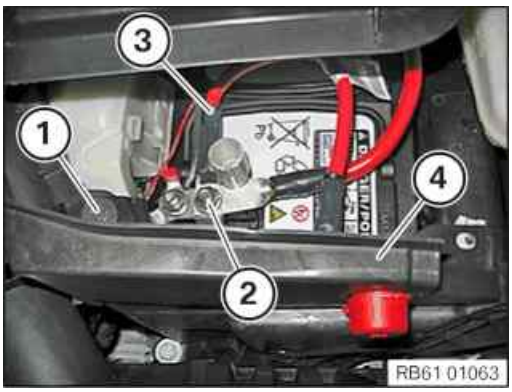


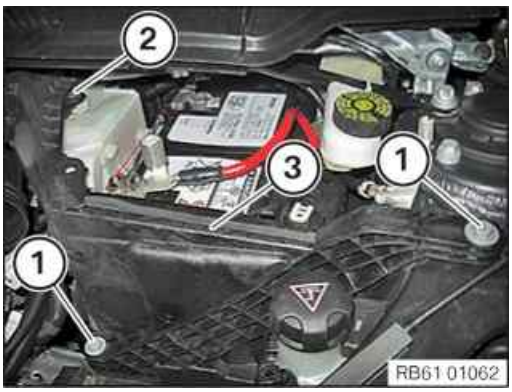
- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



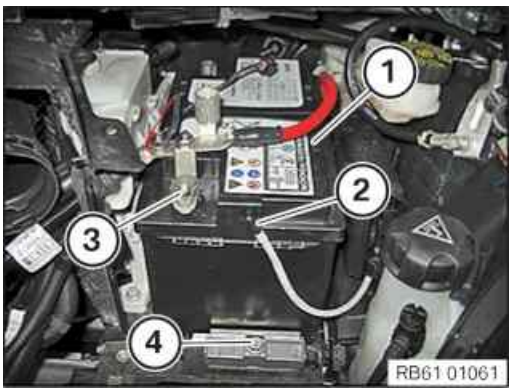
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

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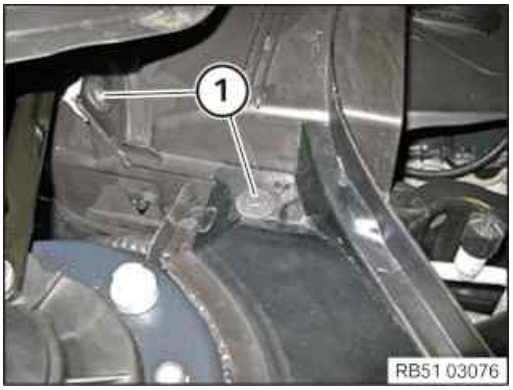
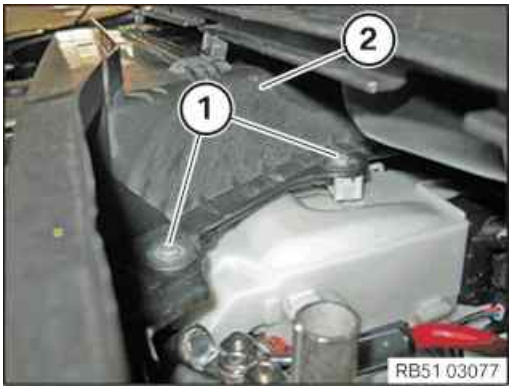
15 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

16 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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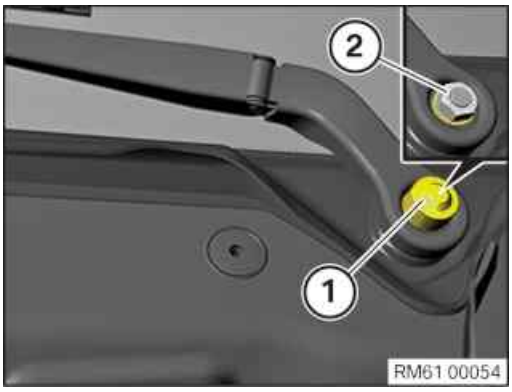
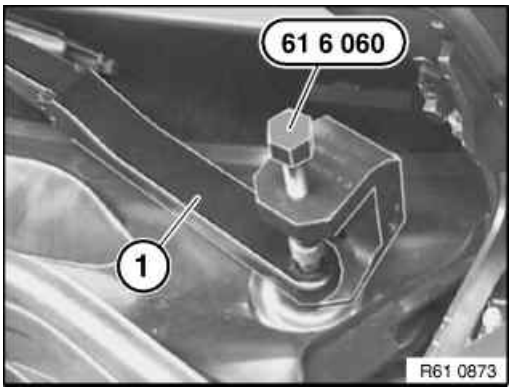


- Remove the protective cap (1).
- Loosen nut (2).



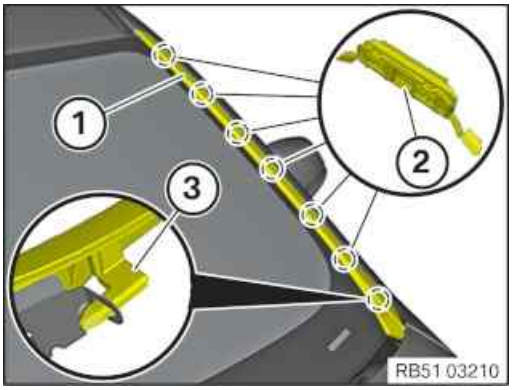
- Pull off the wiper arm (1) using special tool .

17 – Remove the gutter strip on the windscreen on the left and right

NOTICE

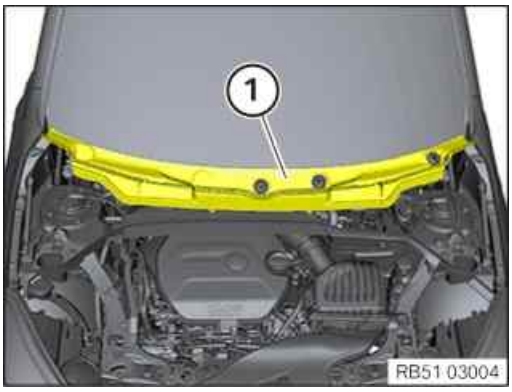
Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

18 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

19 – Remove electronics box

Prerequisite

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Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

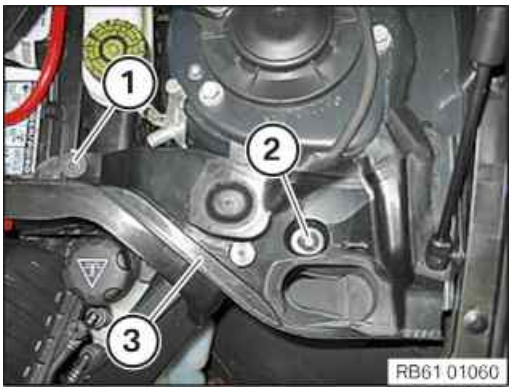
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

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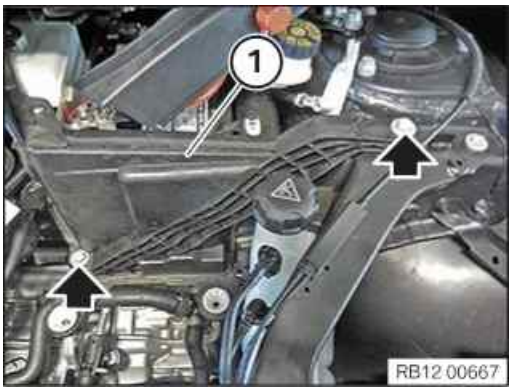
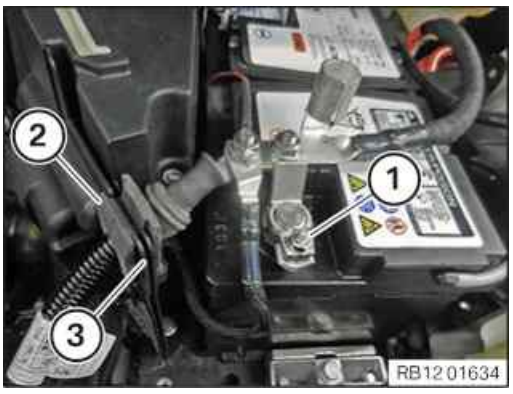
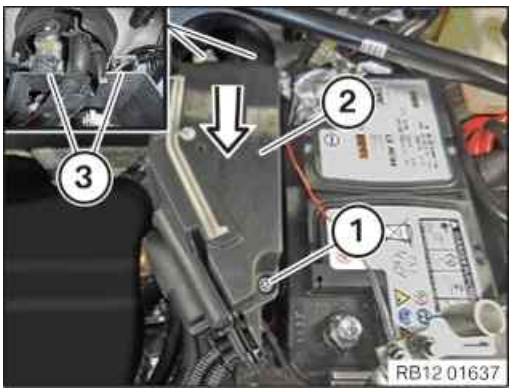
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



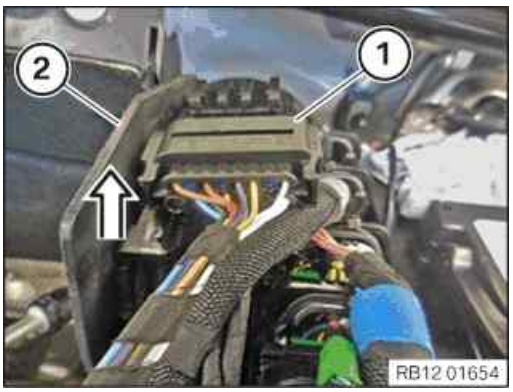
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

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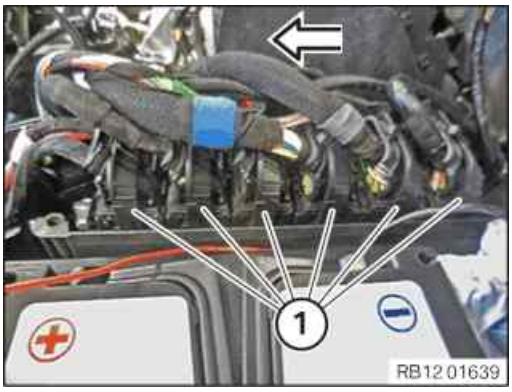
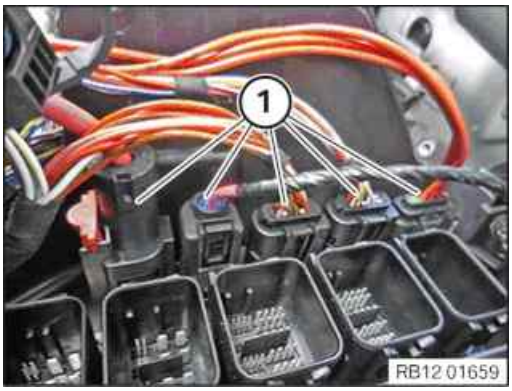
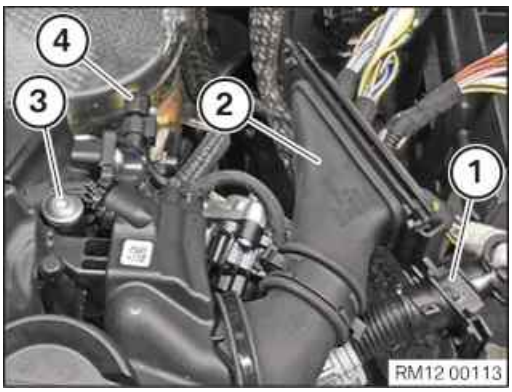


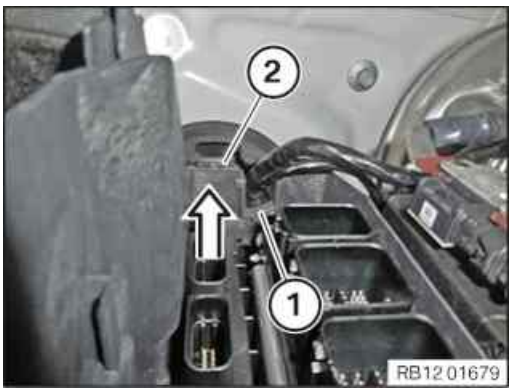
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



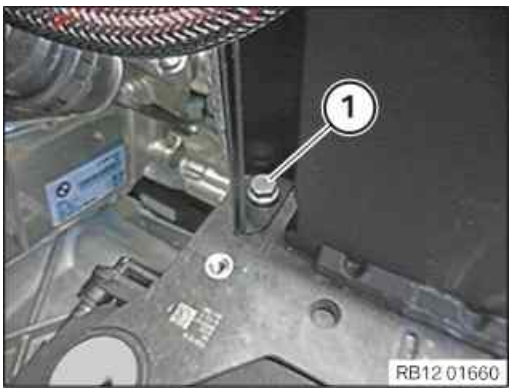
- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).

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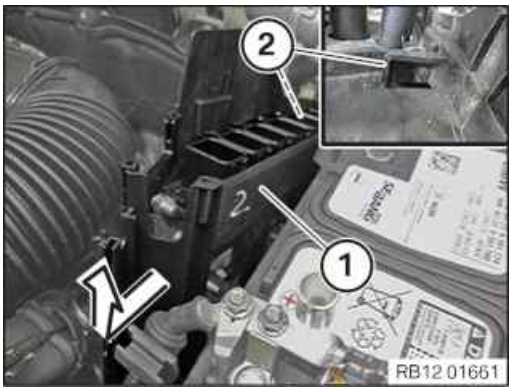
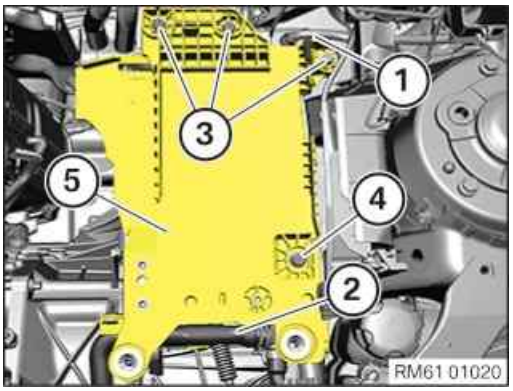


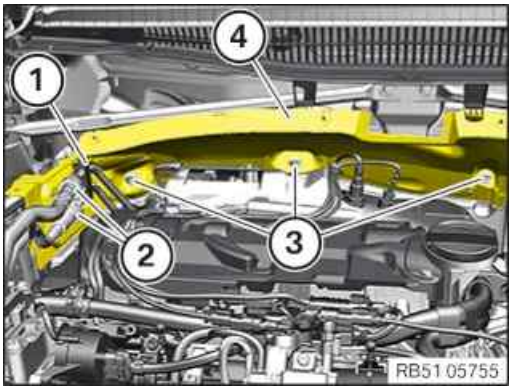
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

20 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

21 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

22 – Removing both front wheels

▸ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

23 – Removing front left and right wheel arch cover

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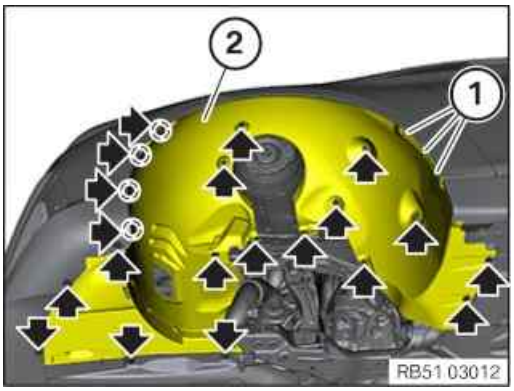
NOTICE

Perform the operations on the left and right side.

▶ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

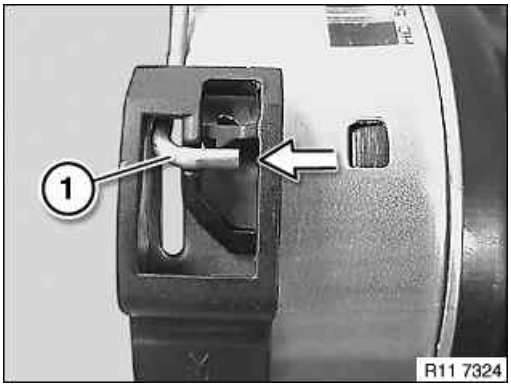
24 – Remove the pressure pipe between the throttle body and the charge air cooler

WARNING

Hot surfaces.

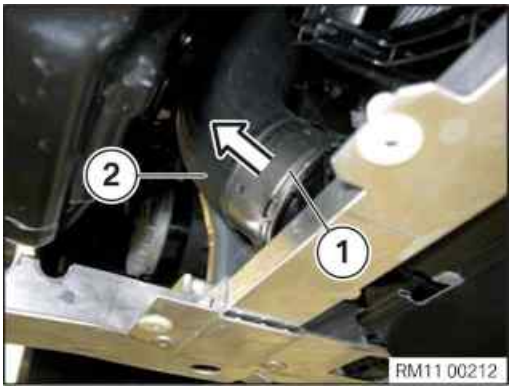
Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock the lock (1).

  The lock (1) must engage in the bracket (arrow).



- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.

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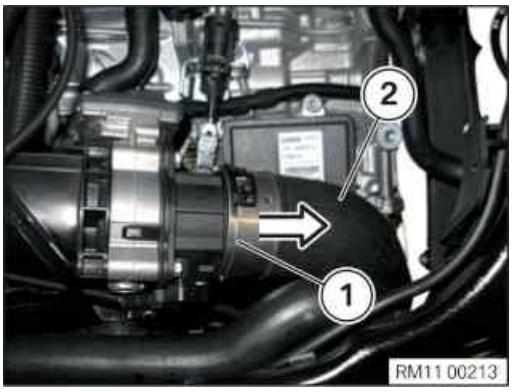

- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.

- Remove the pressure pipe (1) in the direction of the arrow.

25 – Remove right charge-air line

- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).

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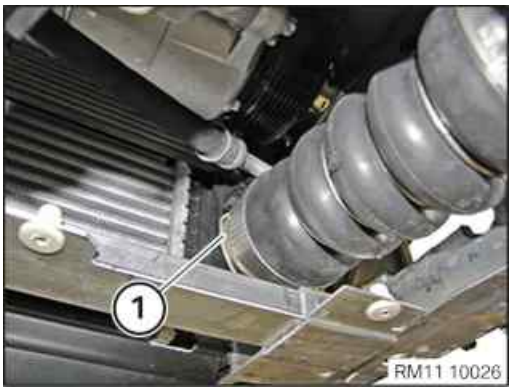
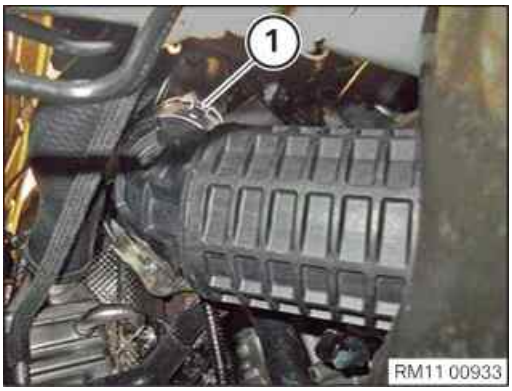
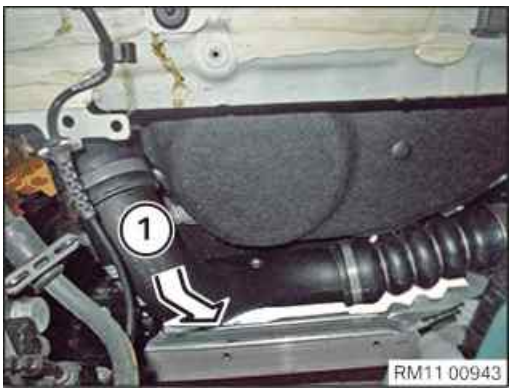


- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

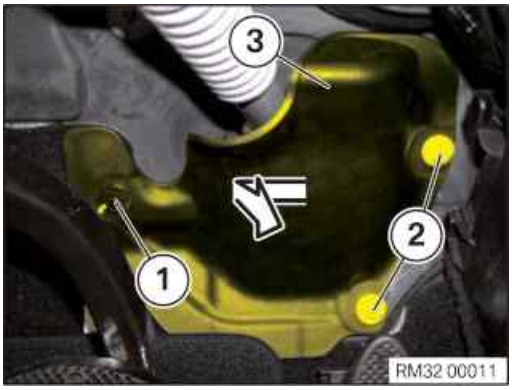


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

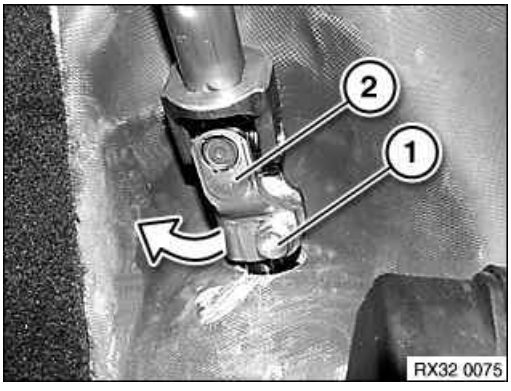
26 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

27 – Securing radiator on left and right

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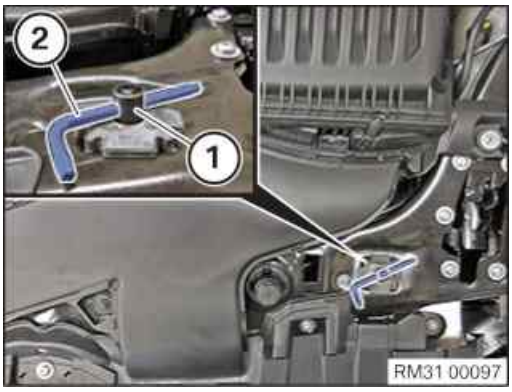
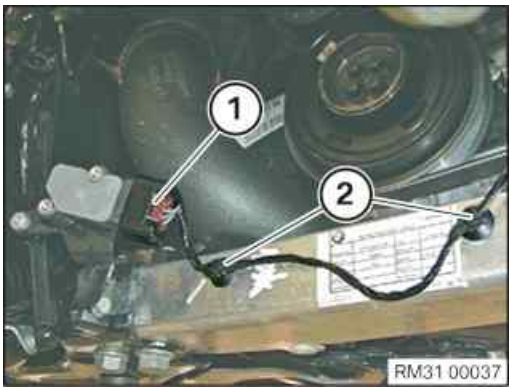


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

28 – With right installation: Detaching ride height sensor cable



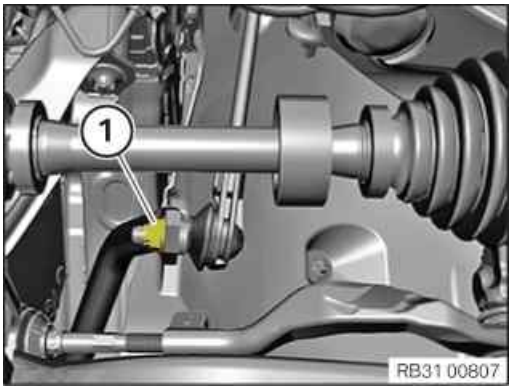
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

29 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Detach the anti-roll bar from the anti-roll bar link**



- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

30 – Detaching rubber mount from front axle support

- Spray rubber mount (1) with lubricant and release from holder on front axle support.

31 – Disconnecting plug connections from steering gear

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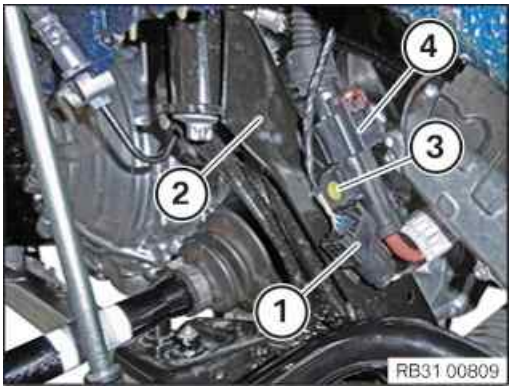
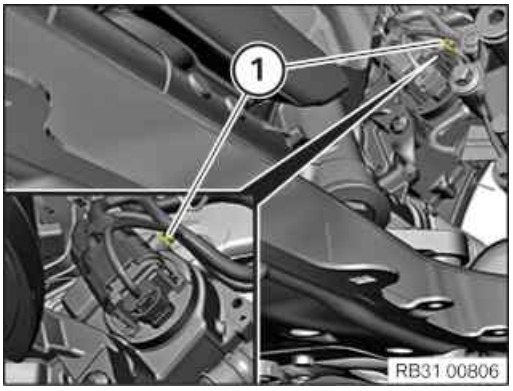
31 – Disconnecting plug connections from steering gear

▶ **If installed: Detach connectors from the front axle carrier**



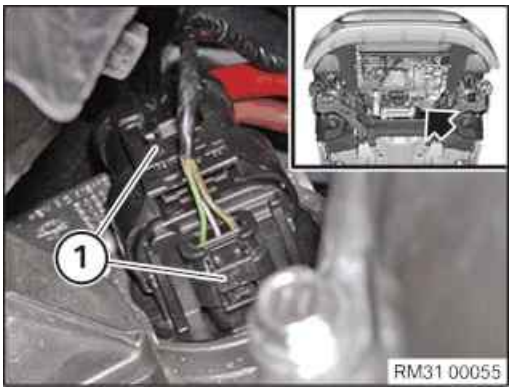
- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



- Disconnect wiring harness (1) from steering gear.

- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

32 – Releasing the mounted part from the front axle support

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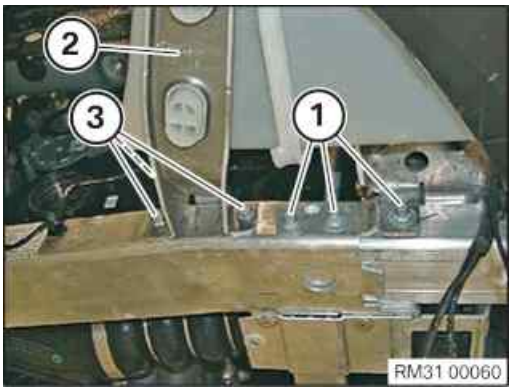
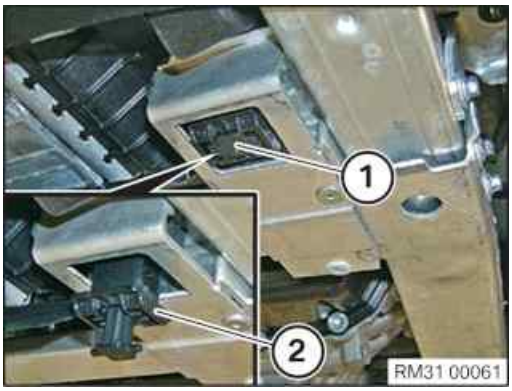


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

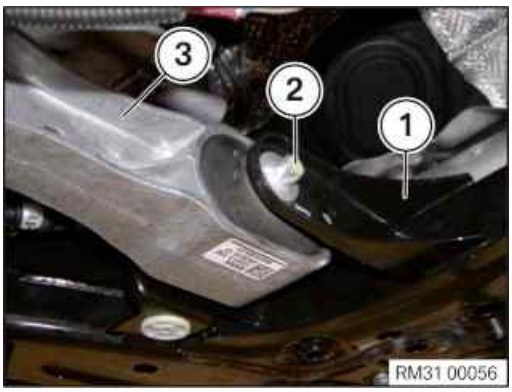
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



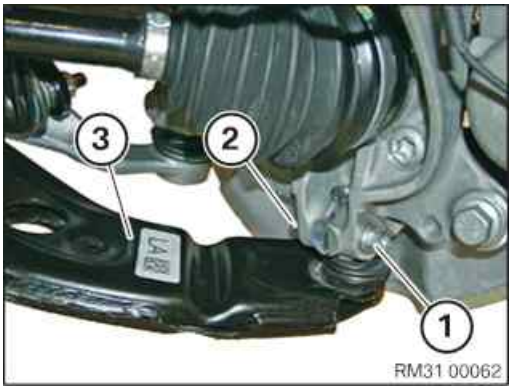
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

33 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .

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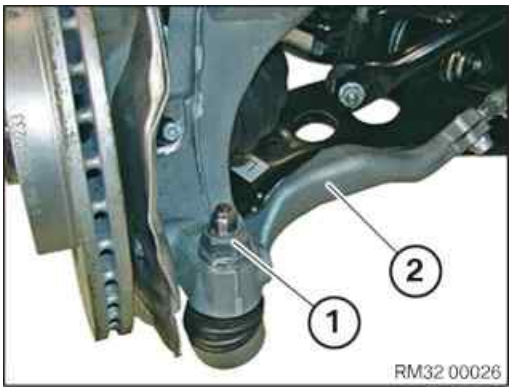
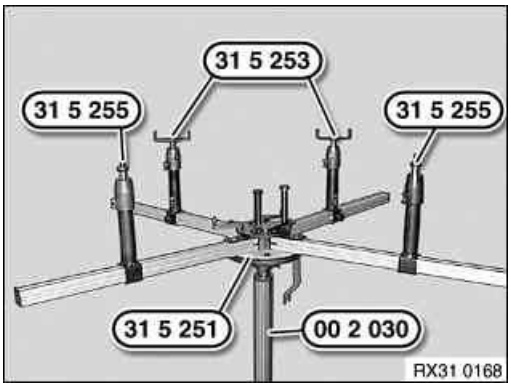


NOTICE

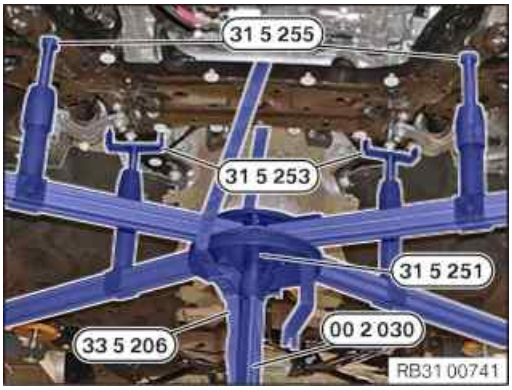
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

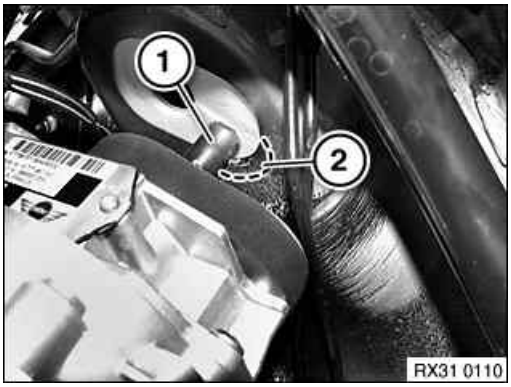
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

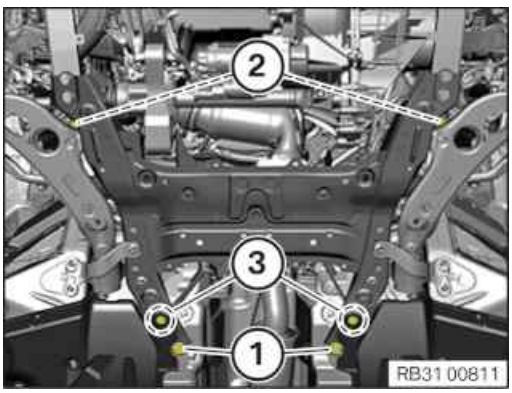


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

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TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

34 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

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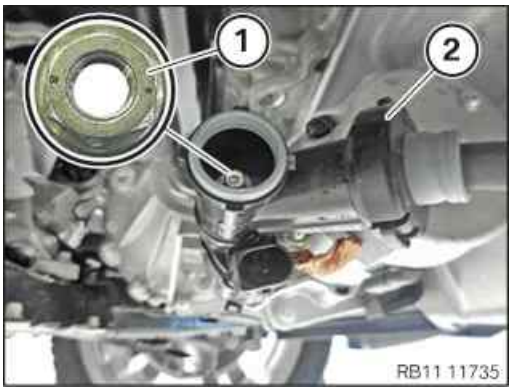
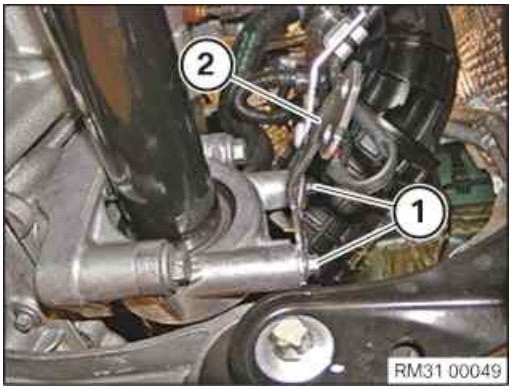


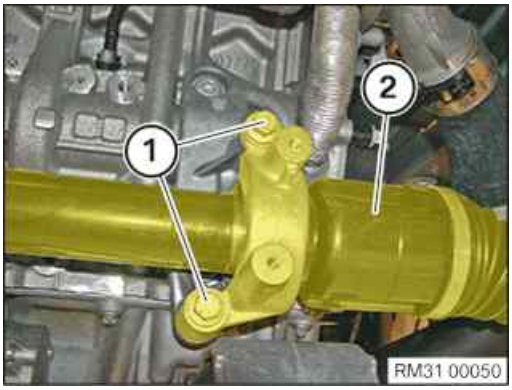
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

- Loosen screws (1).
- Feed out starter motor and remove.

35 – Removing right output shaft partially



- If necessary, unscrew the bolts (1) and remove the holder (heat shield) (2).



- Loosen screws (1).
- Pull out the output shaft (2) from the transmission.
- Tie up output shaft (1).

▸ Remove the left/right radial shaft seal on the differential (manual gearbox)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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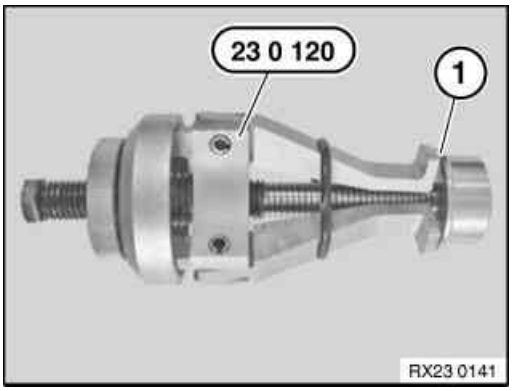
RISK OF DAMAGE

Damage to the transmission.

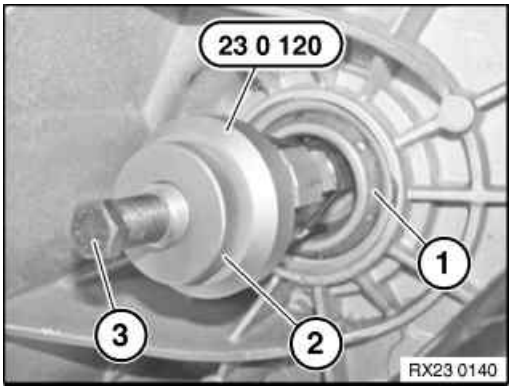
Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



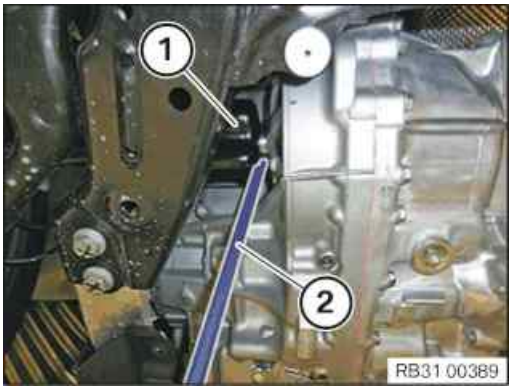
- Prepare special tool **0 496 698 (23 0 120)**.

  The distance (1) must be < 1 mm.



- Insert special tool **0 496 698 (23 0 120)** in the radial shaft seal (1) up to the limit position.
- Spread out the claws by turning the nut (2).
- Screw in screw (3) and pull off the radial shaft seal.

36 – Partially removing the left output shaft



- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

▸ Remove the left/right radial shaft seal on the differential (manual gearbox)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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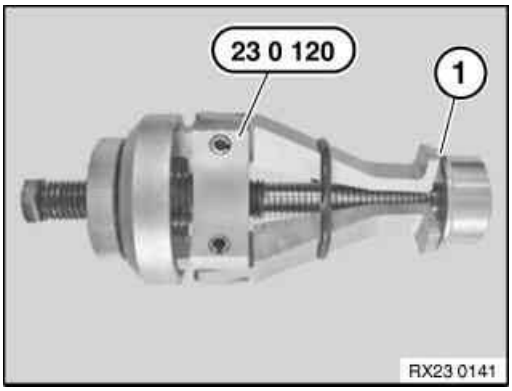
RISK OF DAMAGE

Damage to the transmission.

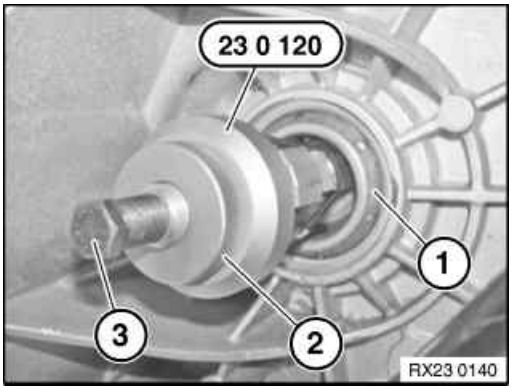
Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Prepare special tool **0 496 698 (23 0 120)**.

  The distance (1) must be < 1 mm.



- Insert special tool **0 496 698 (23 0 120)** in the radial shaft seal (1) up to the limit position.
- Spread out the claws by turning the nut (2).
- Screw in screw (3) and pull off the radial shaft seal.

37 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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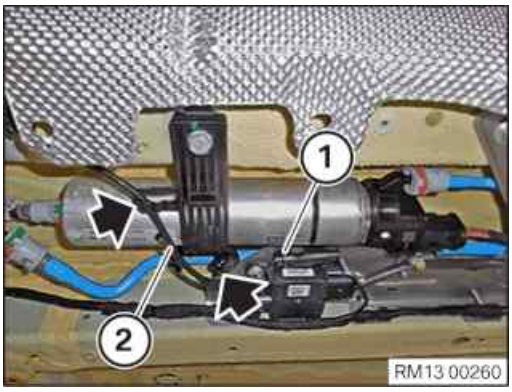
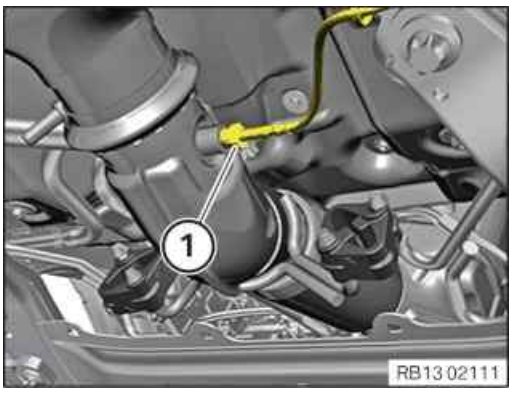


- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

38 – Remove the SCR metering module

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

After repair work, clean the working area thoroughly with water.
Clean special tools with water after every use.

TECHNICAL INFORMATION

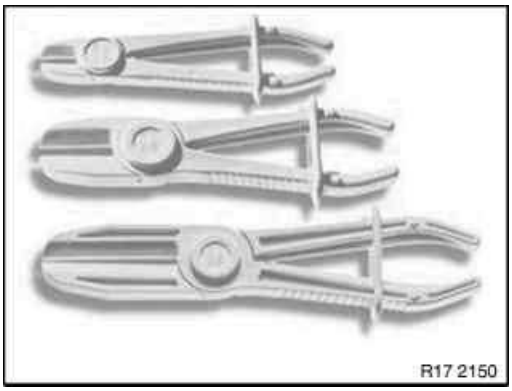
Use only lint-free cloths for cleaning the SCR system: WAYPALL cleaning cloths L20 - see BMW Group Parts.

TECHNICAL INFORMATION

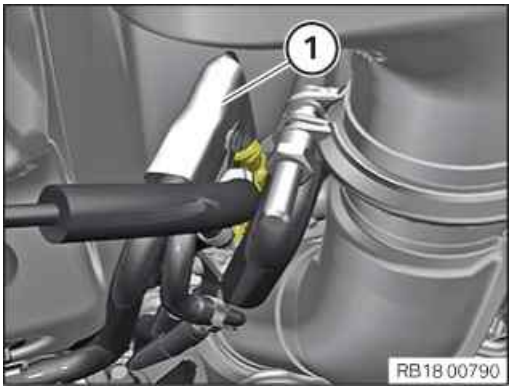
Notes on work at the cooling system form the basis of these repair instructions and must be complied with at all times.
For additional information see: 17 00 ... Instructions for repair work on cooling system

TECHNICAL INFORMATION

Do not unintentionally swap the coolant hoses and coolant lines. If necessary, mark before removal.



- Use commercially available pinch-off tools to pinch off the coolant hoses.



- Guide the heat protection cap (1) out and remove.

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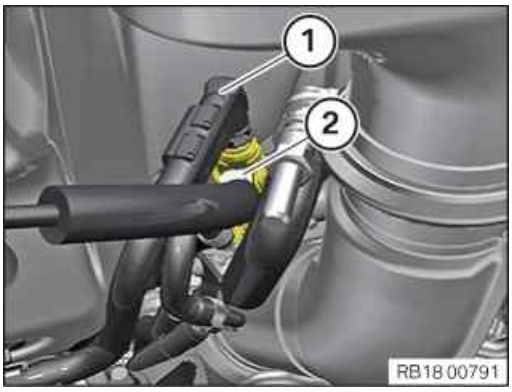
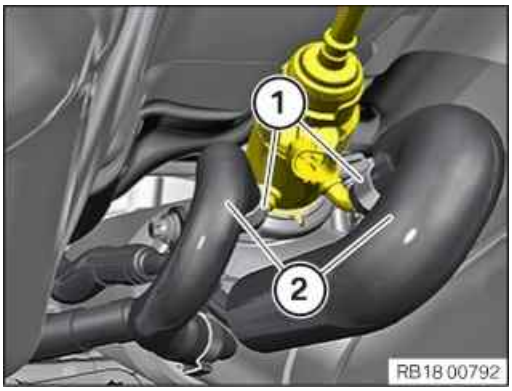
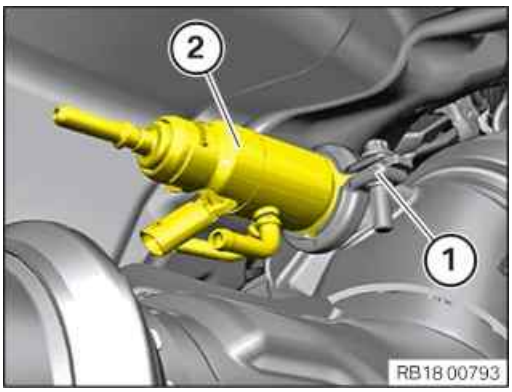


- When releasing the metering line, make sure that **no lateral forces** act on the metering line and the connection.

  The SCR metering module connection can be damaged by lateral forces.
- Unlock and disconnect the metering line (1).
- Unlock and disconnect connector (2).



- Loosen clamps (1).
- Disconnect coolant lines (2).



- Loosen V-band clamp (1).
- Guide out and remove the SCR metering module (2).

MAIN WORK

39 – Removing engine

- Unlock and pull off the fuel lines (1).

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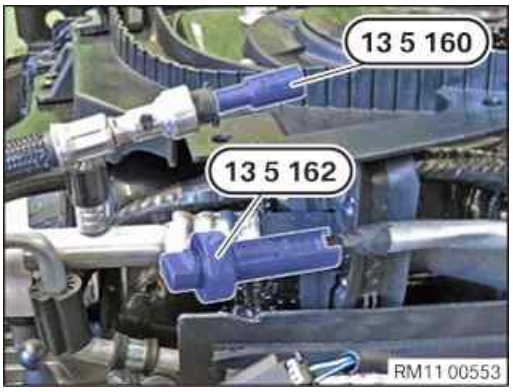
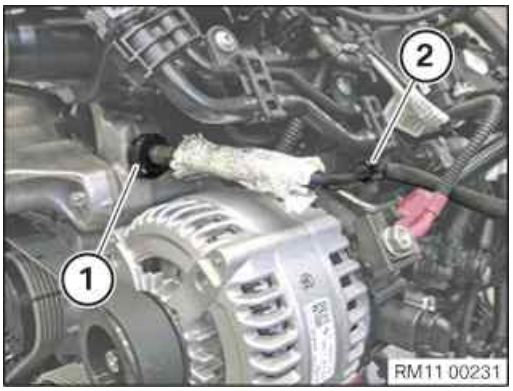
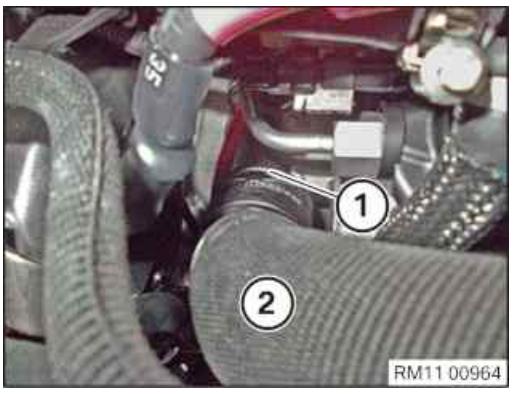


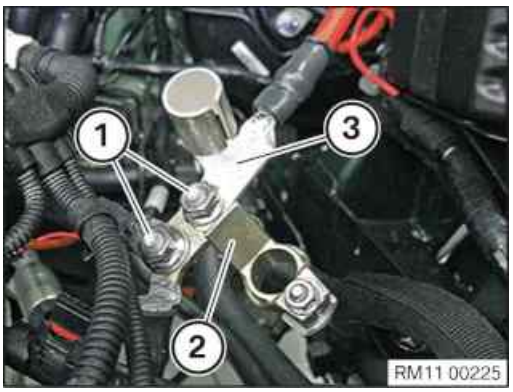
- Seal fuel lines with special tools and .



- Unlock the clamp (1).
- Pull off the coolant line (2) from the cylinder head.



- Unlock lock (1) upwards and pull off coolant hose (2).
- Catch and dispose of escaping coolant.



- Loosen nuts (1).
- Feed out the positive battery terminal (2) and the remote positive terminal (3) and set aside.

- Unscrew the bolt (1) and set the ground strap aside.

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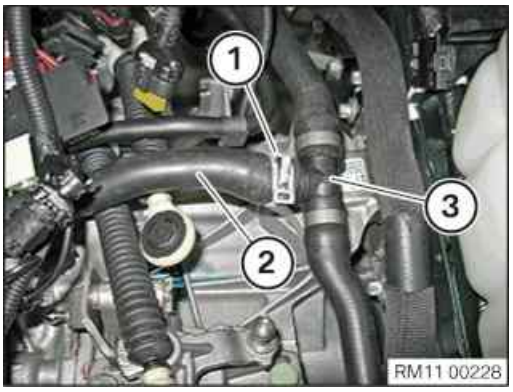
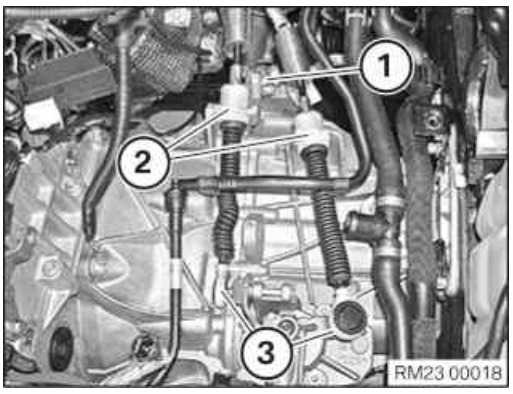
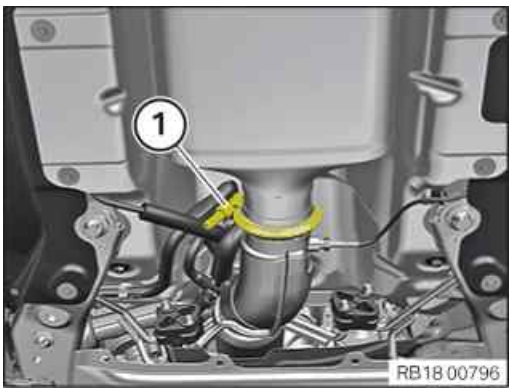


- Detach the clamping collar (1).
- Detach the coolant hose (2) from the coolant line (3).
- Catch and dispose of escaping coolant.

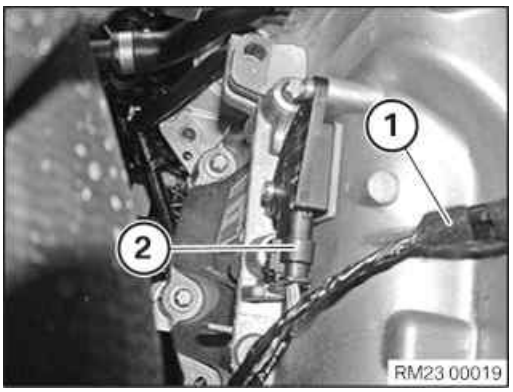
- Unlock and disconnect the vacuum line (1).



- Release screw (1) and guide out the ground strap and set it aside.
- Unlock safeguards (2) on the holders of the gear selector cables and remove.
- Lever fixtures (3) of the gear selector cables with an AF 13 open-end spanner off the ball joints.



- Loosen V-band clamp (1).
- Release exhaust system from diesel particulate filter.



- Unlock plug connection (2) and disconnect.
- Release cable (1) with the holder from the transmission.

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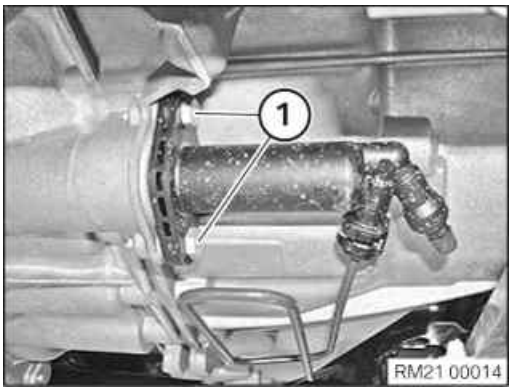
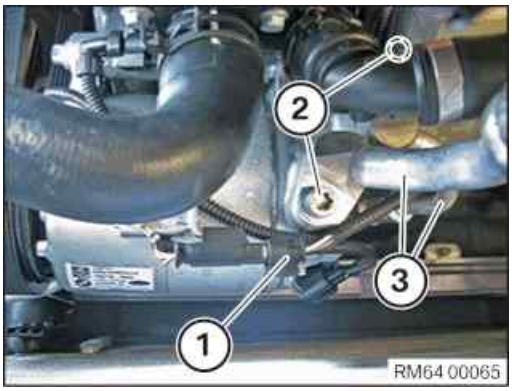


- **Ensure that the clutch slave cylinder remains connected to the pressure line.**
- Loosen screws (1).
- **Slowly** release clutch slave cylinder and remove.



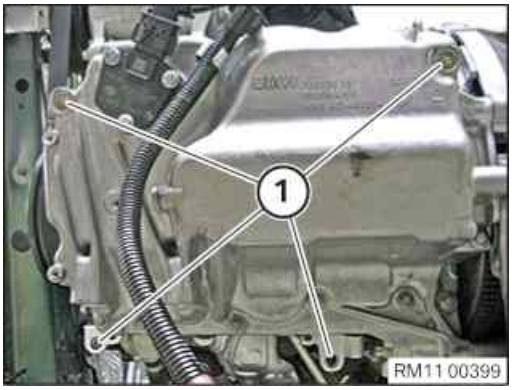
CAUTION

Residual pressure in the air conditioning.

Danger of injury!

- Wear safety goggles and protective gloves when disconnecting the refrigerant line.
- Seal refrigerant lines with seal plugs.

- Unlock plug connection (1) and disconnect.
- Loosen screws (2).
- Feed out the refrigerant lines (3) and set them aside.
- Close the openings on the refrigerant lines (3) and the air conditioning compressor with standard tools.



- Ensure that the **40/50** distance pins of table top **A** of the mobile lifting table are installed in mounting points (1) of the oil sump.

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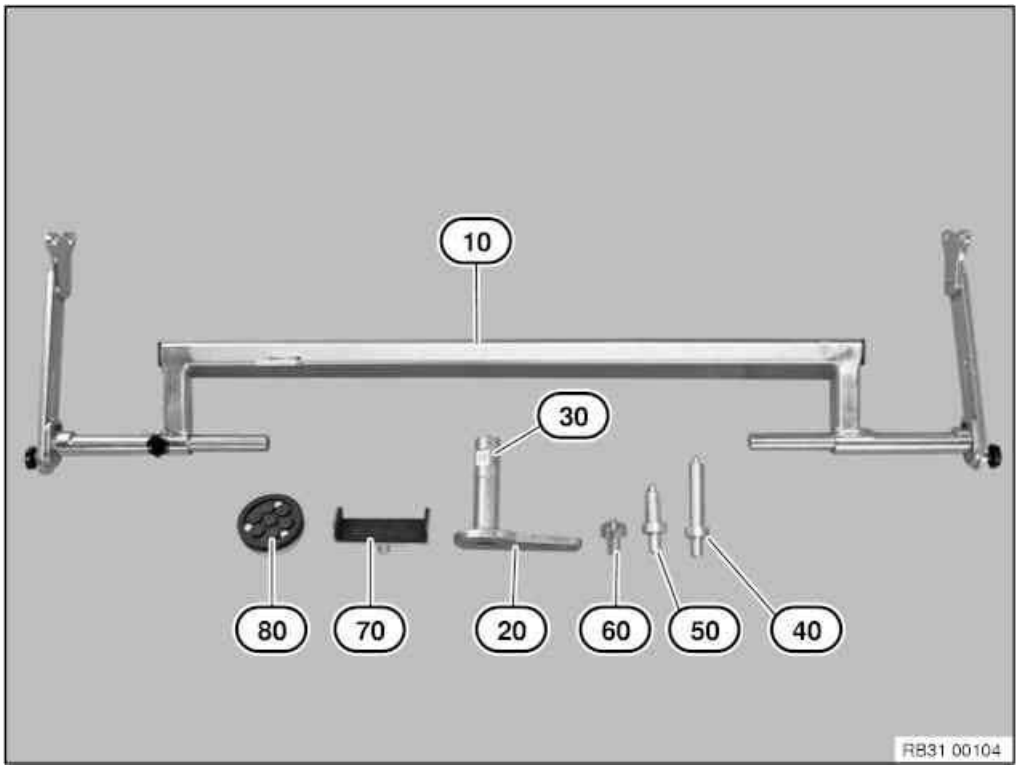
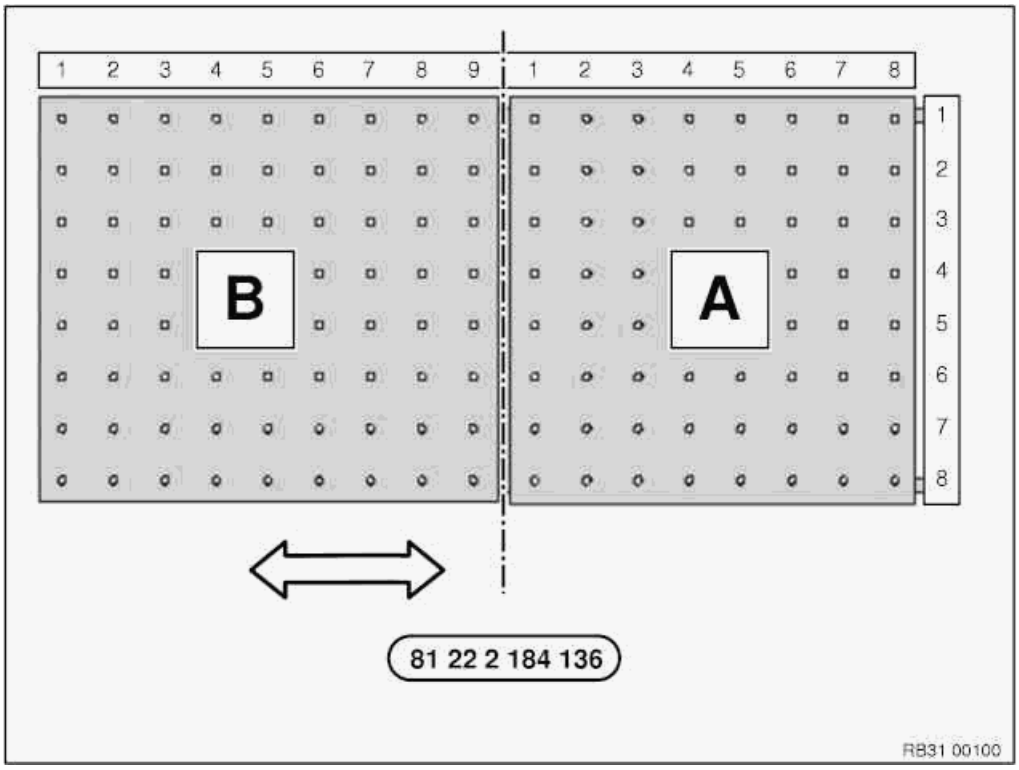


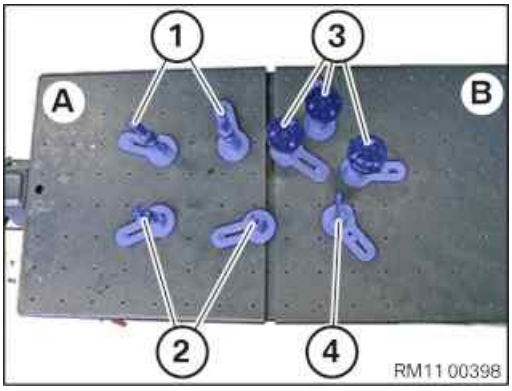
- Overview of the set of special tools **2 305 379**:

Number	Description
10	For mounting swivel bearing with brake disc
20	Retaining element for adjustable fixture
30	Adjustable fixture
40	Distance pin 40 x 160 mm
50	Distance pin 40 x 110 mm
60	Distance pin 40 x 60 mm
70	Fixture with U-profile
80	Plate mounting 100 mm



- Overview of special tools **2 184 136**:

Letter	Description
A	Table top for engine with coordinates
B	Table top for transmission with coordinates



- Position adjustable fixture (30) with distance pin (40) for the engine block on table top (A) at the coordinates **5/6** and **1/7** (1).
- Position adjustable fixture (30) with distance pin (50) for the engine oil sump on table top (A) at coordinates **5/3** and **2/3** (2).
- Position adjustable fixture (30) with distance pin (80) for the transmission housing on table top (B) at coordinates **6/5**, **2/5** and **2/7** (3).
- Position adjustable fixture **2 357 221** for transmission housing on table top (B) at coordinates **6/3** (4).

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- Position the lifting table below the engine.
- Abut all fixtures and screw them to the lifting table.

- Attach the adjustable fixture **2 357 221** to the housing of the clutch slave cylinder with screw (1).

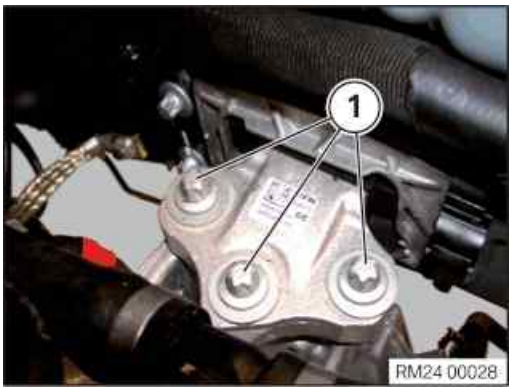
WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

- Position the weight compensation (1) on the vehicle.



WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

- Loosen screws (1).

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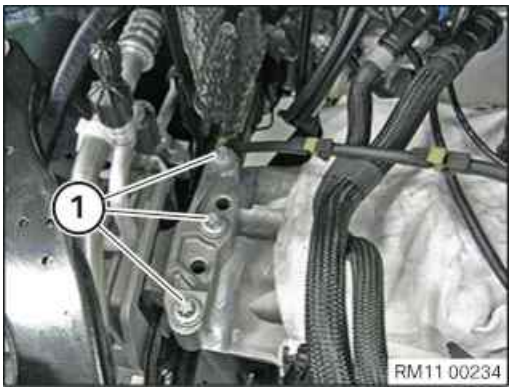


WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

- Loosen screws (1).
- Raise the vehicle **carefully**.

40 – Install engine

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

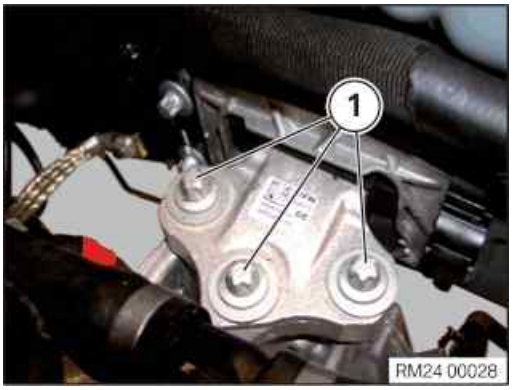
WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

- Position the lifting table and the engine under the vehicle.
- **Carefully** lower the vehicle and, if necessary, position the lifting table **correctly** for the vehicle.



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Transmission mounting

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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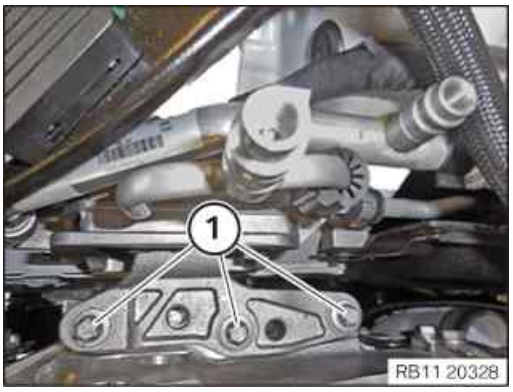


- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1).

Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

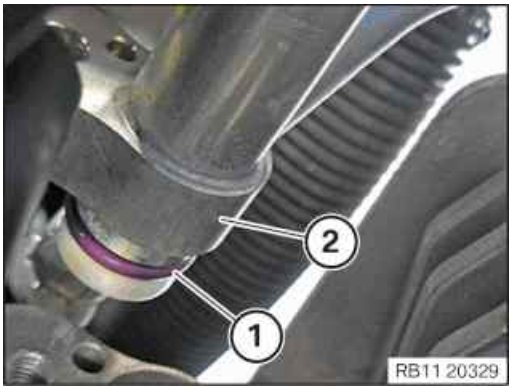
WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

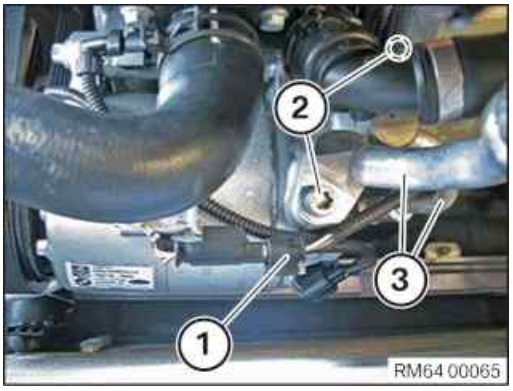
- Ensure there is a specific weight compensation on the motor vehicle.

- Remove weight compensation (1) from the vehicle.
- Lower lifting table(2) and put to one side.



- Replace the sealing ring (1) on the coolant lines (2).

  Parts: Sealing ring

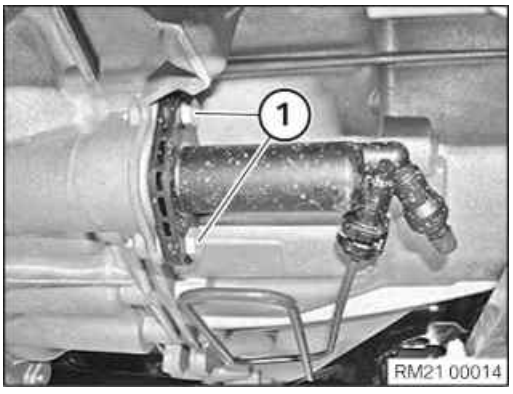


- Feed in and install the refrigerant lines (3).
- Tighten down screws (2).

Refrigerant line on air conditioning compressor

M8		Tightening torque	19 Nm

- Connect connectors (1) and lock.
- Make sure the connector (1) engages audibly.



- Feed in and install the clutch slave cylinder .
- Tighten the screws (1).

Clutch slave cylinder to transmission housing

M8		Tightening torque	19 Nm

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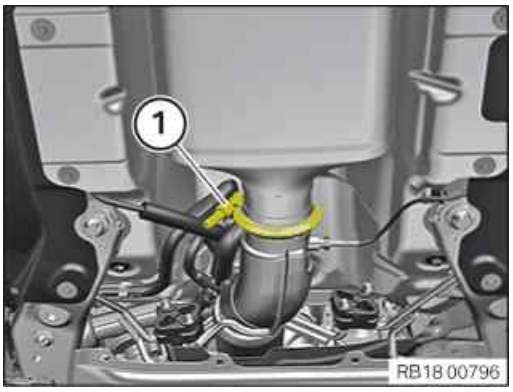
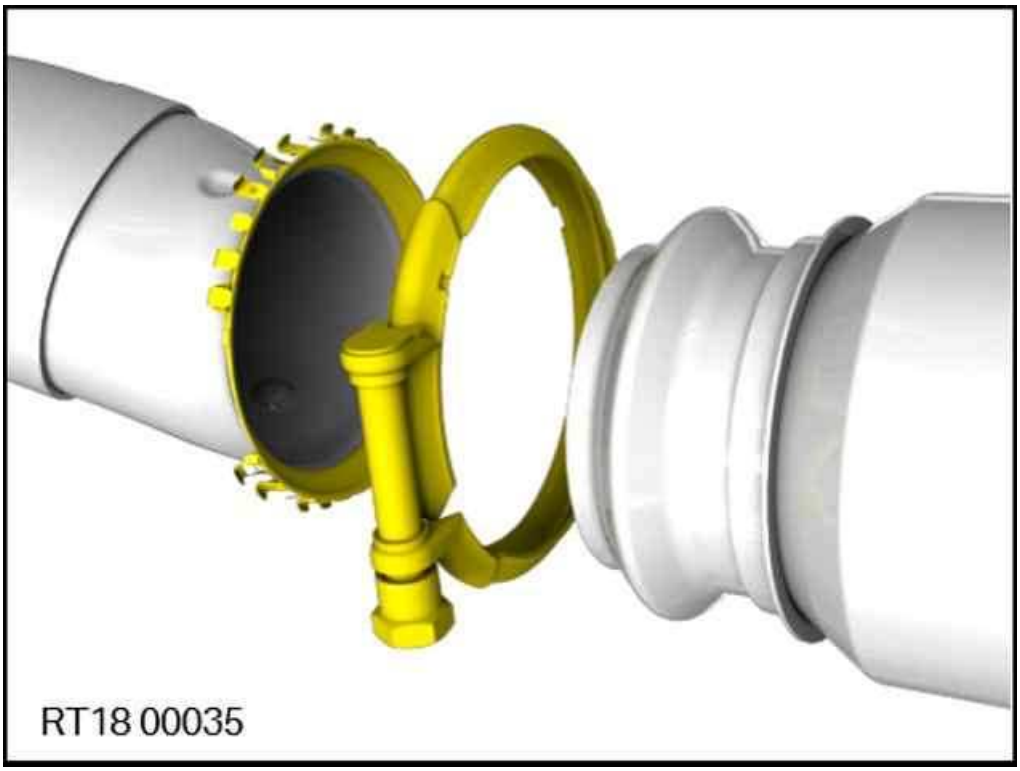
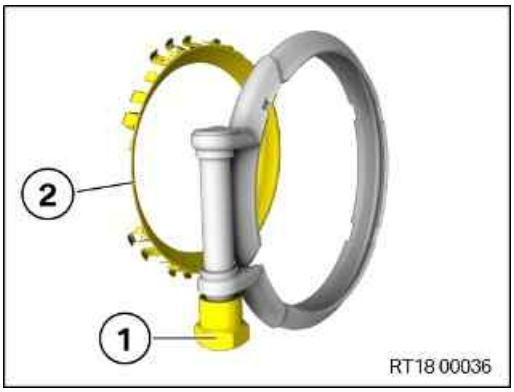


- Connect exhaust system to the diesel particulate filter.
- Feed in and install V-band clamp (1).

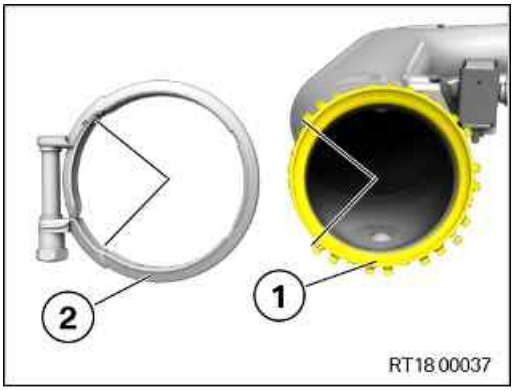
▸ **Install the V-clip**

V-band clamp





- Unscrew the nut (1) and remove the sealing ring (2).



- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.

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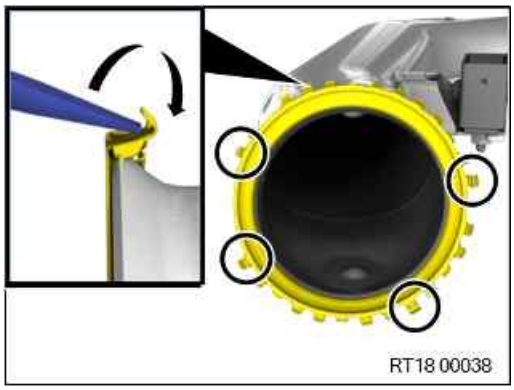
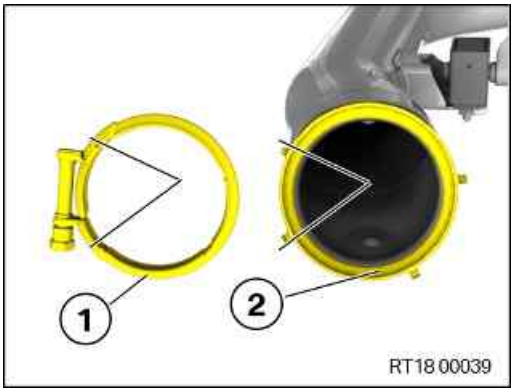
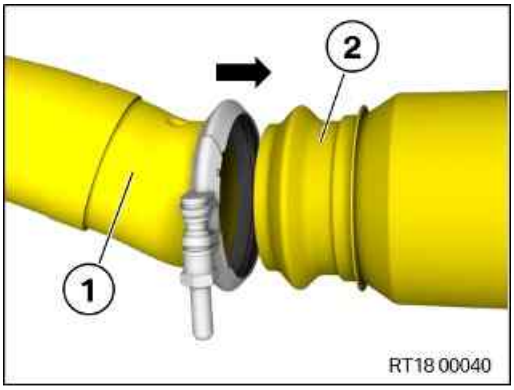


- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

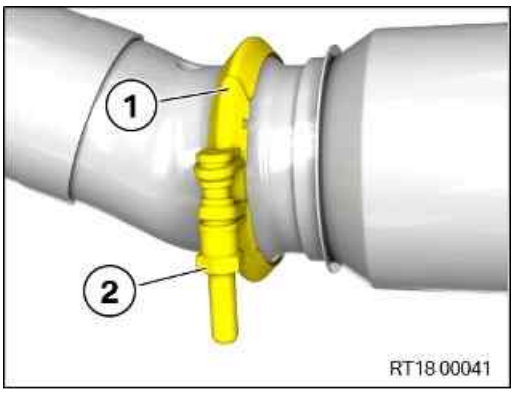


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

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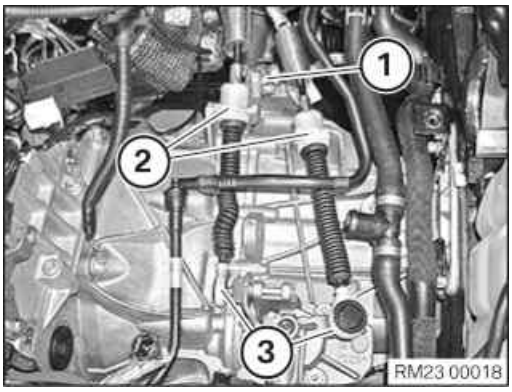
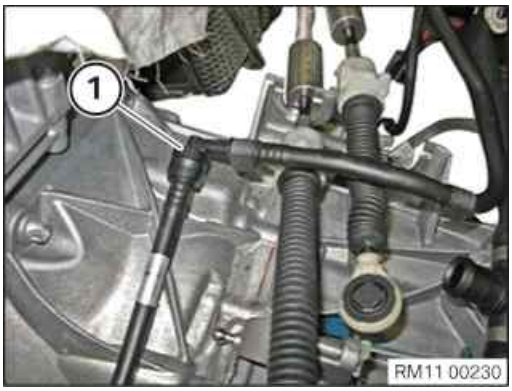


- Insert earth strap and tighten the screw (1).

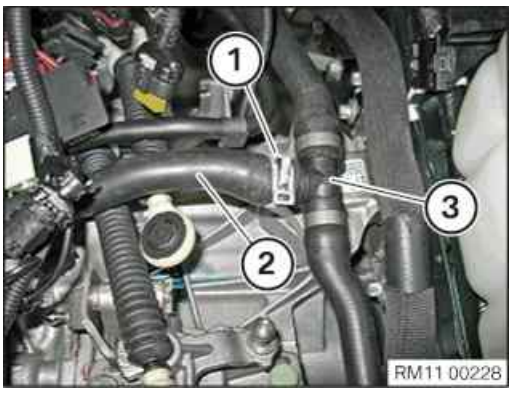
Standard screw connection M8

M8		Tightening torque	19 Nm

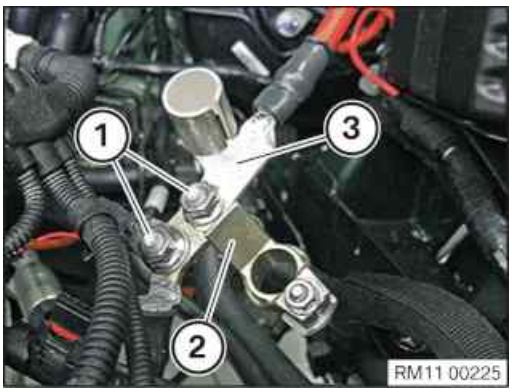
- Attach fixtures (3) of gear selector cables to the ball joints and engage.
- Insert gear selector cables in the holders and secure in the holders with safeguards (2).



- Connect the vacuum line (1) and lock.
- Make sure you can hear the vacuum line (1) engage.



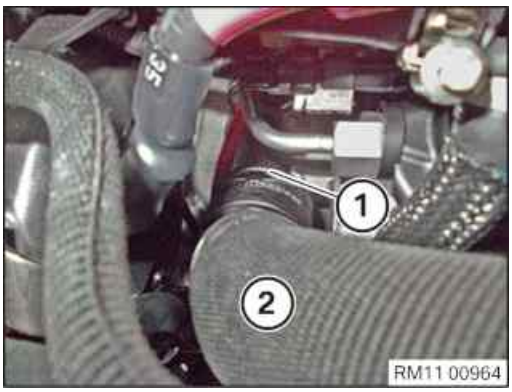
- Insert and install the coolant hose (2) on the coolant line (3).
- Fasten the clamping collar (1).



- Insert and install the positive battery terminal (2) and the remote positive terminal (3).
- Tighten nuts (1).

Positive battery cable to positive battery terminal

M8		Tightening torque	15 Nm



- Connect and lock the coolant lines (2).
- Ensure that the lock (1)engages audibly.

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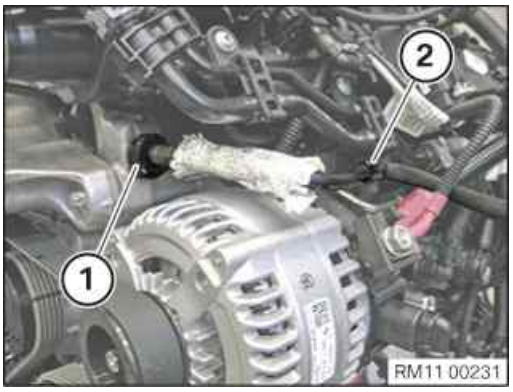
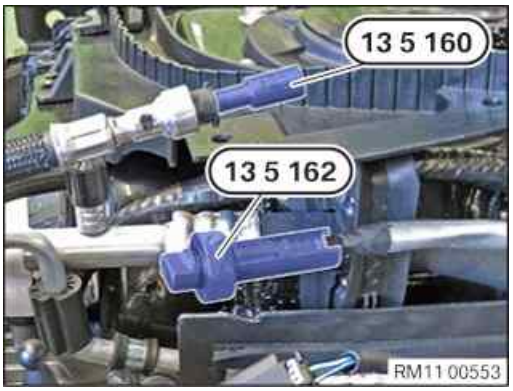


- Connect the coolant line (2).
- Lock clamp (1).

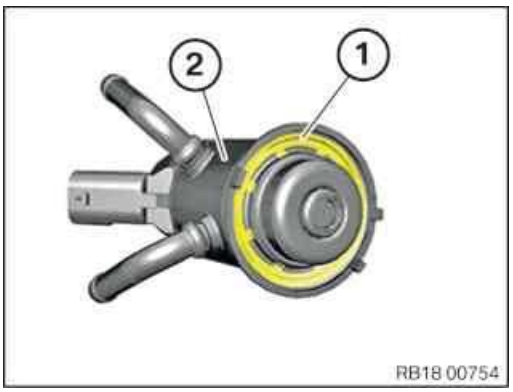


- Thread out special tools and and remove.

- Route and connect fuel lines (1).
- Ensure that the lock engages audibly.

POSTPROCESSES

41 – Install the SCR metering module



- Renew the seal (1) of the SCR metering module (2).

  Parts: Sealing ring

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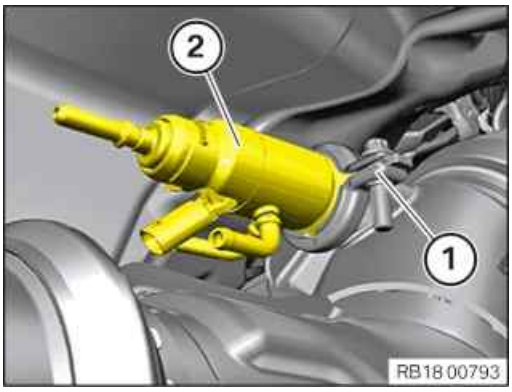
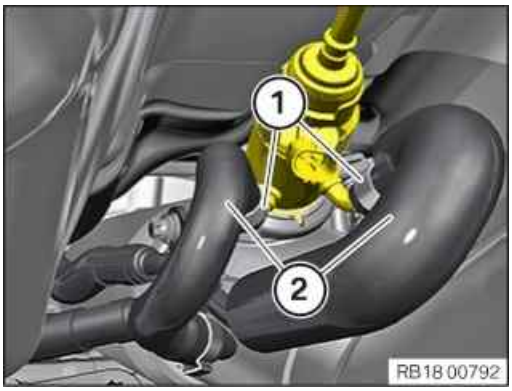


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

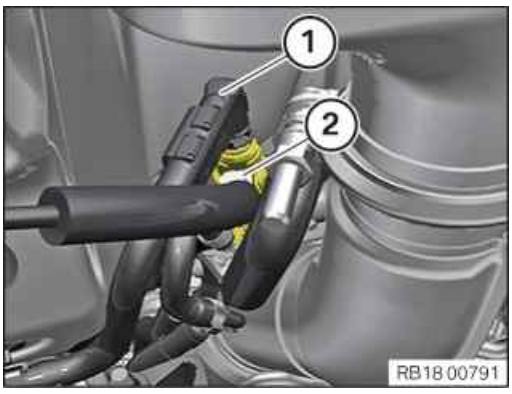
SCR metering module V-clip to exhaust system

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Connect the coolant lines (2).
- Renew the clamps (1).

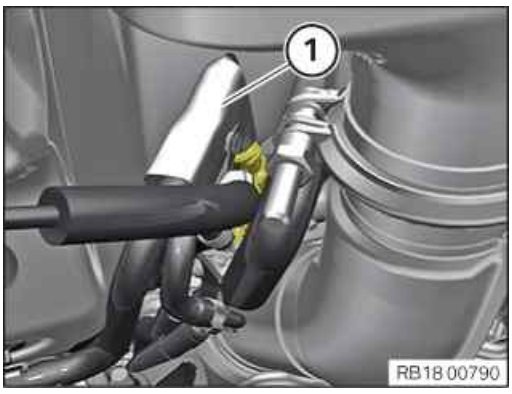
  Parts: Clamps
- Fasten the clamps (1).



- Connect connectors (2) and lock.

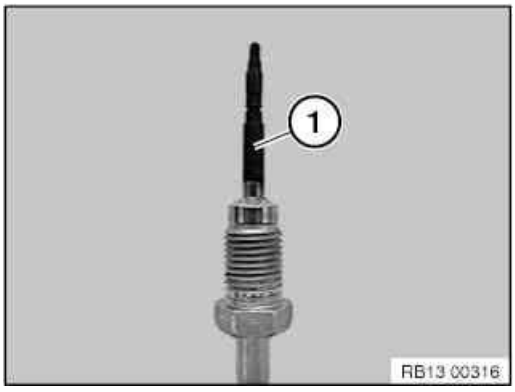
  The connector (2) must engage audibly.
- Connect and lock the metering line (1).

  Metering line (1) must engage audibly.



- Insert and install the heat protection cap (1).

42 – Installing exhaust temperature sensor on catalytic converter



RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.
- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.

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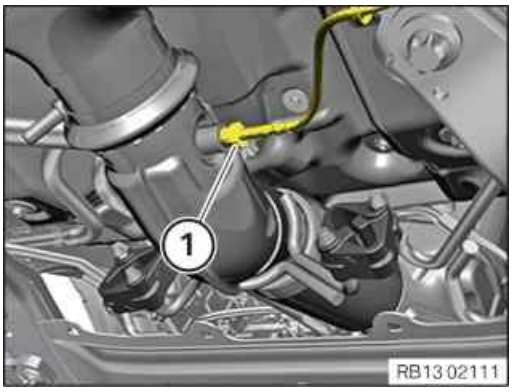
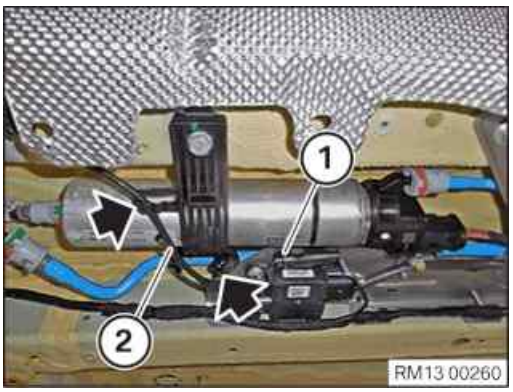


- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

43 – Installing right output shaft partially

▸ Installing the radial shaft seal, right in the differential (manual gearbox)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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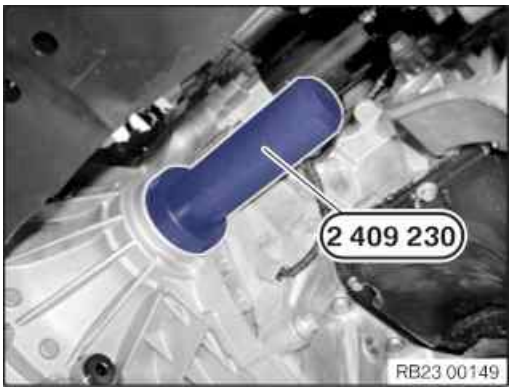
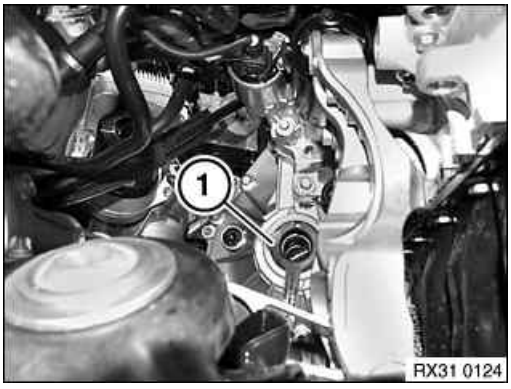


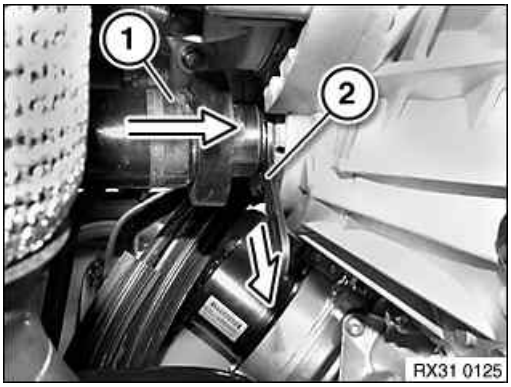
- Coat sealing lips of radial shaft seal with transmission oil.
- Drive the radial shaft seal into the housing with the special tool **2 409 230** until the sealing ring finishes flush with the transmission housing.

- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

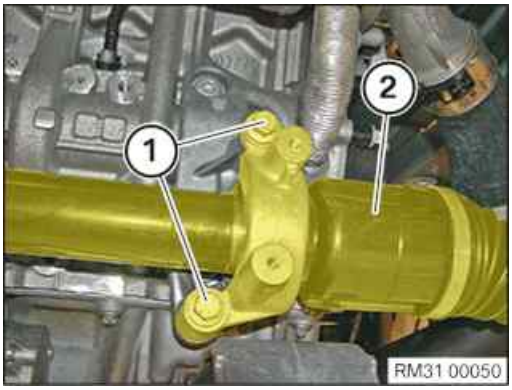
  Parts: O-ring
- Insert new O-ring (1).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.
- Check for secure seat by levering.



- Tighten the screws (1).

Output shaft bearing to engine block

M10		Tightening torque	38 Nm

44 – Partially installing the left output shaft

▸ **Installing the left radial shaft seal on the differential (manual gearbox)**

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CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

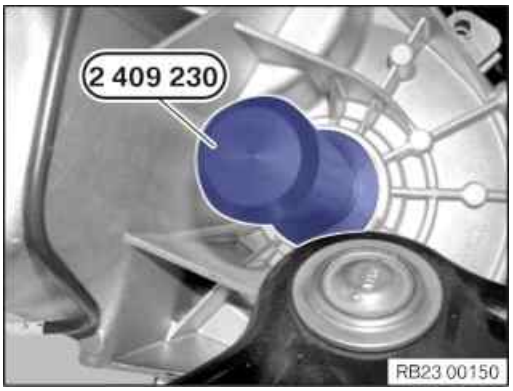
- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

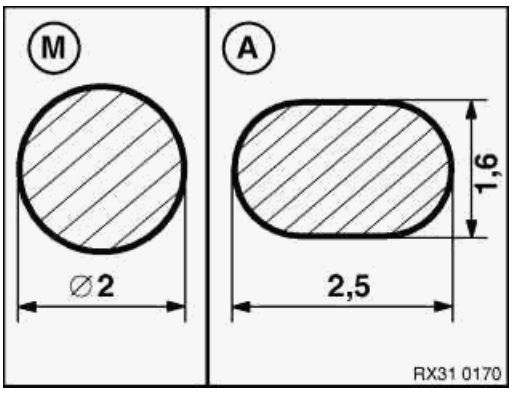
- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Coat sealing lips of radial shaft seal with transmission oil.
- Drive the radial shaft seal into the housing with the special tool **2 409 230** until the sealing ring finishes flush with the transmission housing.

- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).



- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission

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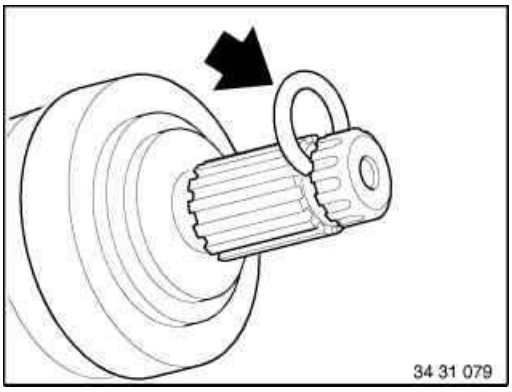
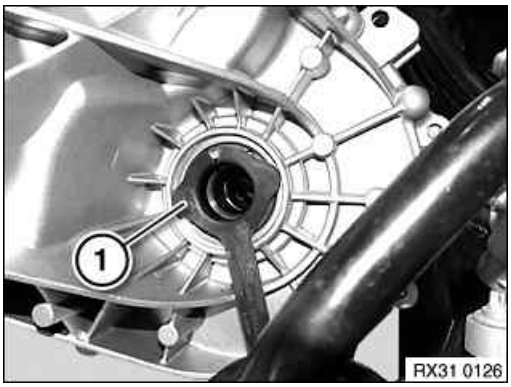
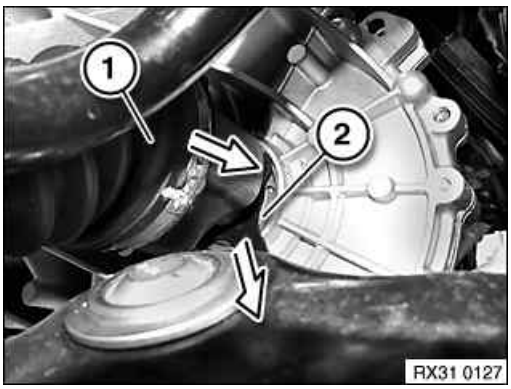


- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

45 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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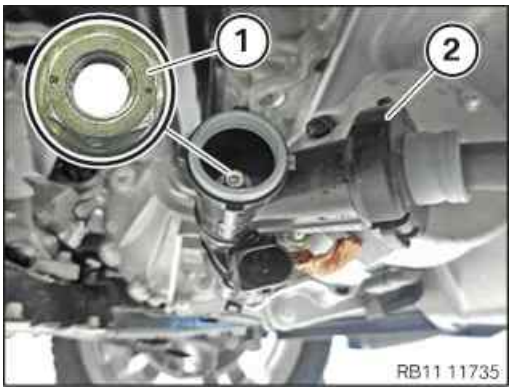


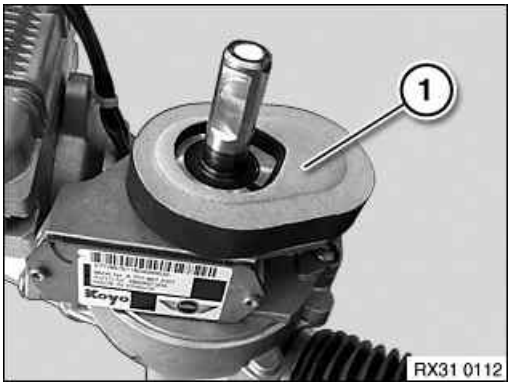
- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

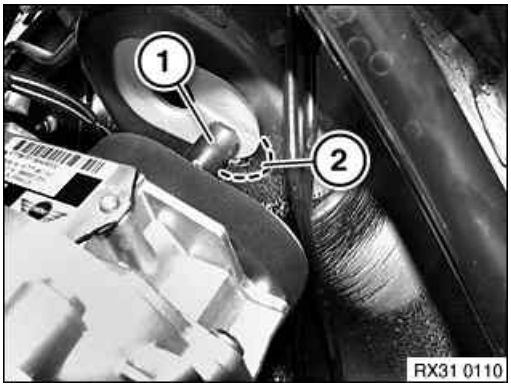
- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

46 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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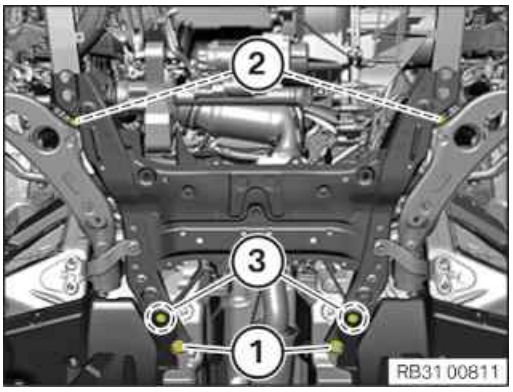


- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

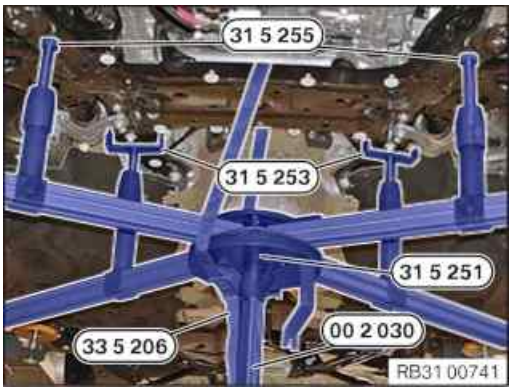
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

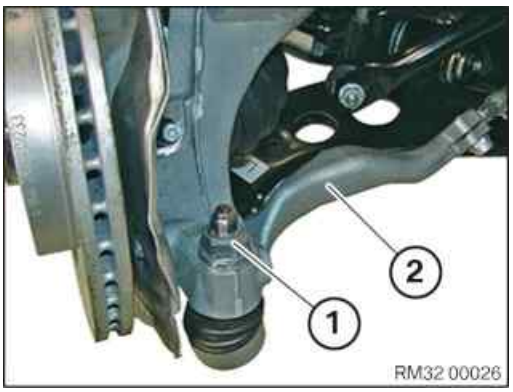
- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.



NOTICE

Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm

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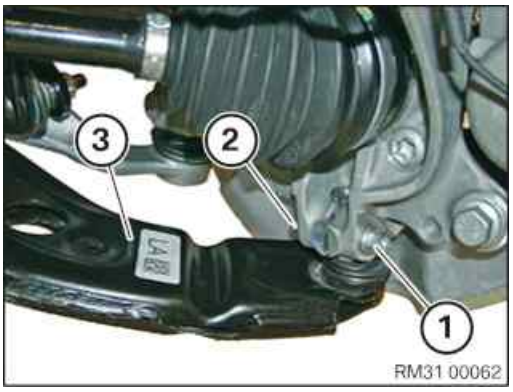


NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

47 – Install the mounted parts on the front axle support

NOTICE

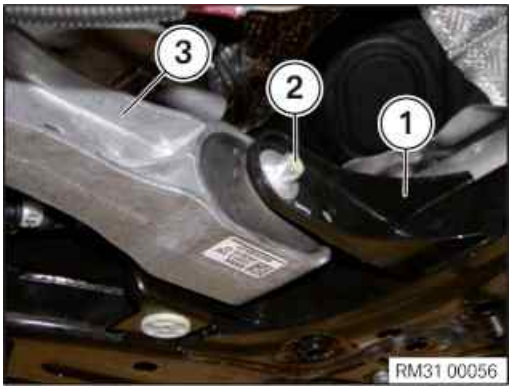
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

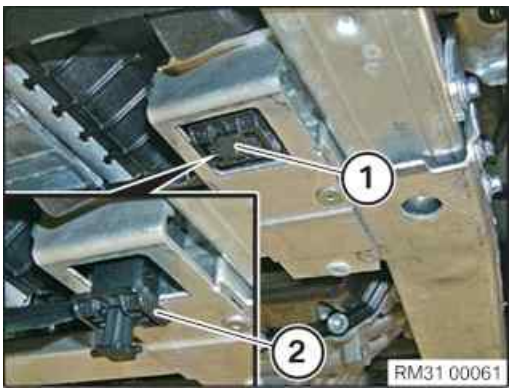
M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.

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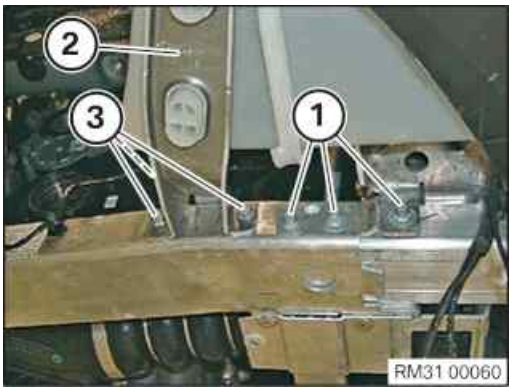


- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

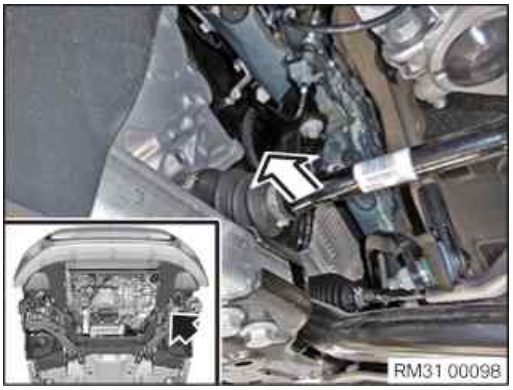
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

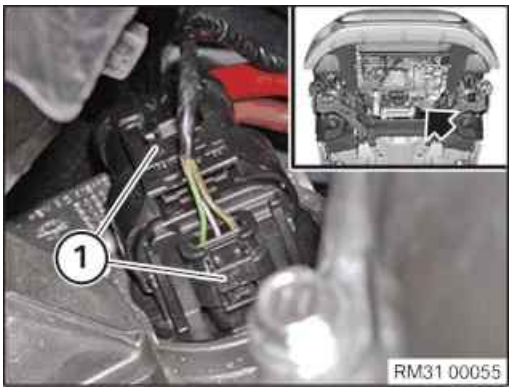
		Tightening torque	11,8 Nm

48 – Attaching connector at steering gear

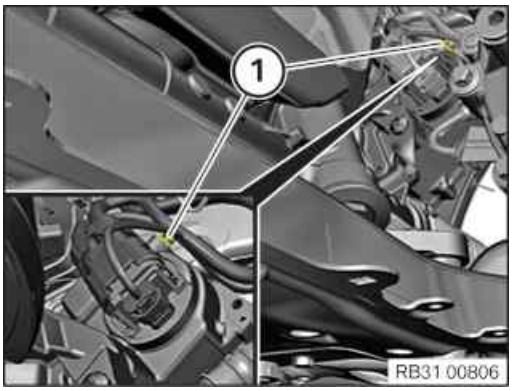


- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**

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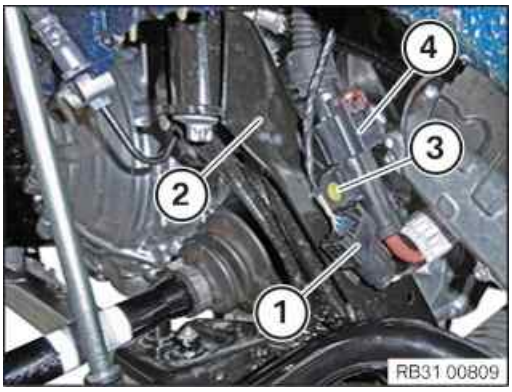


- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

49 – Securing rubber mount on front axle support

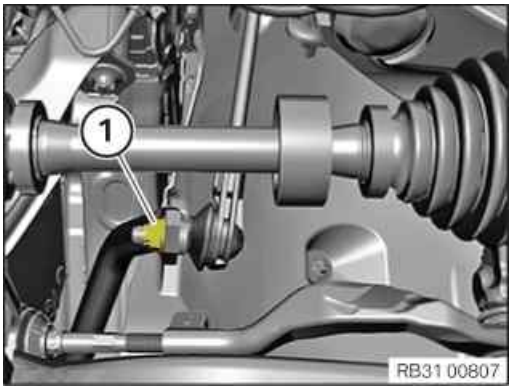
- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

50 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.



▸ **Fastening anti-roll bar on the anti-roll bar link**

- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

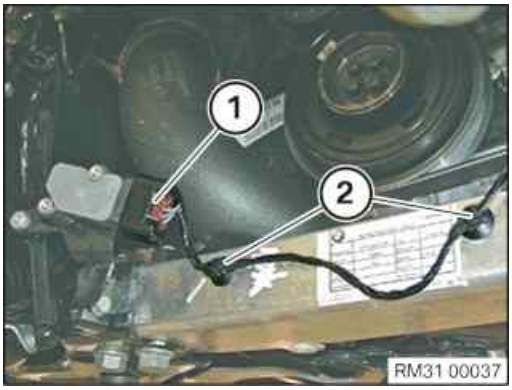
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

51 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

52 – Installing pressure pipe between throttle body and charge air cooler

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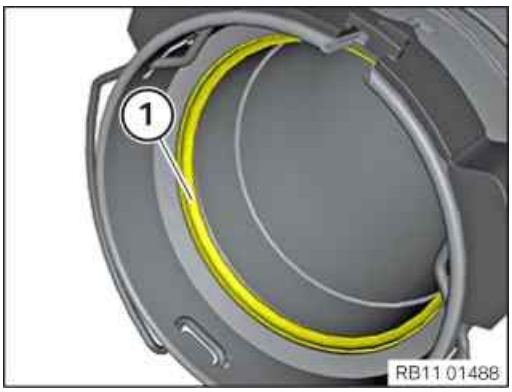
RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



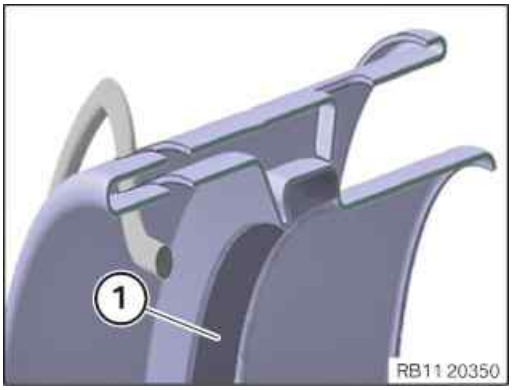
- Check seal (1) for damage and renew seal (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

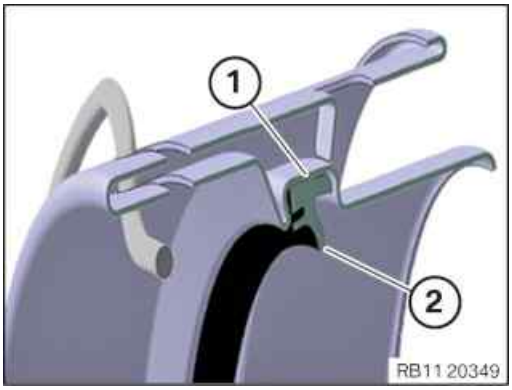
TECHNICAL INFORMATION

Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).

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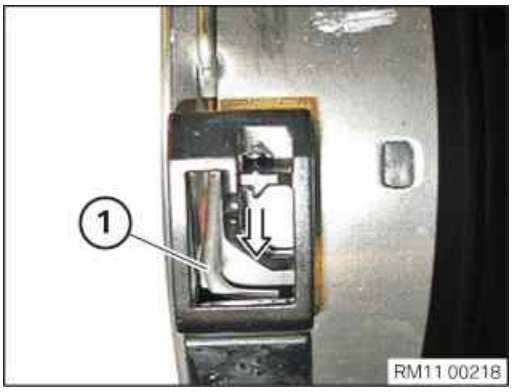
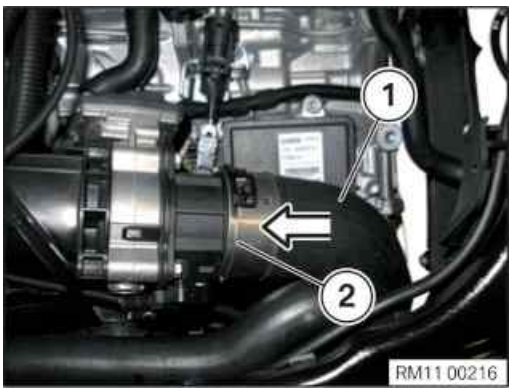
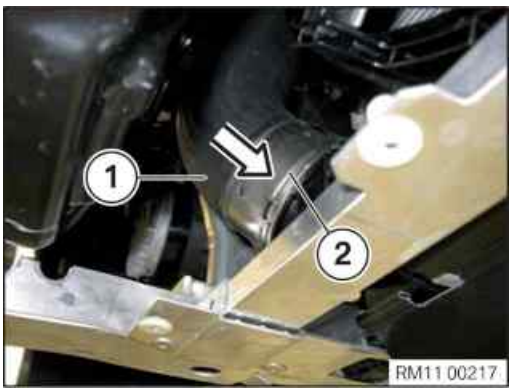


- Detach the locks (1) in the direction of the arrow from the brackets.

- Insert and install the pressure pipe (1) in the direction of the arrow.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (1) engage audibly.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (2)engage audibly.

53 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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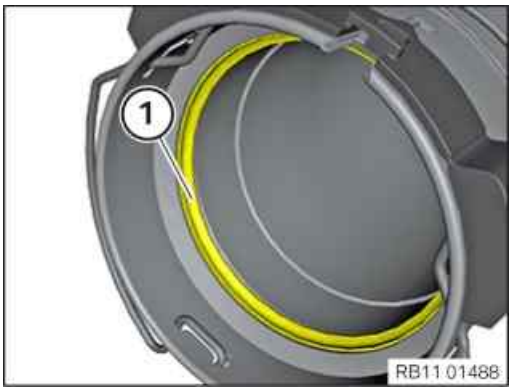
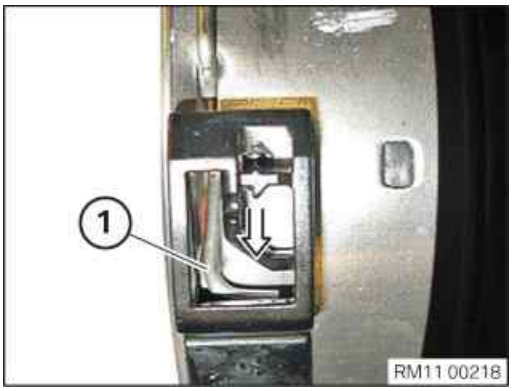
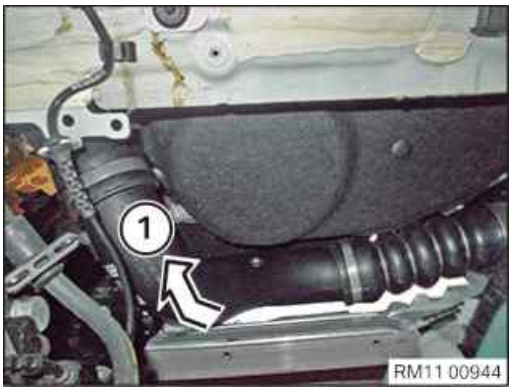


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

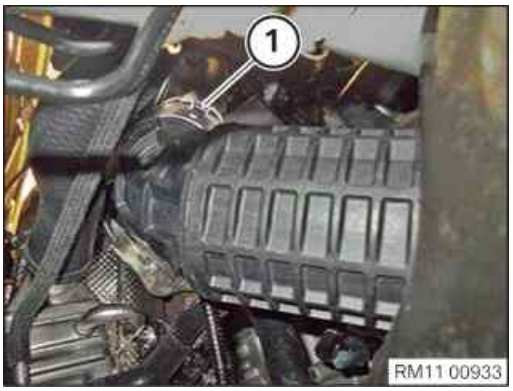
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

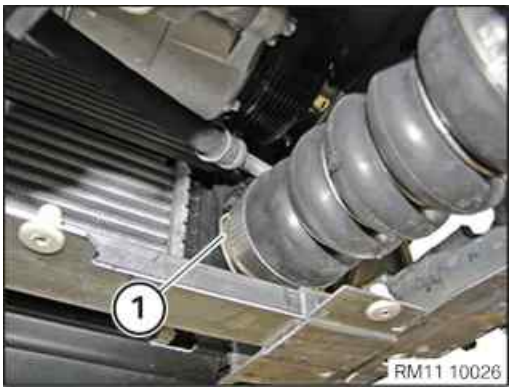


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

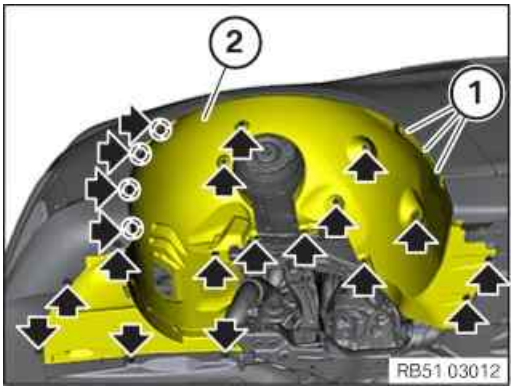
Charge air duct to oil sump

M6		Tightening torque	8 Nm

54 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.



▸ **Installing the front wheel arch cover**

- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

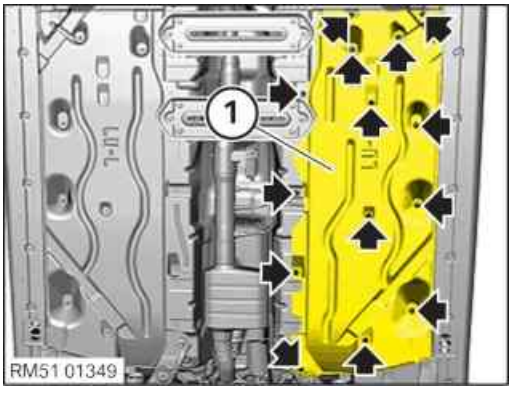
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

55 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

56 – If installed: Installing underbody protection at rear

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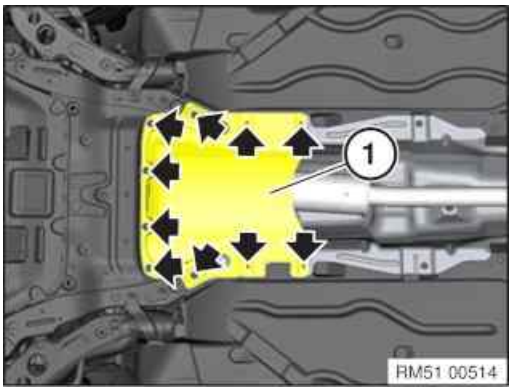
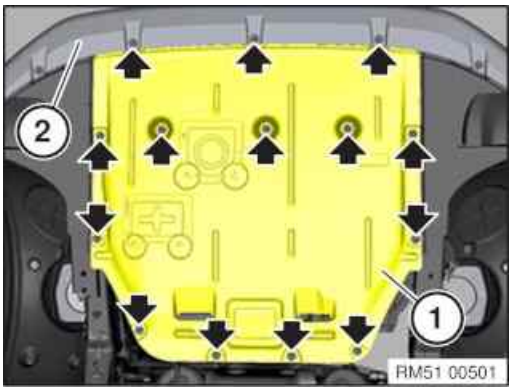


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

57 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

58 – Mount the front left and right wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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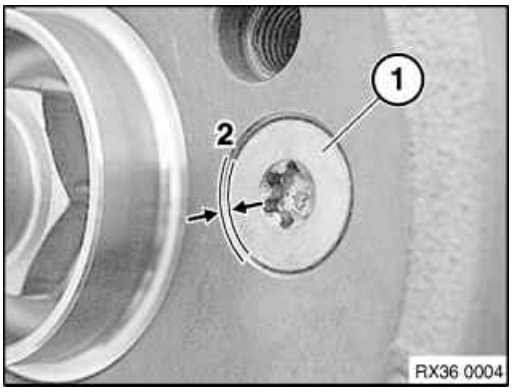


- Check the mounting bolt for the brake disc (1) for secure fit.

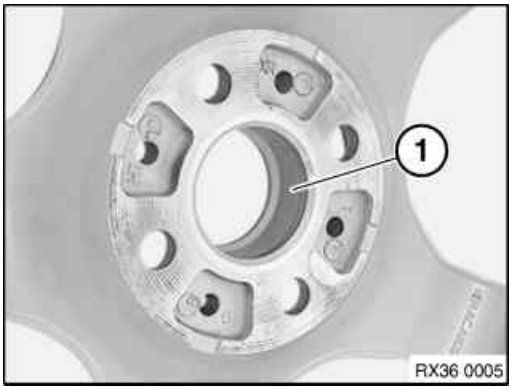
  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

◁

TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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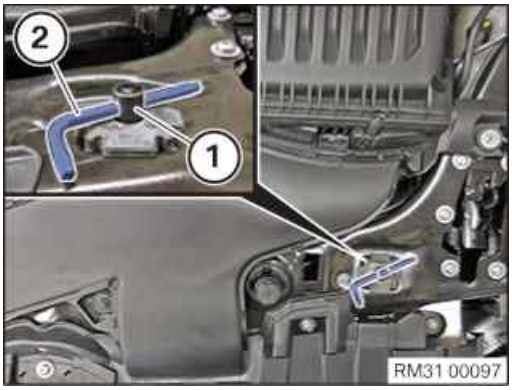
59 – Removing fastener for left and right radiator

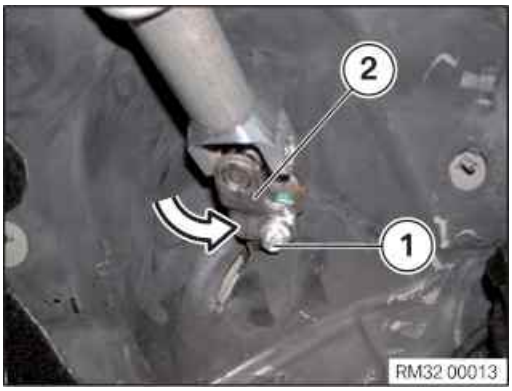


NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

60 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

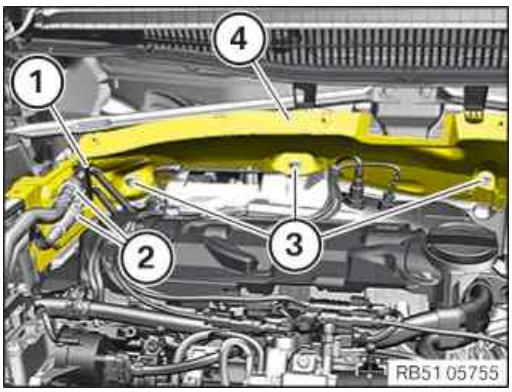
M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

61 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

62 – Install the battery holder

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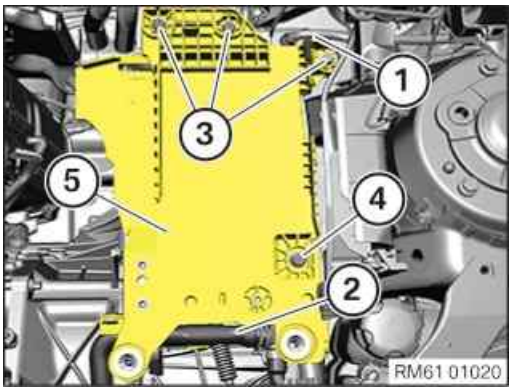


- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

63 – Install electronics box

Prerequisite

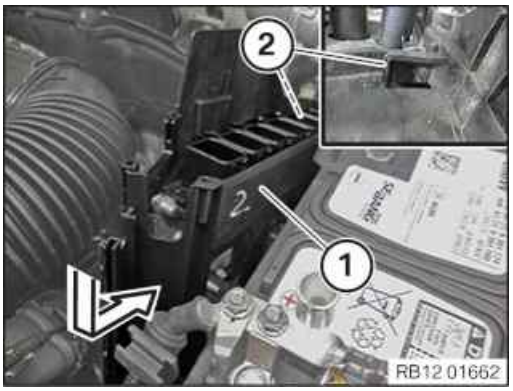
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

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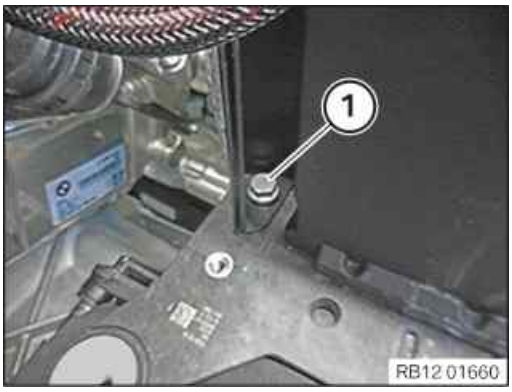
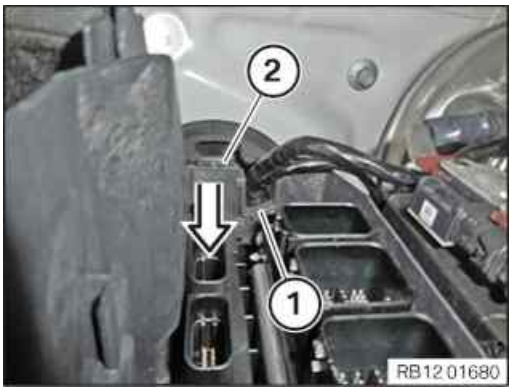


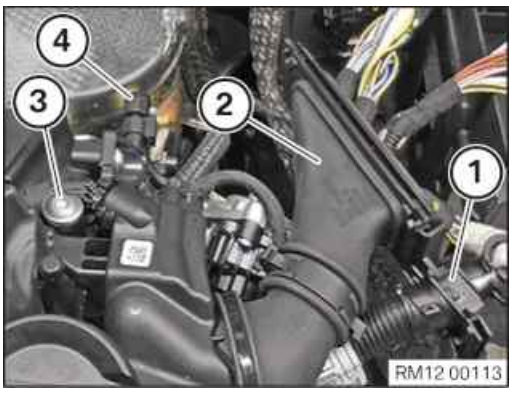
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

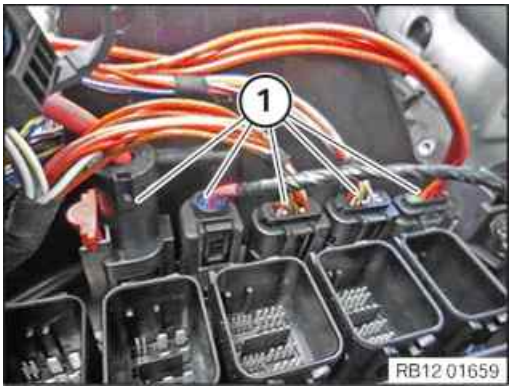


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

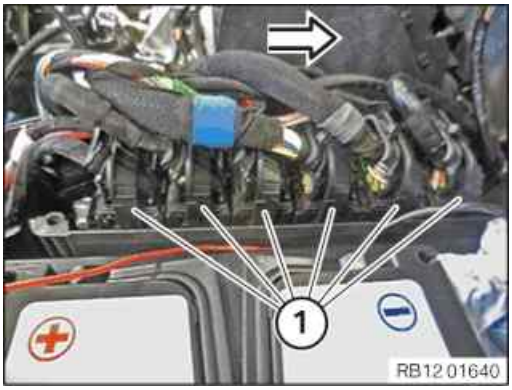
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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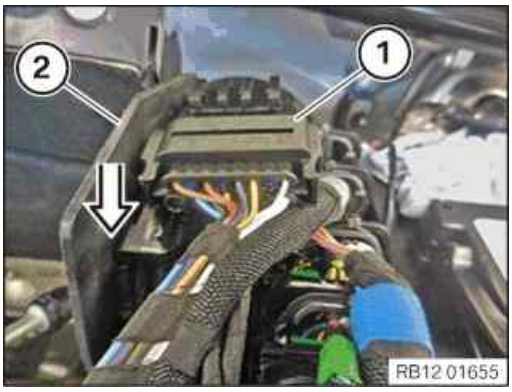
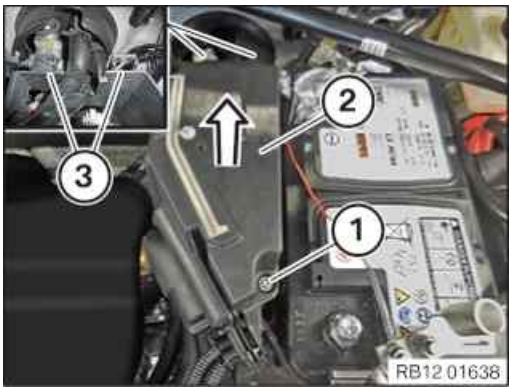


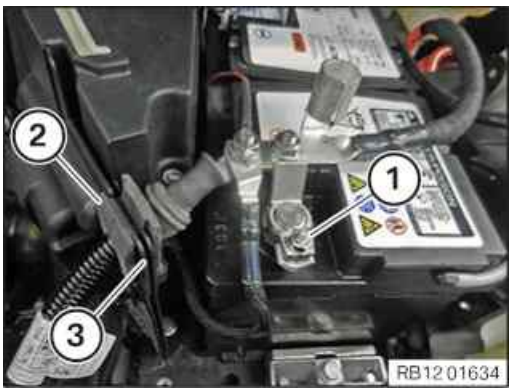
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

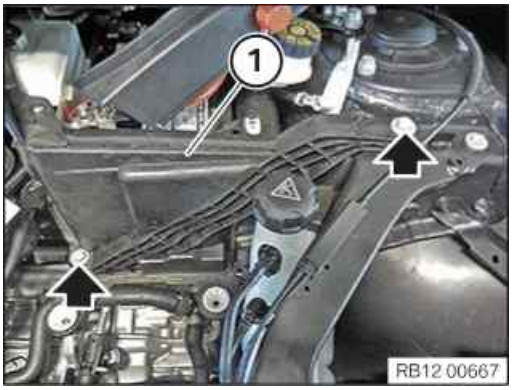
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

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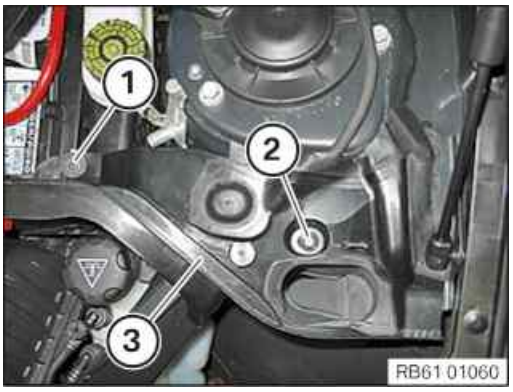
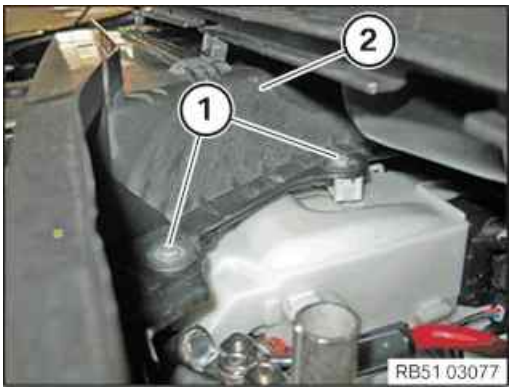


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

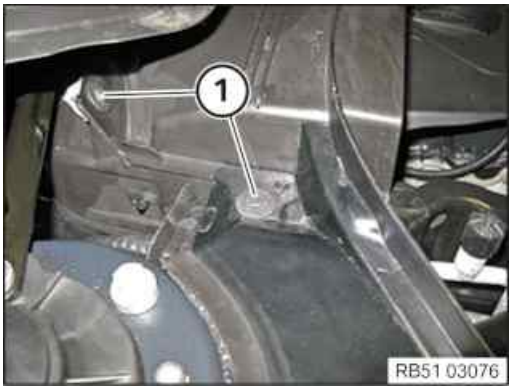
64 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

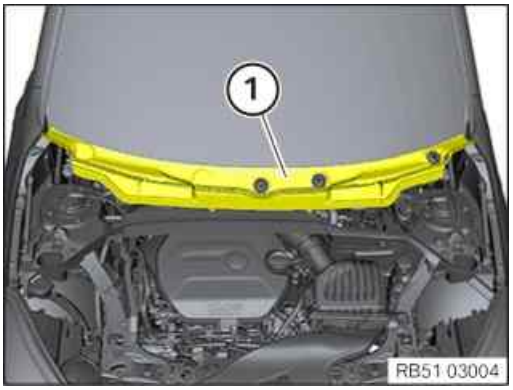
Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

65 – Install the rear cowl panel cover



- Feed in and engage the rear cowl panel cover (1).

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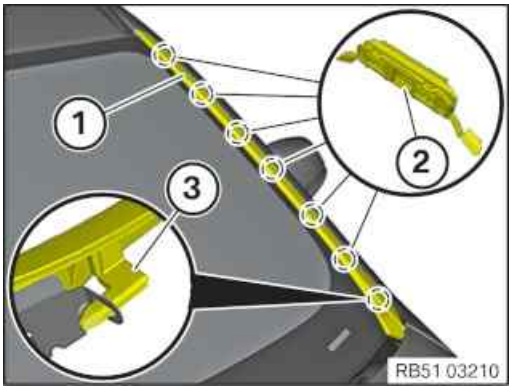
66 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.



▸ **Install the gutter strip on the windscreen**

- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

67 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.

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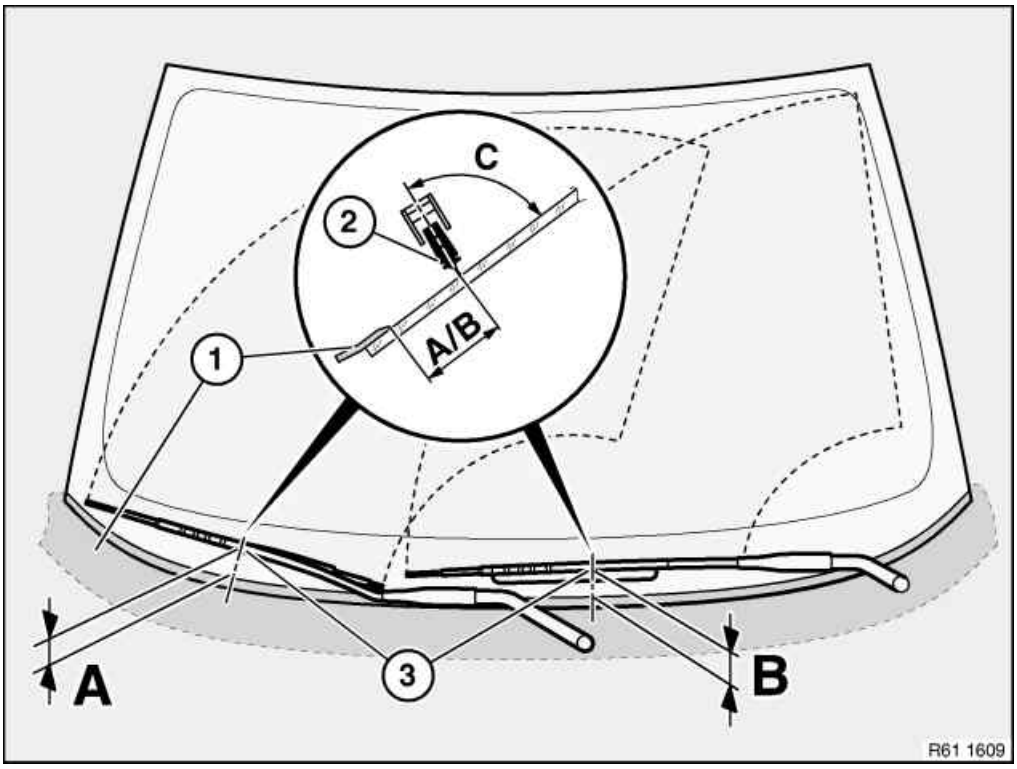
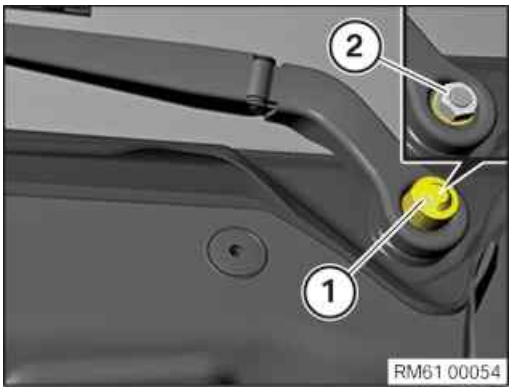


- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

68 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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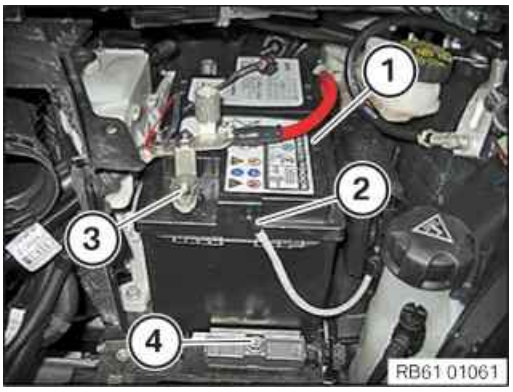


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

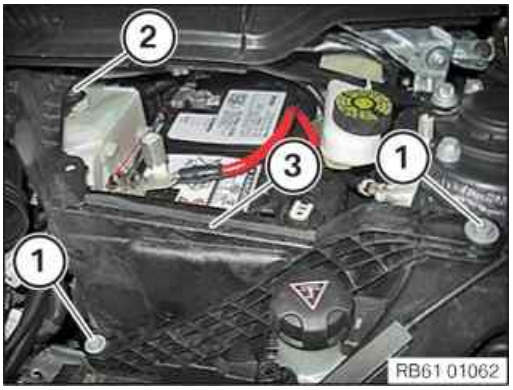
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

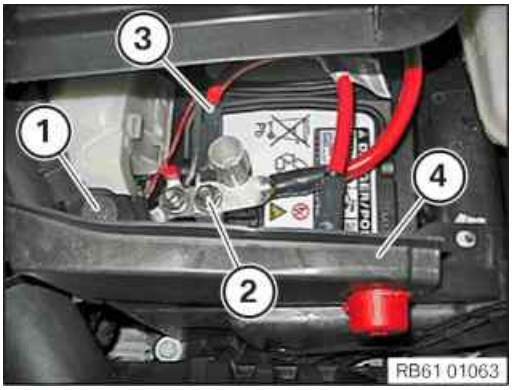
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

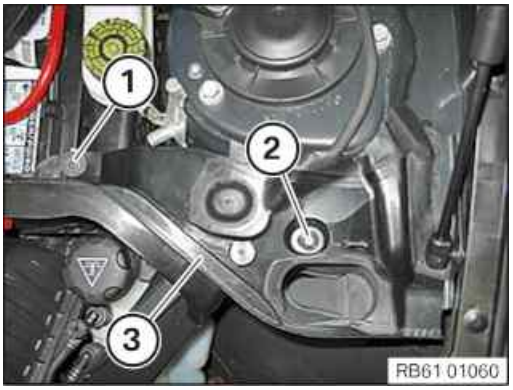
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

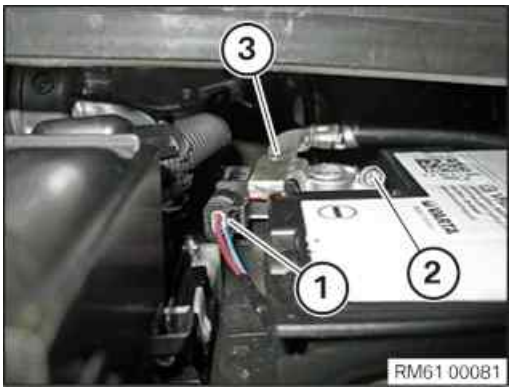
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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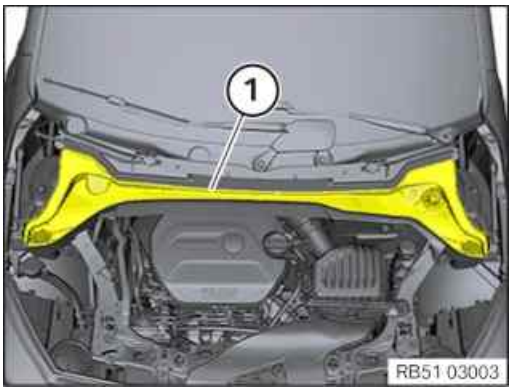
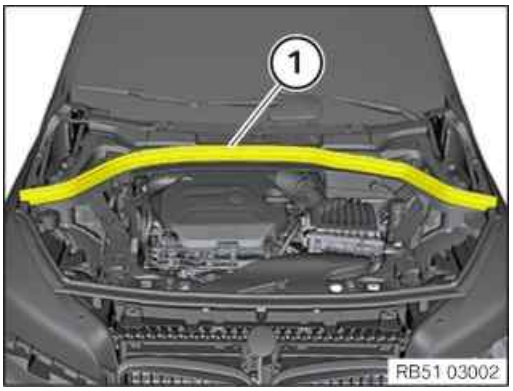
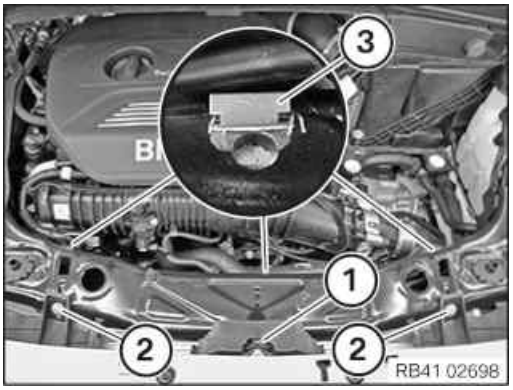


- Feed in the cowl panel cover (1).

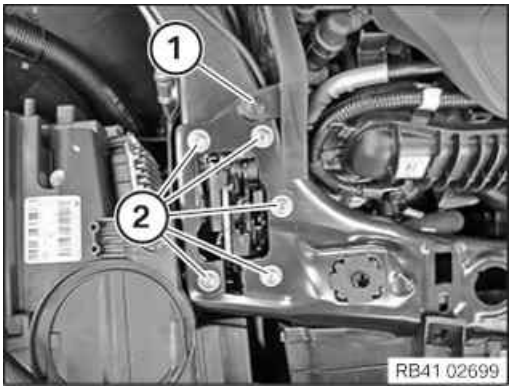


- Press the gasket (1) in a downwards direction.

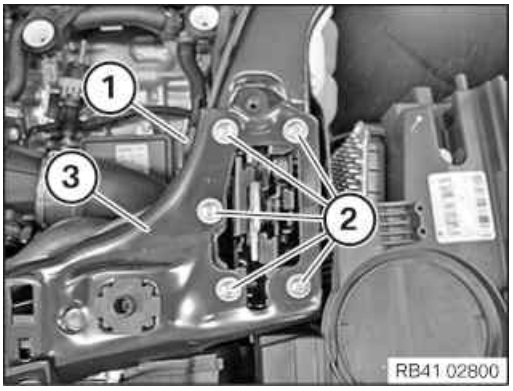
69 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

70 – Connect the coolant line

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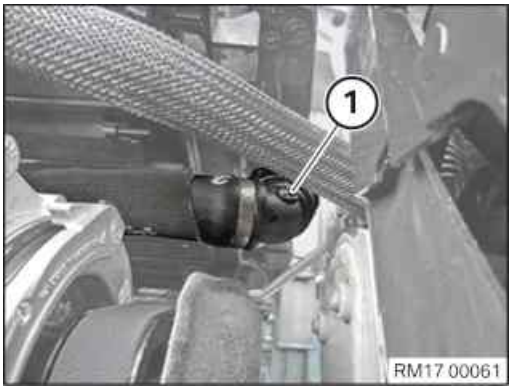
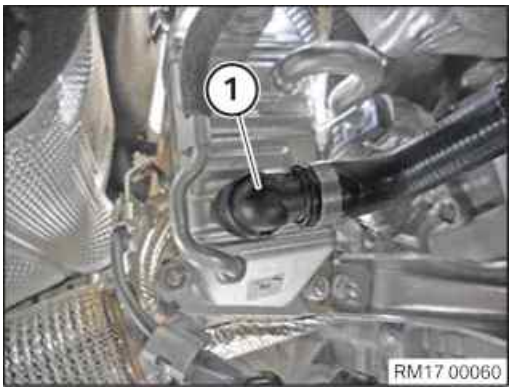
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

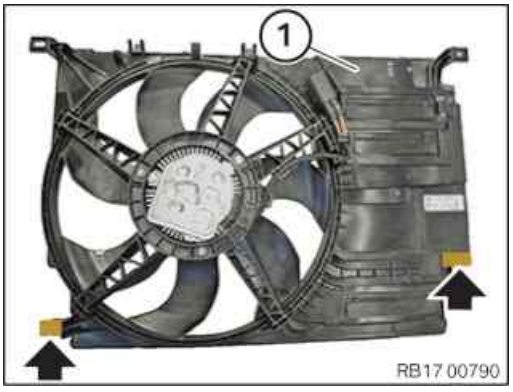


- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

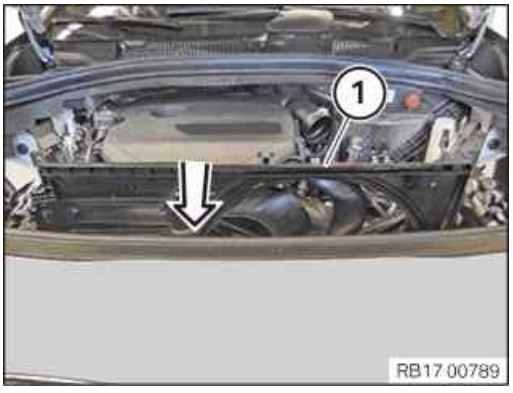
71 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.

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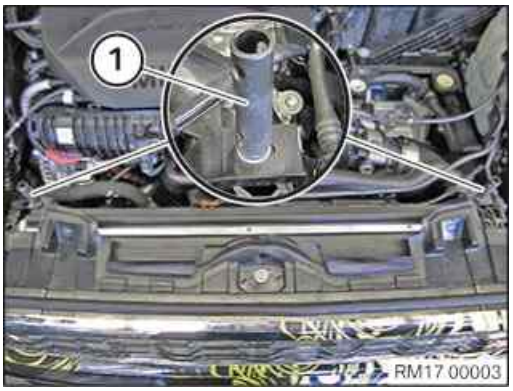
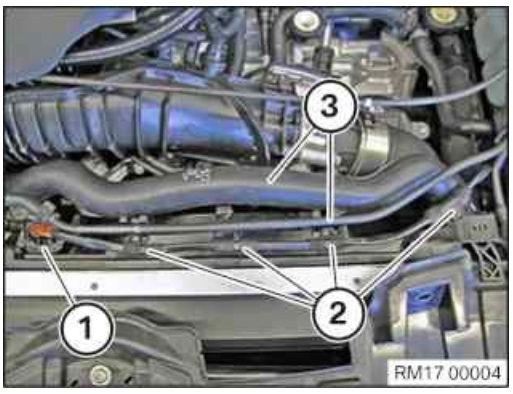
- Lock the left and right locks (arrows).



- Tighten the screws (1).

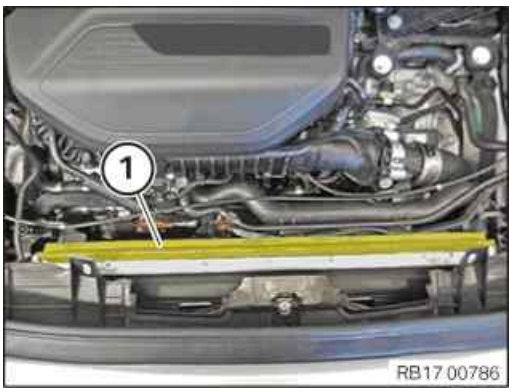
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



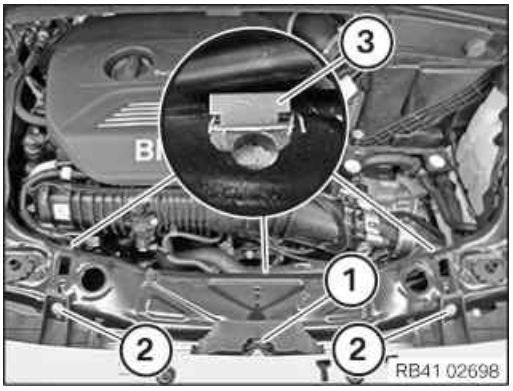
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



- Guide the sealing (1) on the radiator in and install it.

72 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

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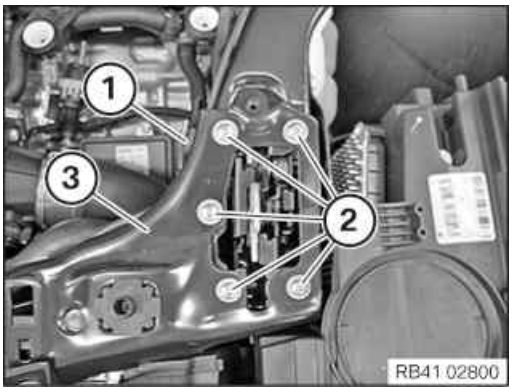
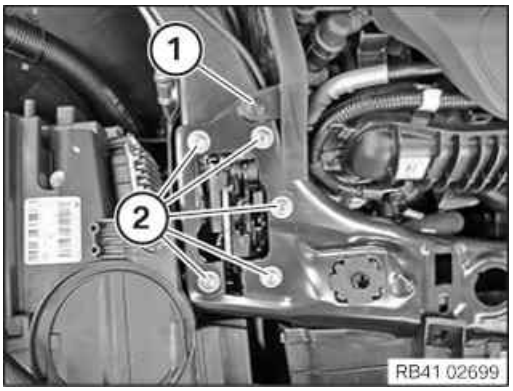


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



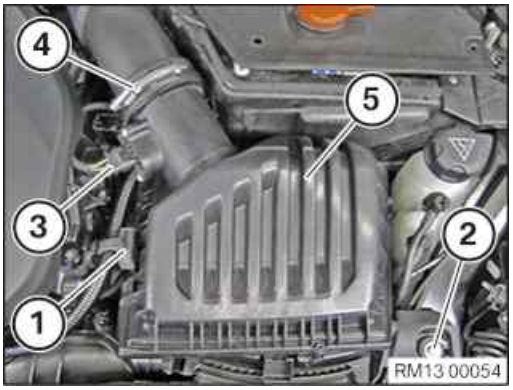
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

73 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

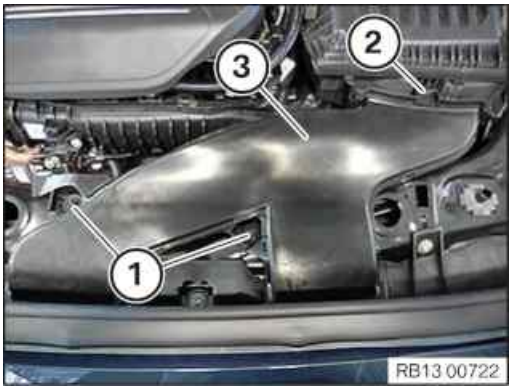
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

74 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

75 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

76 – Removing the oil filler cap

- Open oil filler cap (1).

77 – Topping up the engine oil

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RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

- Pour in engine oil.

Engine oilB37C15U1

Capacity of engine oil	4,8 l

Engine oil: Technically suitable engine oils for BMW Group engines

78 – Installing the oil filler cap

- Close oil filler cap (1).

79 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

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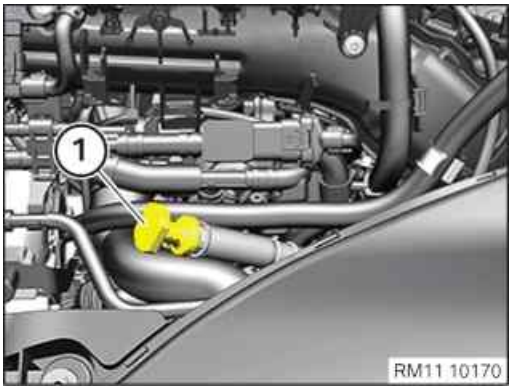
TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

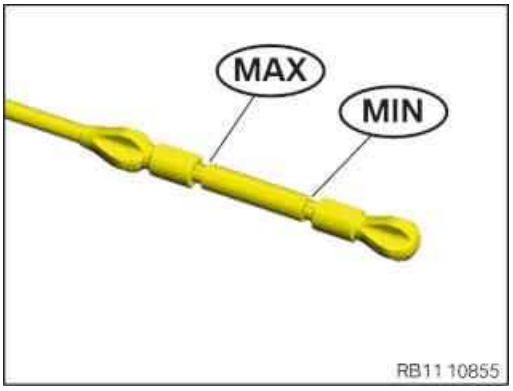


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

80 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

- See additional information.

81 – Evacuate and fill air conditioning

- See additional information.

Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump — Used in step 11

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

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Bracing strut to top cross connection — Used in step 13 72

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 13 72

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 13 72

M6x20		Tightening torque	12 Nm

Transmission mounting — Used in step 40

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Right engine mount to cylinder head — Used in step 40

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Refrigerant line on air conditioning compressor — Used in step 40

M8		Tightening torque	19 Nm

Clutch slave cylinder to transmission housing — Used in step 40

M8		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 40

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Standard screw connection M8 — Used in step 40

M8		Tightening torque	19 Nm

Positive battery cable to positive battery terminal — Used in step 40

M8		Tightening torque	15 Nm

SCR metering module V-clip to exhaust system — Used in step 41

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 42

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Output shaft bearing to engine block — Used in step 43

M10		Tightening torque	38 Nm

Starter motor to transmission — Used in step 45

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 45

M8		Tightening torque	13,5 Nm

Rear end of front axle support to body — Used in step 46

M14 screw	Renew screw.	Tightening torque	175 Nm

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Front axle support, front to body

Used in step 46

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 46 56

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing

Used in step 46

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 46

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 47

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 47

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 47

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 47

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 48

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 50

M10	Renew nut.	Tightening torque	56 Nm

Charge air line to crankcase

Used in step 53

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 53

M6		Tightening torque	8 Nm

Wheel arch cover to body

Used in step 54

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 54

Plastic nut		Tightening torque	3 Nm

Underbody panelling, side

Used in step 55

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 55

Plastic nut		Tightening torque	2,6 Nm

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Underbody protection front

Used in step 57

			3 Nm

Brake disc to front wheel hub

Used in step 58

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

Used in step 58

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 58

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 60

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 60

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 61

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 62

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 63

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 63

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 63

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 63

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 63

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 63

		Tightening torque	3 Nm

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Battery cover			Used in step 63 68
Screw			2,8 Nm

Bulkhead cover, top			Used in step 64
Screw		Tightening torque	3 Nm

Windscreen wiper arm			Used in step 67
Combination hexagon nut		Tightening torque	35 Nm

Battery terminal rail to battery tray			Used in step 68
M8 screw			19 Nm

Positive battery terminal			Used in step 68
NutM6			5 Nm

Trailing link			Used in step 68
M8 screw			19 Nm

Positive battery cable to battery terminal			Used in step 68
Nut M8			15,2 Nm

Negative battery terminal (with IBS)			Used in step 68
NutM6			5 Nm

Fan cowl on radiator			Used in step 71
M6X12		Tightening torque	6 Nm

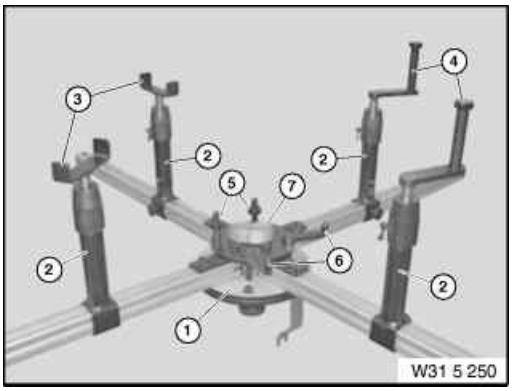
Intake silencer housing to lock bridge			Used in step 73
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 73
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 74
M6		Tightening torque	8 Nm

Overview of Special Tools

0 495 817 (31 5 251) Basic body



Common	Used in step 33 46
Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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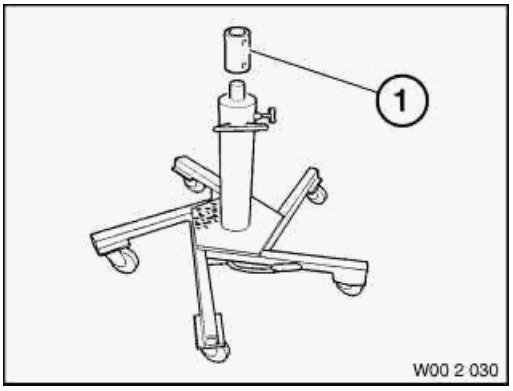
0 490 133 (00 2 030) Device



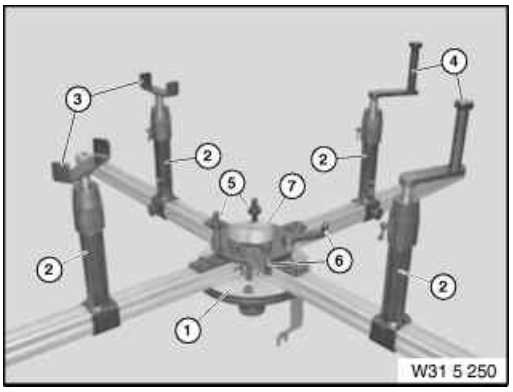
Common Used in step 33 46

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

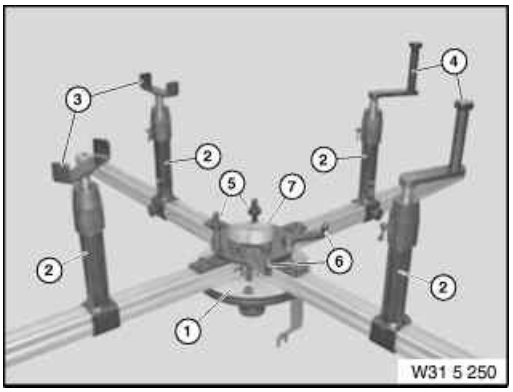
0 495 821 (31 5 255) Adapter



Common Used in step 33

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 495 819 (31 5 253) Adapter



Common Used in step 33

Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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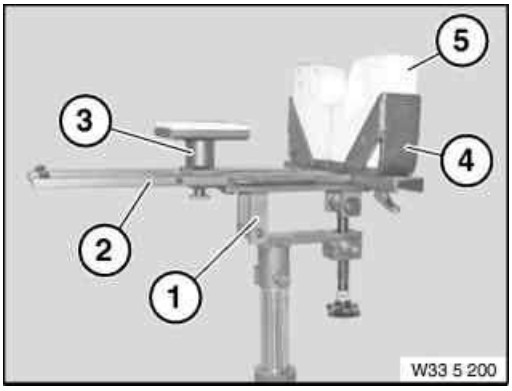
0 496 080 (33 5 206) Belt

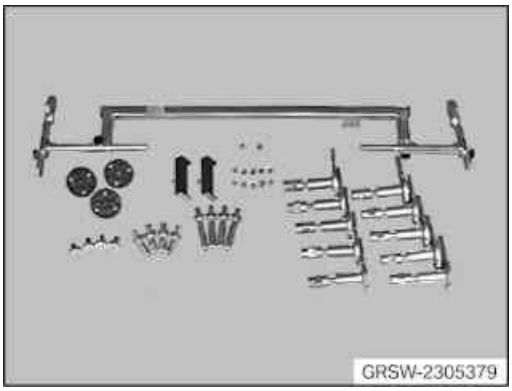


Common	Used in step 33 46
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 698 (23 0 120) Puller

Common	Used in step 35 36
Usage	For pulling out the radial shaft seal on the output (differential) left/right.
Included in the tool or work	
Storage location	A87
Replaced by	
In connection with	
SI-Number	01 11 09 (550)

2 305 379 Accessories



Common	Used in step 39
Usage	Attachment set for unit table lift MHT 1200.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Mobile major assembly table lift MHT 1200 81222184136
SI-Number	06 01 10 (649)

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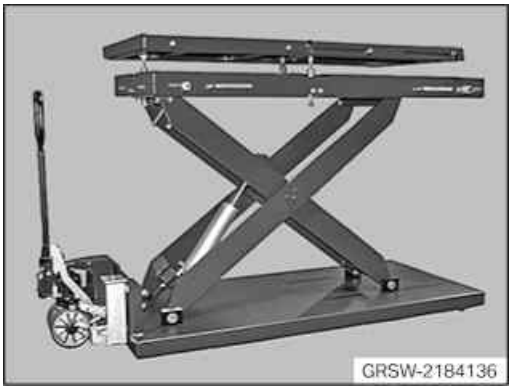
2 184 136 Mobile equipment table lift



Common	Used in step 39
Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

2 357 221 Support

Common	Used in step 39
Usage	Fixture of drive unit (electrical machine/transmission and optional range extender) on the mobile lifting table MHT 1200 81 22 2 184 136 IMPORTANT: required three times! Delivery specification 1 pcs. Was valid as campaign for BMW i Aftersales Basic. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse. Fixture foot 83302357221_C including bracket 83302357221_B and tab 83302357221_A
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 22 13 (988)

2 409 230 Mandrel

Common	Used in step 43 44
Usage	For installing the rear-wheel drive of Transmission output shaft le./ri. silhouette foil is contained in delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A75
Replaced by	
In connection with	
SI-Number	01 56 14 (214)

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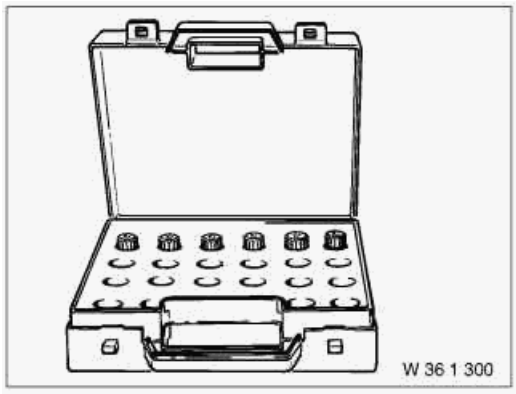
2 344 011 Tool

Common	Used in step 58
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 22
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 22
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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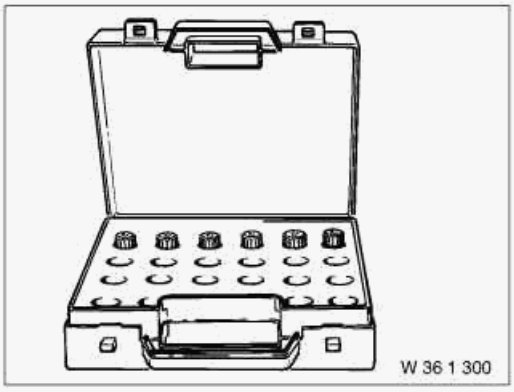
0 495 225 (36 1 327) Wheel stud

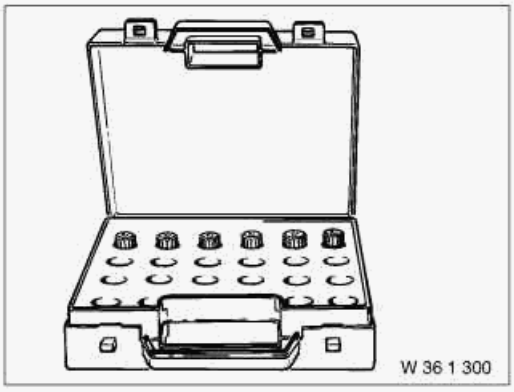


Common	Used in step 22
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 22
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud



Common	Used in step 22
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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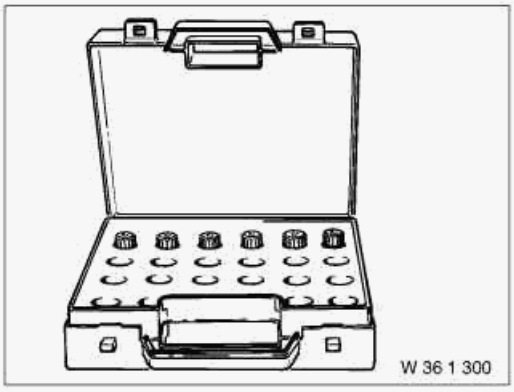
0 495 228 (36 1 331) Wheel stud



Common	Used in step 22
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 22
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 22
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB37C15U1	Used in step 77
Capacity of engine oil	4,8 l

Engine oil: Technically suitable engine oils for BMW Group engines

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	14 68
61 12 ... Notes on intelligent battery sensor (IBS)	14 68

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61 00 ... Notes for disconnecting and connecting battery	14 68
41 00 ... Notes on repairing threads	

Repair instructions	Used in step
64 50 010 Extract, evacuate and fill air conditioning system	1 81
64 50 010 Drawing off, evacuating and filling air conditioning (R134a)	1 81
64 50 010 Drawing off, evacuating and filling air conditioning (R134a)	1 81
64 50 ... Notes on repairs to air conditioning	1 81
64 50 010 Drawing off, evacuating and filling air conditioning (R1234yf)	1 81
64 50 ... Safety information for handling refrigerant R1234yf	1 81
64 50 ... Safety information for handling tetrafluorethane refrigerant R134a	1 81
64 50 ... Safety informations for handling refrigerant oil	1 81
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17 00 008 Draining and topping up coolant for high-temperature circuit	80
17 00 008 Draining and topping up coolant for high-temperature circuit	80
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	80
17 00 039 Bleeding cooling system (B37, B47)	80
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	80
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	80
17 00 008 Draining and topping up the high-temperature coolant circuit	80
17 00 008 Draining and topping up the high-temperature coolant circuit	80
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	80
17 00 008 Draining and topping up the high-temperature coolant circuit	80
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	80
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	80
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	80
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	80
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	80
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	58
3.0 Technically appropriate engine oils for BMW Group engines	77

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11 00 050 Removing and installing engine

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for

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any return shipments. Always package removed components straight away.

- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

PRELIMINARY WORK

1 – Drawing off the air conditioning

- See additional information.

2 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

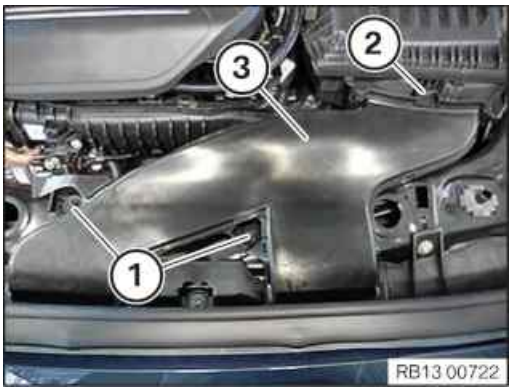
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

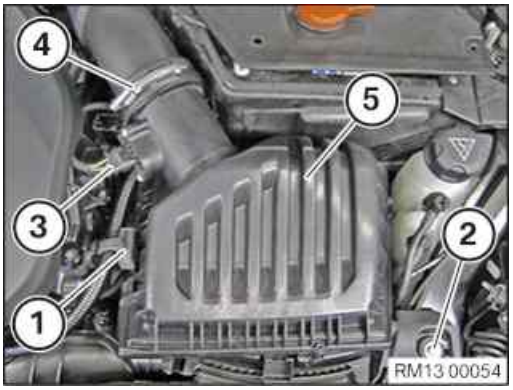
- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

5 – Remove cross connection

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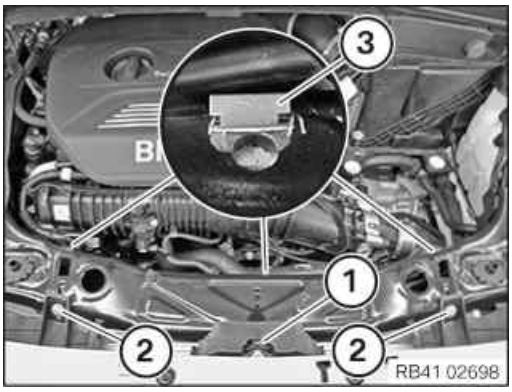
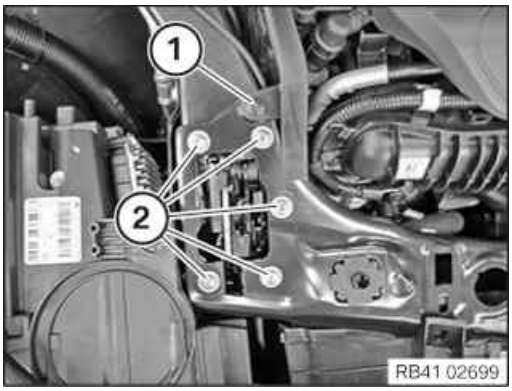
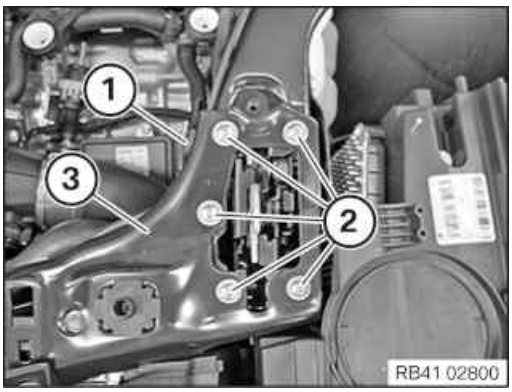


- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

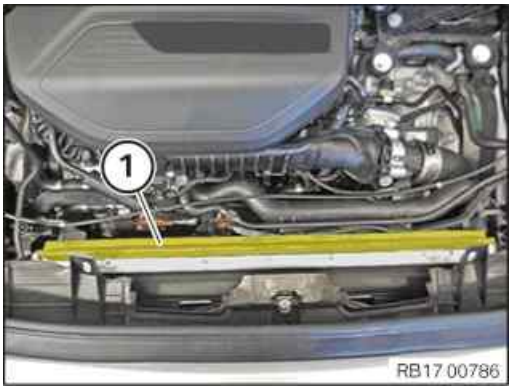
6 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed out and remove the sealing (1) from the radiator.

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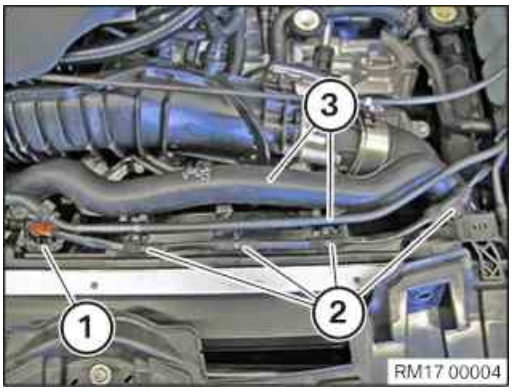
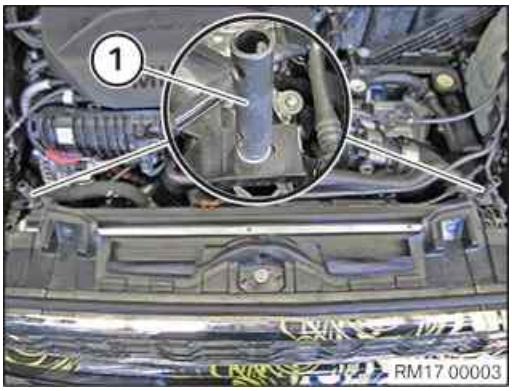
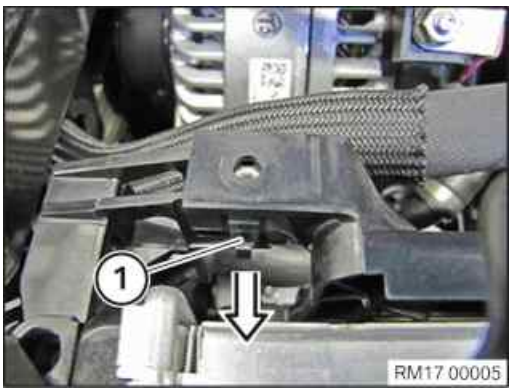


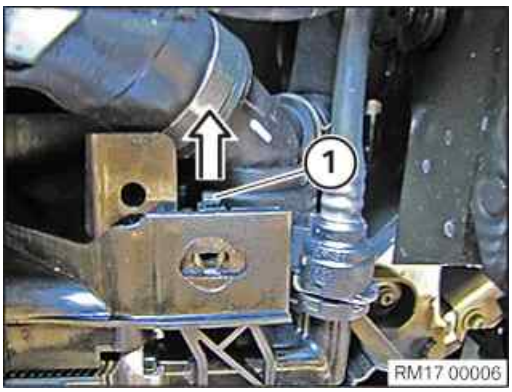
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



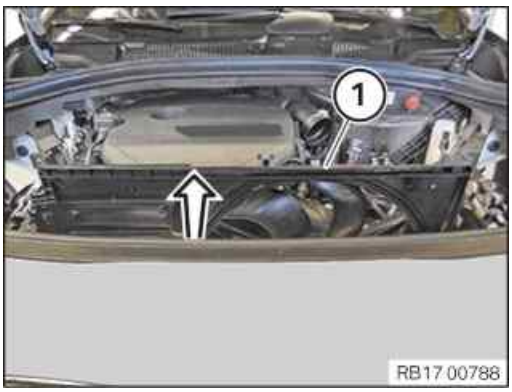
- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



- Unlock the left lock (1) on the fan cowl in the direction of the arrow.



- Guide out fan cowl (1) in direction of arrow and remove.

7 – If installed: Removing rear underbody protection

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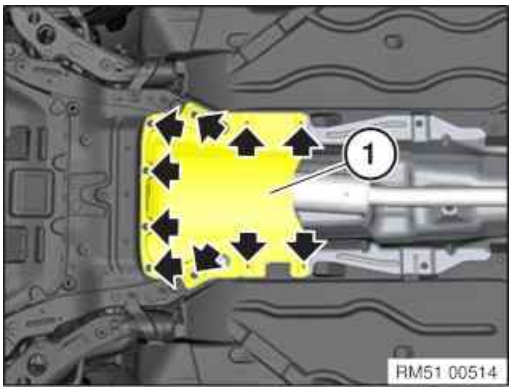
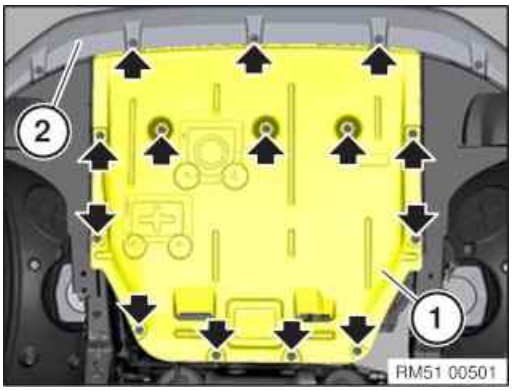


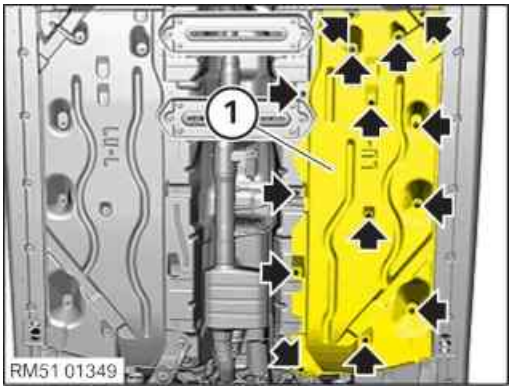
- Remove screws (arrows).
- Remove the rear underbody protection (1).

8 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

9 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

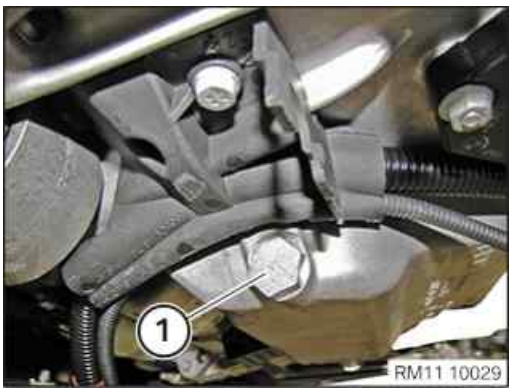
10 – Releasing the oil drain plug

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel.
Observe country-specific waste disposal regulations.

- Release oil drain plug (1).
- Drain engine oil.

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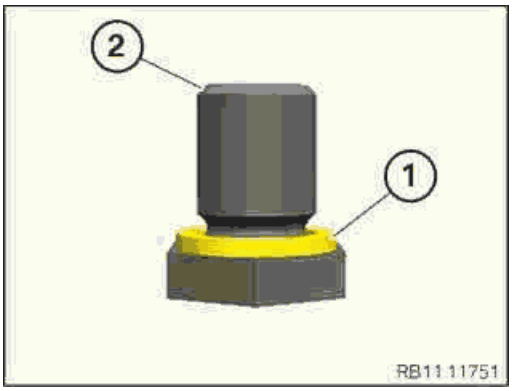
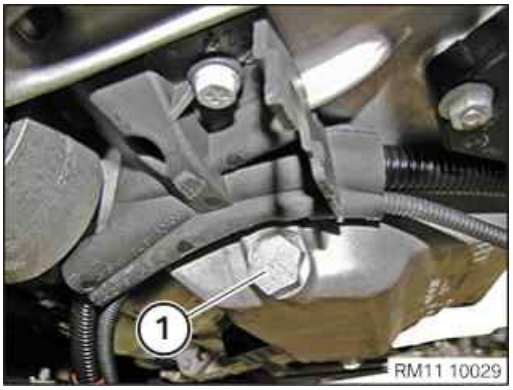
11 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring

- Guide in the sealing ring (1) on the oil drain plug (2) and install.



- Renew the sealing ring.

  Parts: Sealing ring

- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

12 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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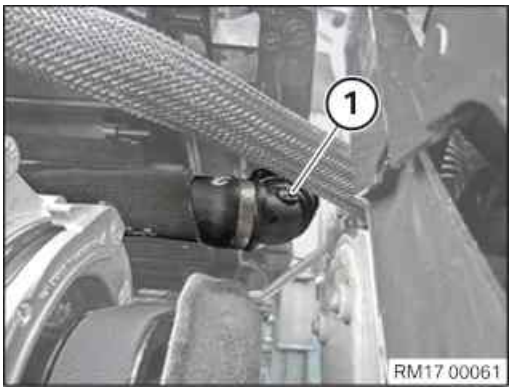
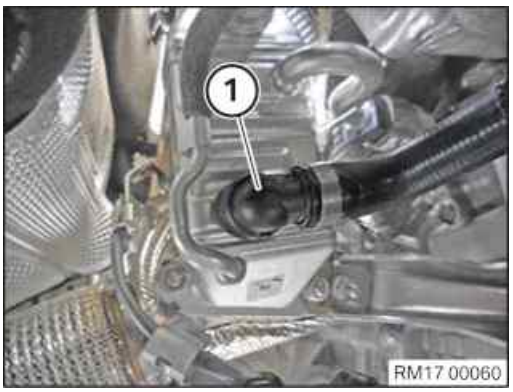
- Loosen sealing cap (1).

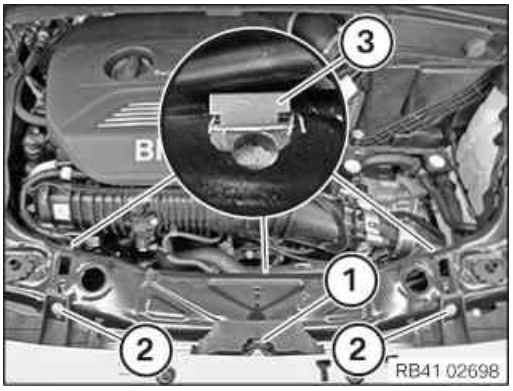


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

13 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

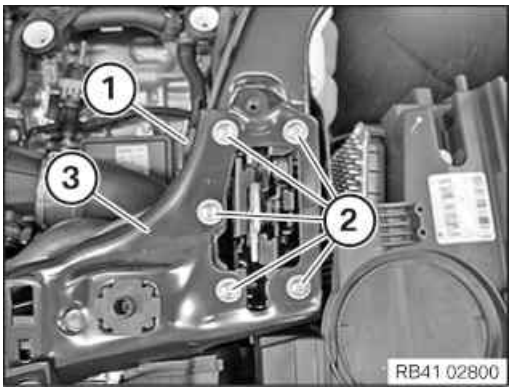
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.



- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

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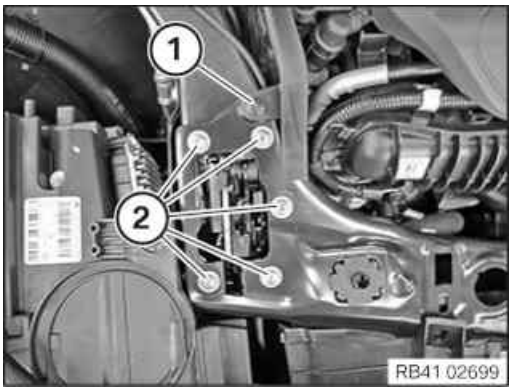


- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

14 – Remove vehicle battery

WARNING

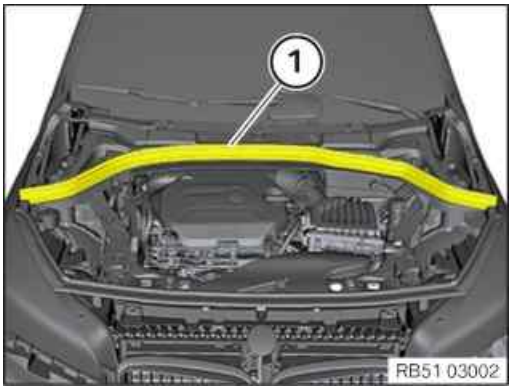
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

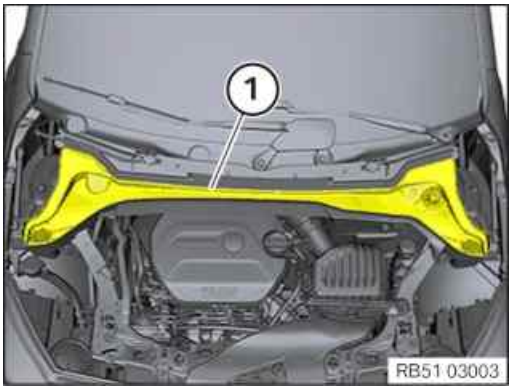
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.

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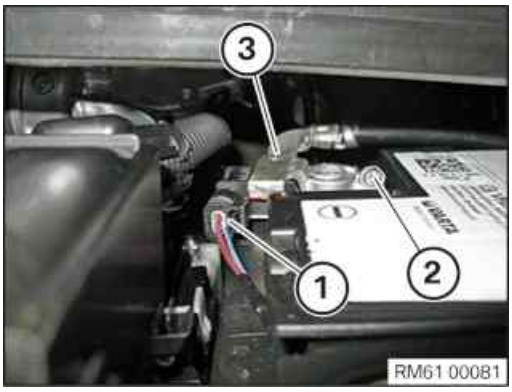
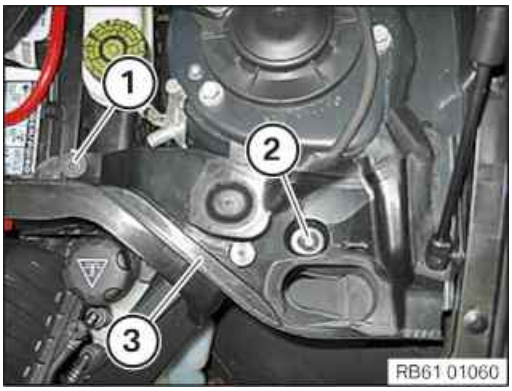
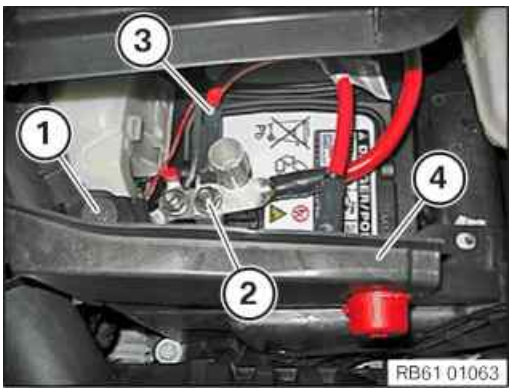


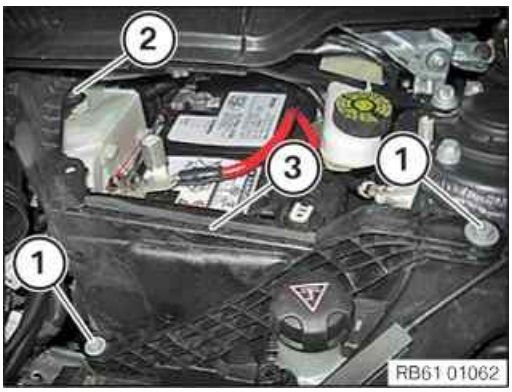
- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



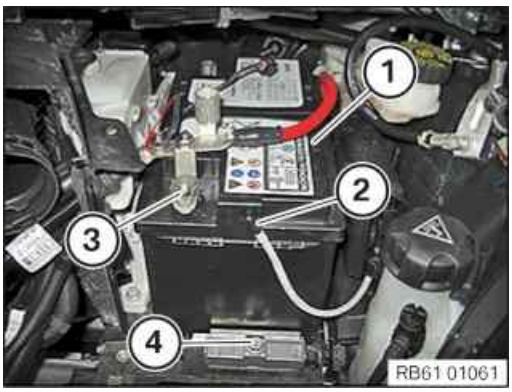
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

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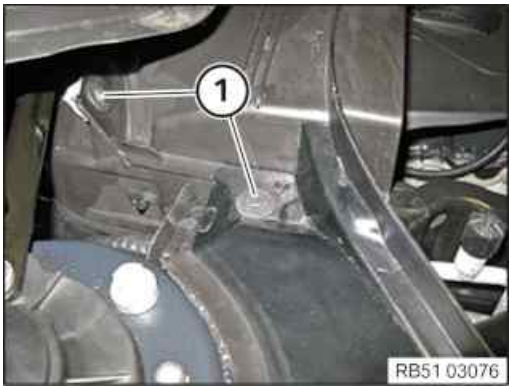
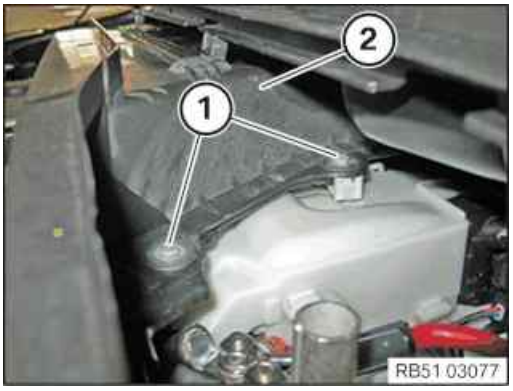
15 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

16 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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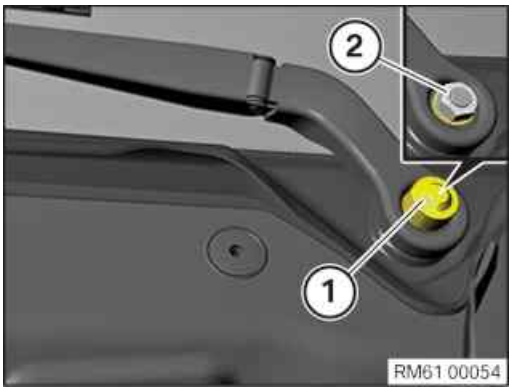
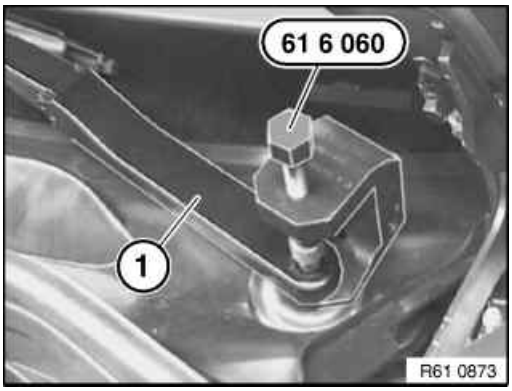


- Remove the protective cap (1).
- Loosen nut (2).



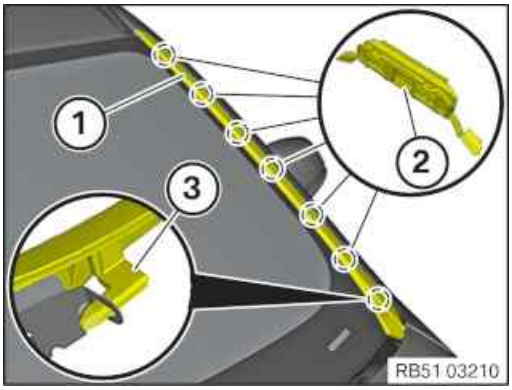
- Pull off the wiper arm (1) using special tool .

17 – Remove the gutter strip on the windscreen on the left and right

NOTICE

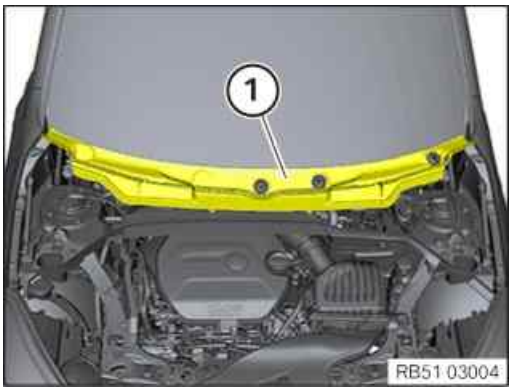
Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

18 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

19 – Remove electronics box

Prerequisite

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Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

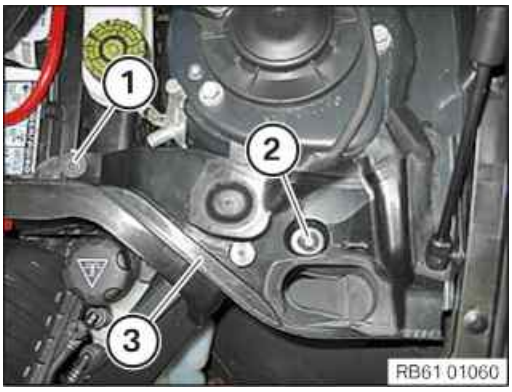
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

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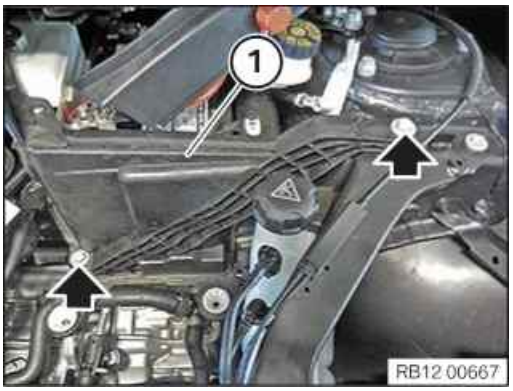
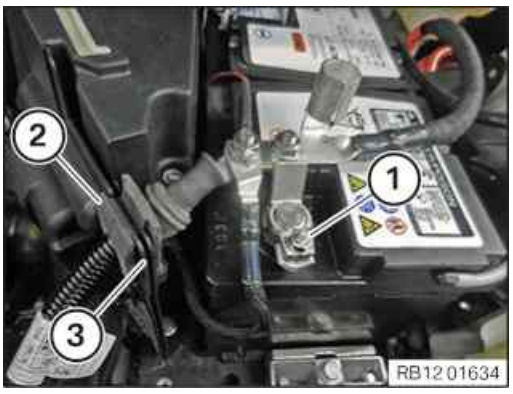
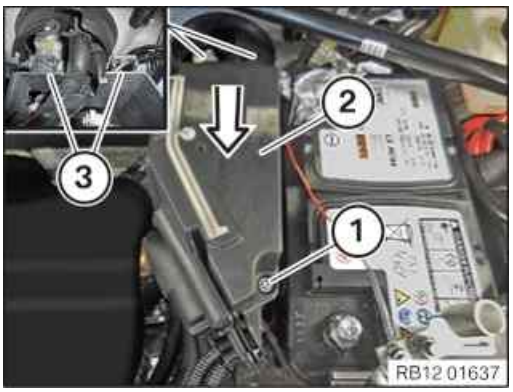
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



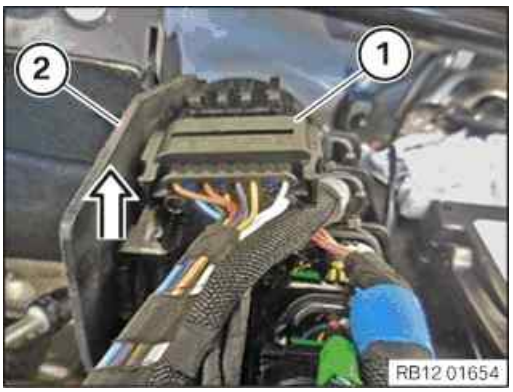
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

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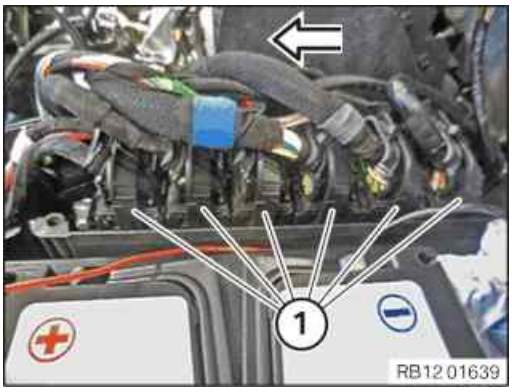
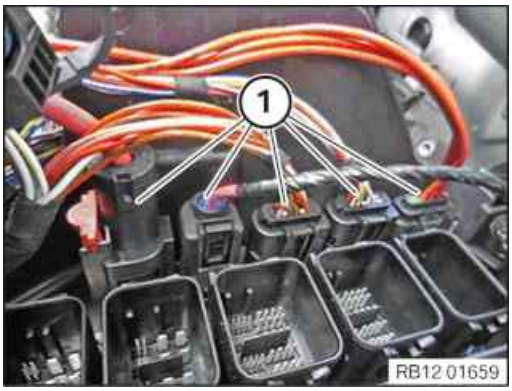
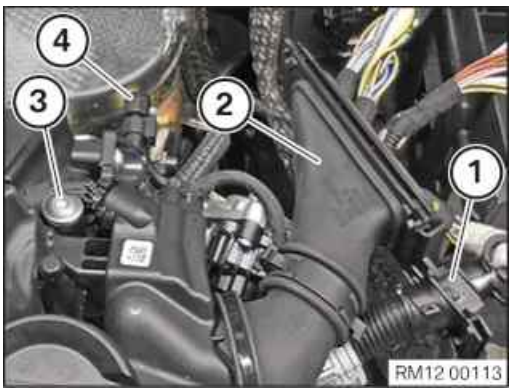


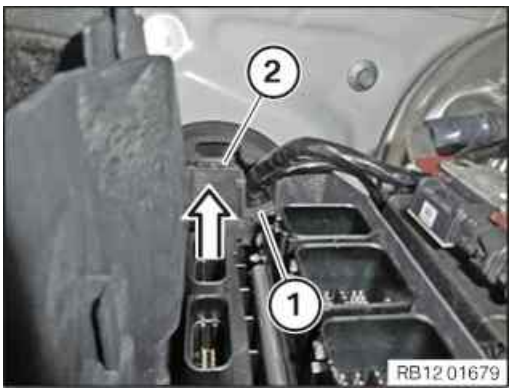
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



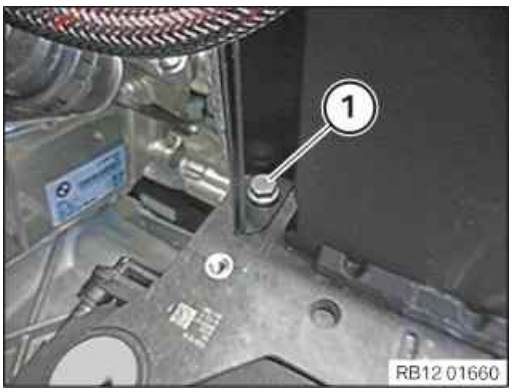
- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).

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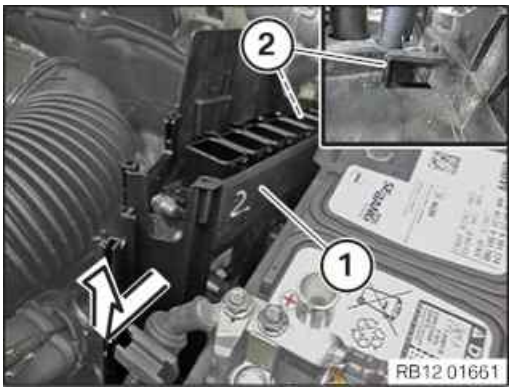
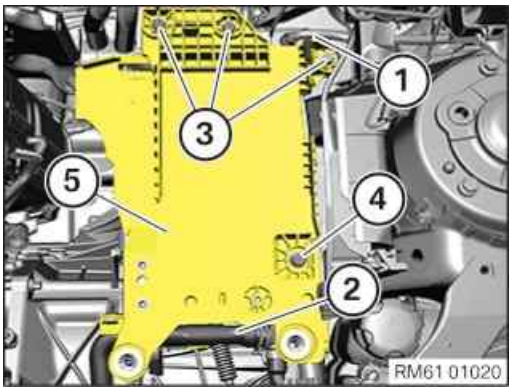


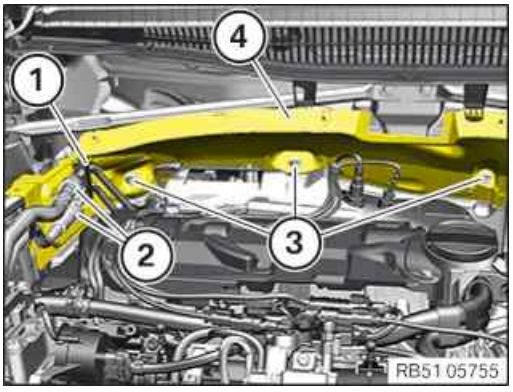
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

20 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

21 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

22 – Removing both front wheels

▸ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

23 – Removing front left and right wheel arch cover

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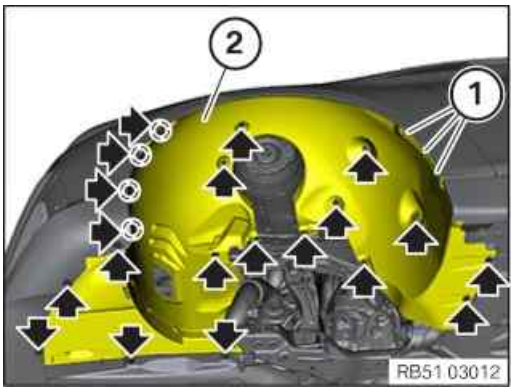
NOTICE

Perform the operations on the left and right side.

▶ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

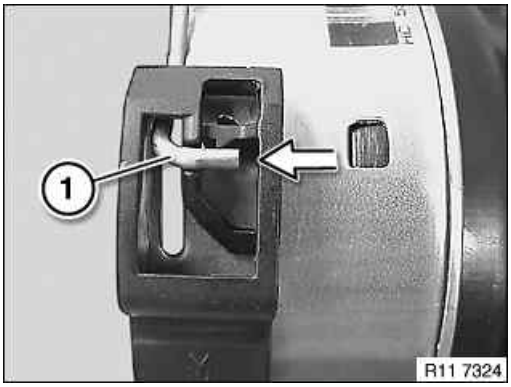
24 – Remove the pressure pipe between the throttle body and the charge air cooler

WARNING

Hot surfaces.

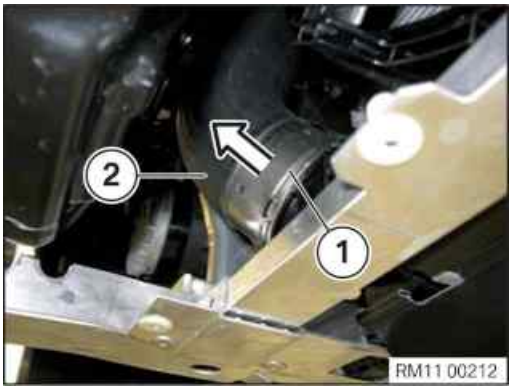
Risk of burning!

- Perform all work only on components that have cooled down.



- Unlock the lock (1).

  The lock (1) must engage in the bracket (arrow).



- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.

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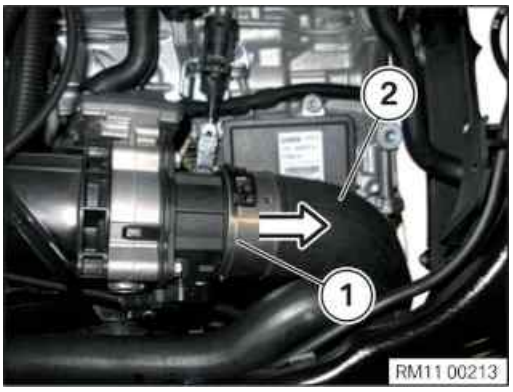

- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.

- Remove the pressure pipe (1) in the direction of the arrow.

25 – Remove right charge-air line

- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).

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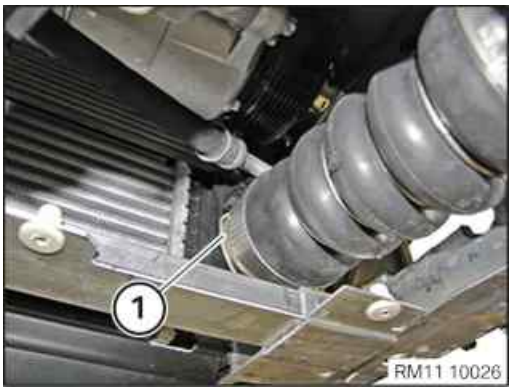
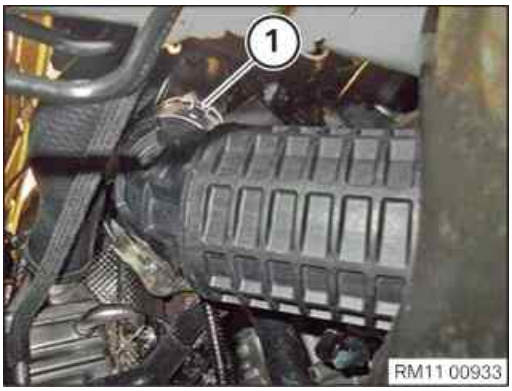
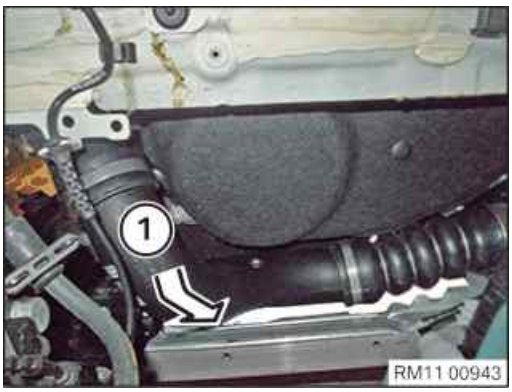


- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

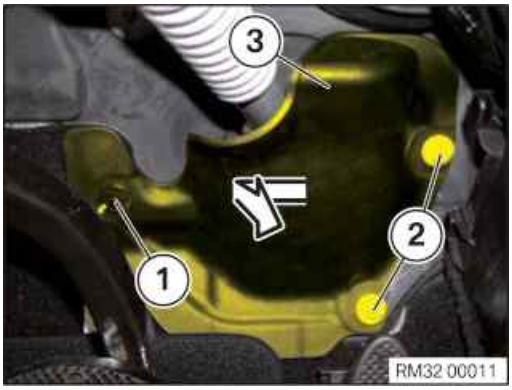


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

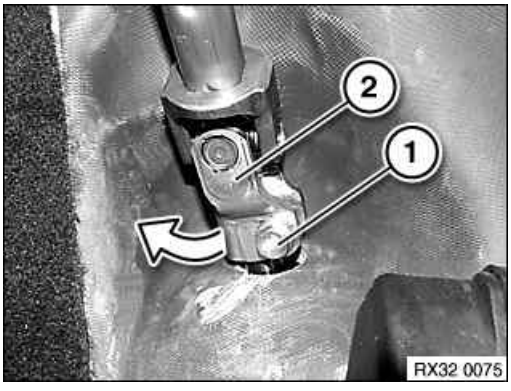
26 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

27 – Securing radiator on left and right

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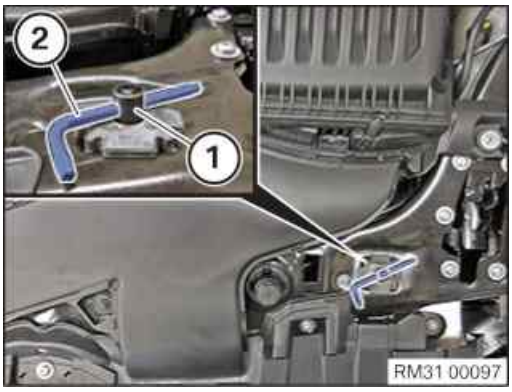
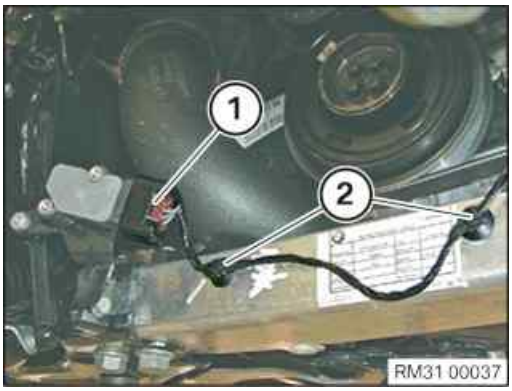


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

28 – With right installation: Detaching ride height sensor cable



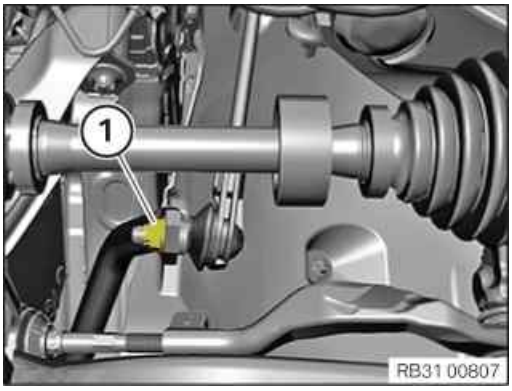
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

29 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Detach the anti-roll bar from the anti-roll bar link**



- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

30 – Detaching rubber mount from front axle support

- Spray rubber mount (1) with lubricant and release from holder on front axle support.

31 – Disconnecting plug connections from steering gear

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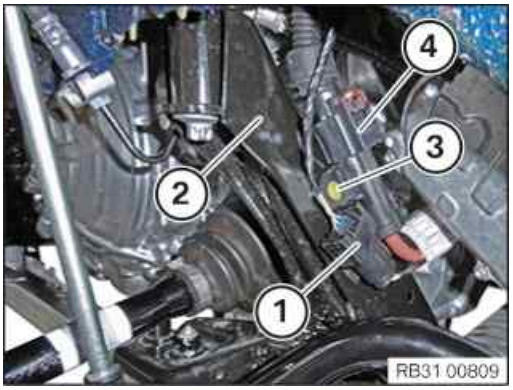
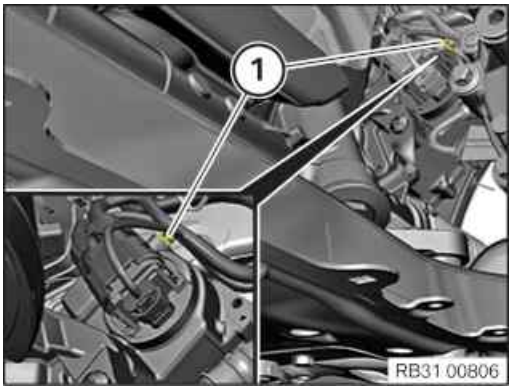
31 – Disconnecting plug connections from steering gear

▶ **If installed: Detach connectors from the front axle carrier**



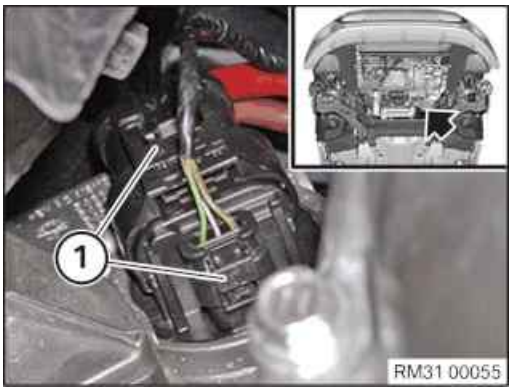
- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



- Disconnect wiring harness (1) from steering gear.

- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

32 – Releasing the mounted part from the front axle support

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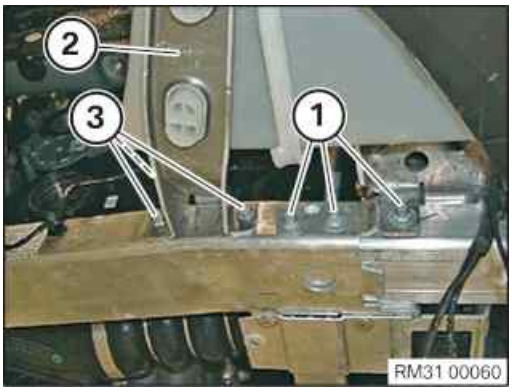
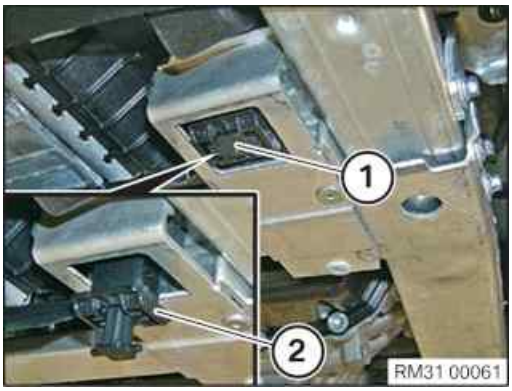


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

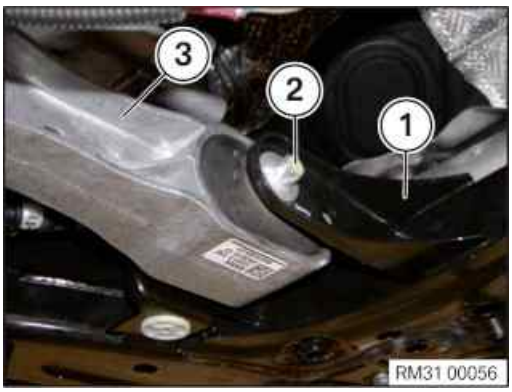
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



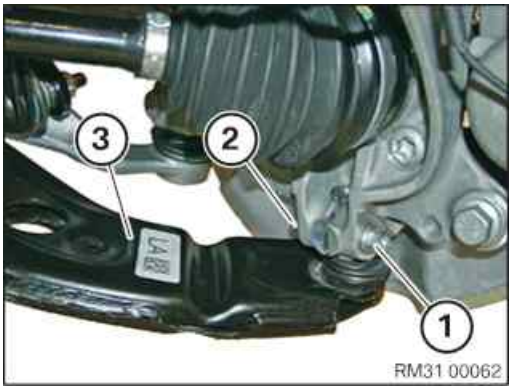
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

33 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .

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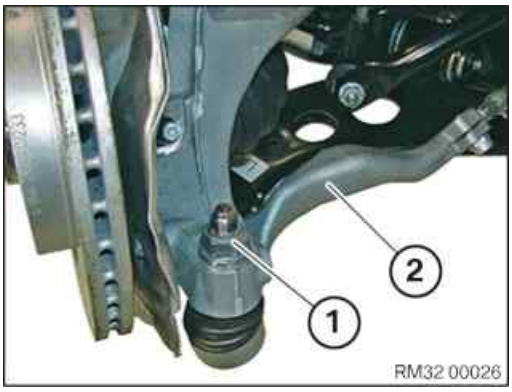
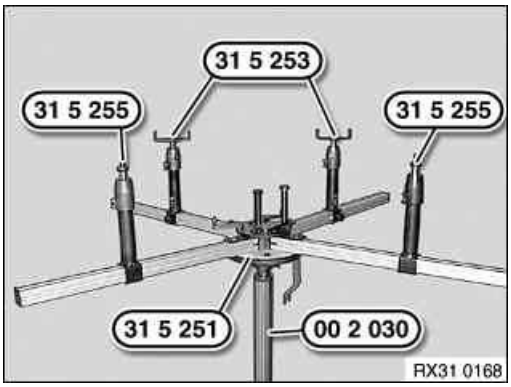


NOTICE

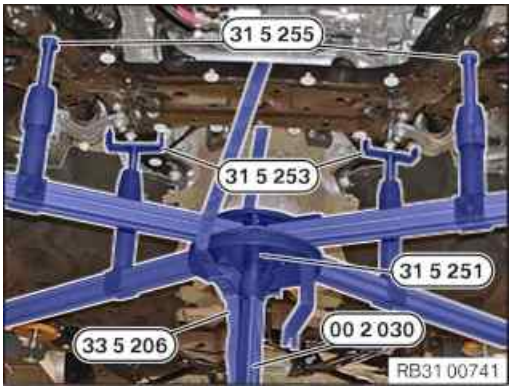
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

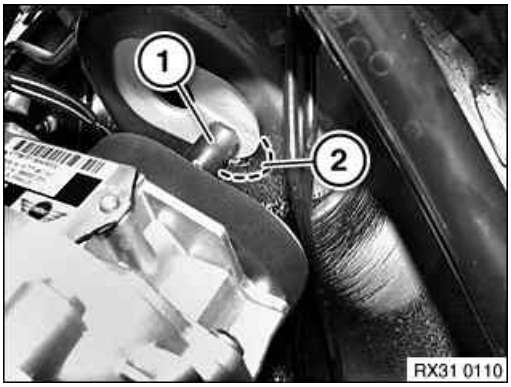
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

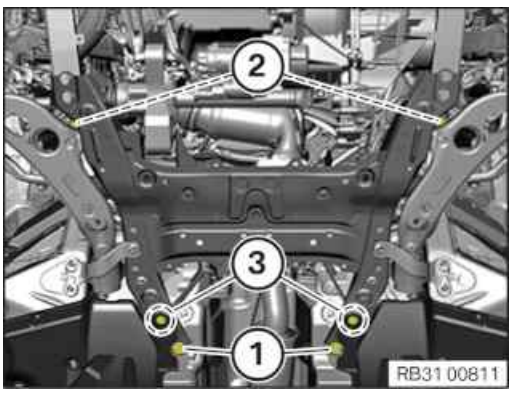


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

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TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

34 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

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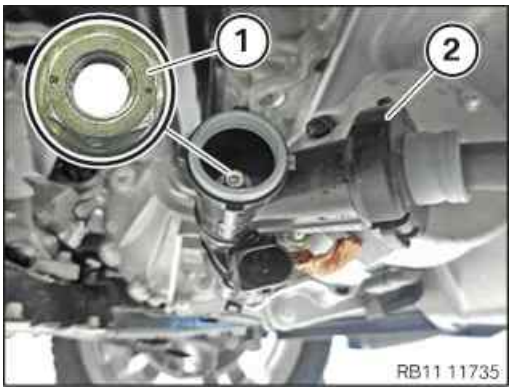
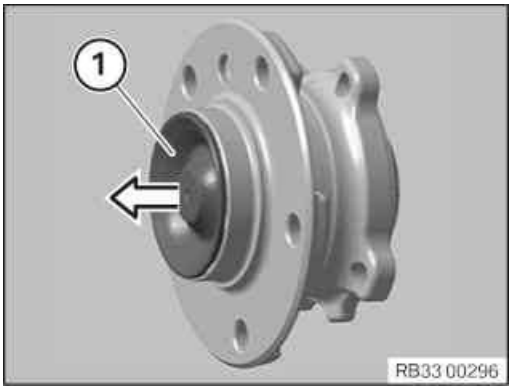


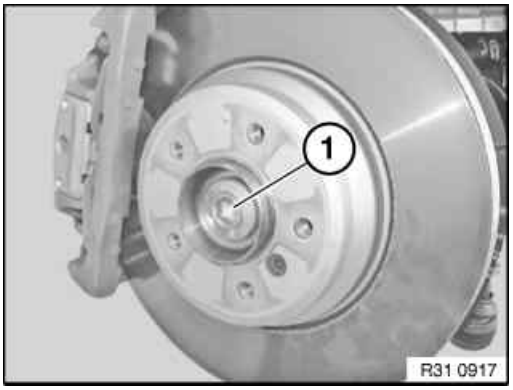
- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

- Loosen screws (1).
- Feed out starter motor and remove.

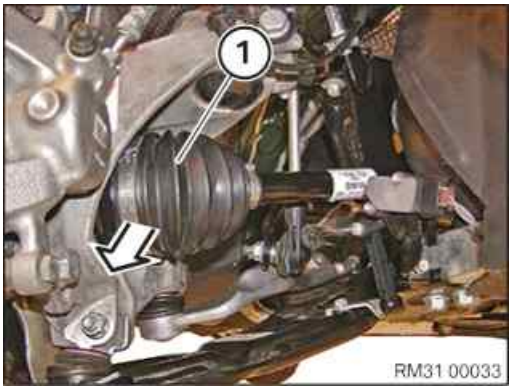
35 – Removing right output shaft (double-clutch transmission (DKG))



- If necessary, lever off the protective cap (1).



- Press the brake pedal to the floor to unscrew the collar bolt (1).



- Protect the output shaft (1) from falling.
- Turn steering wheel to right.
- Pull the output shaft (1) out.

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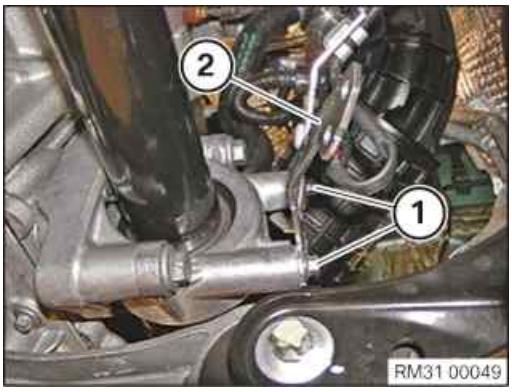
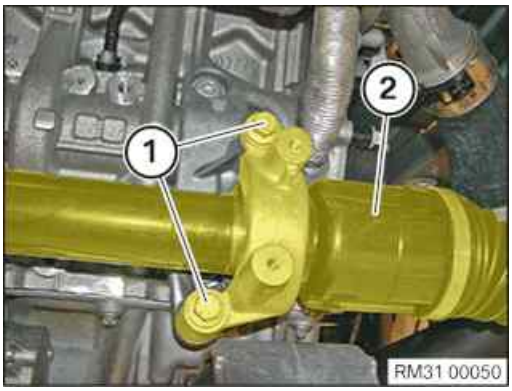


- If necessary, unscrew the bolts (1) and remove the holder (heat shield) (2).



- Loosen screws (1).
- Pull the output shaft (2) out of the transmission and remove it sideways.
- Remove output shaft (1).

▸ **Removing the right radial shaft seal on the differential (7DCT300)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

TECHNICAL INFORMATION

Clean the transmission around the radial shaft seal prior to removing the propeller shaft!
Transmission oil (at maximum 0.3 l) may escape from the radial shaft seal opening when pulling off the propeller shaft!
Collect and dispose of escaping transmission oil!

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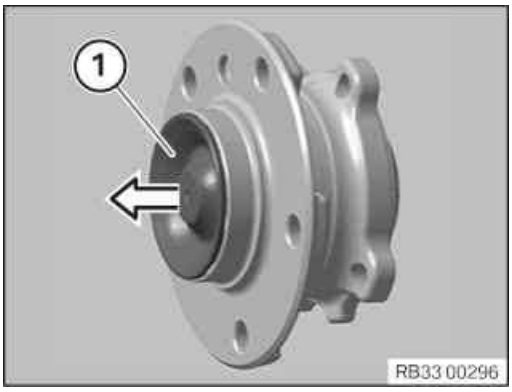
TECHNICAL INFORMATION

Do not use a drill.

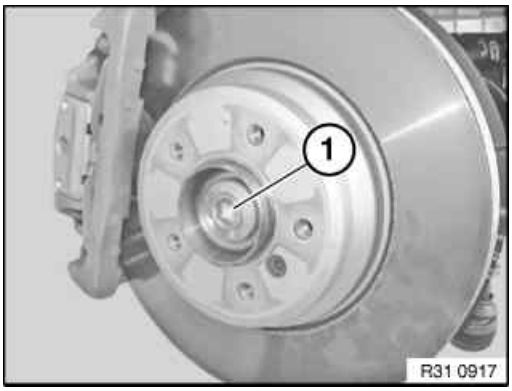
Swarf may damage the transmission and result in a failure of the transmission.

- Drive a hole into the radial shaft seal (1) using a centre punch.
- Screw the special tool **0 491 454 (23 0 490)** into the radial shaft seal (1).
- Drive out the radial shaft seal (1) with the impact weight (2).

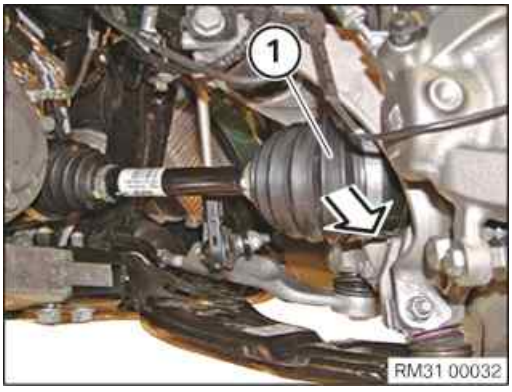
36 – Remove the left drive shaft (double-clutch transmission (DKG))



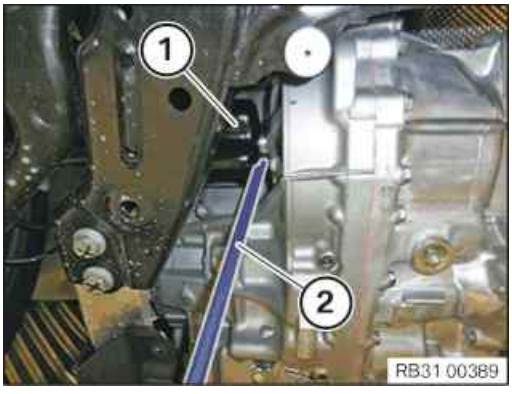
- If necessary, lever off the protective cap (1).



- Press the brake pedal to the floor to unscrew the collar bolt (1).



- Turn steering wheel to left.
- Pull the output shaft (1) out toward the front.



- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Remove output shaft (1).

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▸ **Removing the left radial shaft seal on the differential (7DCT300)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

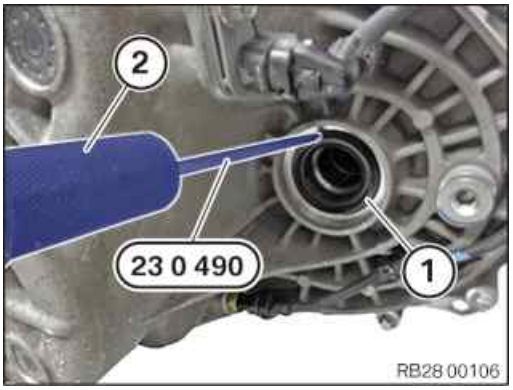
Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

TECHNICAL INFORMATION

Clean the transmission around the radial shaft seal prior to removing the propeller shaft!
Transmission oil (at maximum 0.3 l) may escape from the radial shaft seal opening when pulling off the propeller shaft!
Collect and dispose of escaping transmission oil!



TECHNICAL INFORMATION

Do not use a drill.
Swarf may damage the transmission and result in a failure of the transmission.

- Drill a hole in the radial shaft seal (1) using a centre punch.
- Screw special tool **0 491 454 (23 0 490)** in the radial shaft seal (1).
- Drive out radial shaft seal (1) with the impact weight (2).

37 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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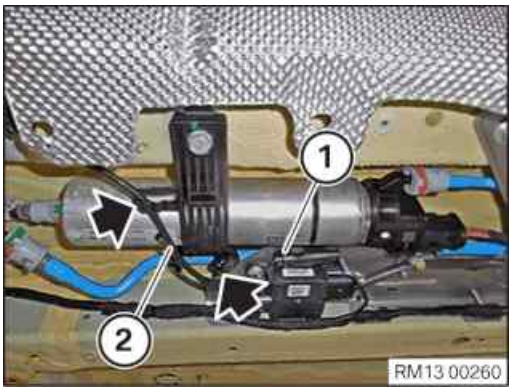
RISK OF DAMAGE

Electrostatic discharge.

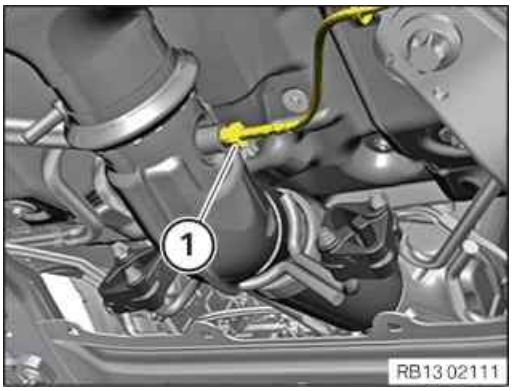
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

38 – Remove the SCR metering module

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

After repair work, clean the working area thoroughly with water.
Clean special tools with water after every use.

TECHNICAL INFORMATION

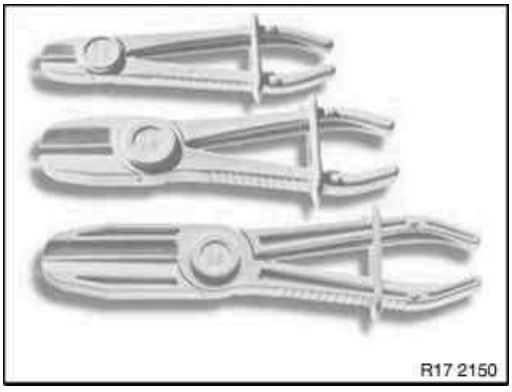
Use only lint-free cloths for cleaning the SCR system: WAYPALL cleaning cloths L20 - see BMW Group Parts.

TECHNICAL INFORMATION

Notes on work at the cooling system form the basis of these repair instructions and must be complied with at all times.
For additional information see: 17 00 ... Instructions for repair work on cooling system

TECHNICAL INFORMATION

Do not unintentionally swap the coolant hoses and coolant lines. If necessary, mark before removal.



- Use commercially available pinch-off tools to pinch off the coolant hoses.

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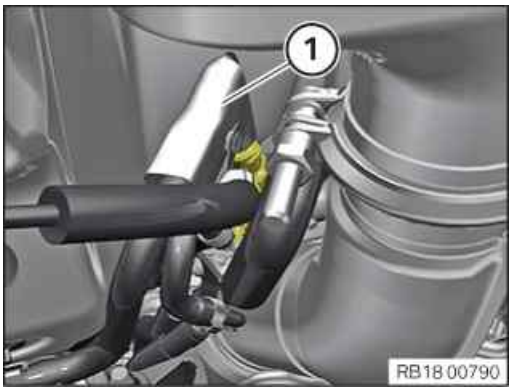
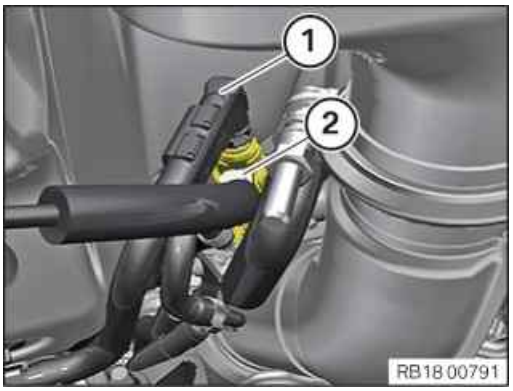
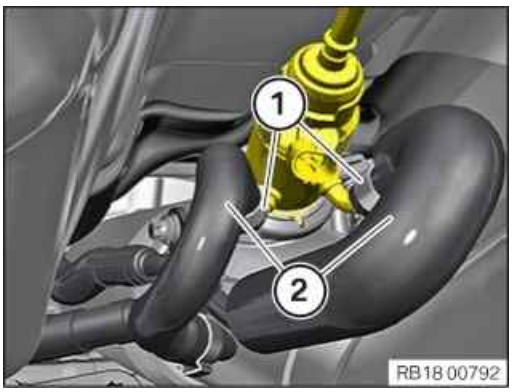


- Guide the heat protection cap (1) out and remove.

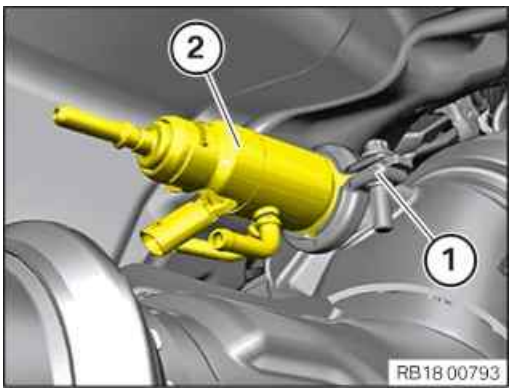


- When releasing the metering line, make sure that **no lateral forces** act on the metering line and the connection.

  The SCR metering module connection can be damaged by lateral forces.
- Unlock and disconnect the metering line (1).
- Unlock and disconnect connector (2).



- Loosen clamps (1).
- Disconnect coolant lines (2).



- Loosen V-band clamp (1).
- Guide out and remove the SCR metering module (2).

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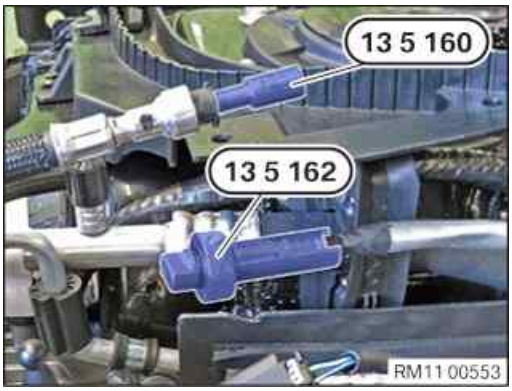
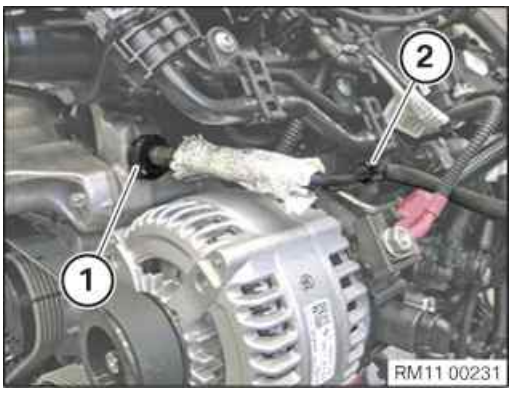
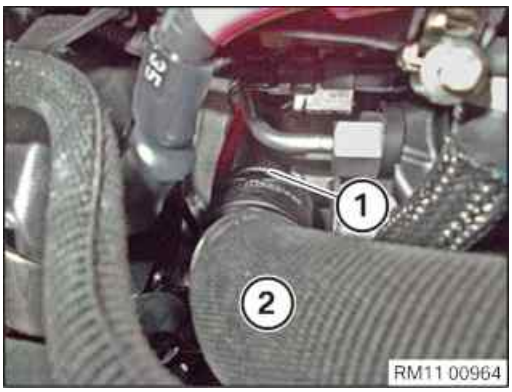
- Unlock and pull off the fuel lines (1).



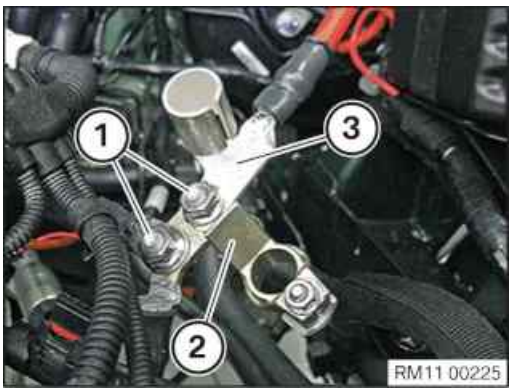
- Seal fuel lines with special tools and .



- Unlock the clamp (1).
- Pull off the coolant line (2) from the cylinder head.



- Unlock lock (1) upwards and pull off coolant hose (2).
- Catch and dispose of escaping coolant.



- Loosen nuts (1).
- Feed out the positive battery terminal (2) and the remote positive terminal (3) and set aside.

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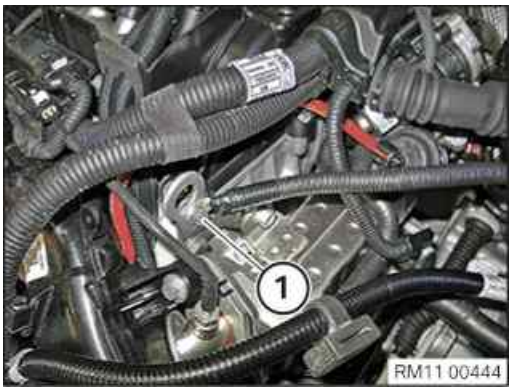
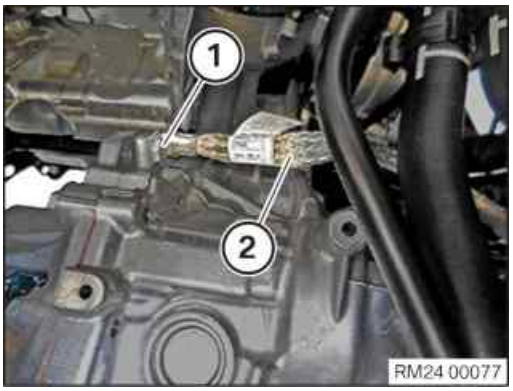
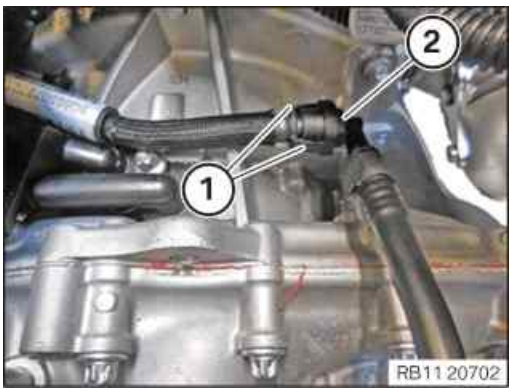


- Unscrew the bolt (1) and set the ground strap aside.

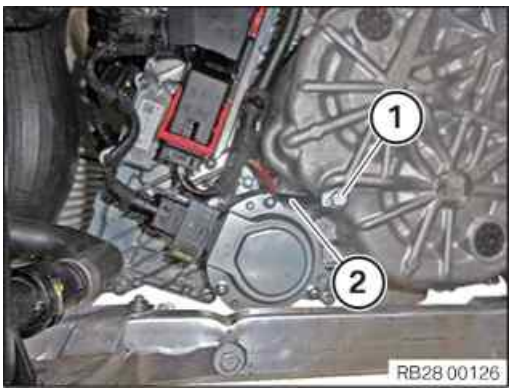


- Loosen screw (1).
- Feed out the grounding cable (2) and set aside.



- Unlock the locks (1).
- Feed out he vacuum line (2) and set it aside.

- Release the clamping collar (1) with the special tool **0 495 794 (17 2 050)**.
- Feed out coolant line (2) and place to one side.
- Catch and dispose of escaping coolant.



- Loosen screw (1).
- Feed out the grounding cable (2) and set aside.

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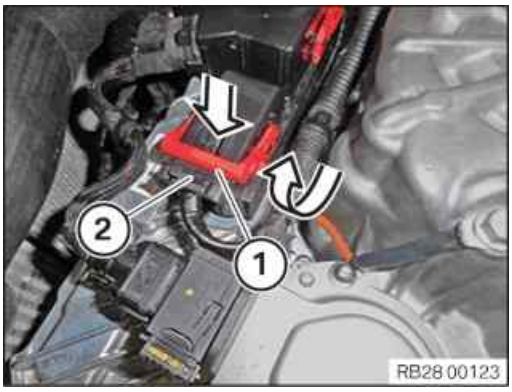
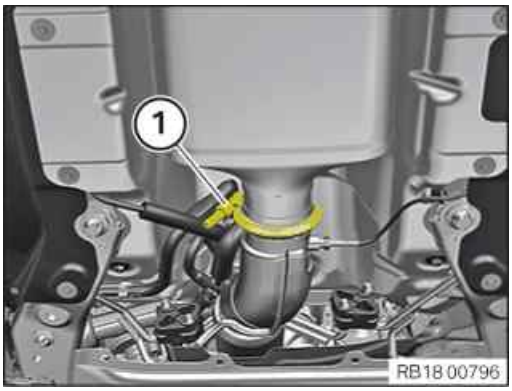
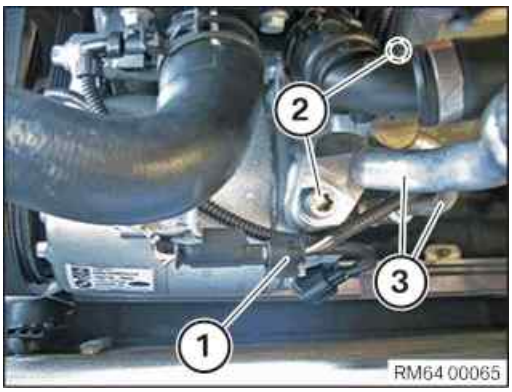


- Unlock and release the lock (1) in direction of arrow.
- Feed out connector (2) and place to one side.



- Loosen V-band clamp (1).
- Release exhaust system from diesel particulate filter.



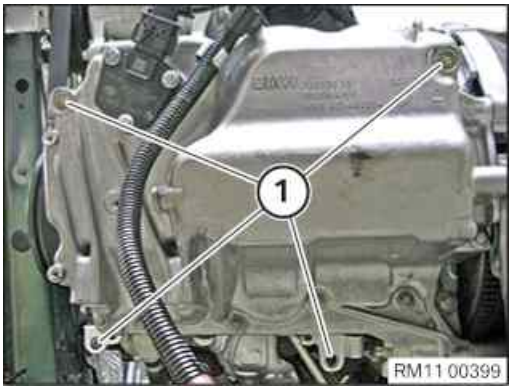
CAUTION

Residual pressure in the air conditioning.

Danger of injury!

- Wear safety goggles and protective gloves when disconnecting the refrigerant line.
- Seal refrigerant lines with seal plugs.

- Unlock plug connection (1) and disconnect.
- Loosen screws (2).
- Feed out the refrigerant lines (3) and set them aside.
- Close the openings on the refrigerant lines (3) and the air conditioning compressor with standard tools.



- Ensure that the spacer pins **40/50** of table top (A) of the mobile lifting table are installed in mounting points (1) of the oil sump.

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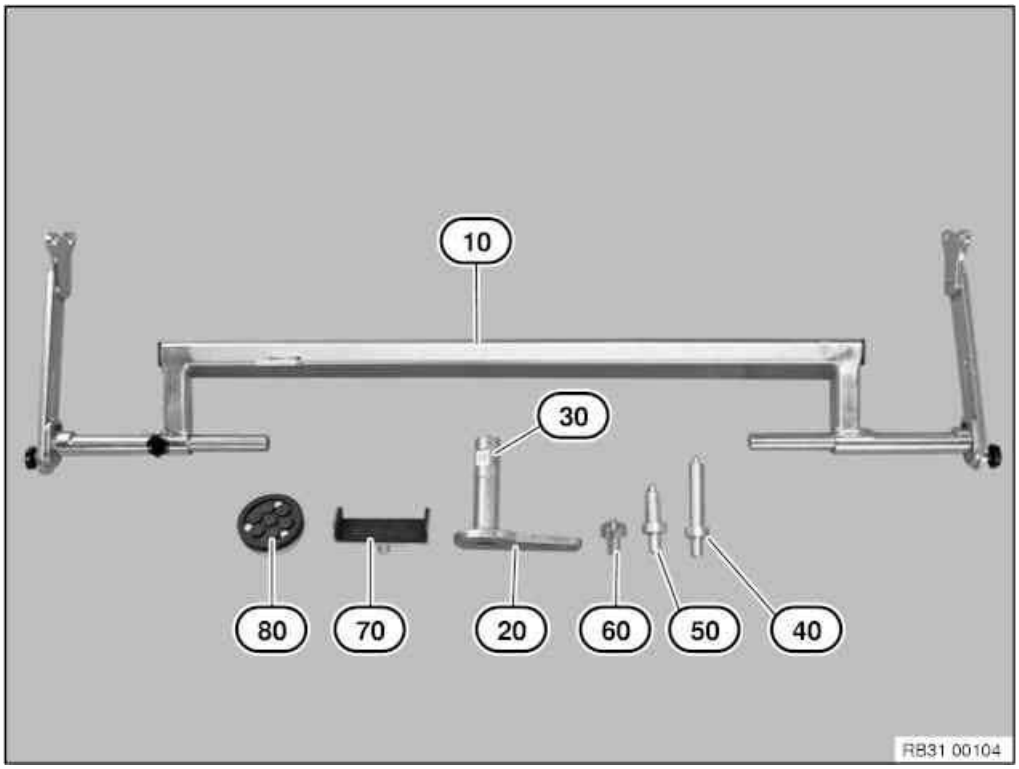
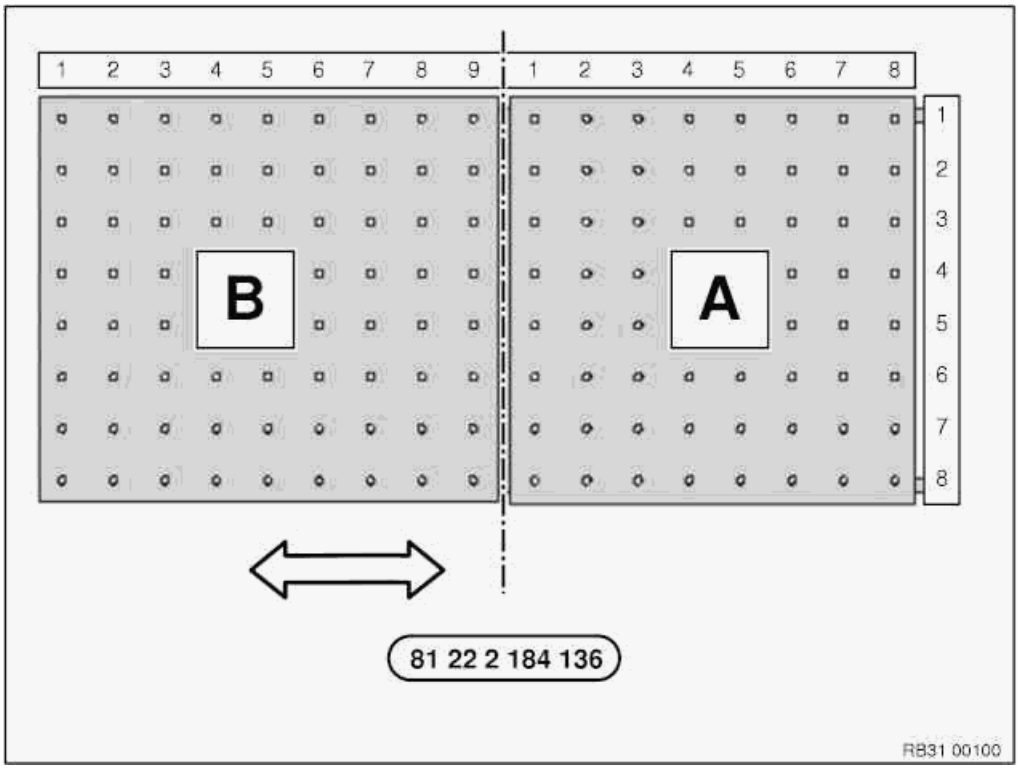


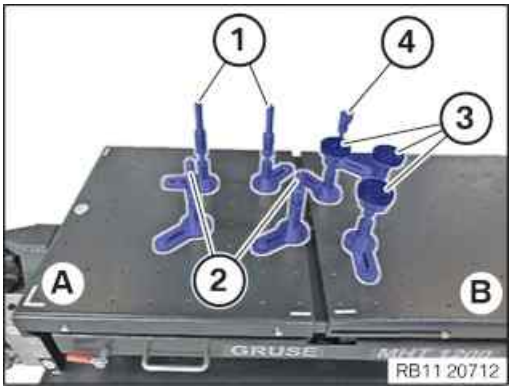
- Overview of the set of special tools **2 305 379**:

Number	Description
10	For mounting the swivel bearing including brake disc
20	Retaining element for adjustable fixture
30	Adjustable fixture
40	Distance pin 40 x 160 mm
50	Distance pin 40 x 110 mm
60	Distance pin 40 x 60 mm
70	Fixture with U-profile
80	Plate mounting 100 mm



- Overview of special tools **2 184 136**:

Letter	Description
A	Table top for engine with coordinates
B	Table top for transmission with coordinates



- Position adjustable mounting (30) with spacer pin (40) for the engine block on the table top (A) at coordinates **5/6** and **1/7** (1).
- Position adjustable fixture (30) with spacer pin (50) for the engine oil sump on table top (A) at coordinates **5/3** and **2/3** (2).
- Position adjustable fixture (30) with distance pin (80) for transmission housing on table top (B) at coordinates **9/6**, **7/6** and **8/2** (3).
- Position the adjustable mounting **2 357 221** for the transmission housing on the table top (B) at coordinates **7/7** (4).

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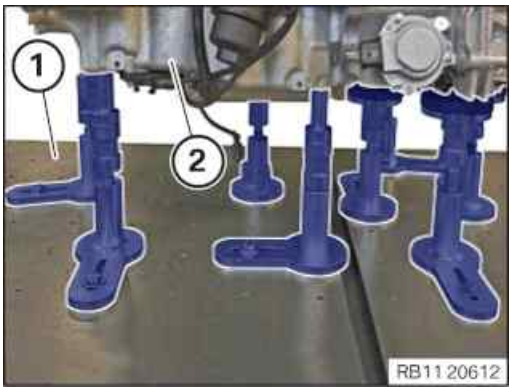
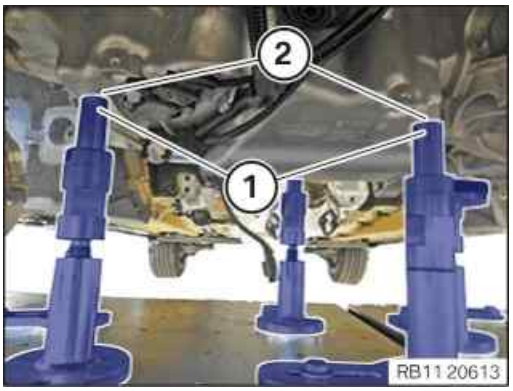
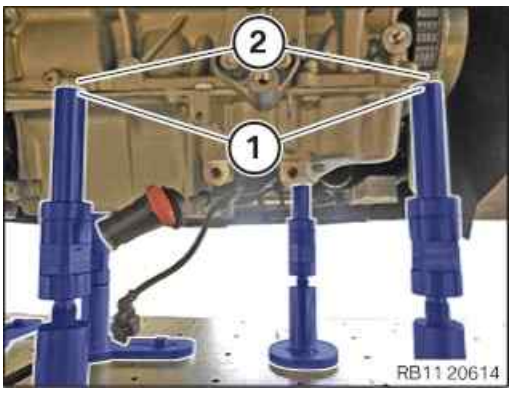


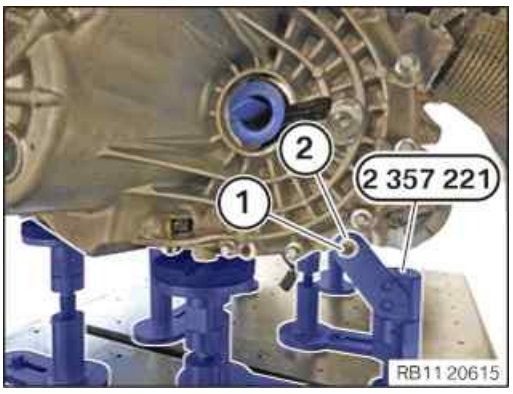
- Position the lifting table (1) below the engine (2).
- Abut all fixtures and screw them to the lifting table (1).



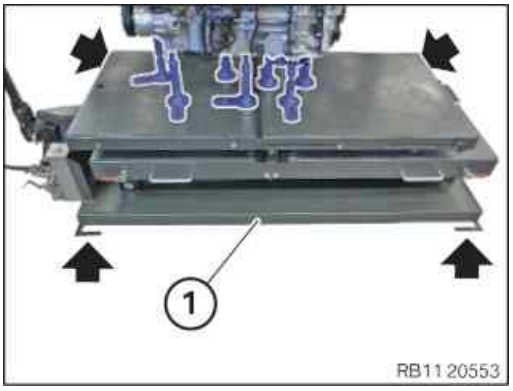
- Make sure that the spacer pins (1) are correctly positioned in the mountings (2) of the engine oil sump.



- Make sure that the spacer pins (1) are correctly positioned in the mountings (2) of the crankcase.



- Screw the special tool **2 357 221** with a commonly available bolt (1) and nut (2) onto the transmission housing.



- Mark the position of the lifting table (1) on the workshop floor (arrows).

  The marks (arrows) make the installation easier.

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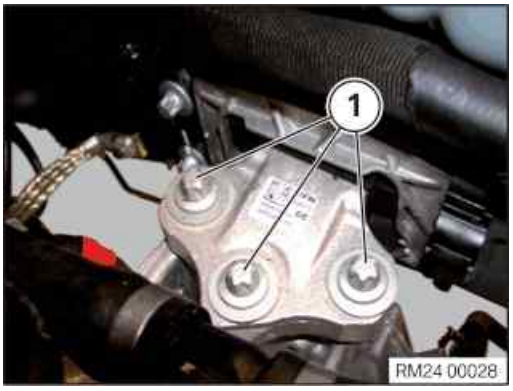
WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

- Position the weight compensation (1) on the vehicle.



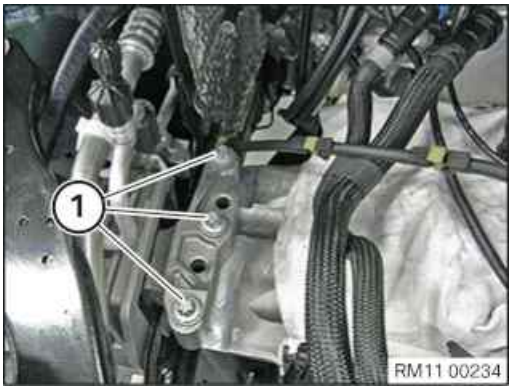
WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

- Loosen screws (1).



WARNING

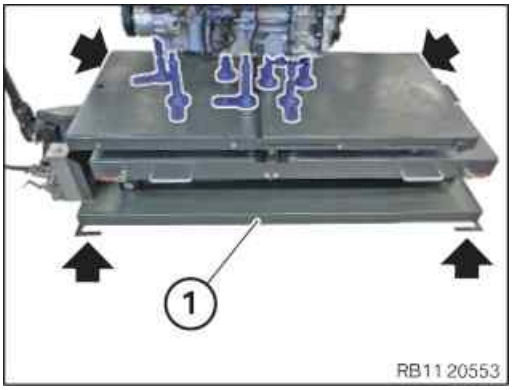
Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

- Loosen screws (1).
- Raise the vehicle **carefully**.

40 – Install engine



- Position the lifting table (1) with the engine under the vehicle.

  The marks (arrows) that were made on the workshop floor during the disassembly serve as positioning aid.

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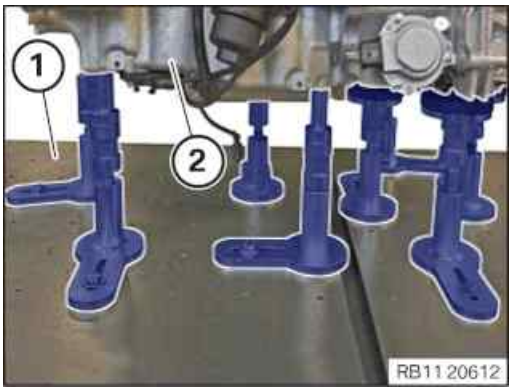


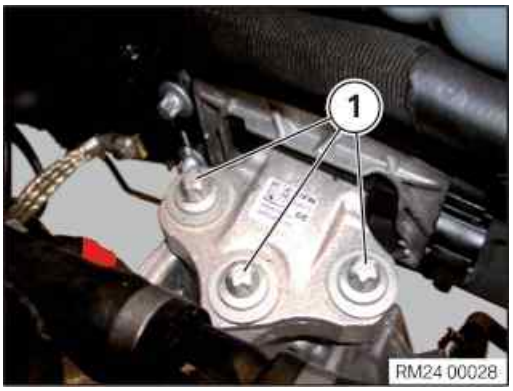
WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

- Lower the vehicle **carefully** and, if necessary, the positioning of the lifting table (1) with the engine (2) must be **corrected**.



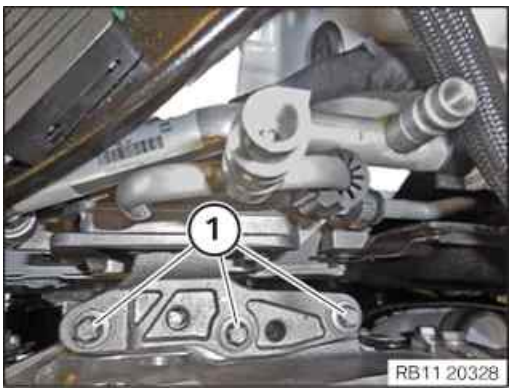
- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1).

Transmission mounting

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



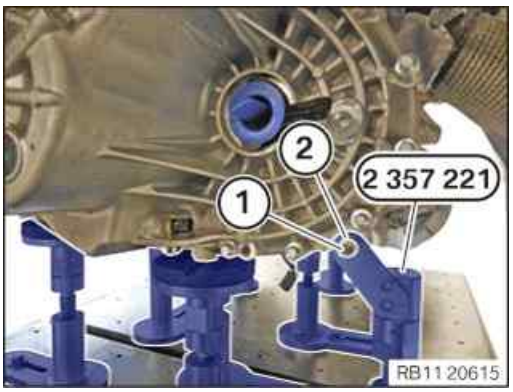
- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1).

Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



- Release standard nut (1) on the special tool **2 357 221**.
- Feed out and remove standard bolt (2) on the special tool **2 357 221**.

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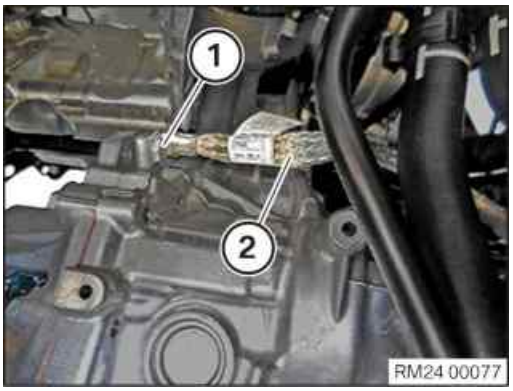
WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

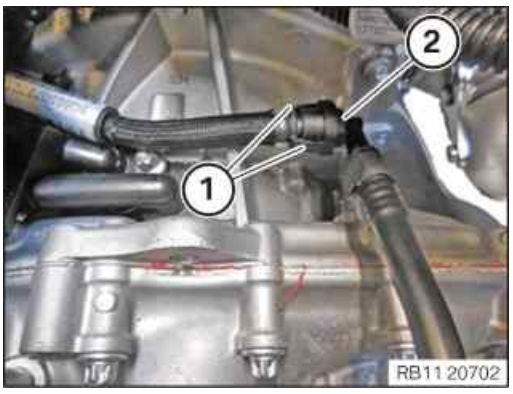
- Remove weight compensation (1) from the vehicle.
- Lower lifting table(2) and put to one side.



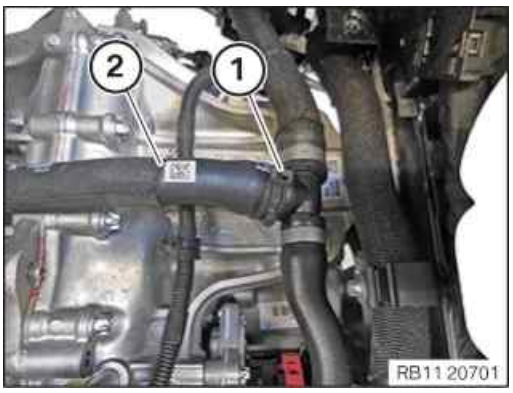
- Thread in and position grounding cable (2).
- Tighten down screw (1).

Standard screw connection M8

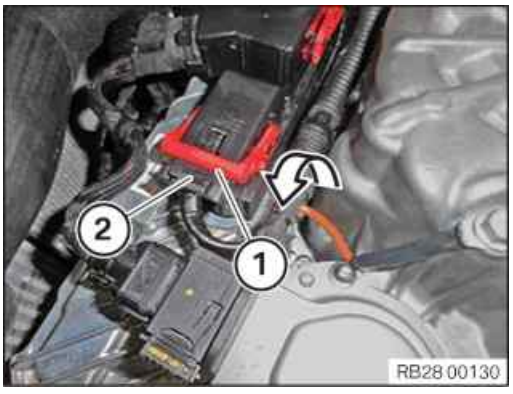
M8		Tightening torque	19 Nm



- Connect the vacuum line (2) and lock.
- Ensure that the locks (1) engage audibly.



- Feed in and install coolant line (2).
- Secure clamping collar (1) with the special tool **0 495 794 (17 2 050)**.



- Feed in and install the connector (2).
- Lock the lock in direction of arrow (1).
- Ensure that the lock (1)engages audibly.

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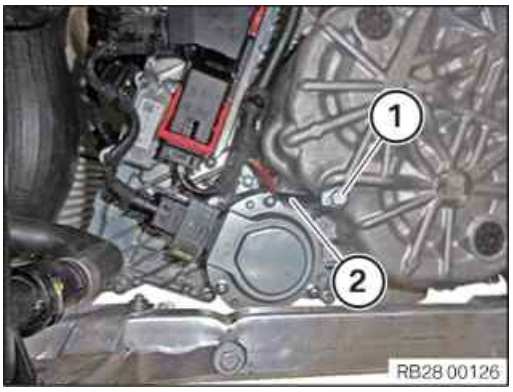
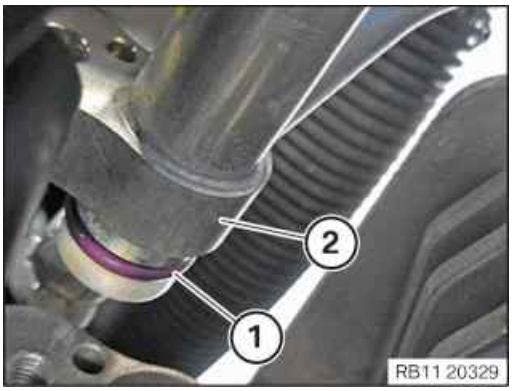


- Install and position grounding cable (2).
- Tighten down screw (1).

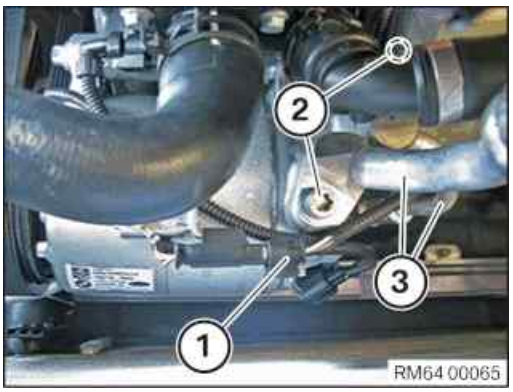
Standard screw connection M6

M6		8 Nm



- Renew sealing ring (1) of the refrigerant lines (2).

  Parts: Sealing ring

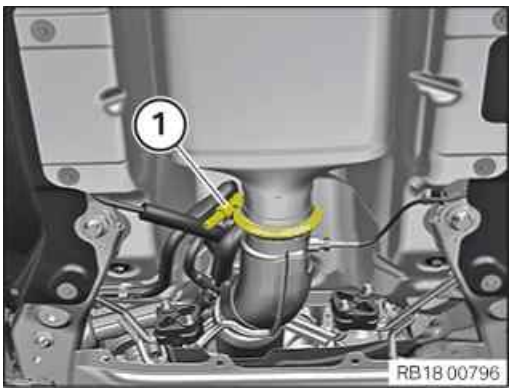


- Feed in and install the refrigerant lines (3).
- Tighten the screws (2).

Refrigerant line on air conditioning compressor

M8		Tightening torque	19 Nm

- Connect connectors (1) and lock.
- Make sure the connector (1) engages audibly.



- Connect exhaust system to the diesel particulate filter.
- Feed in and install V-band clamp (1).

▸ **Install the V-clip**

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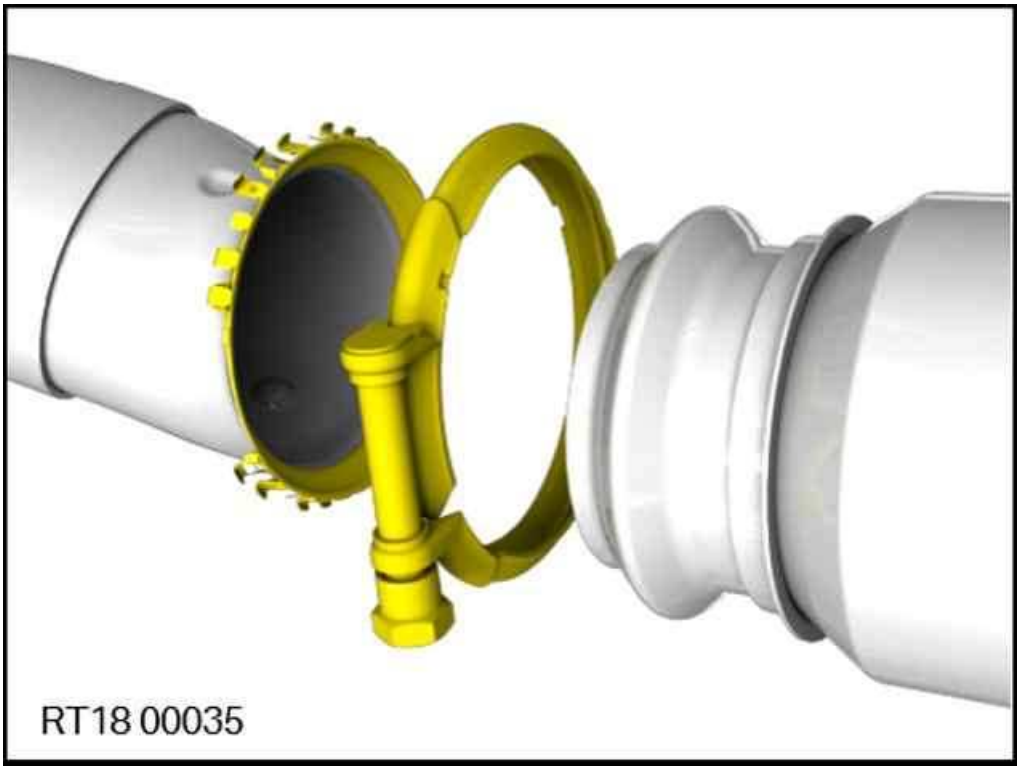
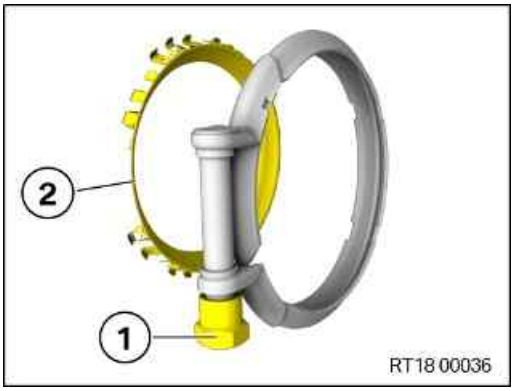
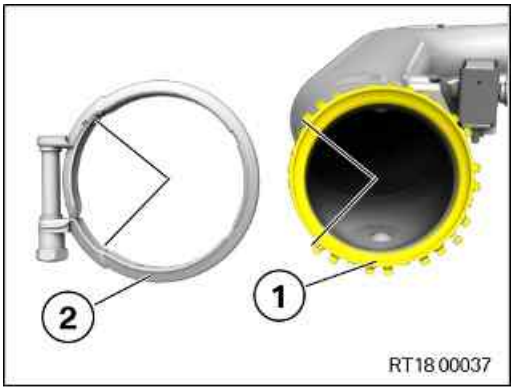
V-band clamp



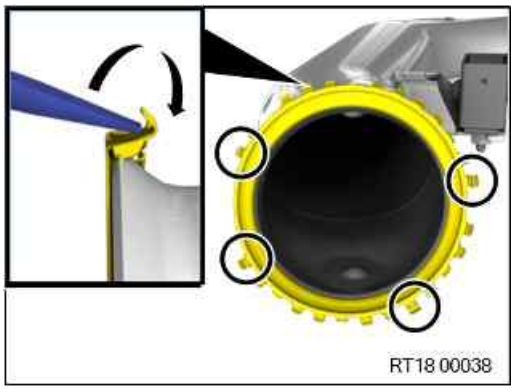


- Unscrew the nut (1) and remove the sealing ring (2).



- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

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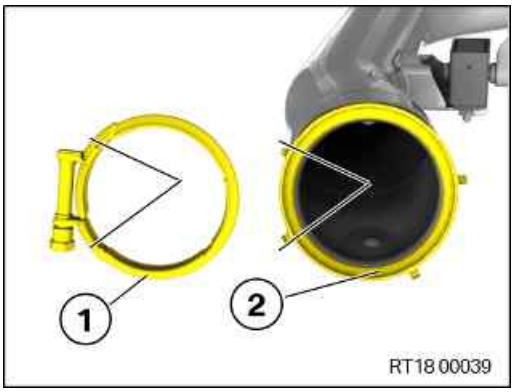
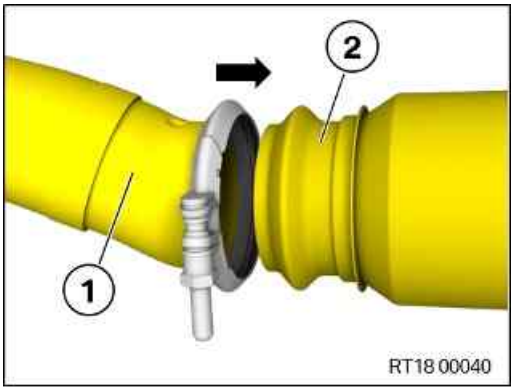
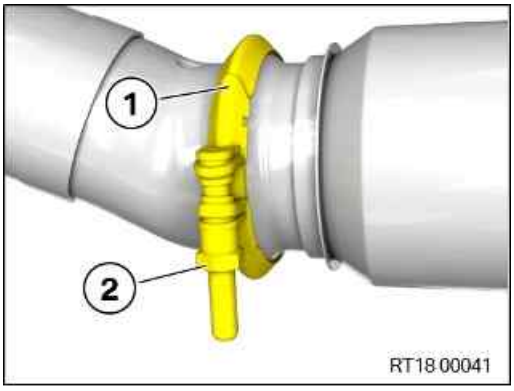


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



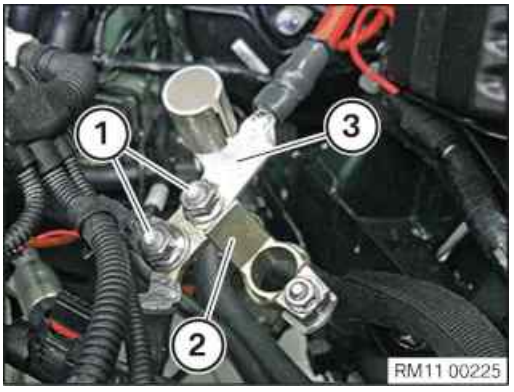
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Insert and install the positive battery terminal (2) and the remote positive terminal (3).
- Tighten nuts (1).

Positive battery cable to positive battery terminal

M8		Tightening torque	15 Nm

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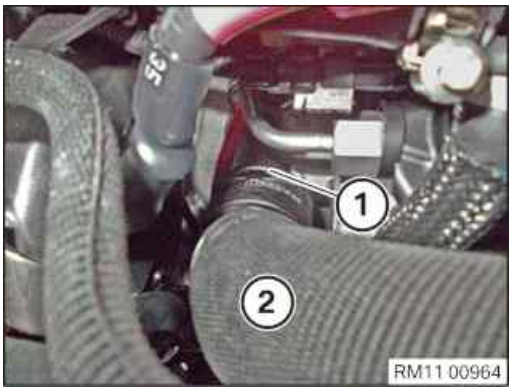
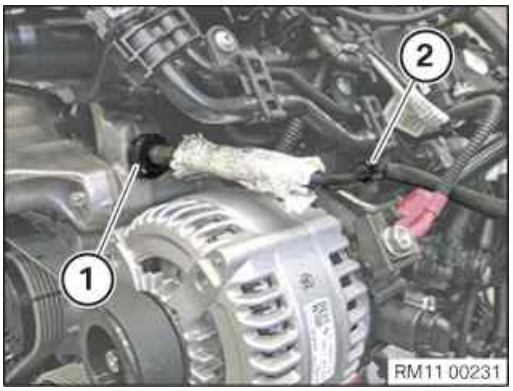
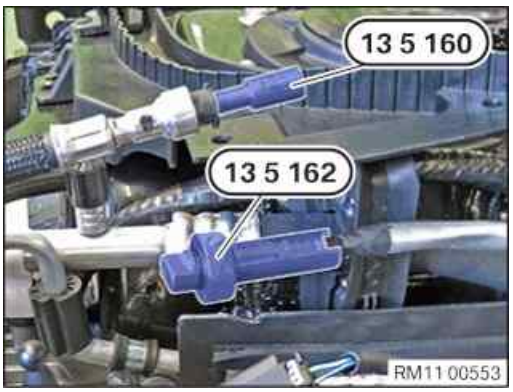


- Connect and lock the coolant lines (2).
- Ensure that the lock (1) engages audibly.



- Connect the coolant line (2).
- Lock clamp (1).



- Thread out special tools and remove.

- Route and connect fuel lines (1).
- Ensure that the locks engage audibly.

POSTPROCESSES

41 – Install the SCR metering module

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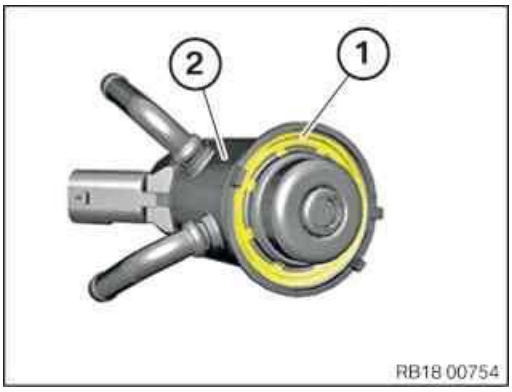
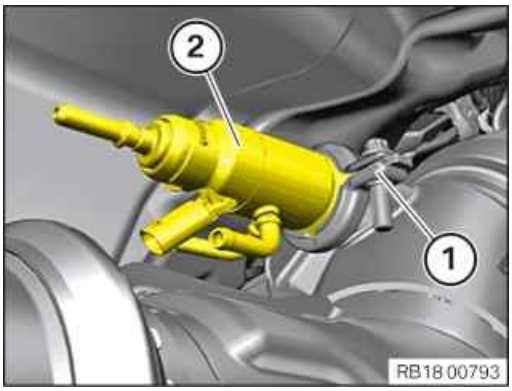


- Renew the seal (1) of the SCR metering module (2).

  Parts: Sealing ring

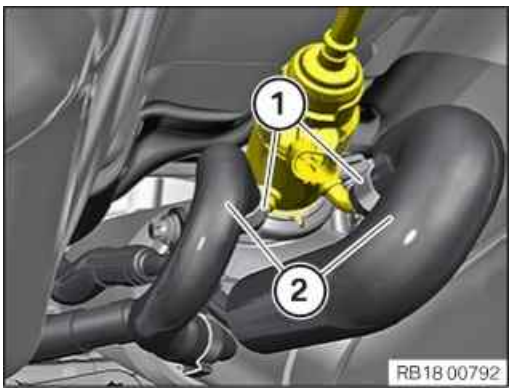


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

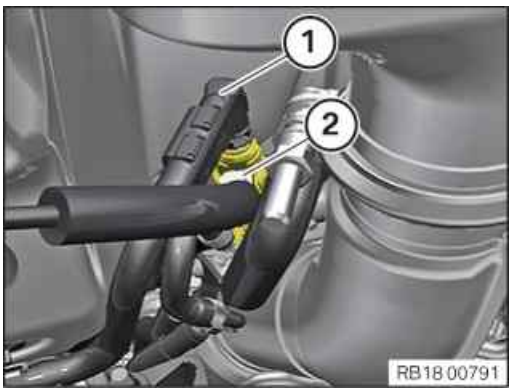
SCR metering module V-clip to exhaust system

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Connect the coolant lines (2).
- Renew the clamps (1).

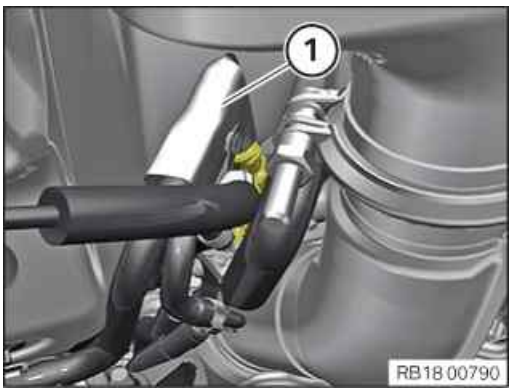
  Parts: Clamps
- Fasten the clamps (1).



- Connect connectors (2) and lock.

  The connector (2) must engage audibly.
- Connect and lock the metering line (1).

  Metering line (1) must engage audibly.



- Insert and install the heat protection cap (1).

42 – Installing exhaust temperature sensor on catalytic converter

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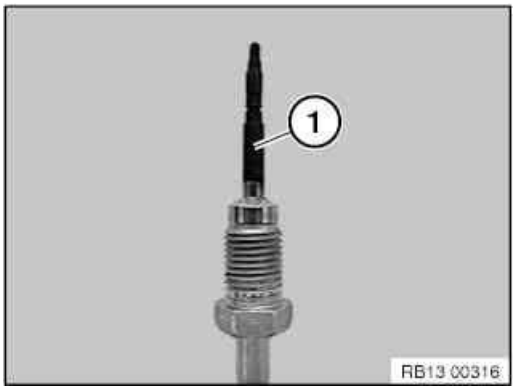


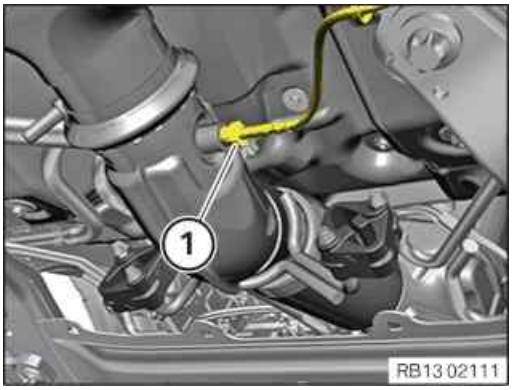
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.

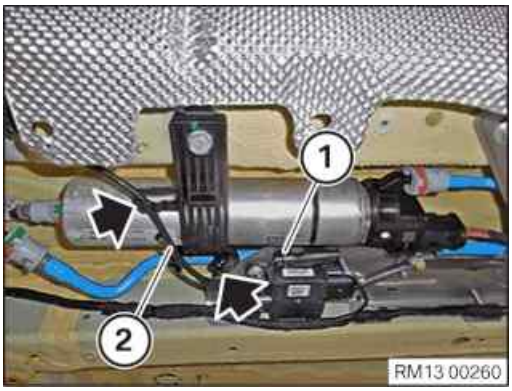


- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

43 – Installing the output shaft, right (double-clutch transmission (DKG))

▸ **Installing the right radial shaft seal on the differential (7DCT300)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

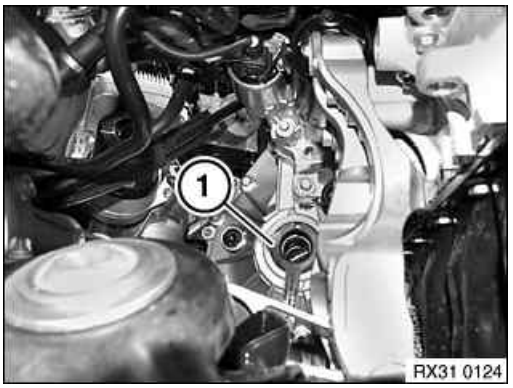
- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

- Coat sealing lips of radial shaft seal with transmission oil.
- Drive the radial shaft seal into the gearbox housing using the special tool **2 409 230**.

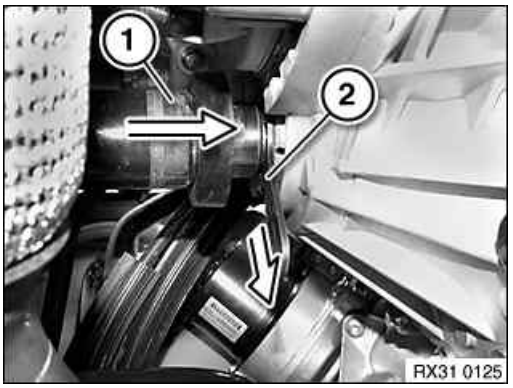
  The sealing ring must lie flush with the gearbox housing.

- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.

Note: Make sure the output shaft is joined in parallel to the axle and without being entangled.

- Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.
- Check for secure seat by levering.

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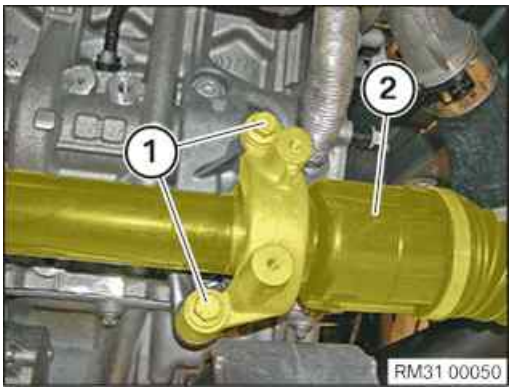
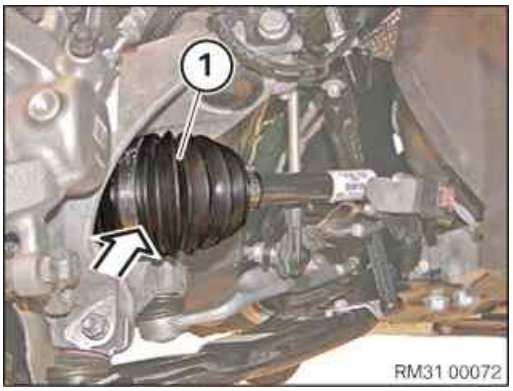


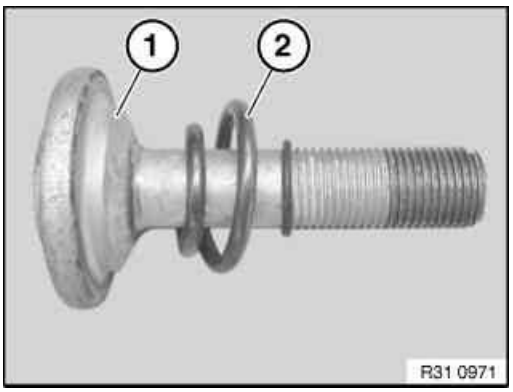
- Tighten the screws (1).

Output shaft bearing to engine block

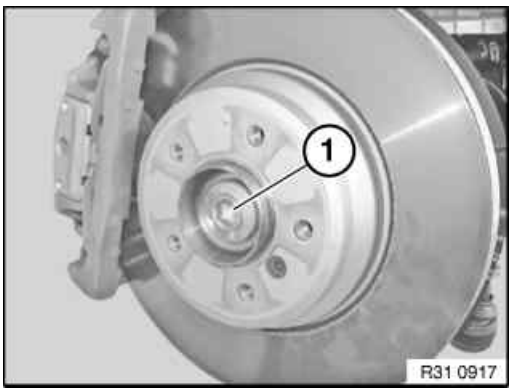
M10		Tightening torque	38 Nm



- Turn steering wheel to right.
- Insert the output shaft (1) into the swivel bearing from the front.

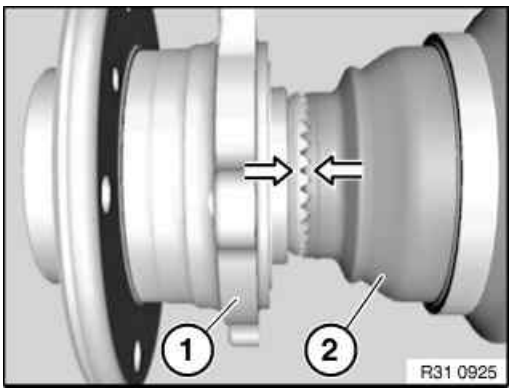


- Note installation position of compression spring (2).
- Keep the collar bolt (1) and the front gearing of the wheel bearing and the output shaft clean and free of grease.



- Renew collar bolt (1) with compression spring.

  Parts: Collar bolt with compression spring
- Hand-tighten the collar bolt (1) with the compression spring.



- Install the front gearing of the wheel bearing (1) and output shaft (2) in an interlocking position (tooth-in-tooth position).
- Check whether the front gearing is locked tooth in tooth by reciprocally rotating wheel hub and the output shaft.
- If positive locking is ensured: Tighten the collar bolt to tightening torque. For this purpose, press the brake pedal.

Output shaft to wheel bearing

M16	Replace the collar bolt.	Jointing torque	210 Nm
		Angle of rotation	90 °

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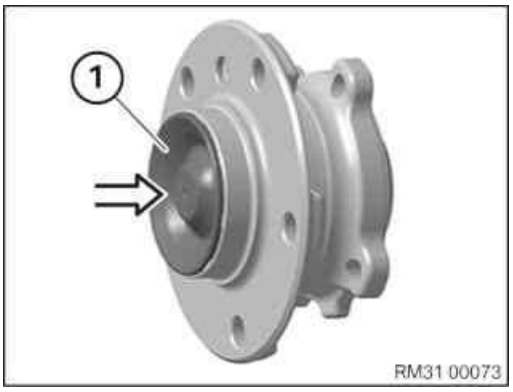

- If necessary, attach protective cap (1).

44 – Installing left output shaft (double-clutch transmission (DKG))

▶ **Installing the left radial shaft seal on the differential (7DCT300)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

- Coat sealing lips of radial shaft seal with transmission oil.
- Drive in radial shaft seal using the special tool **2 409 230** into the transmission housing.

  The sealing ring must close flush with the transmission housing.

- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

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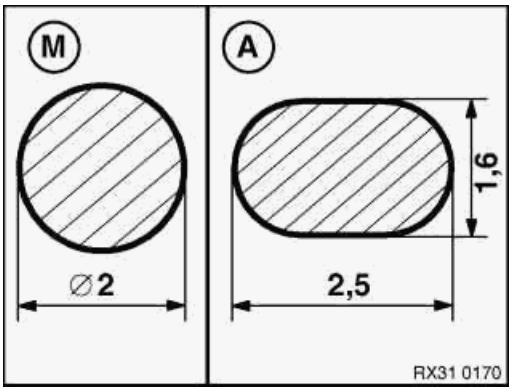
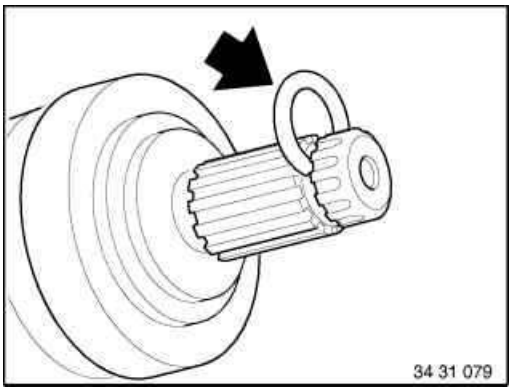


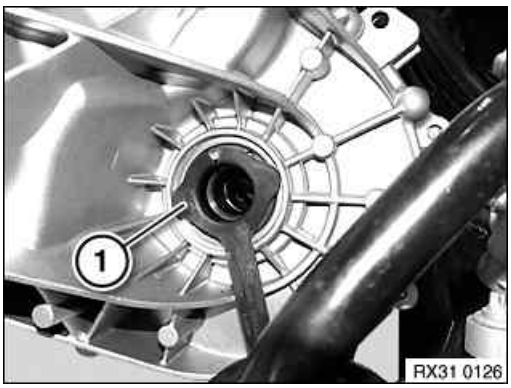
- Do not mix up circlips.

  Different types of output shafts fitted:

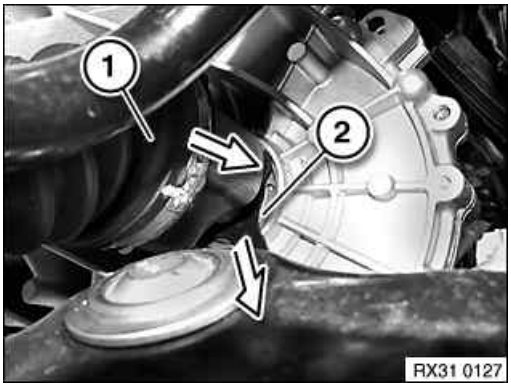
  - M: Manual transmission
  - A: Automatic transmission



- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

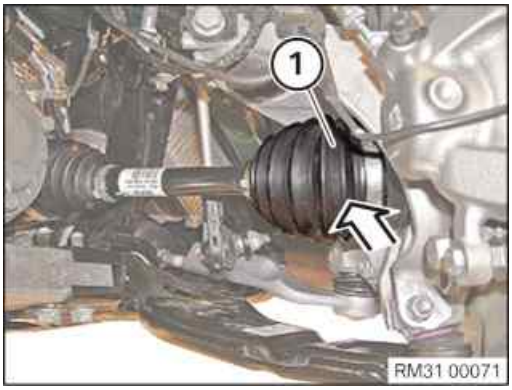


- Insert output shaft (1) into transmission.

Note: Make sure the output shaft is joined in parallel to the axle and without being entangled.

- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

  The output shaft (1) must engage audibly.
- Check for secure seat by levering.



- Turn steering wheel to left.
- Insert the output shaft (1) into the swivel bearing from the front.

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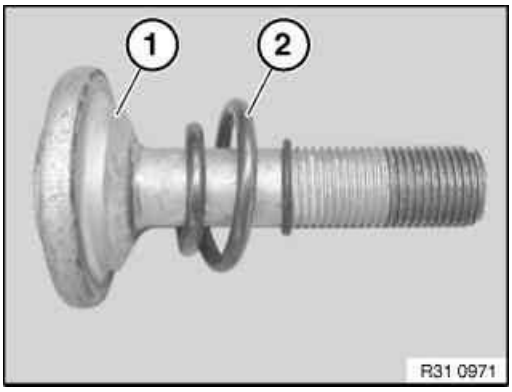
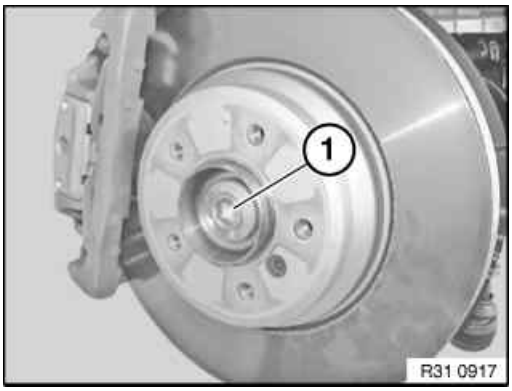
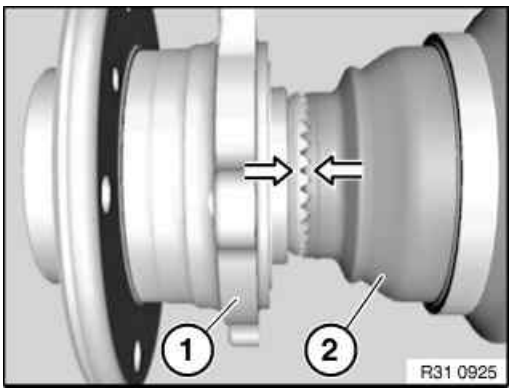


- Note installation position of compression spring (2).
- Keep the collar bolt (1) and the front gearing of the wheel bearing and the output shaft clean and free of grease.



- Renew collar bolt (1) with compression spring.

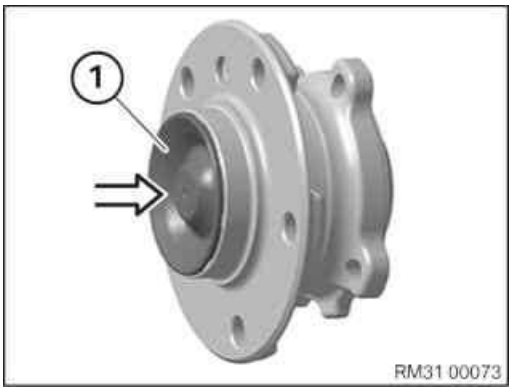
  Parts: Collar bolt with compression spring
- Hand-tighten the collar bolt (1) with the compression spring.



- Install the front gearing of the wheel bearing (1) and output shaft (2) in an interlocking position (tooth-in-tooth position).
- Check whether the front gearing is locked tooth in tooth by reciprocally rotating wheel hub and the output shaft.
- When positive locking is ensured: Tighten the collar bolt to tightening torque. For this purpose, press the brake pedal.

Output shaft to wheel bearing

M16	Replace the collar bolt.	Jointing torque	210 Nm
		Angle of rotation	90 °



- If necessary, attach protective cap (1).

45 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

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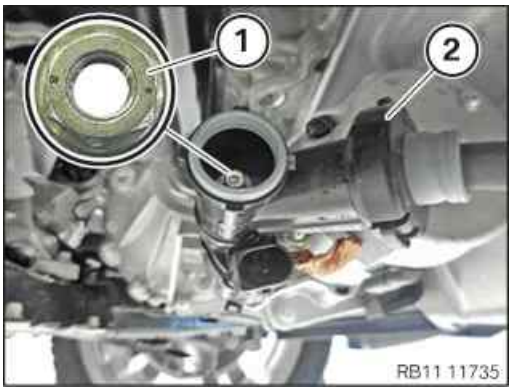
- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



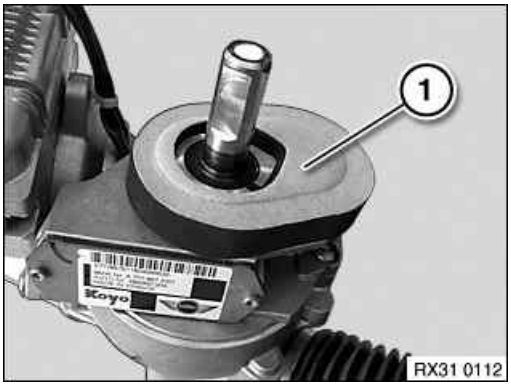
- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

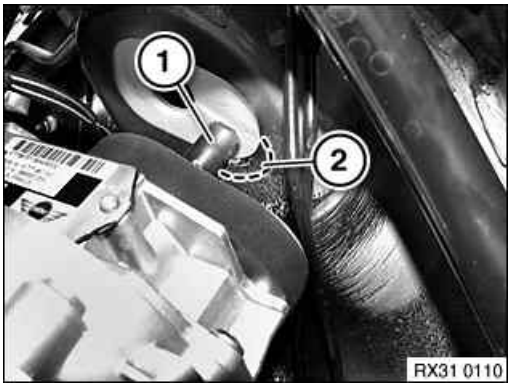
- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

46 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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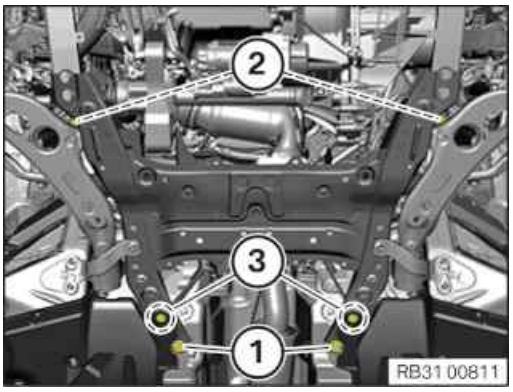


- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

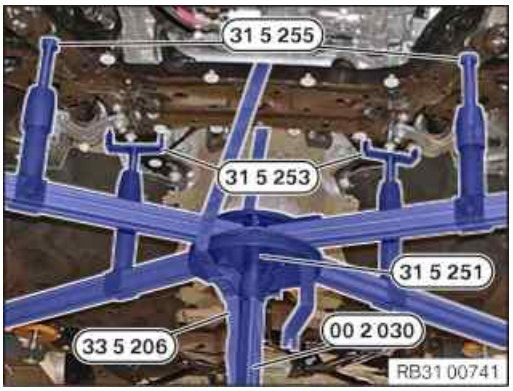
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

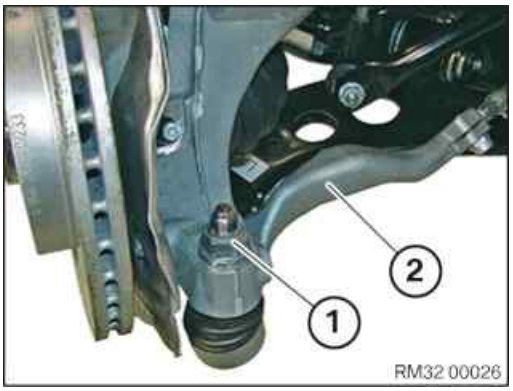
- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.



NOTICE

Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm

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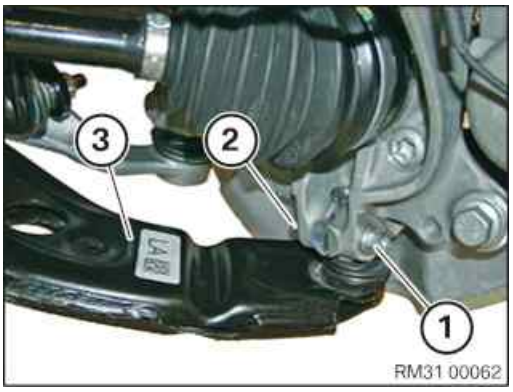


NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

47 – Install the mounted parts on the front axle support

NOTICE

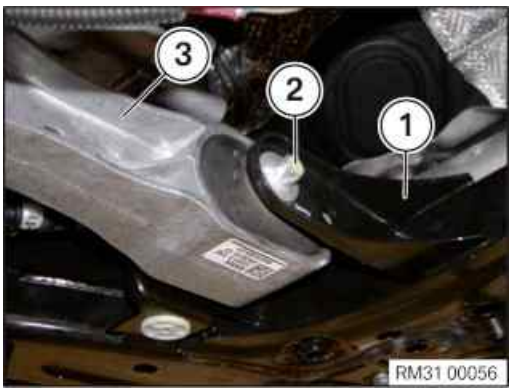
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

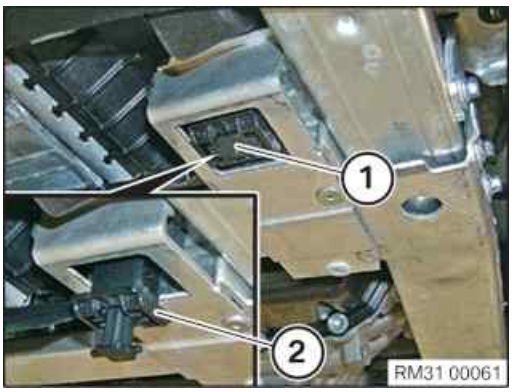
M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.

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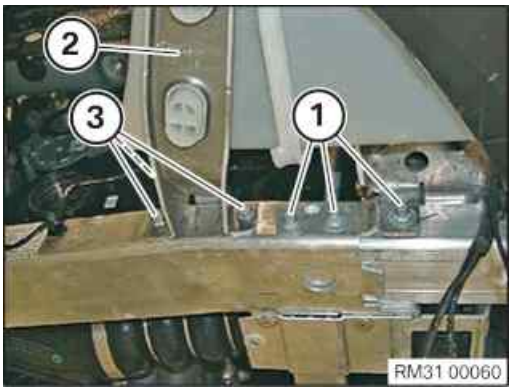


- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

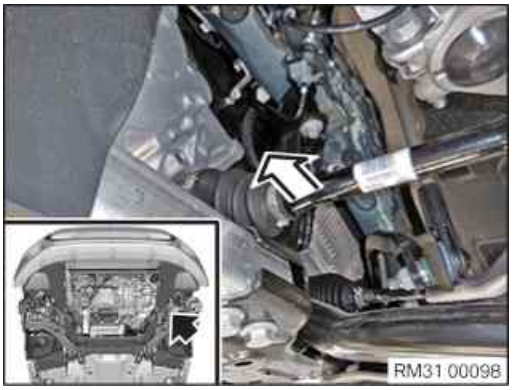
Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

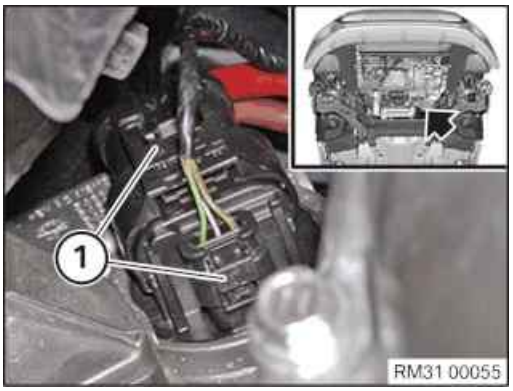
		Tightening torque	11,8 Nm

48 – Attaching connector at steering gear

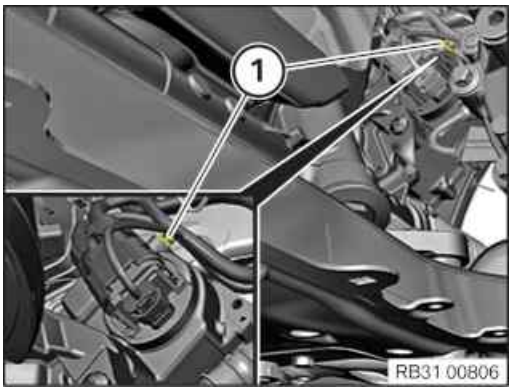


- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**

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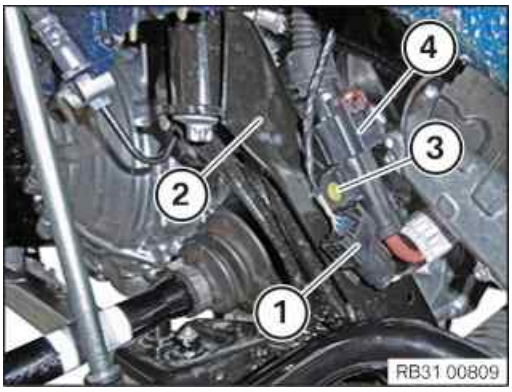


- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

49 – Securing rubber mount on front axle support

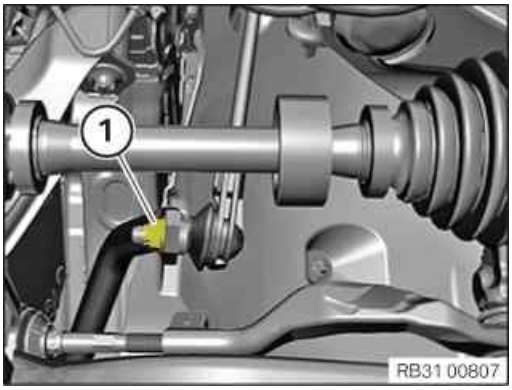
- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

50 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.



▸ **Fastening anti-roll bar on the anti-roll bar link**

- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

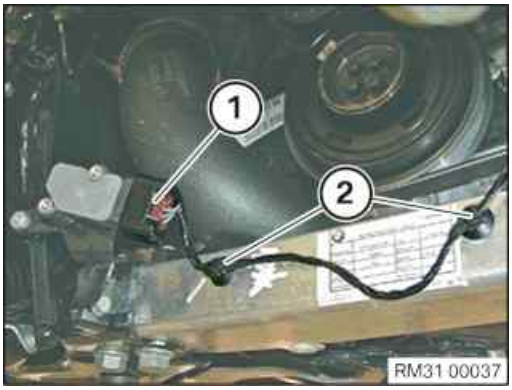
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

51 – With right installation: Securing the cable for the ride height sensor



- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

52 – Installing pressure pipe between throttle body and charge air cooler

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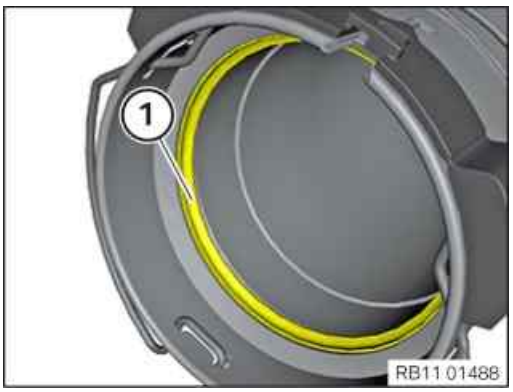
RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



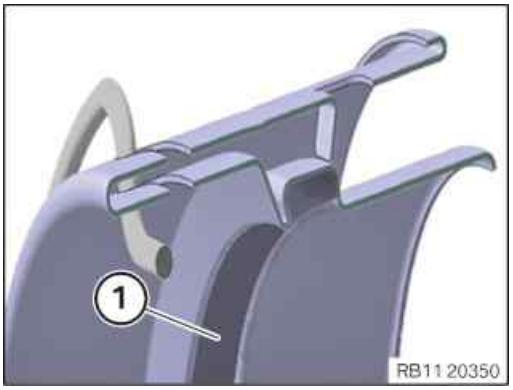
- Check seal (1) for damage and renew seal (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

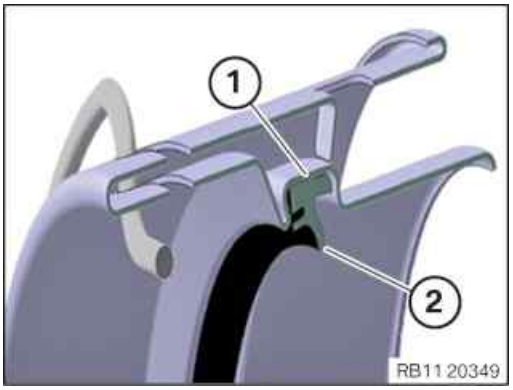
TECHNICAL INFORMATION

Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).

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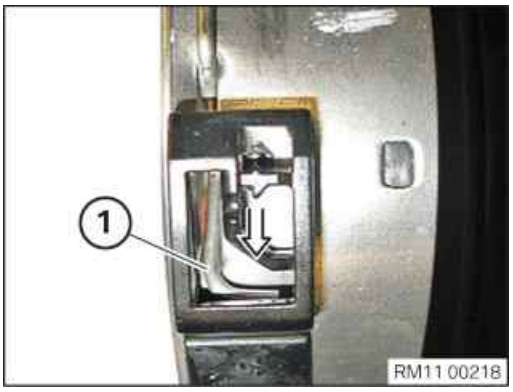
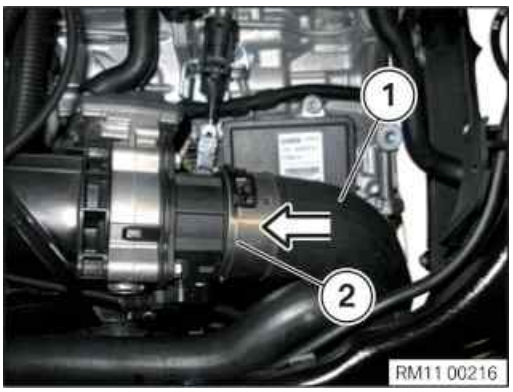
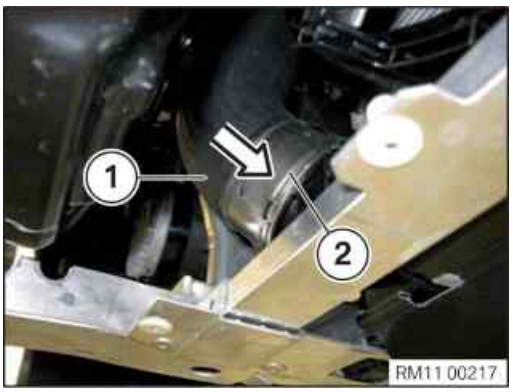


- Detach the locks (1) in the direction of the arrow from the brackets.

- Insert and install the pressure pipe (1) in the direction of the arrow.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (1) engage audibly.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (2)engage audibly.

53 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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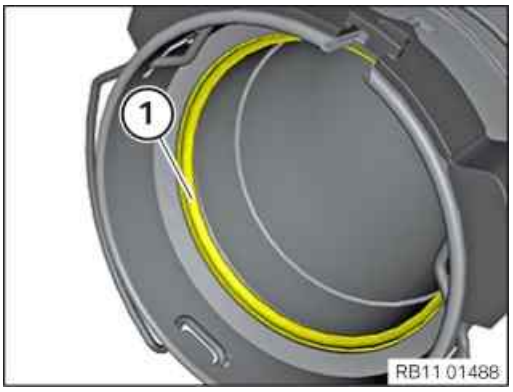
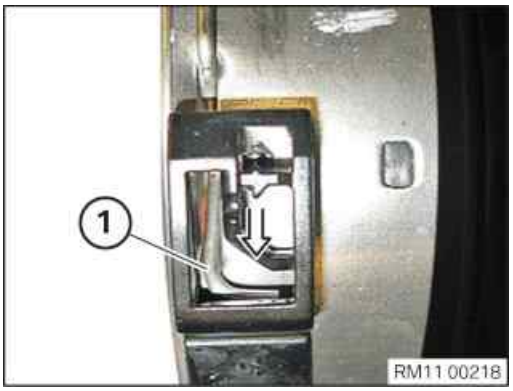
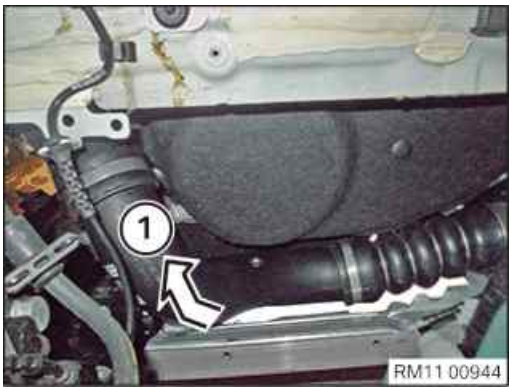


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

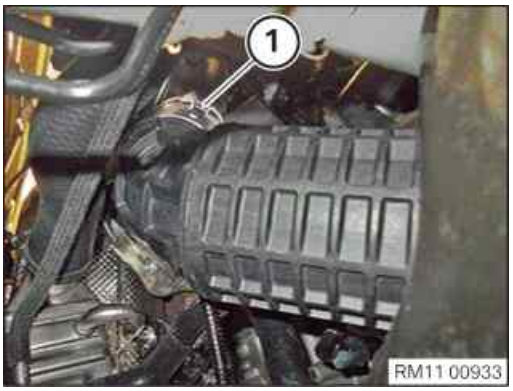
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

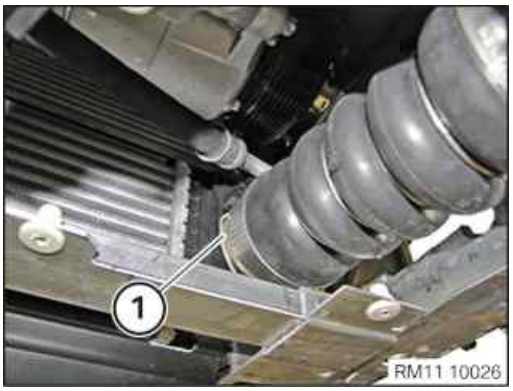


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

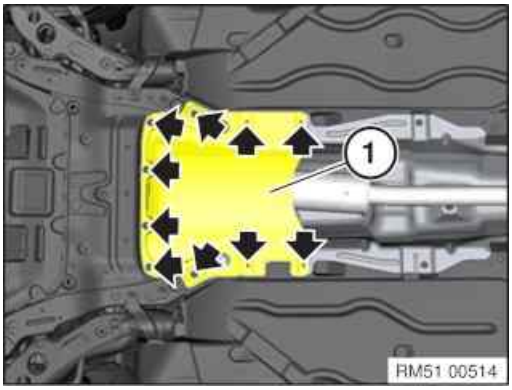
M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

54 – If installed: Installing underbody protection at rear

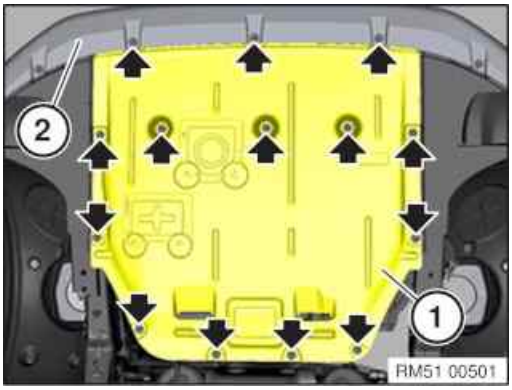


- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

55 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

56 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**

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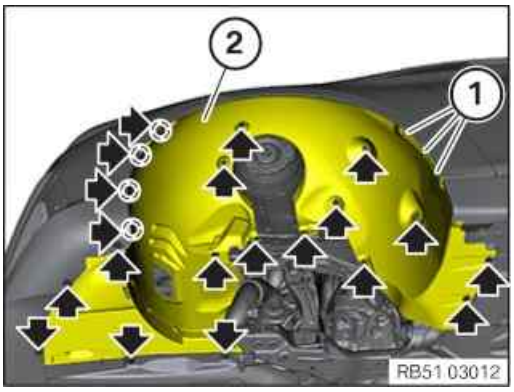


- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

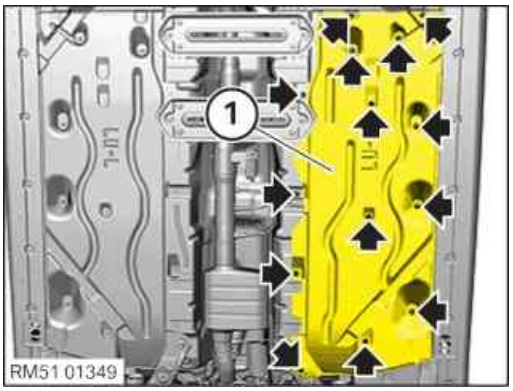
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

57 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

58 – Mount the front left and right wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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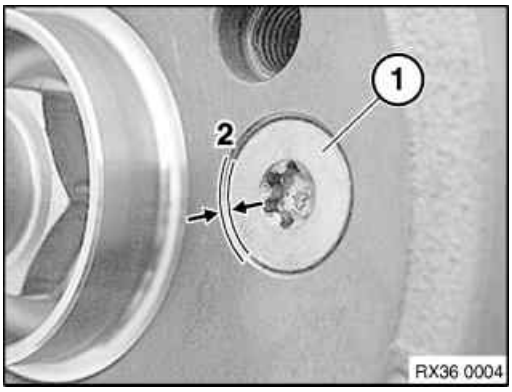


- Check the mounting bolt for the brake disc (1) for secure fit.

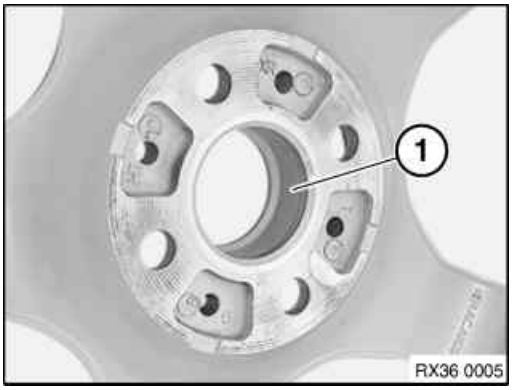
  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

◁

TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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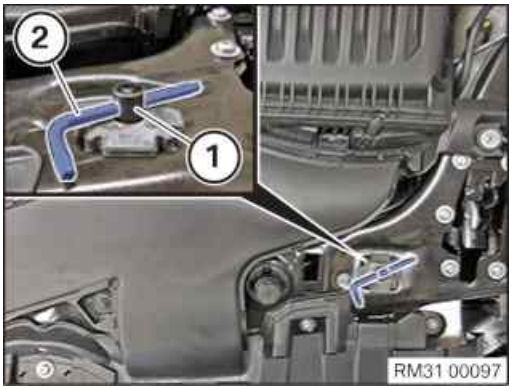
59 – Removing fastener for left and right radiator

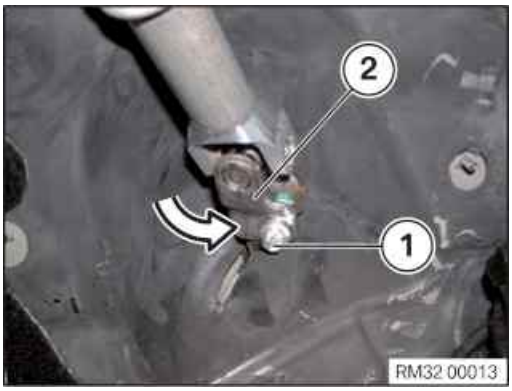


NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

60 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

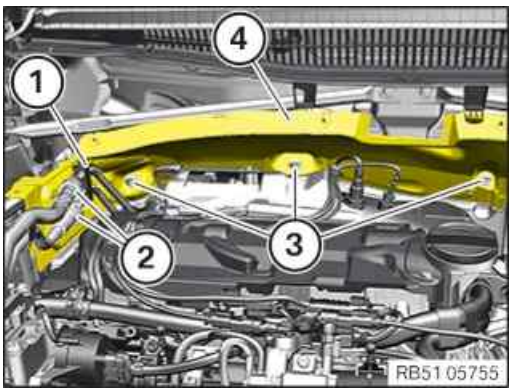
M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

61 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

62 – Install the battery holder

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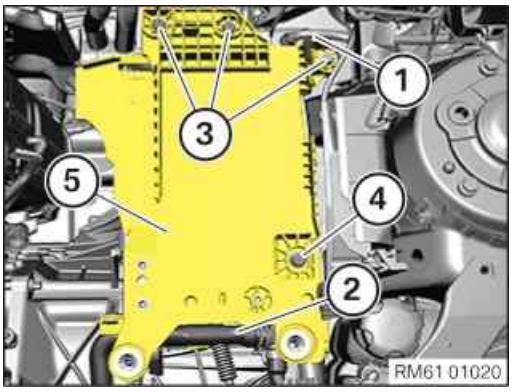


- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

63 – Install electronics box

Prerequisite

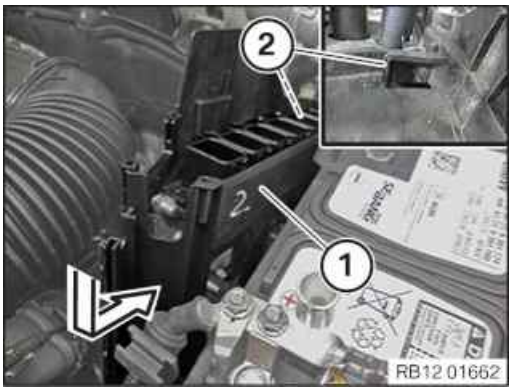
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

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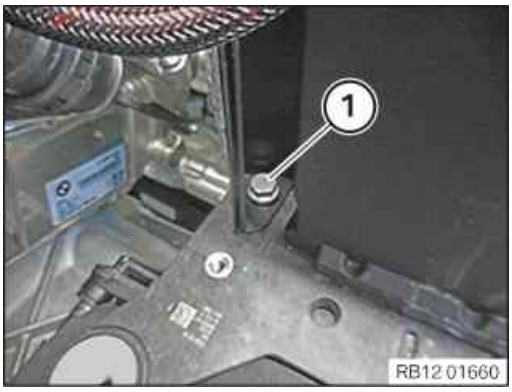
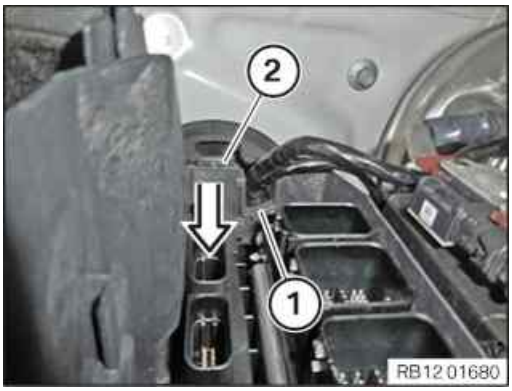


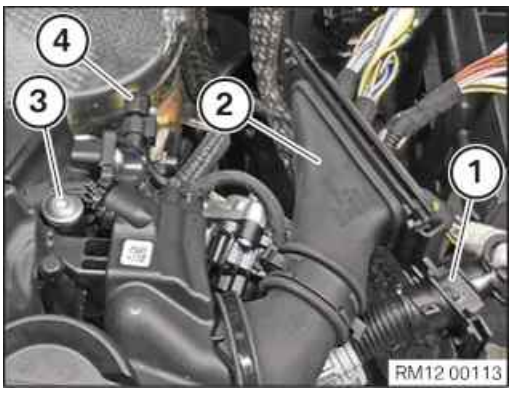
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

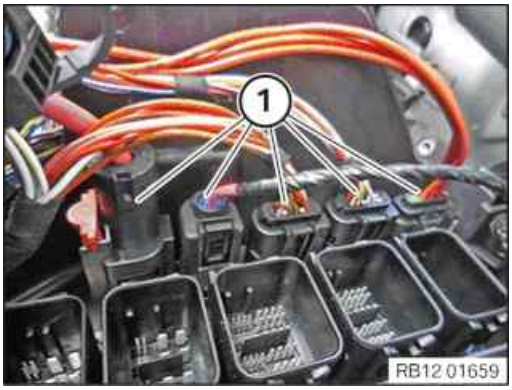


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

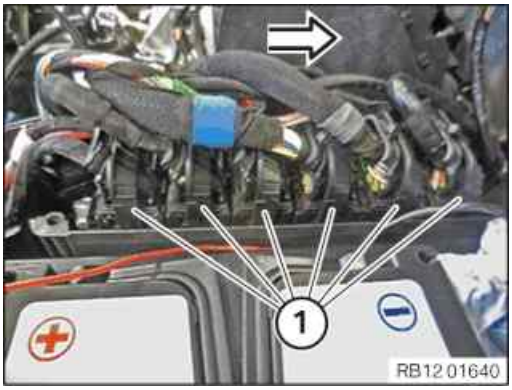
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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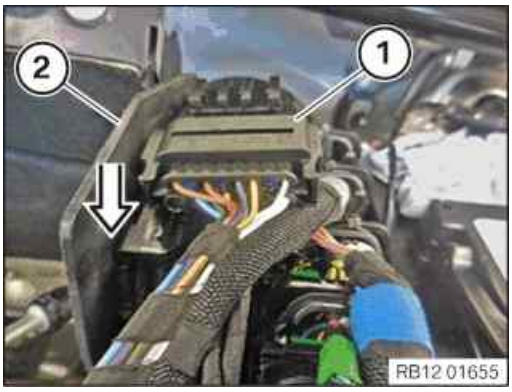
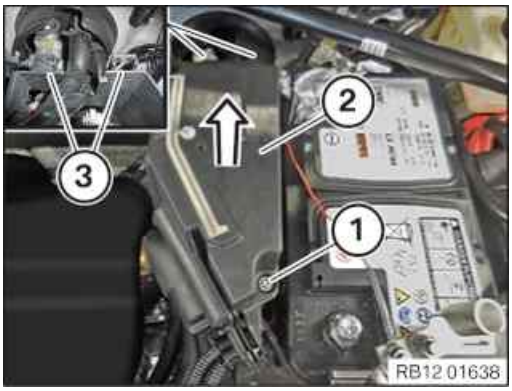


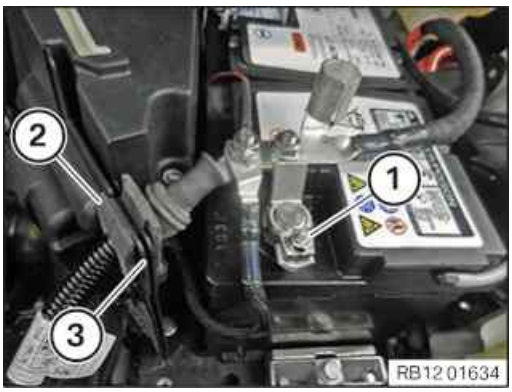
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

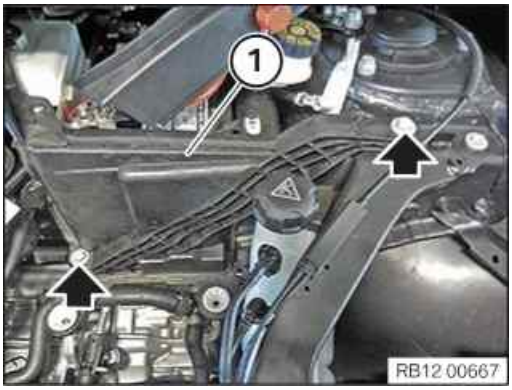
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

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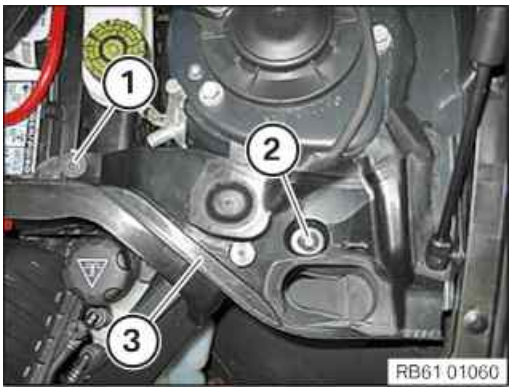
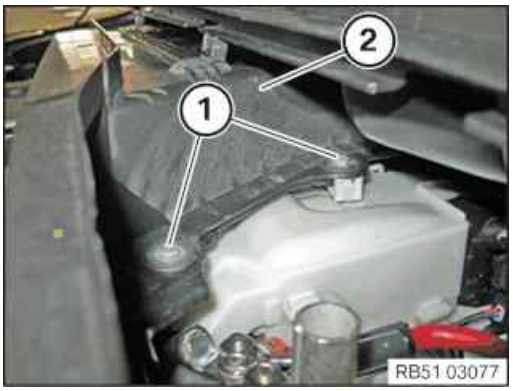


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

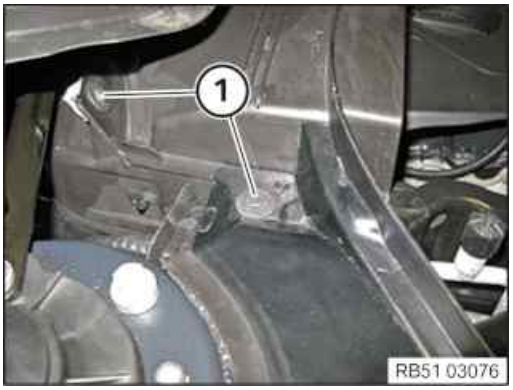
64 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

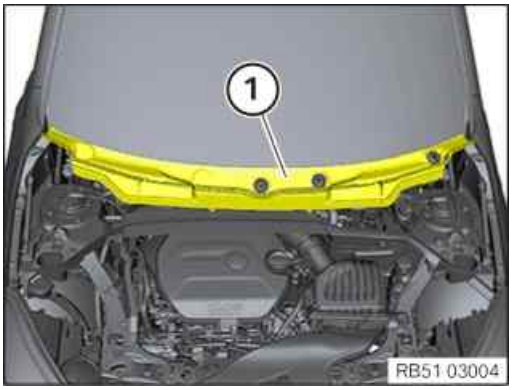
Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

65 – Install the rear cowl panel cover



- Feed in and engage the rear cowl panel cover (1).

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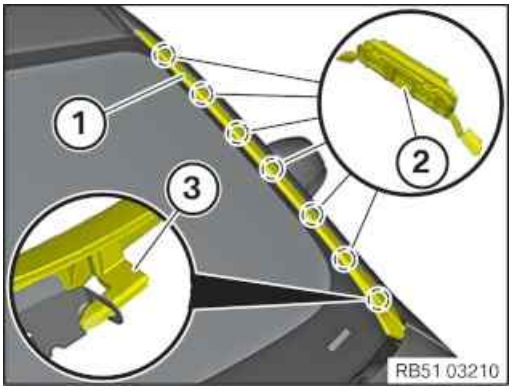
66 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.



▸ **Install the gutter strip on the windscreen**

- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

67 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.

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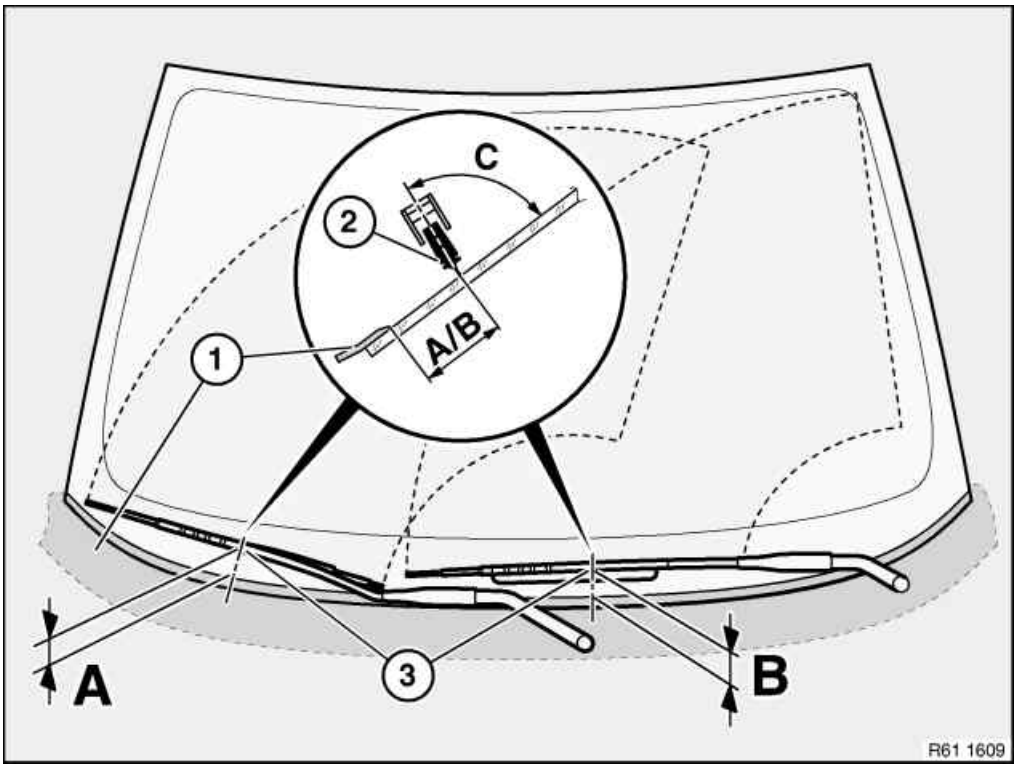
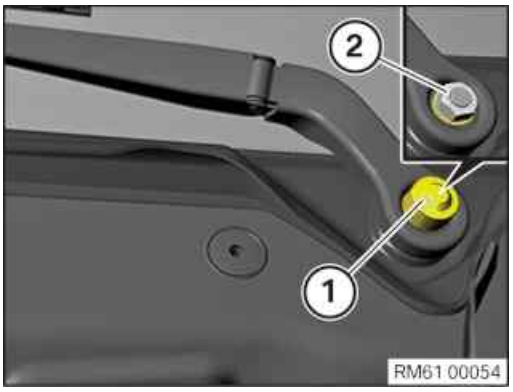


- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

68 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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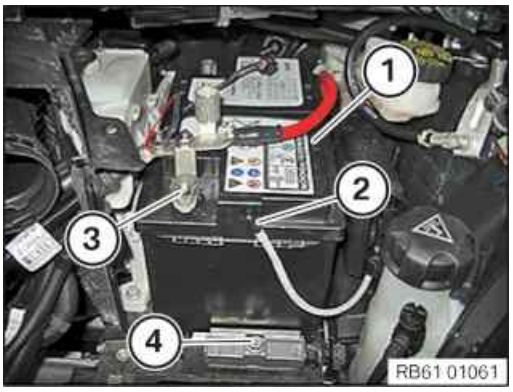


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

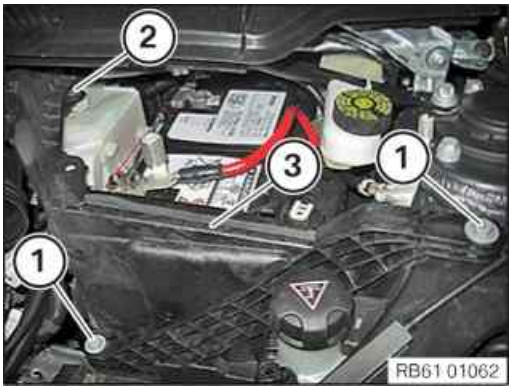
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

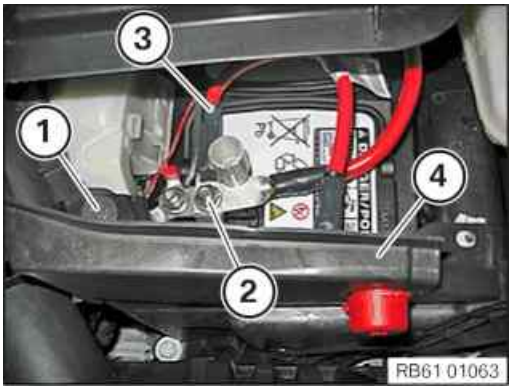
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

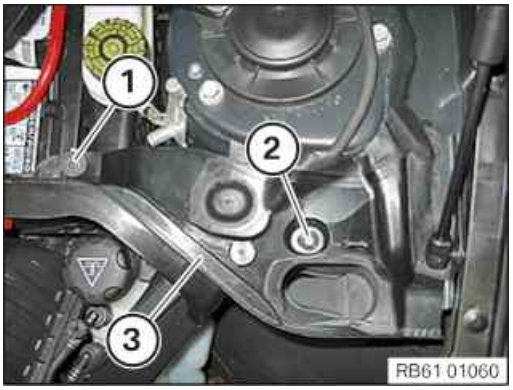
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

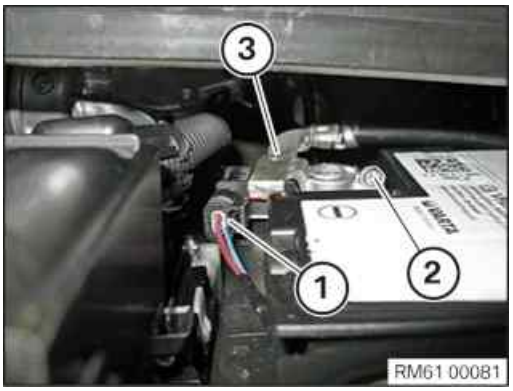
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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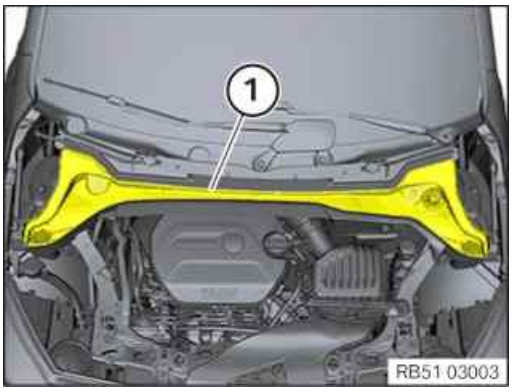
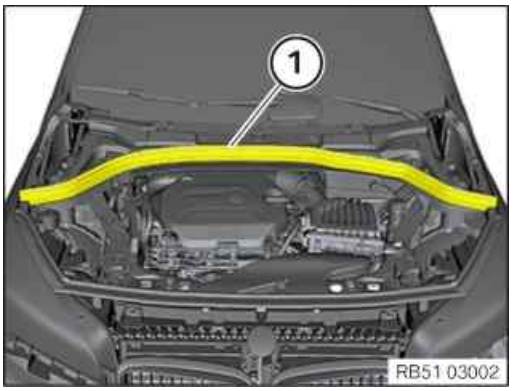
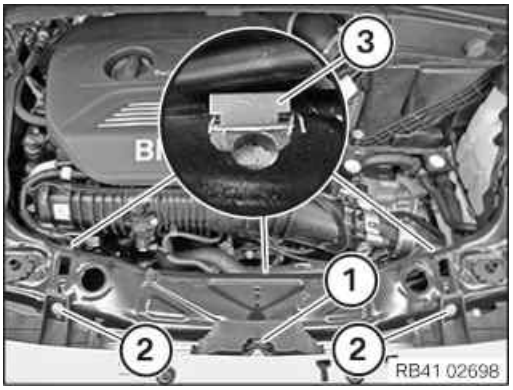


- Feed in the cowl panel cover (1).

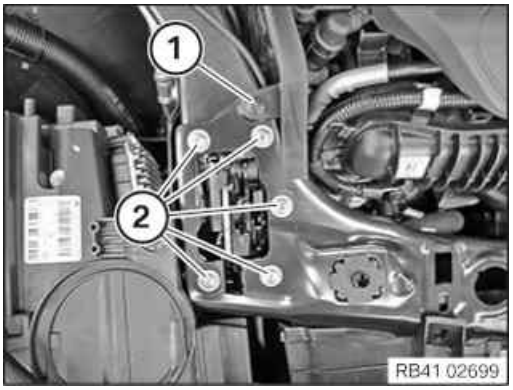


- Press the gasket (1) in a downwards direction.

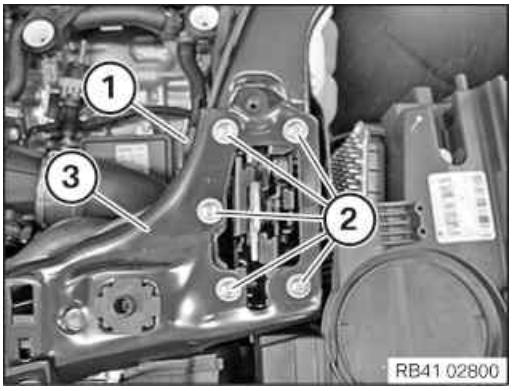
69 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

70 – Connect the coolant line

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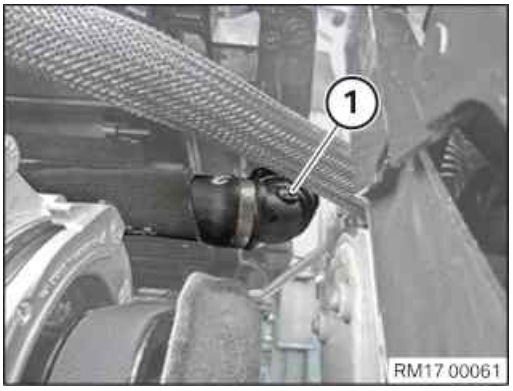
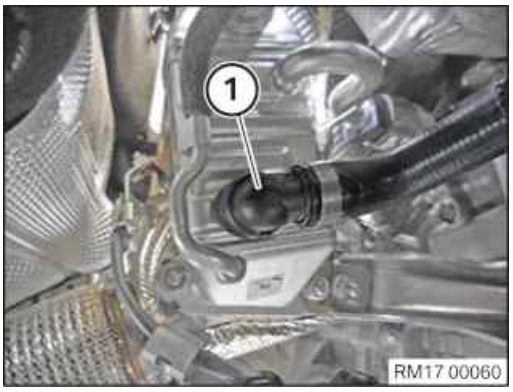
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

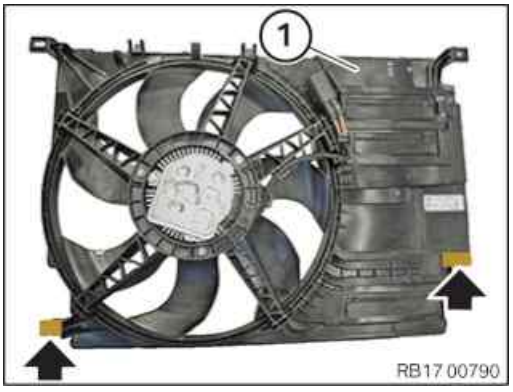


- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

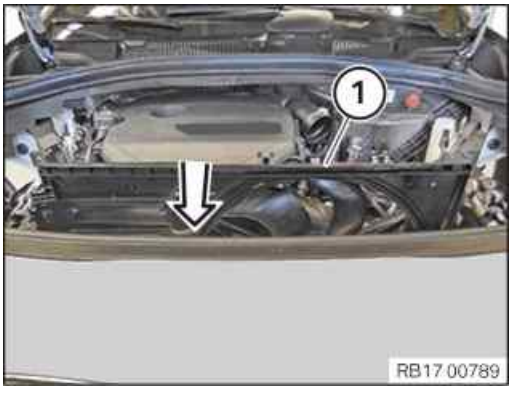
71 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.

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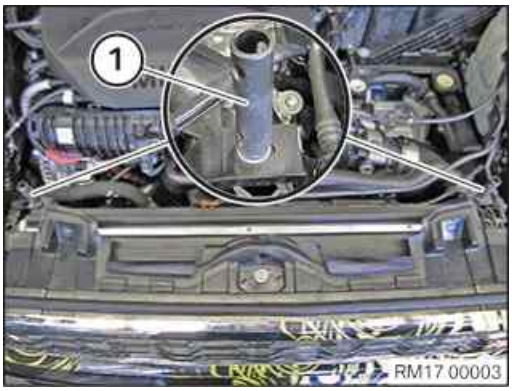
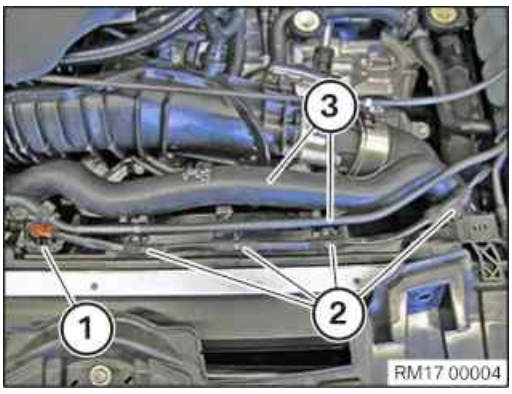
- Lock the left and right locks (arrows).



- Tighten the screws (1).

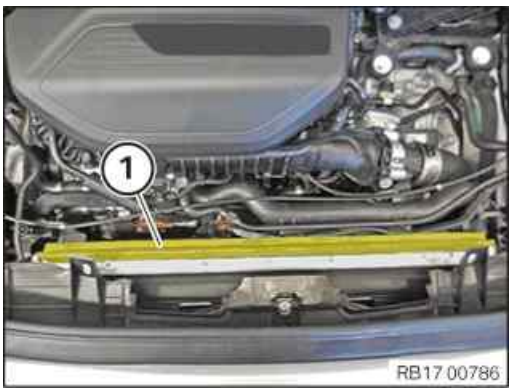
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



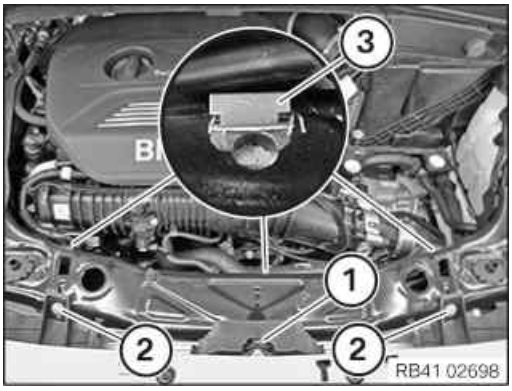
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



- Guide the sealing (1) on the radiator in and install it.

72 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

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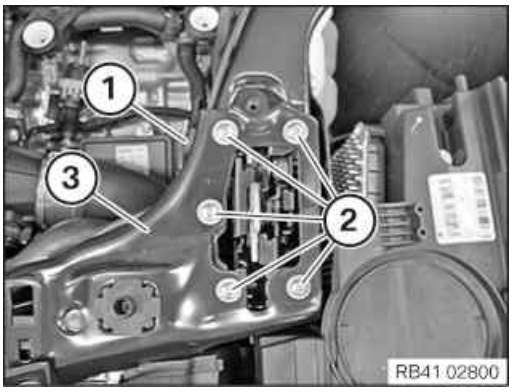
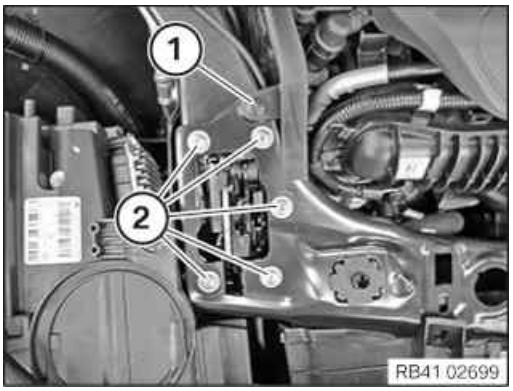


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



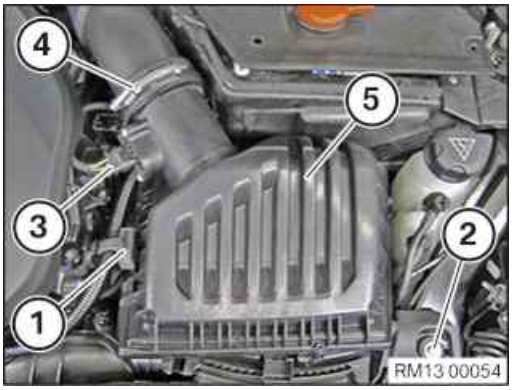
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

73 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

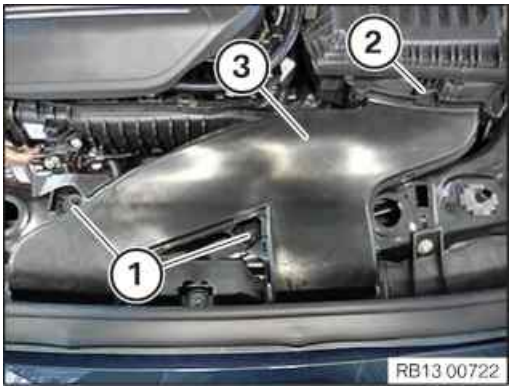
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

74 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

75 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

76 – Removing the oil filler cap

- Open oil filler cap (1).

77 – Topping up the engine oil

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RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

- Pour in engine oil.

Engine oilB37C15U1

Capacity of engine oil	4,8 l

Engine oil: Technically suitable engine oils for BMW Group engines

78 – Installing the oil filler cap

- Close oil filler cap (1).

79 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

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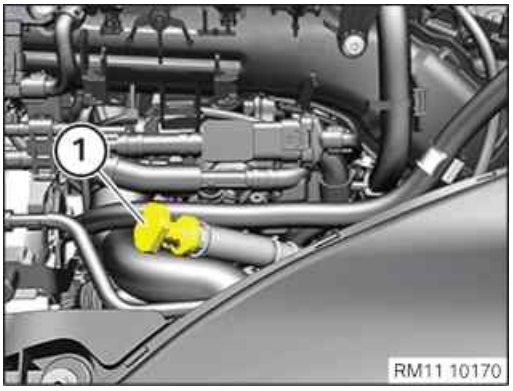
TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

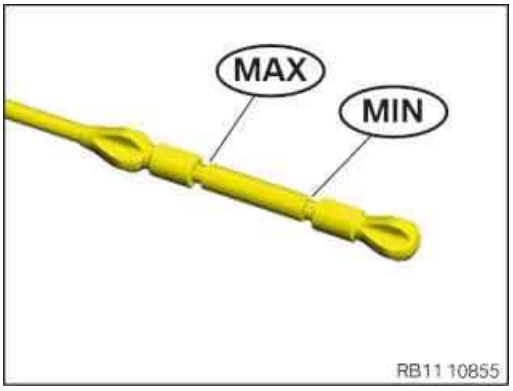


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

80 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

- See additional information.

81 – Evacuate and fill air conditioning

- See additional information.

Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump — Used in step 11

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

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Bracing strut to top cross connection — Used in step 13 72

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 13 72

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 13 72

M6x20		Tightening torque	12 Nm

Transmission mounting — Used in step 40

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Right engine mount to cylinder head — Used in step 40

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Standard screw connection M8 — Used in step 40

M8		Tightening torque	19 Nm

Standard screw connection M6 — Used in step 40

M6			8 Nm

Refrigerant line on air conditioning compressor — Used in step 40

M8		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 40

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Positive battery cable to positive battery terminal — Used in step 40

M8		Tightening torque	15 Nm

SCR metering module V-clip to exhaust system — Used in step 41

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 42

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Output shaft bearing to engine block — Used in step 43

M10		Tightening torque	38 Nm

Output shaft to wheel bearing — Used in step 43 44

M16	Replace the collar bolt.	Jointing torque	210 Nm
		Angle of rotation	90 °

Starter motor to transmission — Used in step 45

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 45

M8		Tightening torque	13,5 Nm

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Rear end of front axle support to body

Used in step 46

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body

Used in step 46

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 46 54

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing

Used in step 46

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 46

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 47

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support

Used in step 47

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 47

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 47

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 48

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 50

M10	Renew nut.	Tightening torque	56 Nm

Charge air line to crankcase

Used in step 53

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 53

M6		Tightening torque	8 Nm

Underbody protection front

Used in step 55

			3 Nm

Wheel arch cover to body

Used in step 56

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 56

Plastic nut		Tightening torque	3 Nm

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Underbody panelling, side

Used in step 57

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 57

Plastic nut		Tightening torque	2,6 Nm

Brake disc to front wheel hub

Used in step 58

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

Used in step 58

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 58

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 60

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 60

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 61

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support

Used in step 62

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 63

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 63

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 63

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 63

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 63

M8		Tightening torque	19 Nm

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Positive battery connection point cover to engine compartment partition wall			Used in step 63
		Tightening torque	3 Nm

Battery cover			Used in step 63 68
Screw			2,8 Nm

Bulkhead cover, top			Used in step 64
Screw		Tightening torque	3 Nm

Windscreen wiper arm			Used in step 67
Combination hexagon nut		Tightening torque	35 Nm

Battery terminal rail to battery tray			Used in step 68
M8 screw			19 Nm

Positive battery terminal			Used in step 68
NutM6			5 Nm

Trailing link			Used in step 68
M8 screw			19 Nm

Positive battery cable to battery terminal			Used in step 68
Nut M8			15,2 Nm

Negative battery terminal (with IBS)			Used in step 68
NutM6			5 Nm

Fan cowl on radiator			Used in step 71
M6X12		Tightening torque	6 Nm

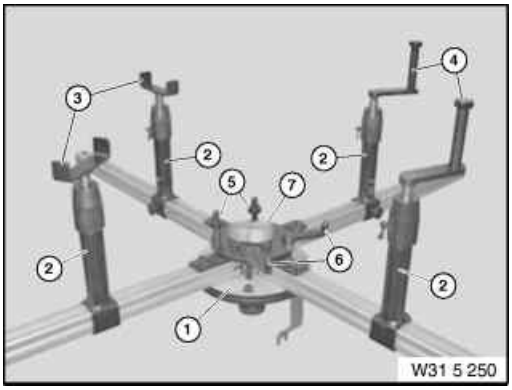
Intake silencer housing to lock bridge			Used in step 73
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 73
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 74
M6		Tightening torque	8 Nm

Overview of Special Tools

0 495 817 (31 5 251) Basic body



Common	Used in step 33 46
Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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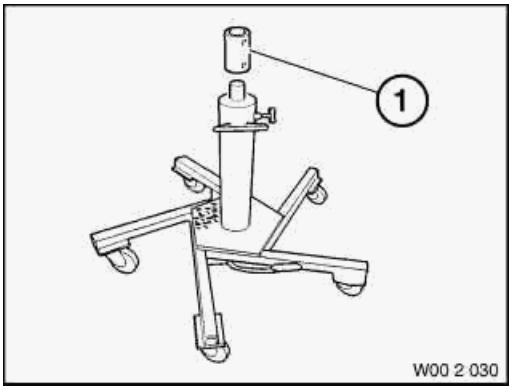
0 490 133 (00 2 030) Device



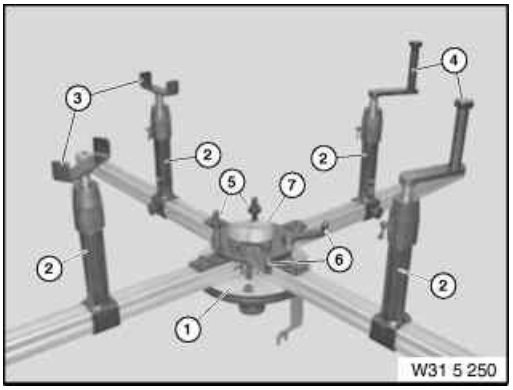
Common Used in step 33 46

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

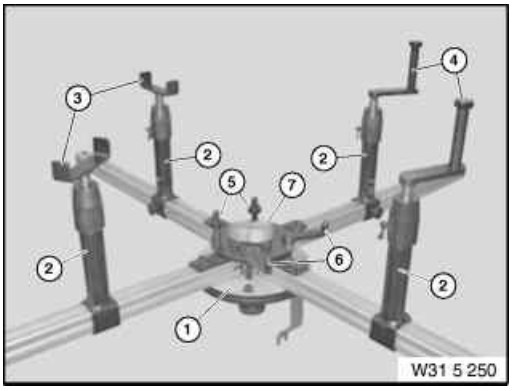
0 495 821 (31 5 255) Adapter



Common Used in step 33

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 495 819 (31 5 253) Adapter



Common Used in step 33

Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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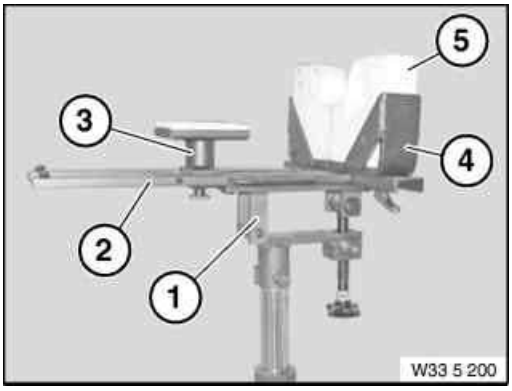
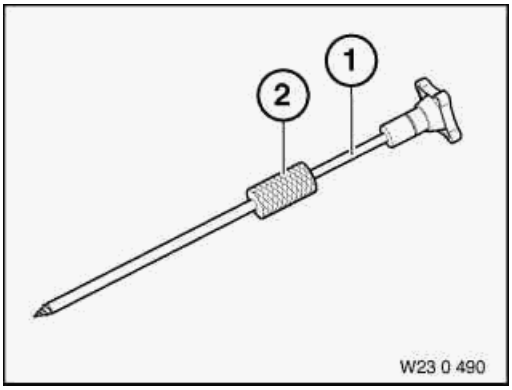
0 496 080 (33 5 206) Belt



Common Used in step 33 46

Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

0 491 454 (23 0 490) Puller



Common Used in step 35 36

Usage	For removing shaft seal
Included in the tool or work	
Storage location	A13
Replaced by	
In connection with	
SI-Number	01 15 96 (106)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 491 455 (23 0 491)		**Rod** With self-tapping screw Deletion, only available via tool set	
2	0 491 456 (23 0 492)		**Weight** (Weight)	

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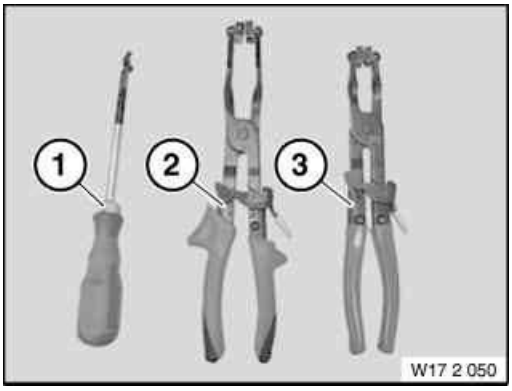
0 495 794 (17 2 050) Pliers



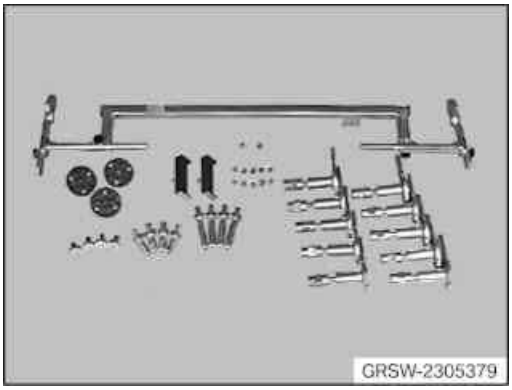
Common Used in step 39 40

Usage	(Set of pliers) For assembling and disassembling the spring band clamps (Coolant hoses)
Included in the tool or work	
Storage location	B85
Replaced by	
In connection with	
SI-Number	01 26 06 (321)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 795 (17 2 051)		**Release tool** Remaining inventories will be sold off and then no longer available individually, but as part of complete tool set 17 2 050 = 0495794 only.	
2	0 495 796 (17 2 052)		**Pliers** (Pliers (curved version) Remaining inventories will be sold off and then no longer available as individual parts, but as part of complete tool set 17 2 050 = 0495794 only.	
3	0 495 797 (17 2 053)		**Pliers** (Pliers (straight version) Remaining inventories will be sold off and then no longer available as individual parts, but as part of complete tool set 17 2 050 = 0495794 only.	

2 305 379 Accessories



Common Used in step 39

Usage	Attachment set for unit table lift MHT 1200.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Mobile major assembly table lift MHT 1200 81222184136
SI-Number	06 01 10 (649)

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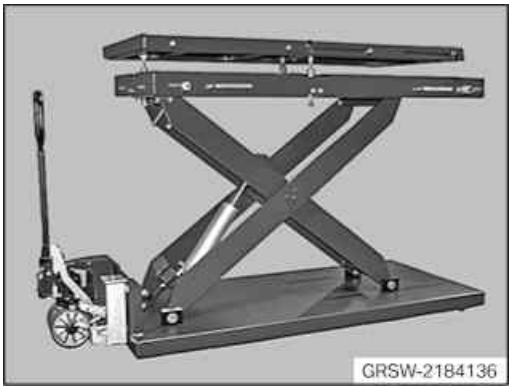
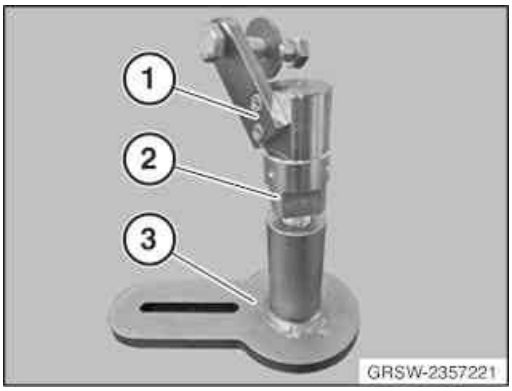
2 184 136 Mobile equipment table lift



Common	Used in step 39
Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

2 357 221 Support



Common	Used in step 39 40
Usage	Fixture of drive unit (electrical machine/transmission and optional range extender) on the mobile lifting table MHT 1200 81 22 2 184 136 IMPORTANT: required three times! Delivery specification 1 pcs. Was valid as campaign for BMW i Aftersales Basic. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse. Fixture foot 83302357221_C including bracket 83302357221_B and tab 83302357221_A
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 22 13 (988)

2 409 230 Mandrel

Common	Used in step 43 44
Usage	For installing the rear-wheel drive of Transmission output shaft le./ri. silhouette foil is contained in delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A75
Replaced by	
In connection with	
SI-Number	01 56 14 (214)

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2 344 011 Tool

Common	Used in step 58
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 22
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 22
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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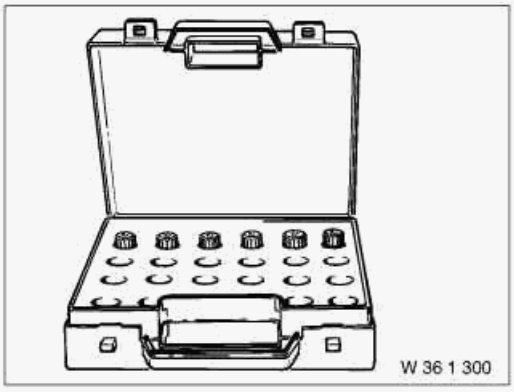
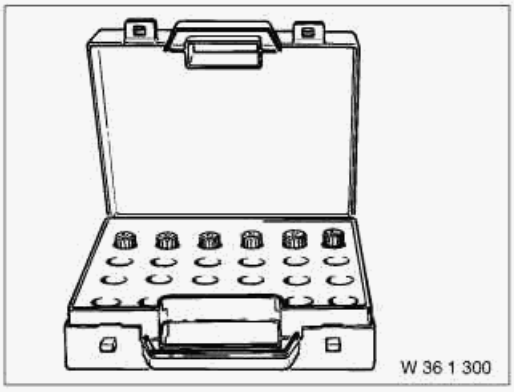
0 495 225 (36 1 327) Wheel stud



Common	Used in step 22
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 22
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 22
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 22
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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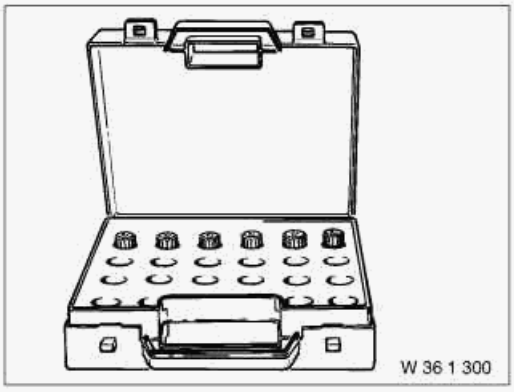
0 495 229 (36 1 332) Wheel stud



Common	Used in step 22
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 22
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB37C15U1	Used in step 77
Capacity of engine oil	4,8 l

Engine oil: Technically suitable engine oils for BMW Group engines

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	14 68
61 12 ... Notes on intelligent battery sensor (IBS)	14 68
61 00 ... Notes for disconnecting and connecting battery	14 68
41 00 ... Notes on repairing threads	

Repair instructions	Used in step
64 50 010 Extract, evacuate and fill air conditioning system	1 81
64 50 010 Drawing off, evacuating and filling air conditioning (R134a)	1 81
64 50 010 Drawing off, evacuating and filling air conditioning (R134a)	1 81
64 50 ... Notes on repairs to air conditioning	1 81
64 50 010 Drawing off, evacuating and filling air conditioning (R1234yf)	1 81
64 50 ... Safety information for handling refrigerant R1234yf	1 81
64 50 ... Safety information for handling tetrafluorethane refrigerant R134a	1 81
64 50 ... Safety informations for handling refrigerant oil	1 81
61 35 ... Notes on ESD protection (Electro Static Discharge)	19 37

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17 00 ... Instructions for repair work on cooling system	38
17 00 008 Draining and topping up coolant for high-temperature circuit	80
17 00 008 Draining and topping up coolant for high-temperature circuit	80
17 00 008 Draining and topping up coolant for high-temperature circuit	80
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	80
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	80
00 .. ... Raising the vehicle using a vehicle hoist	

Operating materials	Used in step
2.0 Grease for wheel centring	58
3.0 Technically appropriate engine oils for BMW Group engines	77

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11 00 050 Removing and installing engine with transmission (B37C)

Special tools required:

- 32 1 270
- 00 9 030
- 2 358 042

Recycling:

Catch and dispose of escaping fuel with auxiliary materials.

Observe country-specific waste disposal regulations.

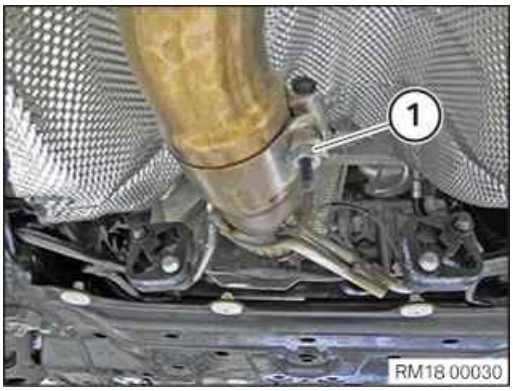
Important!

Seal openings or lines on air conditioning with special tool 32 1 270 to prevent escape of media and contamination.

Necessary preliminary tasks:

- Remove acoustic cover
- Remove battery.
- Remove control unit and equipment holder.
- Remove front axle complete.
- Remove both output shafts.
- Remove starter motor.
- Drain engine oil.
- Remove charge air cooler.
- Remove radiator.

REMOVAL:



Release clamp (1).

Replace clamp (1).

Slide exhaust system from diesel particulate filter.

Parts: Clamp.

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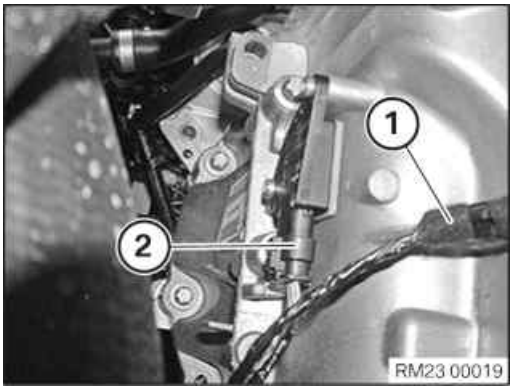
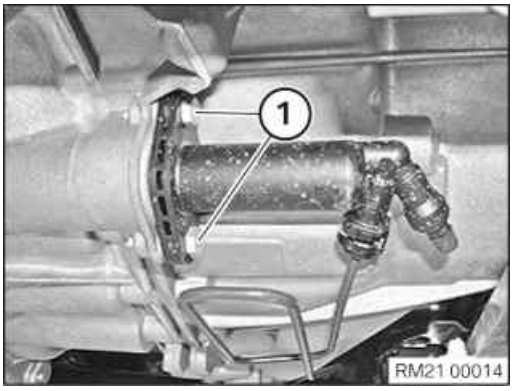


Vehicles with manual transmission:

Disconnect plug connection (2) on gear sensor.

Detach cable (1) with holder from transmission.



Vehicles with manual transmission:

Note:
Pressure line of clutch slave cylinder remains connected.

Important!

Slowly relieve tension on clutch slave cylinder otherwise air may be drawn in through sealing sleeve.

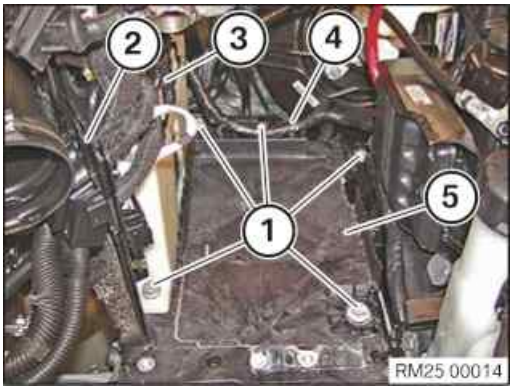
If possible, do not deflect push rod of clutch slave cylinder.

A deflection of the push rod caused by removal will cause easy escape of fluid. This escape of fluid does not mean that the clutch slave cylinder is damaged.

Exchange is therefore not necessary.

Vehicles with manual transmission:

Release nuts (1) and remove clutch slave cylinder.



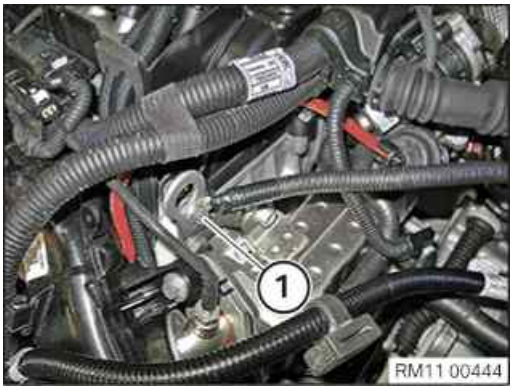
Release screws (1).

Release battery housing (2) from bracket and remove.

Release control unit (3) from bracket.

Detach wiring harness (4) from battery tray (5).

Remove battery tray (5).



Loosen screw connection (1) of the ground strap.

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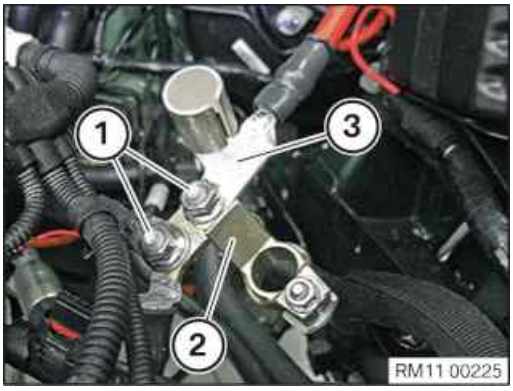
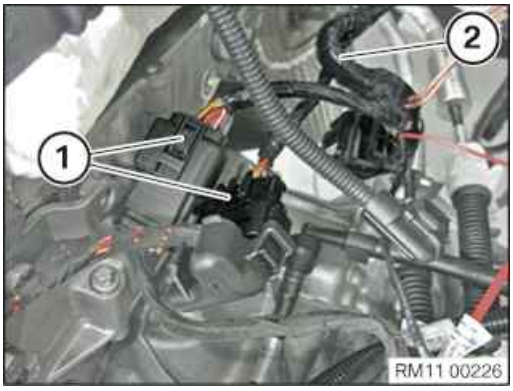


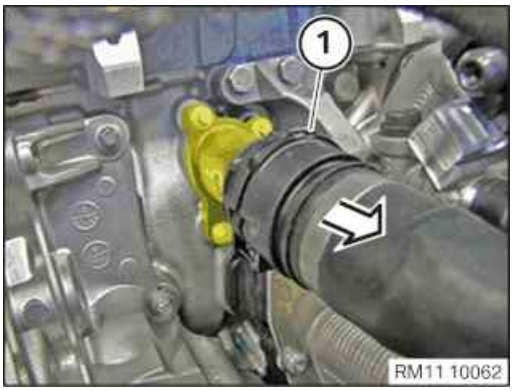
Unscrew nuts (1).

Disconnect positive battery terminal (2) and positive battery connection point (3).

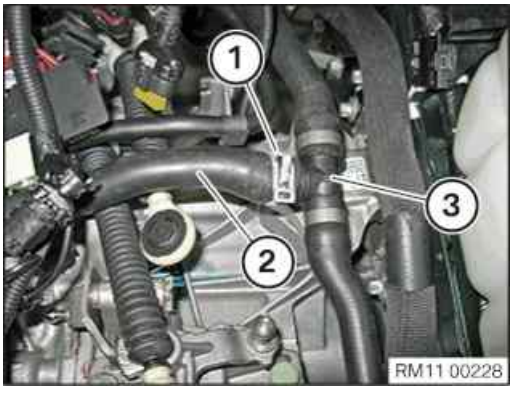


Unlock plug connections (1) and disconnect.

Disconnect wiring harness (2) from engine wiring harness.



Release coolant hose (1) and pull off connecting branch.



Release clamp (1).

Pull hose (2) off connecting pipe (3).

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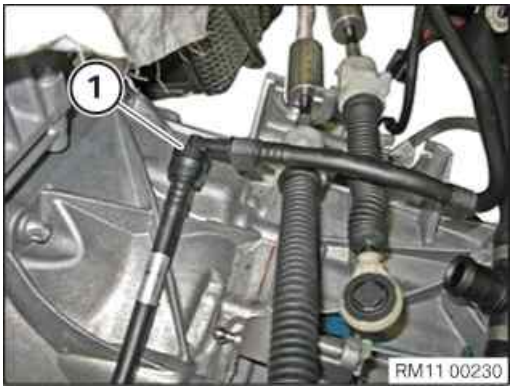
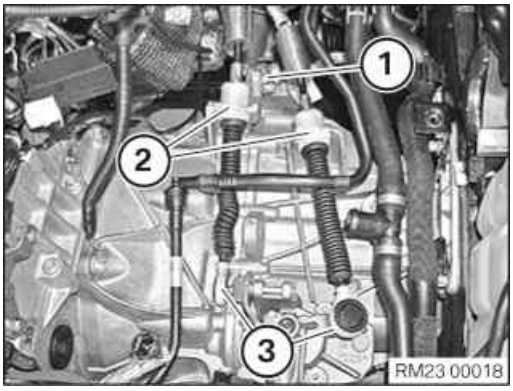


Release vacuum line (1) connection and disconnect.

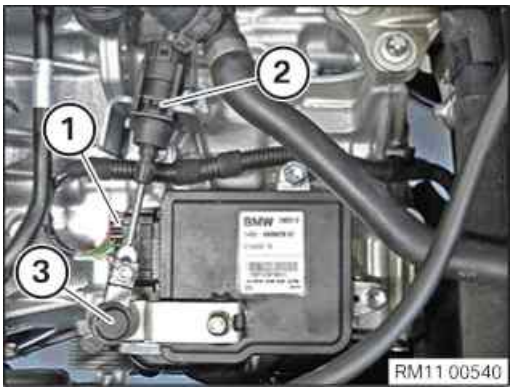


Release screw (1) and remove ground strap.

Vehicles with manual gearbox:

Release clips on limit position/holder (2).

Detach selector lever cables (3) at ball joints.



Vehicles with automatic transmission:

Unlock and disconnect the connector (1).

Release clips on limit position/holder (2).

Detach selector lever cable (3) at ball joint.

Disconnect fuel lines (1).

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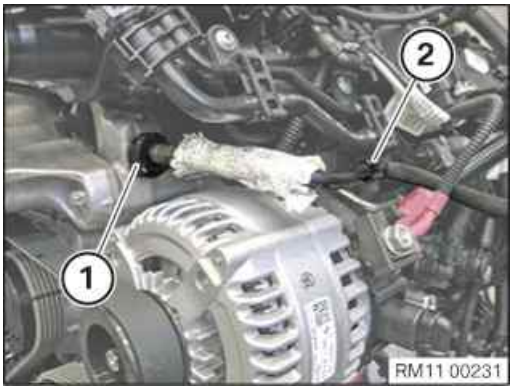
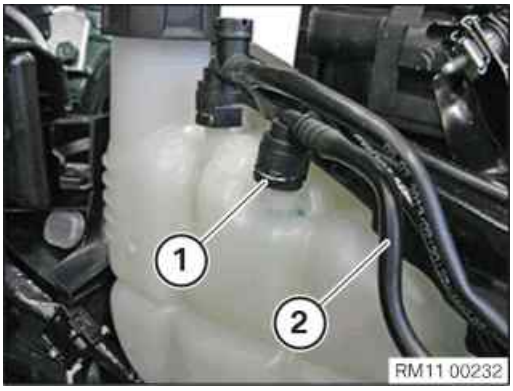


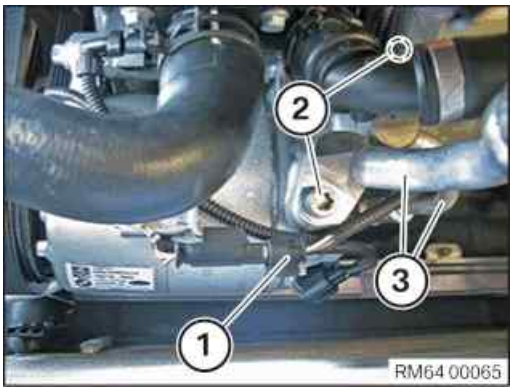
Unlock coolant line (1) and pull off.

Unclip coolant line (1) from holder (2).



Unlock coolant line (1) and pull off.

Remove coolant line (1).

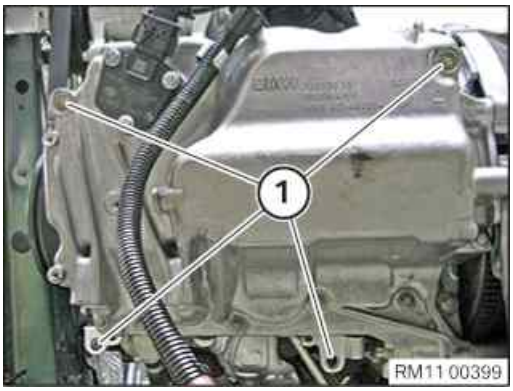


Unfasten screws (2).

Remove refrigerant lines (3).

Installation note:
Replace sealing rings.

Use special tool 00 9 030 to mount sealing rings without damaging them.



Note:
The fixtures (40/50) of table top **A** of the mobile table lift must be seated in the mounting points (1).

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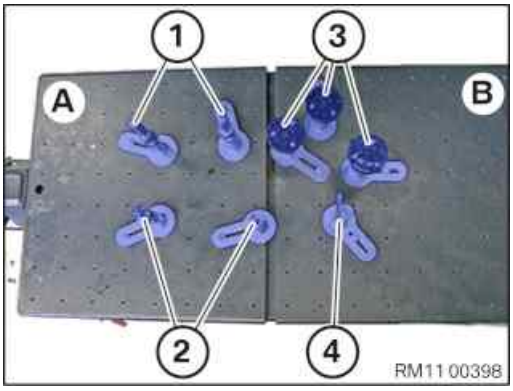


Vehicles with manual gearbox:

Prepare mobile table lift:

Note:
Position engine assembly on table top **A**.

Position transmission on table top **B** .

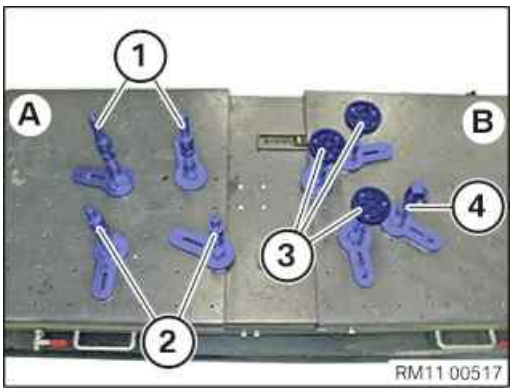
Structure of table lift.

Position fixture (30) with fixture (40) for engine block on table top **A** at co-ordinates **5/6** and **1/7** (1).

Position fixture (30) with fixture (50) for oil sump on table top **A** at co-ordinates **5/3** and **2/3** (2).

Position fixture (30) with fixture (80) for transmission housing on table top **B** at co-ordinates **6/5**, **2/5** and **2/7** (3).

Position fixture (83 30 2 357 221) for transmission housing on table top **B** at co-ordinates **7/3** (4).



Vehicle with automatic transmission:

Prepare mobile table lift:

Note:
Position engine assembly on table top **A**.

Position transmission on table top **B** .

Structure of table lift.

Position fixture (30) with fixture (40) for engine block on table top **A** at co-ordinates **5/5** and **2/6** (1).

Position fixture (30) with fixture (50) for oil sump on table top **A** at co-ordinates **4/2** and **2/3** (2).

Position fixture (30) with fixture (80) for transmission housing on table top **B** at co-ordinates **9/6**, **7/6** and **8/2** (3).

Position fixture (83 30 2 357 221) for transmission housing on table top **B** at co-ordinates **6/3** (4).

Important!

Removal weight approx. 150 kg to 300 kg.

Check payload of vehicle, empty if necessary.

Load front footwell with sandbags if necessary, approx. 100 kg.

Note safety instructions of table lift.

Vehicles with manual gearbox:

Position table lift under the engine.

Abut all fixtures and screw to the table lift.

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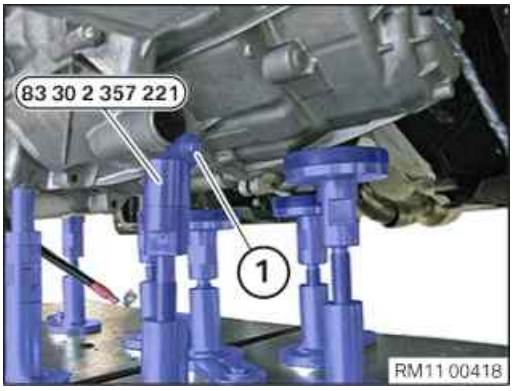


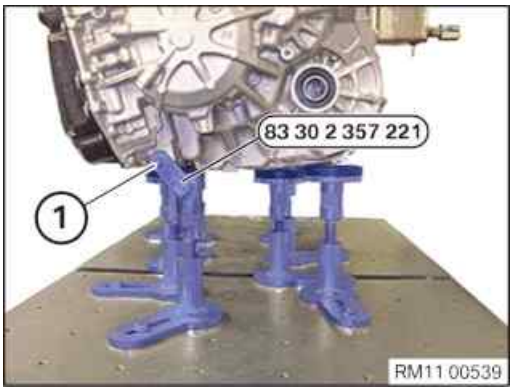
Vehicles with manual gearbox:

Screw fixture (83 30 2 357 221) to the housing for the clutch slave cylinder.

Vehicles with automatic transmission:

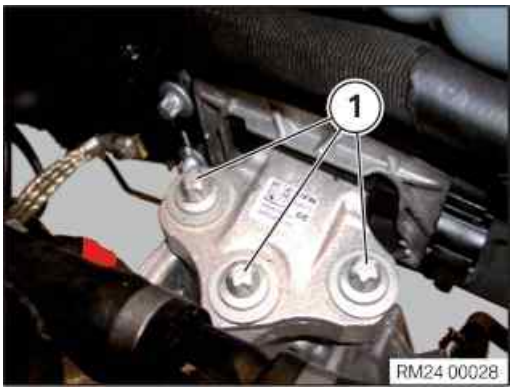
Position table lift under the engine.

Abut all fixtures and screw to the table lift.



Vehicles with automatic transmission:

Screw fixture (83 30 2 357 221) to the transmission housing with screw (1).



Release screws (1).

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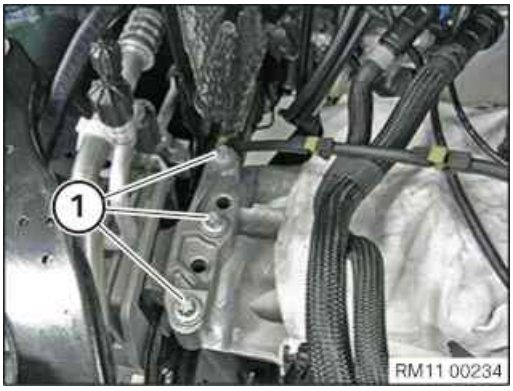
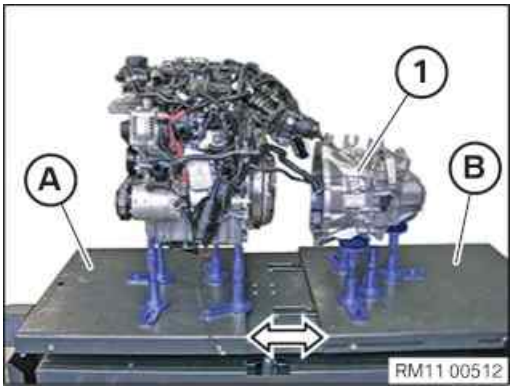
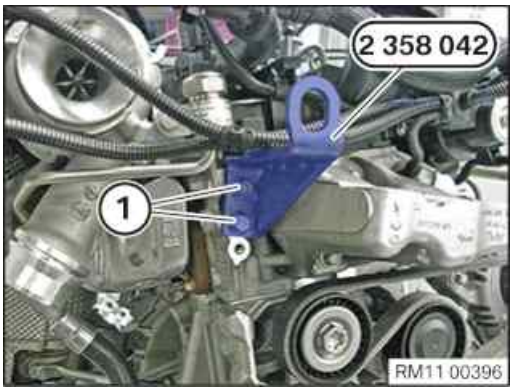


Release screw connection (1) of right engine support.



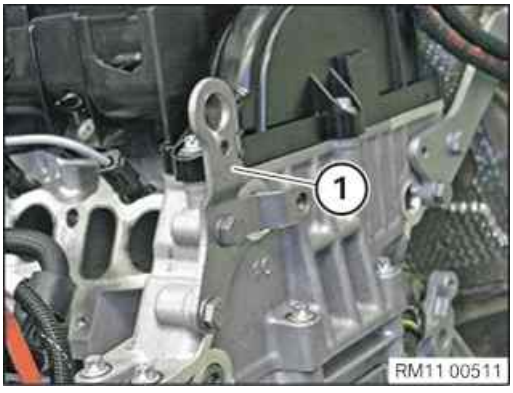
Loosen transmission.

Slide table top **B** in direction of arrow and remove transmission.



When using a workshop crane, the securing eye 2 358 042 must be screwed on.

Tightening torque: 11 00 4AZ.



When using a workshop crane, the securing eye (1) provided must be used.

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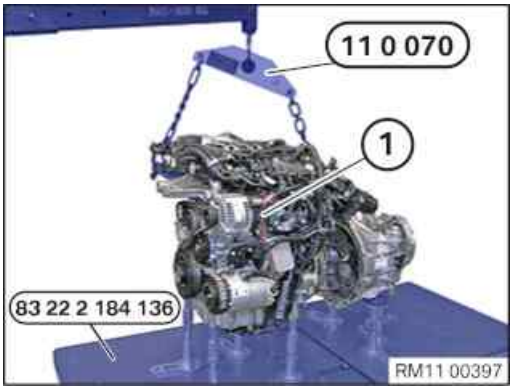
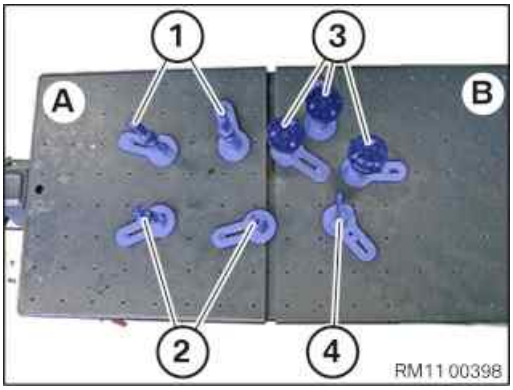


Lifting the engine from the table lift is described in the instructions Mount engine on assembly stand.

INSTALLATION:



Vehicles with manual gearbox:

Prepare mobile table lift:

Note:
Position engine assembly on table top **A**.

Position transmission on table top **B** .

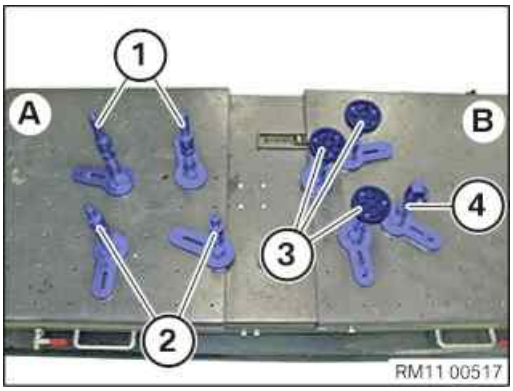
Structure of table lift.

Position fixture (30) with fixture (40) for engine block on table top **A** at co-ordinates **5/6** and **1/7** (1).

Position fixture (30) with fixture (5) for oil sump on table top **A** at co-ordinates **5/3** and **2/3** (2).

Position fixture (30) with fixture (80) for transmission housing on table top **B** at co-ordinates **6/5**, **2/5** and **2/7** (3).

Position fixture (83 30 2 357 221) for transmission housing on table top **B** at co-ordinates **7/3** (4).



Vehicle with automatic transmission:

Prepare mobile table lift:

Note:
Position engine assembly on table top **A**.

Position transmission on table top **B** .

Structure of table lift.

Position fixture (30) with fixture (40) for engine block on table top **A** at co-ordinates **5/5** and **2/6** (1).

Position fixture (30) with fixture (50) for oil sump on table top **A** at co-ordinates **4/2** and **2/3** (2).

Position fixture (30) with fixture (80) for transmission housing on table top **B** at co-ordinates **9/6**, **7/6** and **8/2** (3).

Position fixture (83 30 2 357 221) for transmission housing on table top **B** at co-ordinates **6/3** (4).

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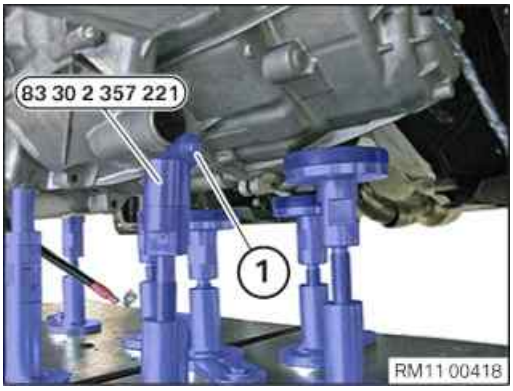
Vehicles with manual gearbox:

Place engine on table lift.

Lower vehicle.



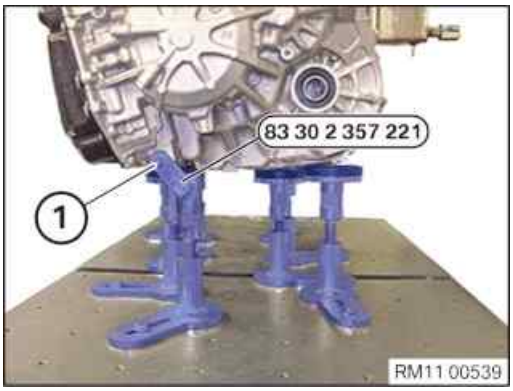
Vehicles with manual gearbox:

Screw fixture (83 30 2 357 221) to the housing for the clutch slave cylinder.

Vehicles with automatic transmission:

Place engine on table lift.

Lower vehicle.



Vehicles with automatic transmission:

Screw fixture (83 30 2 357 221) to the transmission housing with screw (1).

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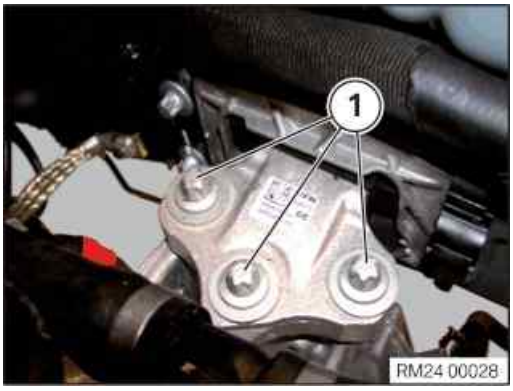
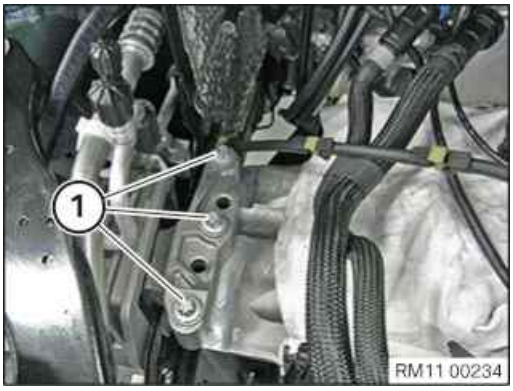


Position table lift with engine and transmission under the vehicle.

Carefully lower the vehicle.

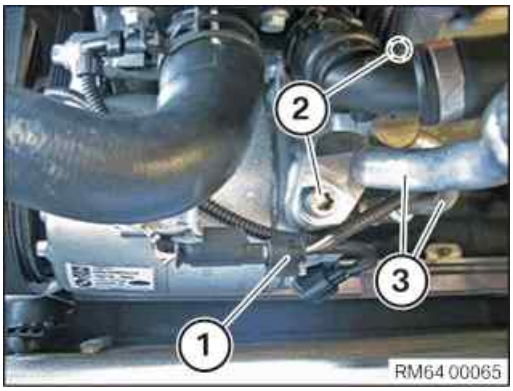
Tighten screws (1) on transmission carrier.

Tightening torque 22 32 1AZ.



Tighten screws (1) on right engine support.

Tightening torque 22 11 1AZ.



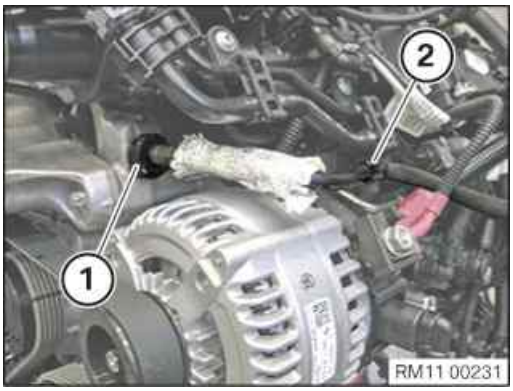
Join refrigerant lines (3) to compressor.

Tighten down screws (2).

Tightening torque 64 53 4AZ.

Installation note:
Replace sealing rings.

Use special tool 00 9 030 to mount sealing rings without damaging them.



Install coolant line (1) in vehicle

Connect and lock coolant line (1).

Clip coolant line (1) into holder (2).

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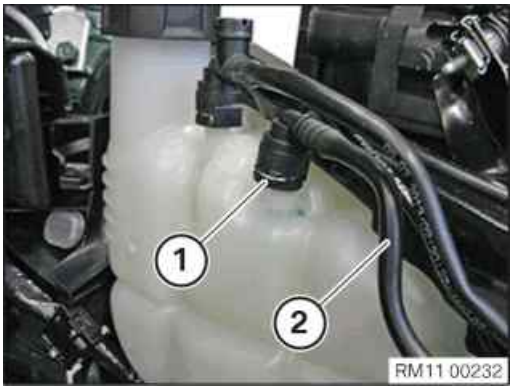
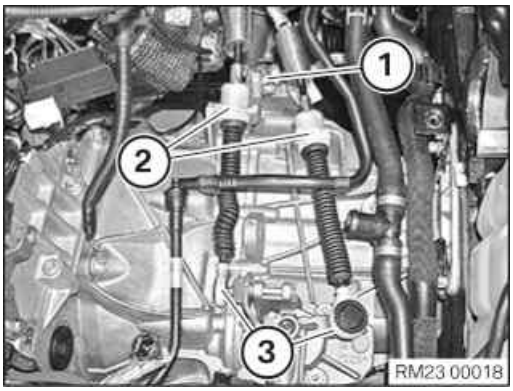


Connect and lock coolant line (1).

Connect fuel lines (1).

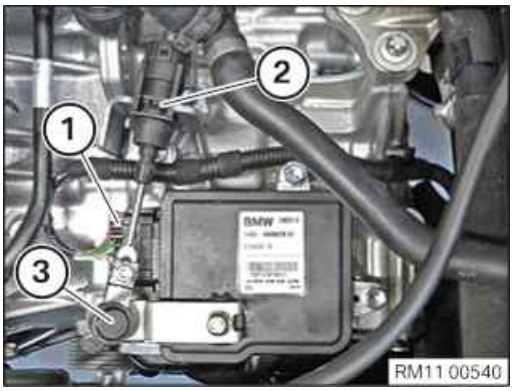


Position ground strap and tighten screw (1).

Vehicles with manual gearbox:

Attach selector lever cables (3) at ball joints.

Fasten limit position/holder (2) with clips.



Vehicles with automatic transmission:

Unlock and disconnect the connector (1).

Release clips on limit position/holder (2).

Detach selector lever cable (3) at ball joint.

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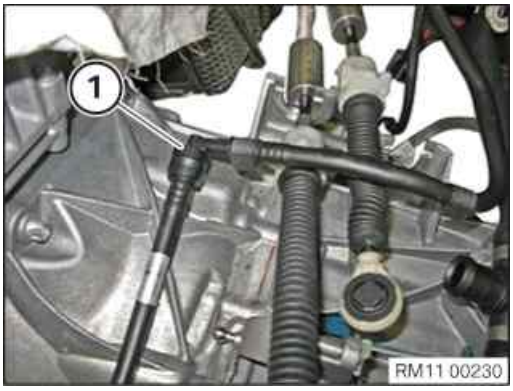
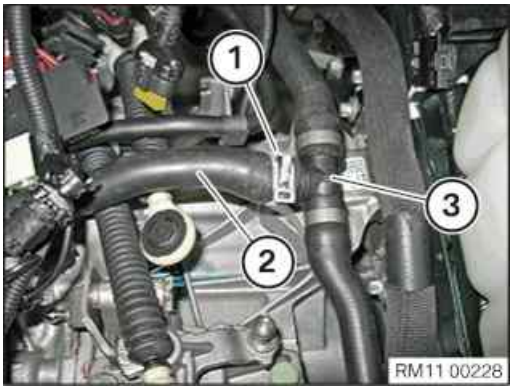
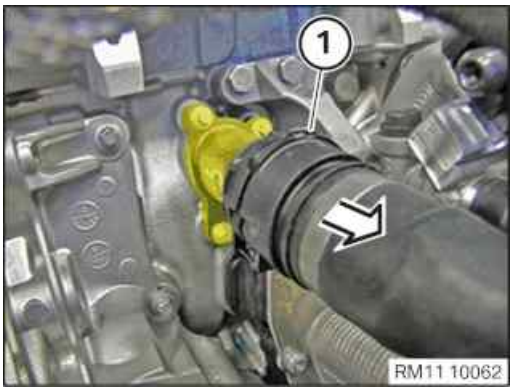


Connect vacuum line (1).

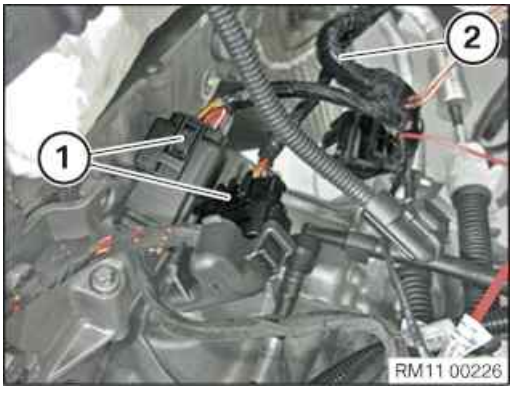


Connect hose (2) to connecting pipe (3).

Fasten clamp (1).



Connect coolant hose (1) to the connecting branch counter to the direction of arrow and lock.



Join wiring harness (2) and engine wiring harness.

Connect the plug (1).

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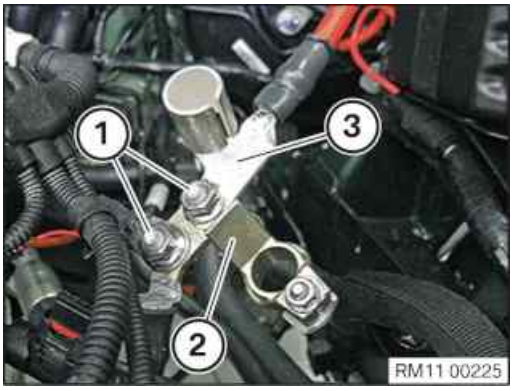
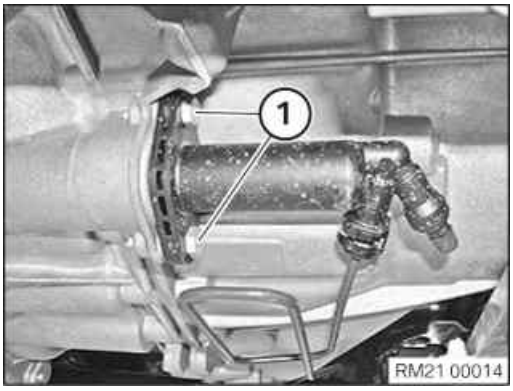


Connect positive battery terminal (2) and positive battery connection point (3).

Tighten down nuts (1).



Vehicles with manual transmission:

Note:
Pressure line of clutch slave cylinder remains connected.

Important!

Slowly relieve tension on clutch slave cylinder otherwise air may be drawn in through sealing sleeve.

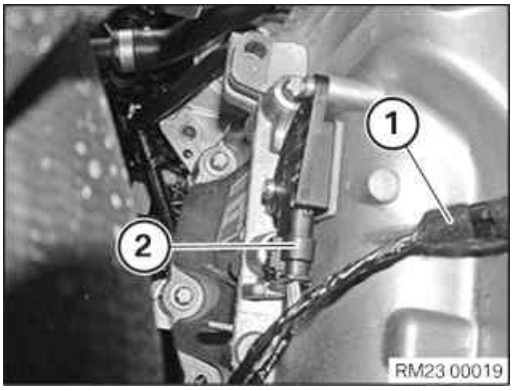
If possible, do not deflect push rod of clutch slave cylinder.

A deflection of the push rod caused by removal will cause easy escape of fluid. This escape of fluid does not mean that the clutch slave cylinder is damaged.

Exchange is therefore not necessary.

Carefully insert clutch slave cylinder and tighten nuts (2).

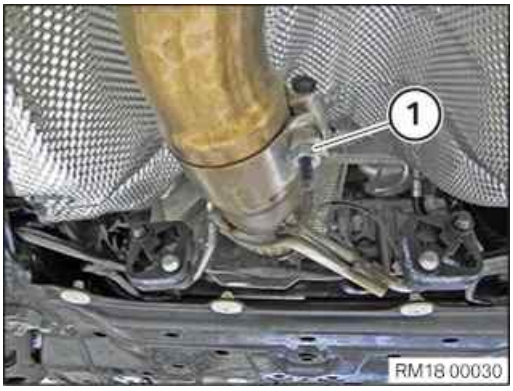
Tightening torque 21 52 1AZ.



Manual gearbox only:

Connect connector (2) of neutral gear sensor.

Fasten cable (1) with holder on transmission.



Slide exhaust system onto diesel particulate filter.

Tighten clamp (1).

Tightening torque 18 20 1AZ.

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Required follow-up work:

- Install radiator.
- Install charge air cooler.
- Install both output shafts.
- Install starter.
- Install complete front axle.
- Top up engine oil.
- Install control unit with equipment holder.
- Install battery.
- Install acoustic cover.

Check cooling system for tightness.

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00 Safety information for working on vehicles with automatic engine start-stop function (MSA)

Warning!

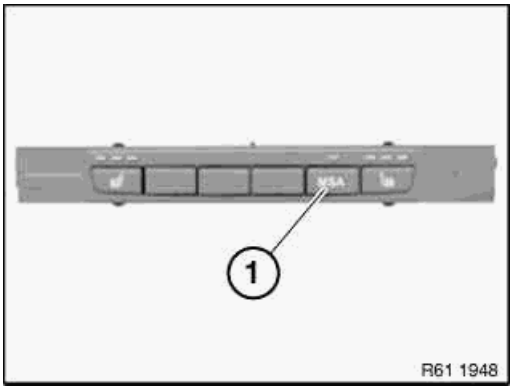
If the engine hood/bonnet contact is pulled upwards (workshop mode), the information "switch closed" is output. The automatic engine start-stop function is active.

An automatic engine start is possible.

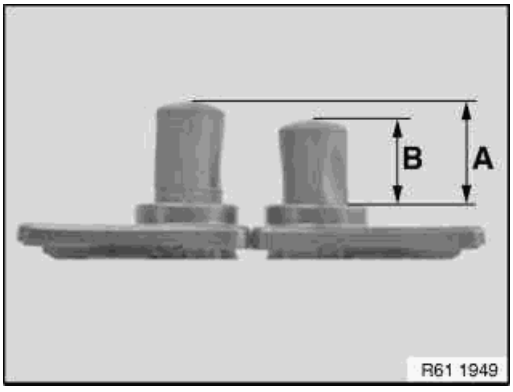
Observe safety precautions when working on MSA vehicles.

Before carrying out practical work on the engine, always ensure that the MSA functionality is deactivated so as to prevent automatic engine starting while work is being carried out in the engine compartment.

MSA function is deactivated by:



- Deactivate MSA by means of button (1) in passenger compartment
- Open seat belt buckle and driver's door



- Open engine bonnet/hood and ensure that engine hood/bonnet contact is not in workshop mode
  - Workshop mode

    A = 10 mm
  - Basic setting (engine hood/bonnet open)

    B = 7 mm

  To make sure that the engine hood/bonnet contact is at the basic setting, if necessary press the hood/bonnet contact up to the limit position before starting work and slowly release.

When working with diagnosis tools:

- Observe instructions in diagnosis tool

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Note:
For further information on automatic engine start-stop function (MSA):

- Refer to the Service Information (bulletin) (for manual transmissions) Service Information (bulletin) 61 01 07 335
- Refer to the Service Information (bulletin) (for automatic transmissions or twin-clutch gearboxes) Service Information (bulletin) 61 01 10 629

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00 Safety instructions for handling oil

Warning!

Danger of poisoning if oil is ingested/absorbed through the skin!

Risk of injury if oil comes into contact with eyes and skin!

Recycling:

Observe country-specific waste disposal regulations.

Measures if oil is unintentionally released:

- Personal precautionary measures: Danger of slipping! Keep non-involved persons away from the work area. Wear personal protective clothing/equipment.
- Environmental protection measures: Prevent oil from draining into drain channels, sewerage systems, pits, cellars, water and the ground.
- Limiting spread: Use oil blocks to prevent the surface spread of oil.
- Cleaning procedure: Bind and dispose of escaped oil with nonflammable absorbents.

  Note: Do not flush oil away with water or aqueous cleaning agents.

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11 00 670 Securing engine in installation position

Special tools required:

- 2 358 042
- 00 6 100
- 00 6 130
- 2 365 070
- 11 0 000
- 2 357 269
- 00 0 490

Warning!

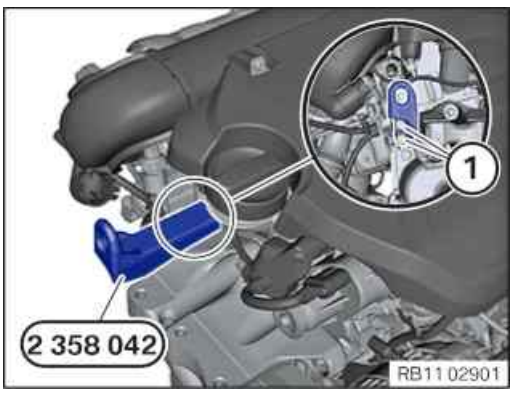
Danger of injury!

Observe following instructions relating to special tool:

1. Prior to each use, check the special tools for defects, modifications and operational reliability.
2. Damaged/modified special tools must not be used!
3. No changes or modifications may be made to the special tools!
4. Keep special tools dry, clean and free of grease.

Necessary preliminary tasks:

- Remove upper bulkhead cover



Only for B37 and B38engines:

Align special tool 2 358 042 on the engine and secure with screws (1).

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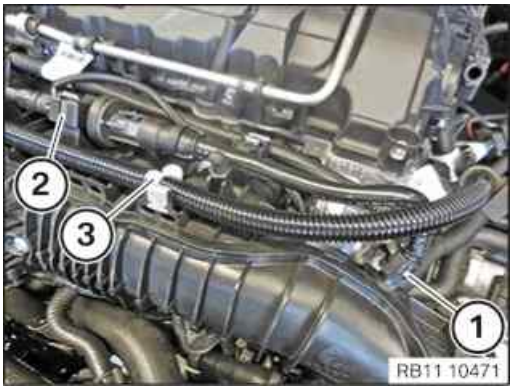
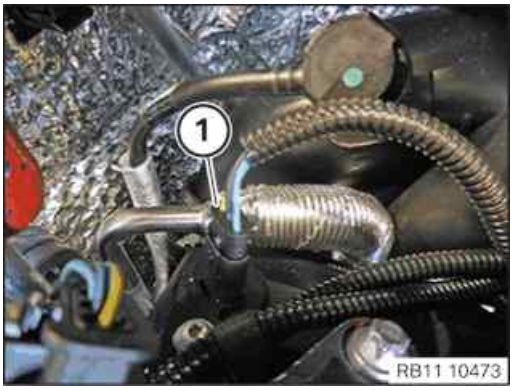
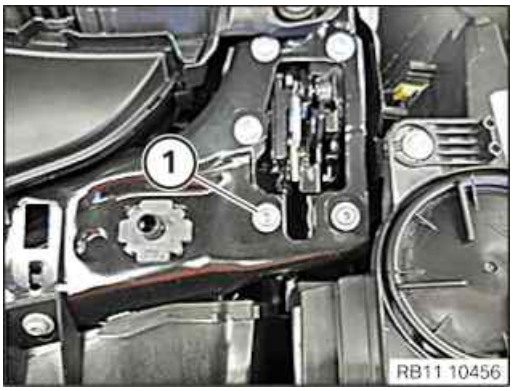


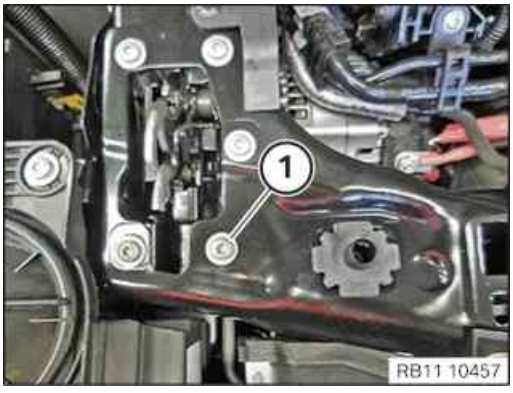
Unlock and disconnect line (1).
Pull off line from holder (2).
Release cable (3) from holder.



Unlock connector (1) and pull off.



Release screw (1) from left engine compartment lock.



Release screw (1) from right engine compartment lock.

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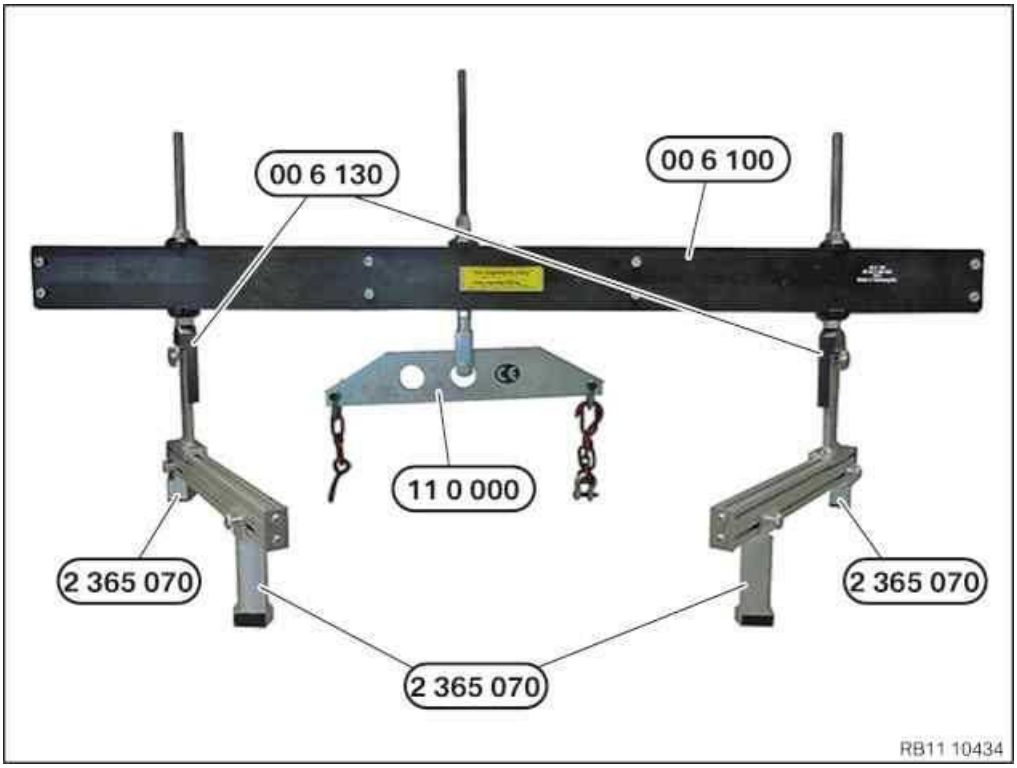

Remount engine bridges 00 6 100 with special tool 00 6 130 , 2 365 070 and 11 0 000 on the vehicle.

With the help of an assistant, fit the entire cross-member 00 6 100 onto the vehicle.

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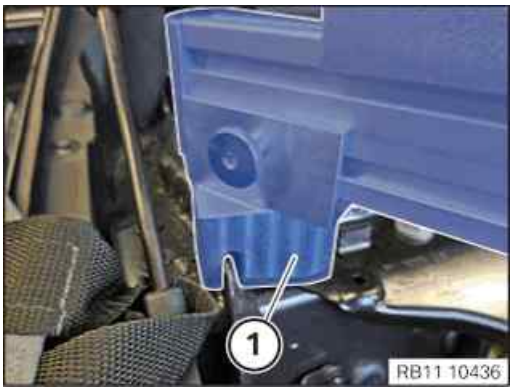
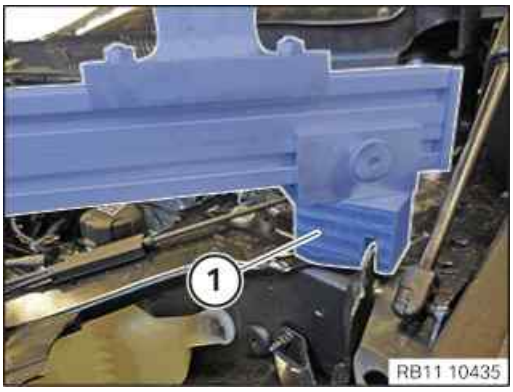


(1) = rear right support point.



(1) = rear left support point.

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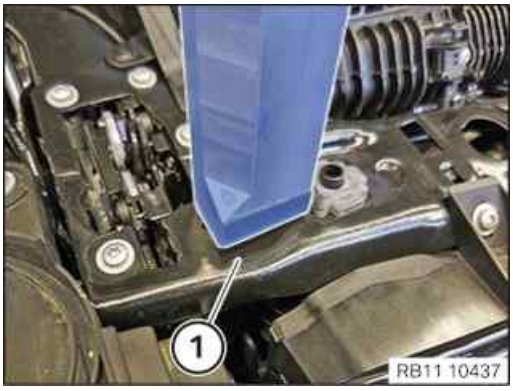
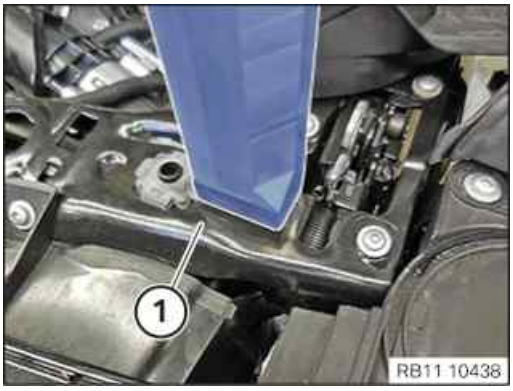
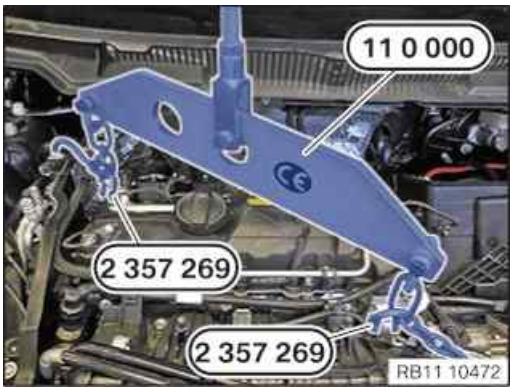


(1) = front right support point.



(1) = front left support point.



After mounting the cross-member,

Attach special tool 2 357 269 to the chains and engine mounting lugs.

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Screw in shackle screws (2 and 3).

Slightly pretension the spindle (1) of the engine support beam.

Warning!
Danger of injury!

Tighten down all adjusting screws, knurled screws and nuts on cross-member 00 6 100 and on special tool 00 0 490 .

Attention!

Avoid a change of engine position in the transverse or longitudinal direction!

Always make sure there is sufficient clearance between the engine (or its add-on parts) and the body.

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11 27 020 Removing and installing/replacing counterbalance shaft (B37C)

Special tools required:

- 2 288 942
- 11 5 370
- 2 288 943

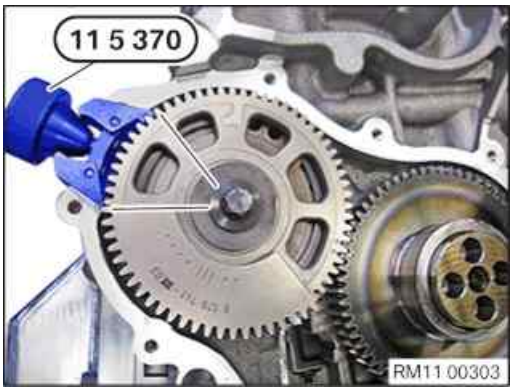
Necessary preliminary tasks:

- Remove engine with gearbox.
- Remove transmission.
- Mount engine on assembly stand.
- Remove cylinder head.
- Remove flywheel.
- Remove oil sump.
- Remove rear timing case cover.
- Remove vibration damper.
- Remove belt tensioner.
- Remove front, lower timing case cover.

Removal:

Use special tool 2 288 942 to fix counterbalance shaft in TDC position of cylinder 1.

Screw special tool 2 288 942 to crankcase (1).



Important!

Ring gear of the counterbalance shaft gear has two sections (fixed gearwheel and free gearwheel).

Ring gear is preloaded and must be blocked before removal.

If the gear must be installed again, the ring gear must remain blocked with special tool 11 5 370 until installation.

If a new gear is being installed, the ring gear must be blocked using the factory fixation until installation.

Block the ring gear of the gear in the position shown using special tool 11 5 370 .

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Note:
When counterbalance shaft is locked, marks on crankshaft and gear of counterbalance shaft must align.

Release screw (1).

Loosen screw connection (1) on special tool 2 288 942 .

Remove special tool 2 288 942 .

Screw special tool 2 288 943 into the counterbalance shaft as far as the limit position.

Important!

If the gear must be installed again, the ring gear must remain blocked with special tool 11 5 370 until installation.

If a new gear is being installed, the ring gear must be blocked using the factory fixation until installation.

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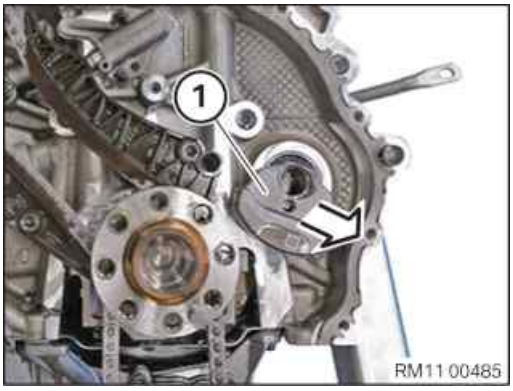
Separate the counterbalance shaft from gear (1) with hammer blows on special tool 2 288 943 .

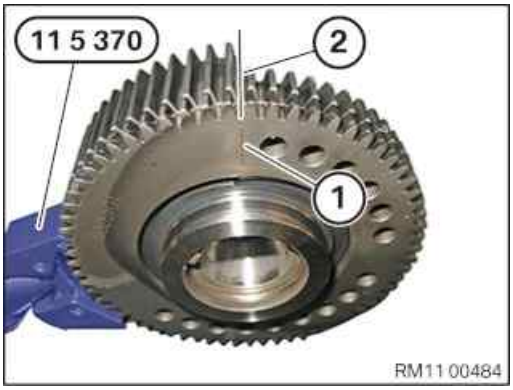
Remove special tool 2 288 943 .

Note:
If necessary, secure the counterbalance shaft against falling.



Remove counterbalance shaft (1) in direction of arrow.*Note:*
If necessary, secure gear of the counterbalance shaft against falling.

Remove gear of the counterbalance shaft in direction of arrow.*Note:*
Figure B38.



Important!

If the gear must be installed again, the ring gear must remain blocked with special tool 11 5 370 until installation.

Installation:

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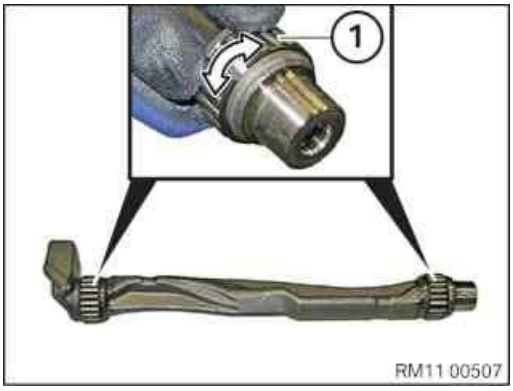
Important!

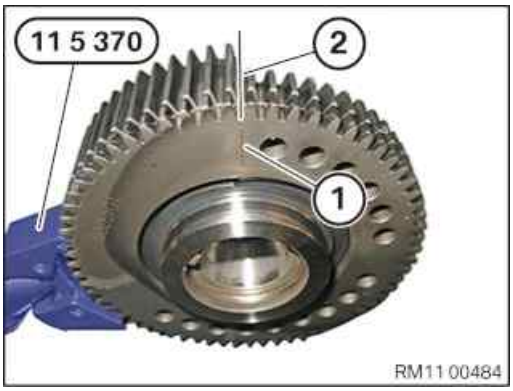
If a new gear is being installed, the ring gear must be blocked using the factory fixation until installation.



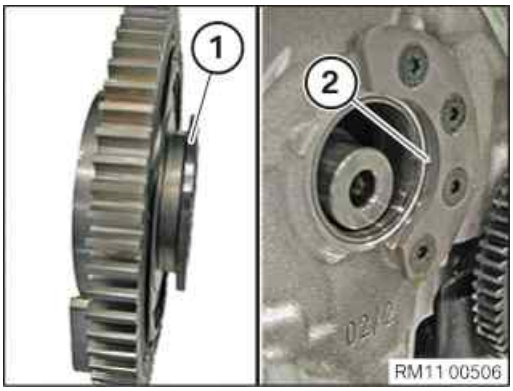
Check needle bearing (1) of the counterbalance shaft.

If necessary, pull needle bearing (1) off the counterbalance shaft and replace it.

Note:
Picture shows B38



Note:
With correct preload, the mark (1) on the free gearwheel and the section (2) of the fixed gearwheel are aligned.



Note:
Gear is guided over guide ring (1) in crankcase (2).

Figure B38.

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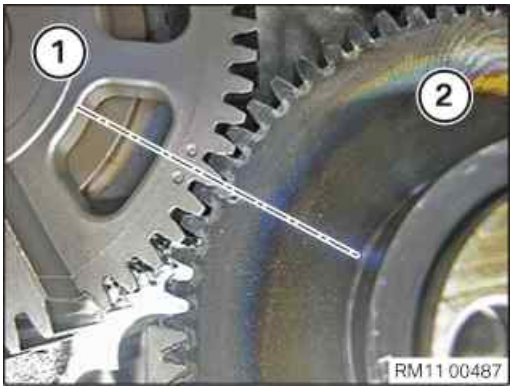
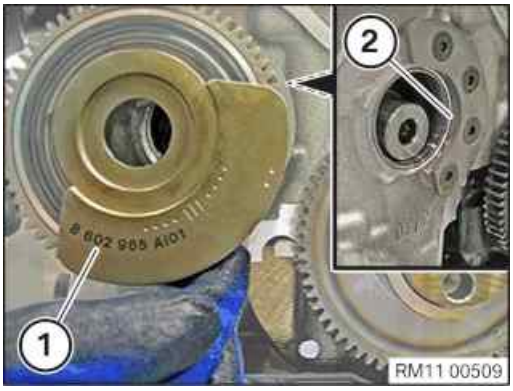


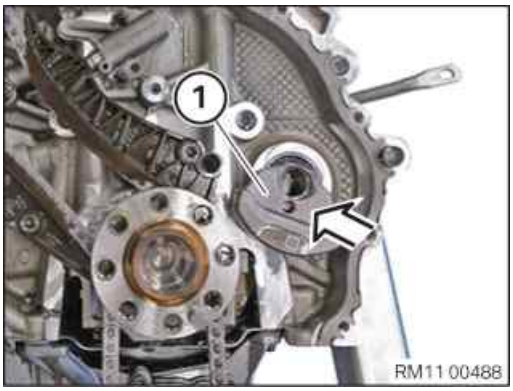
Important!

The marks on the gear (1) of the counterbalance shaft and the crankshaft (2) must align.

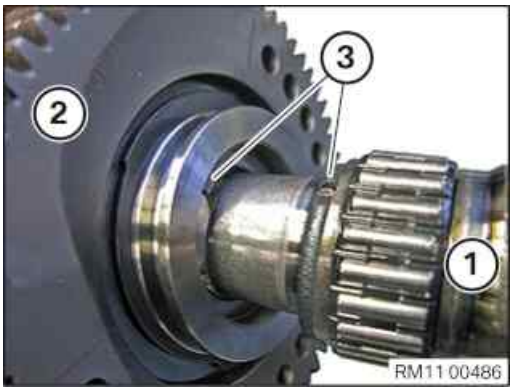


Insert gear (1) of the counterbalance shaft into the guide of the crankcase.*Note:*
Secure counterbalance shaft gear (1) against falling if necessary.

Figure B38.



Install counterbalance shaft (1) in the crankcase in direction of arrow.



Important!

Counterbalance shaft (1) can only be installed in the gear (2) in one position.

Pay attention to encoding (3).

Note:
For purposes of clarity, picture shows component removed.

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Bring counterbalance shaft (1) into contact in gear (2).

Note:
Parts: Replace screw (1).

Insert screw (1) and tighten until it makes contact.

Use special tool 2 288 942 to fix counterbalance shaft in TDC position of cylinder 1.

Screw special tool 2 288 942 to crankcase (1).

Tighten screw (1).

Tightening torque: 11 27 1AZ.

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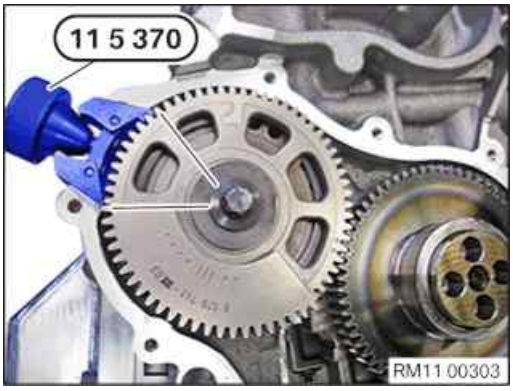

Remove special tool 11 5 370 .

With new gear:

Remove factory retainer.

Loosen screw connection (1) on special tool 2 288 942 .

Remove special tool 2 288 942 .

Required follow-up work:

- Install front lower timing case cover.
- Install belt tensioner.
- Install vibration damper.
- Install rear timing case cover.
- Install oil sump.
- Install flywheel.
- Install cylinder head.
- Remove engine from assembly stand and place on table lift.
- Attach transmission.
- Install engine with transmission.

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11 12 729 Checking cylinder head for watertightness

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Maintain conditions of absolute cleanliness.

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1 – Remove vehicle battery

WARNING

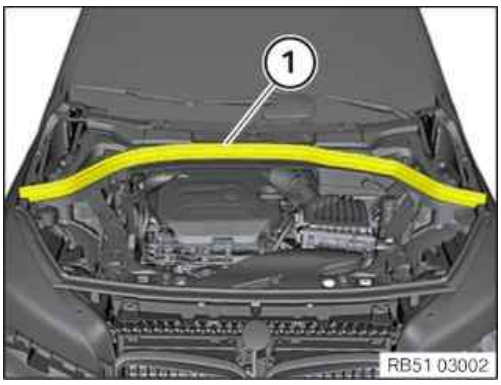
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

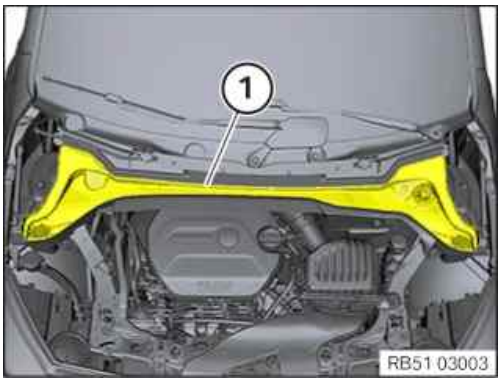
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

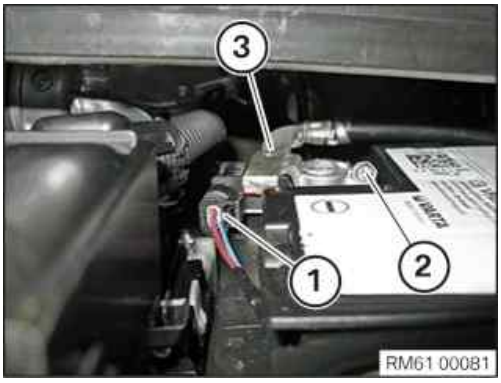
For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).

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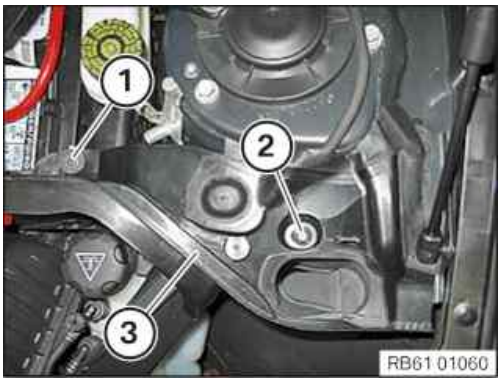
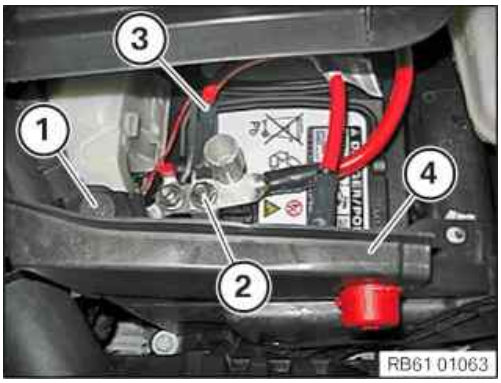
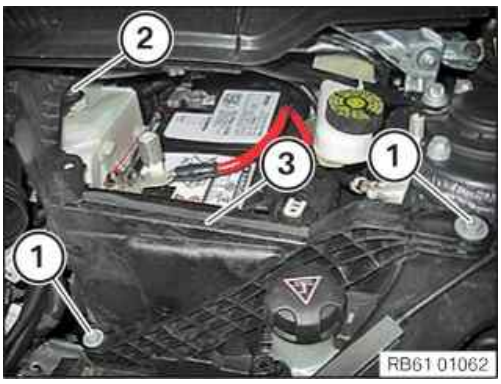


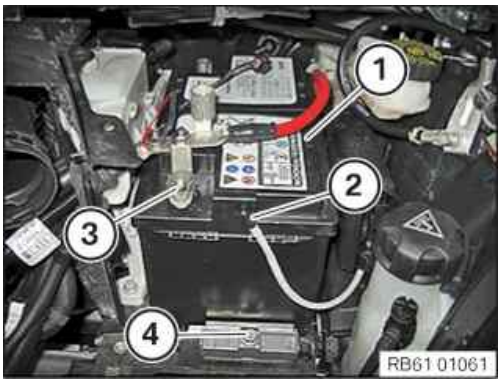
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Removing the upper bulkhead cover

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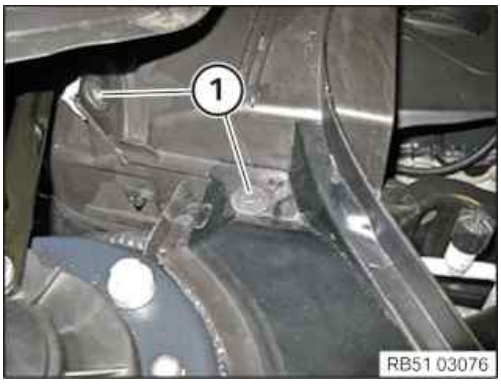
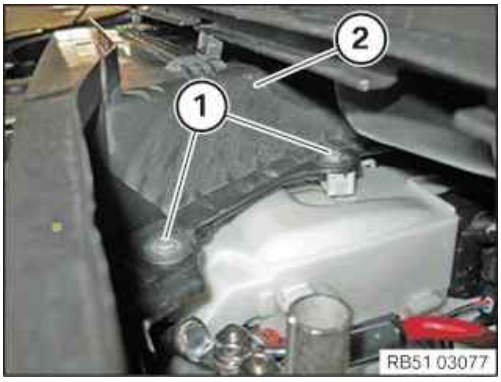
- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

3 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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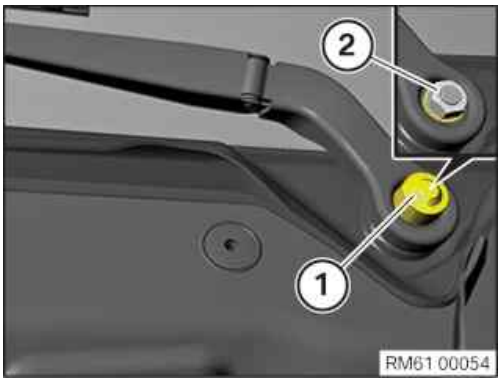
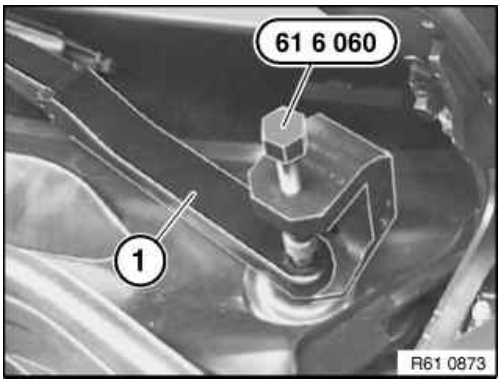


- Remove the protective cap (1).
- Loosen nut (2).



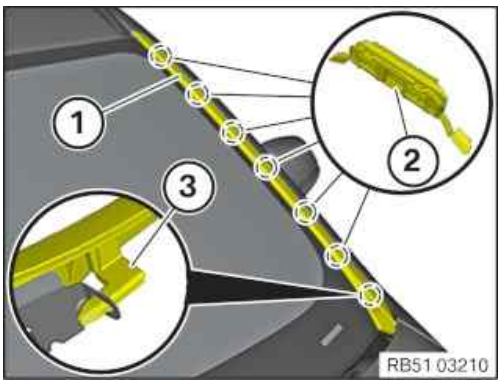
- Pull off the wiper arm (1) using special tool .

4 – Remove the gutter strip on the windscreen on the left and right

NOTICE

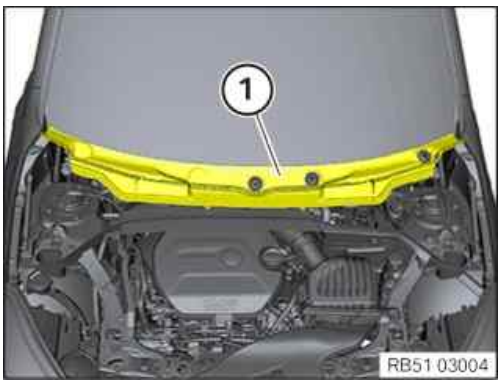
Description is for left component only. Procedure on the right side is identical.

▶ Remove the gutter strip on the windscreen



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

5 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

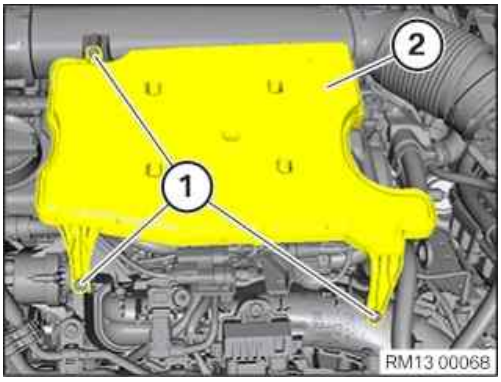
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

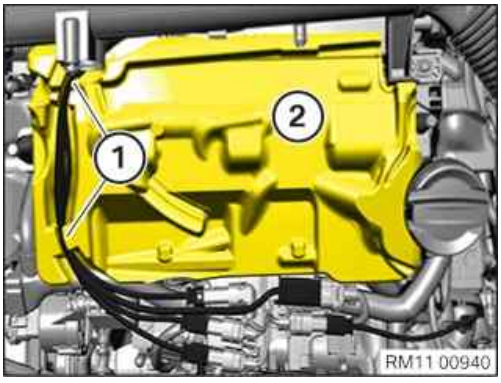
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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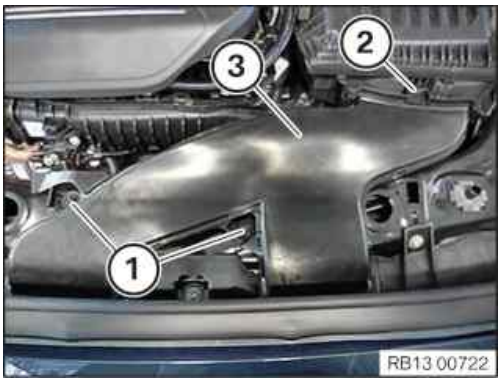
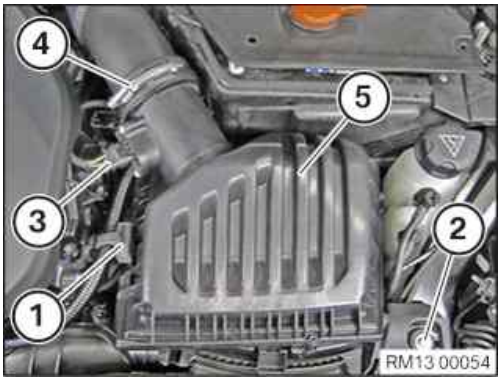


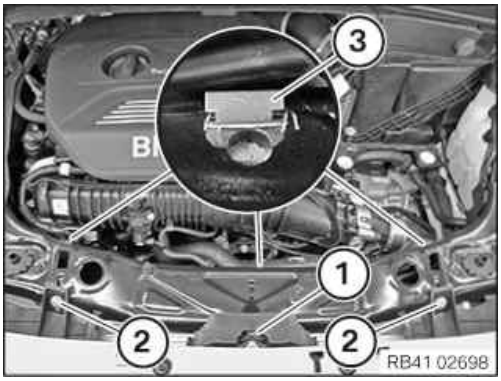
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

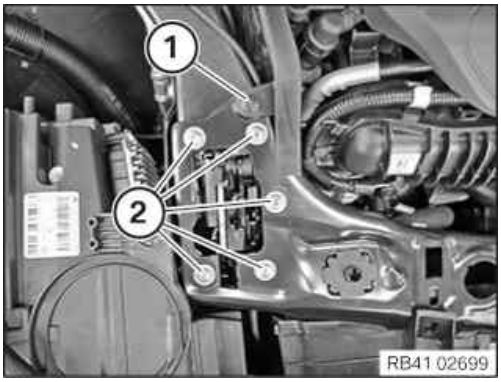


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

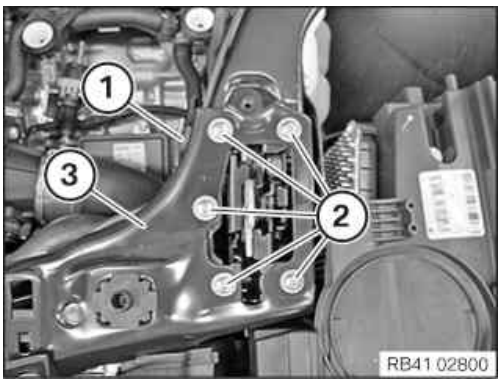
11 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

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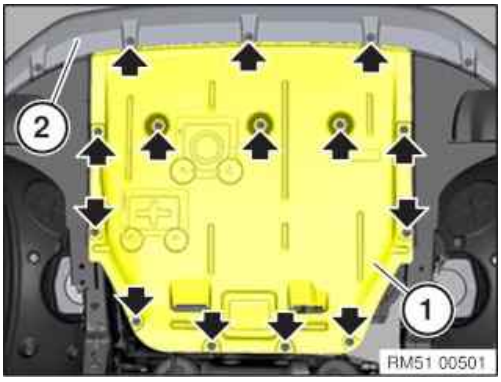
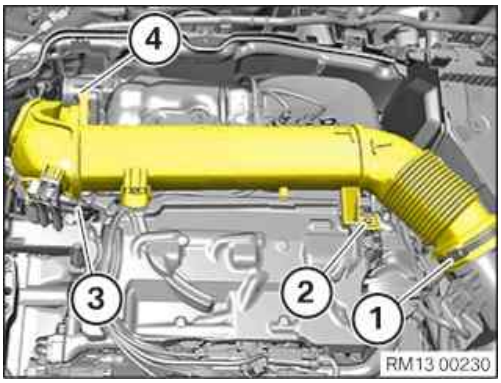
12 – Removing the front underbody protection

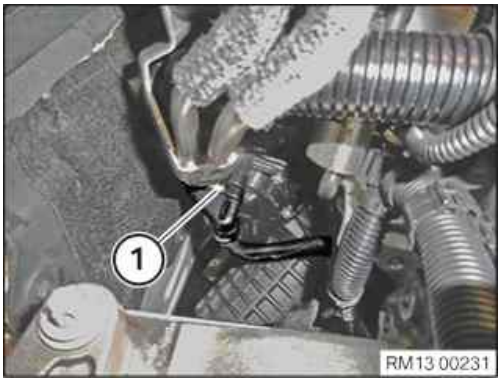


- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

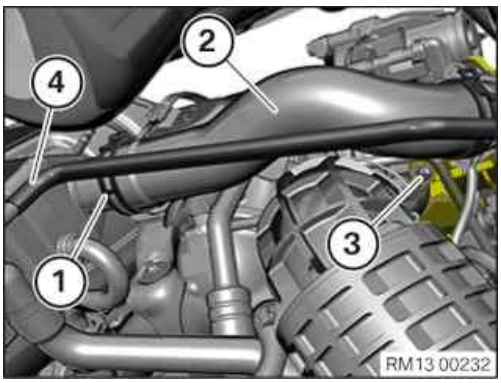
13 – Removing clean air pipe



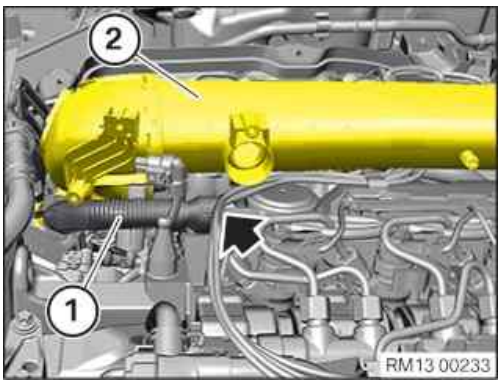
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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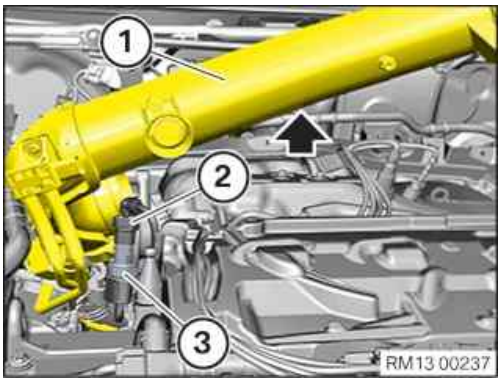

- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

14 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

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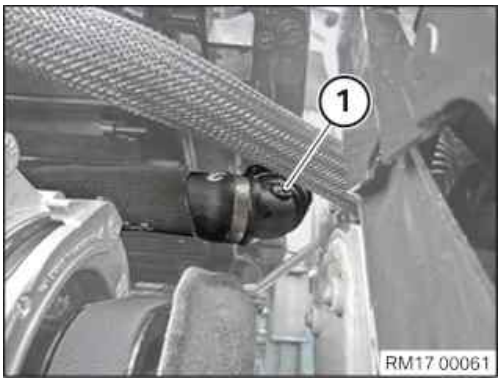
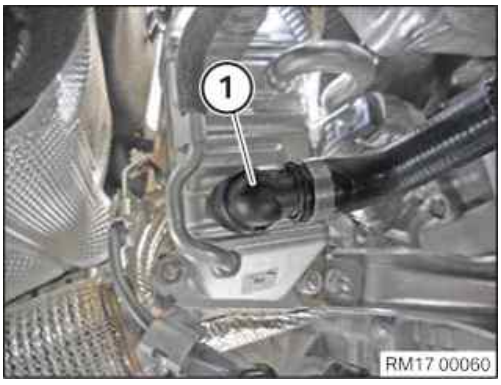


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

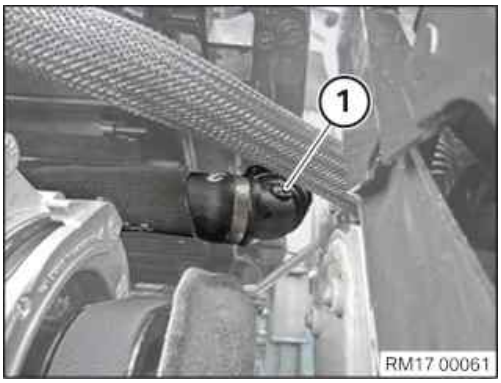


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

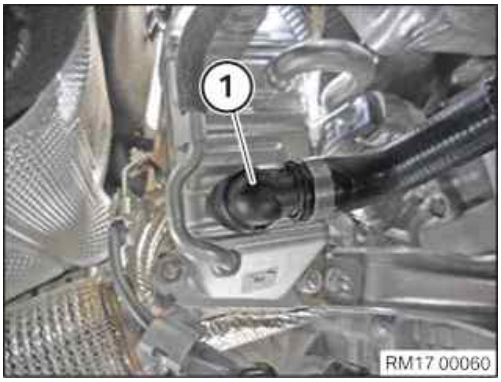
15 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

16 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

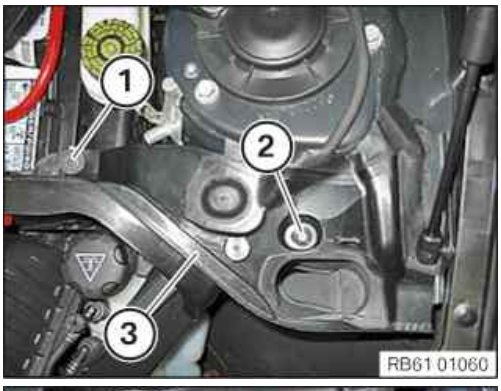
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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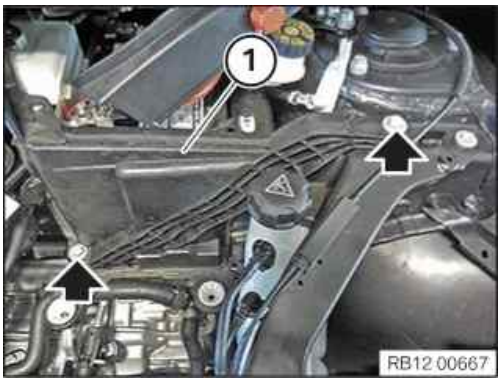
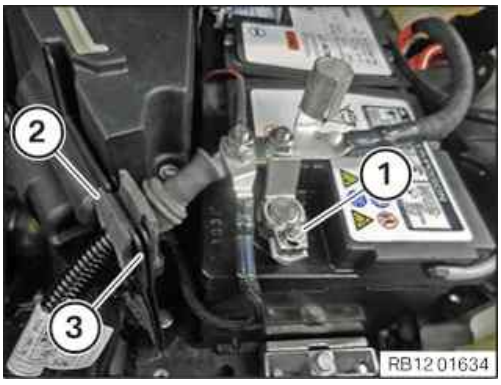
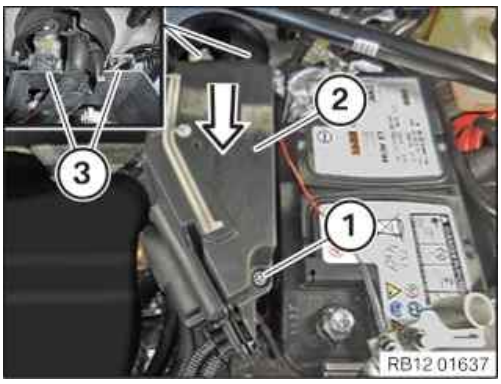


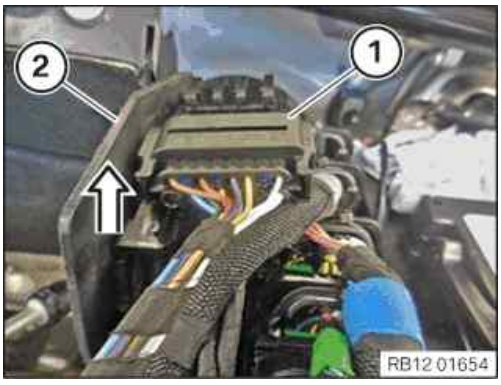
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



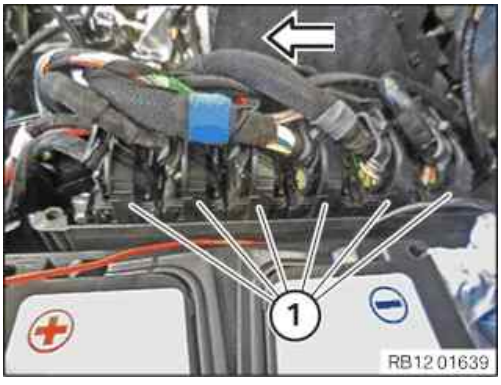
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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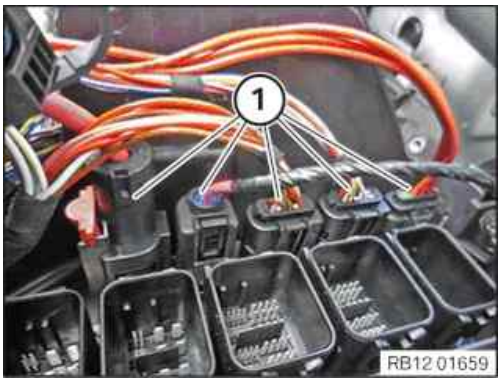
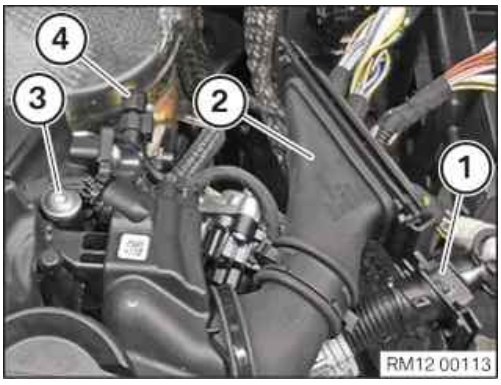
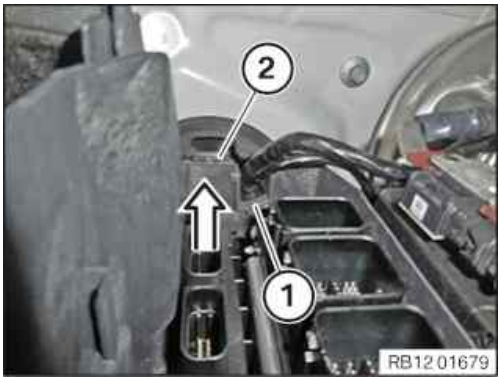


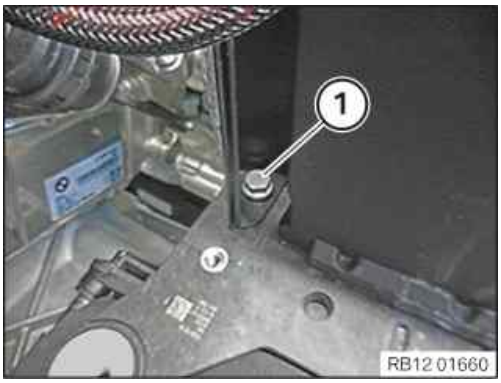
- Unlock and loosen connector (1).



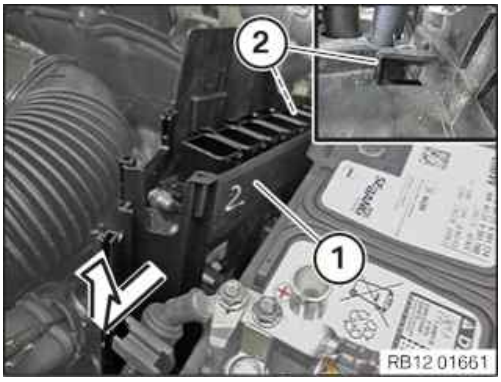
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

17 – Remove battery holder

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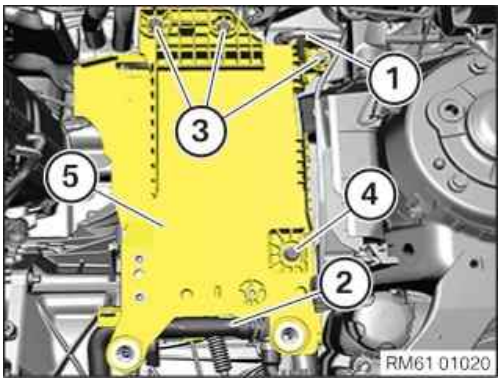
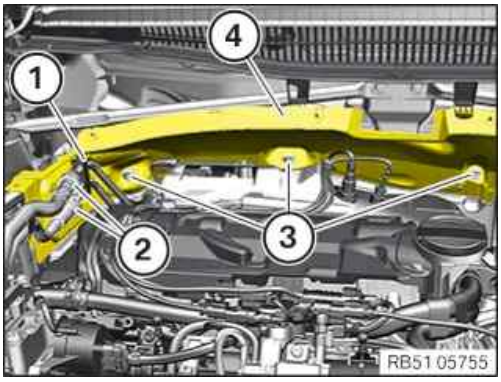


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

18 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

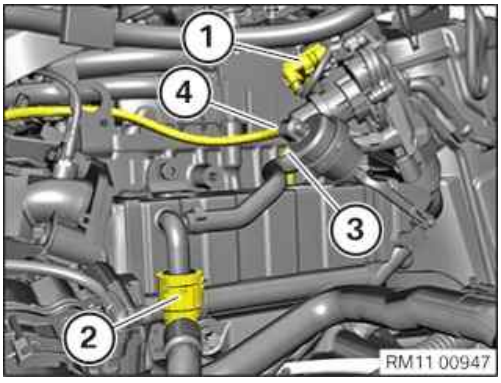
19 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

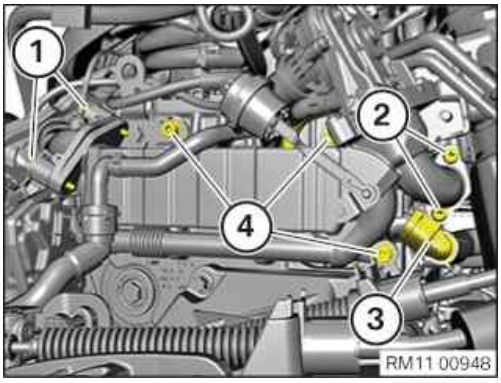
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

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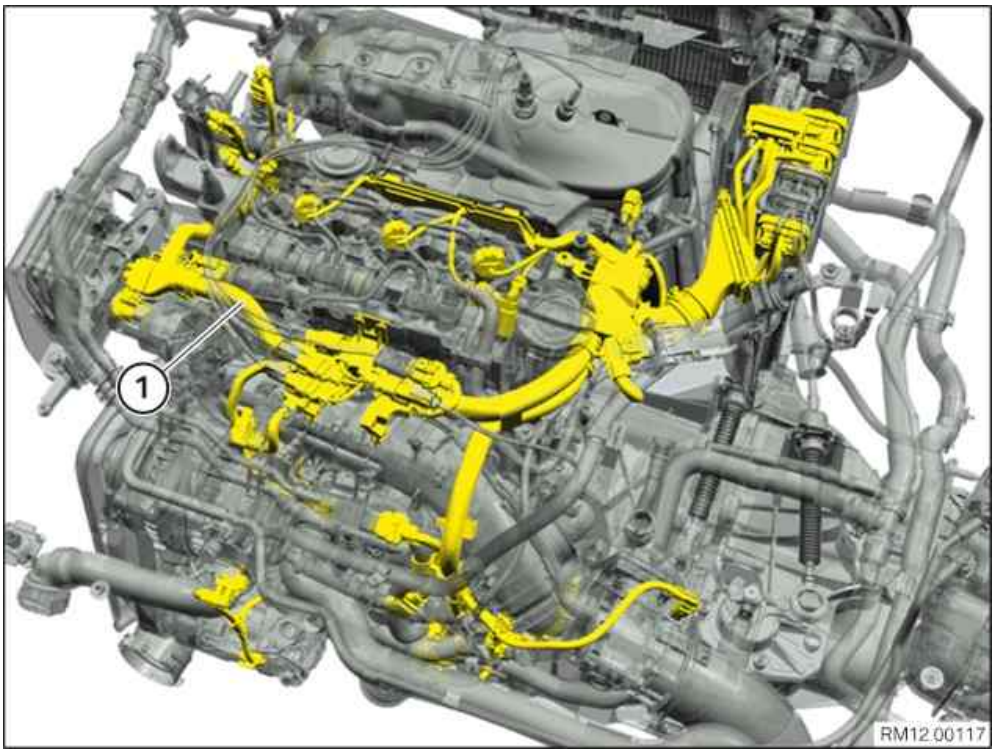
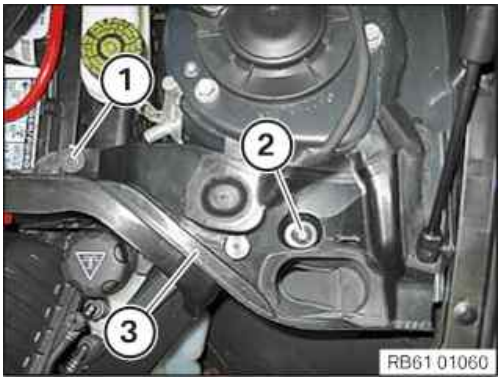
20 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine

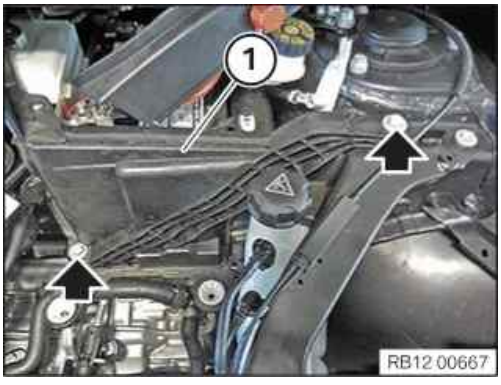


1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.

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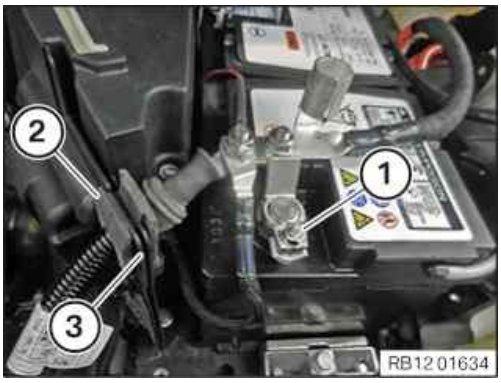
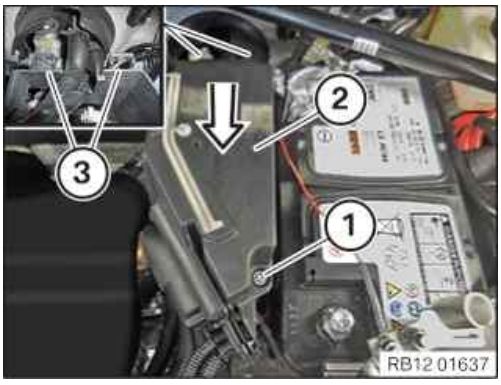
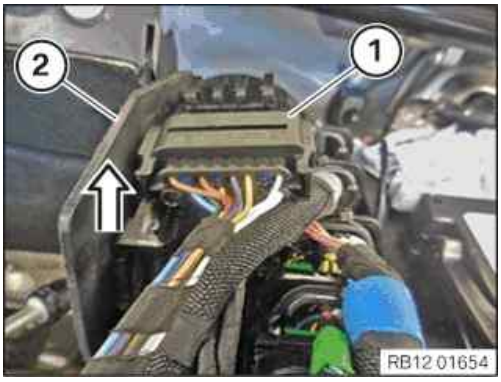


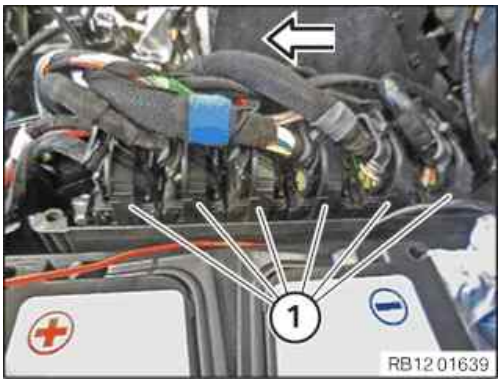
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).

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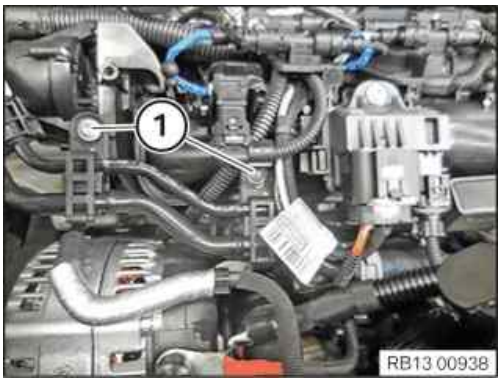
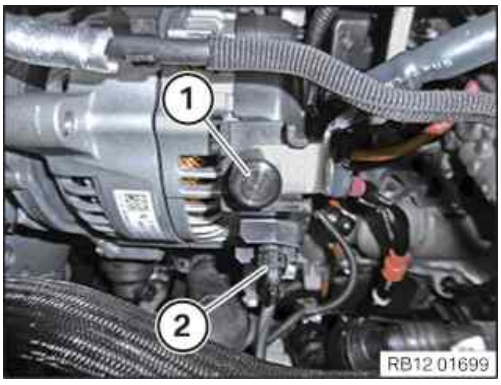
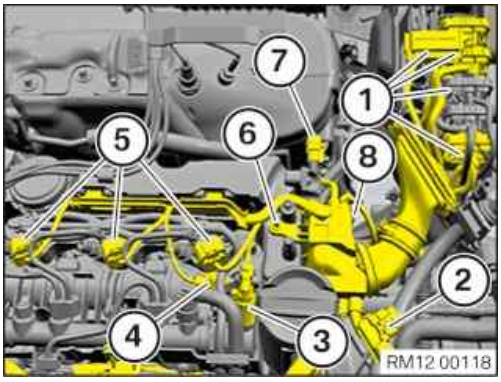


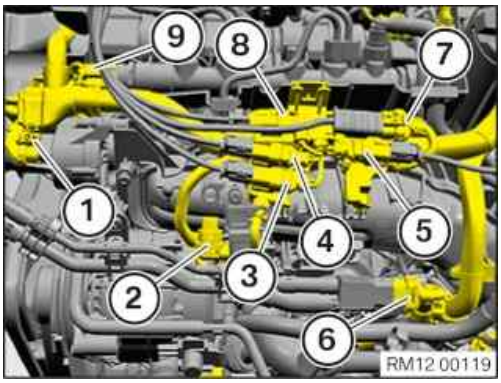
- Loosen screws (1).



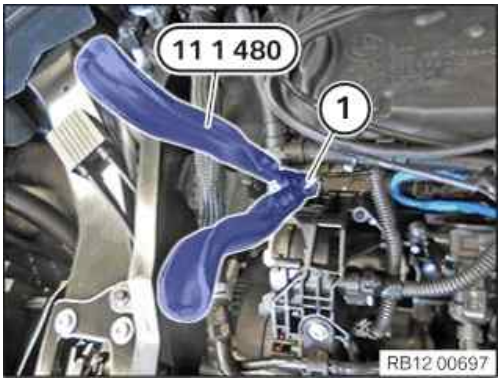
- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.



- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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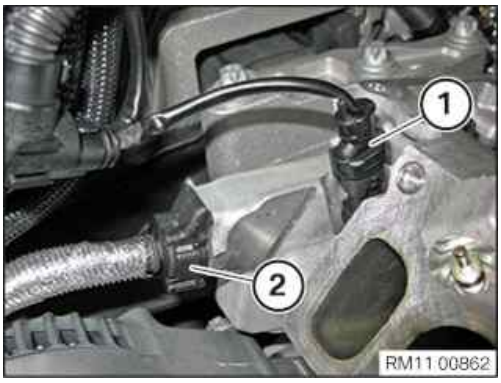
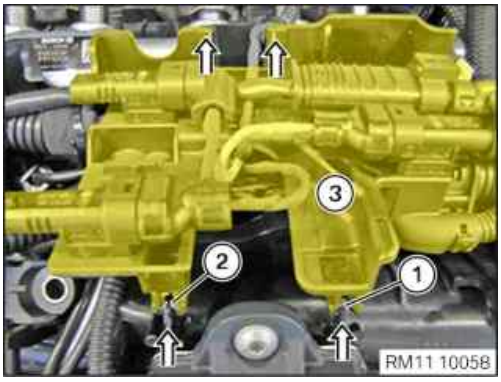


- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

21 – Removing the cable clips from the intake plenum



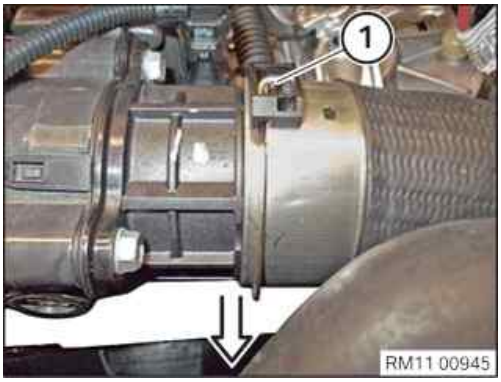
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

22 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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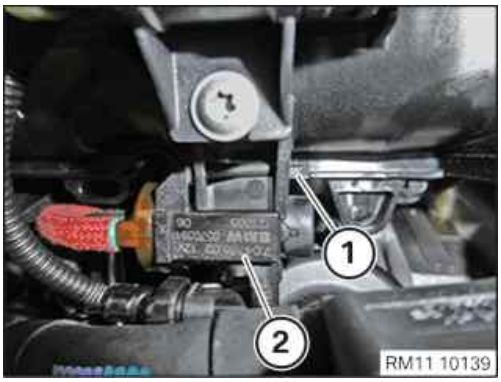
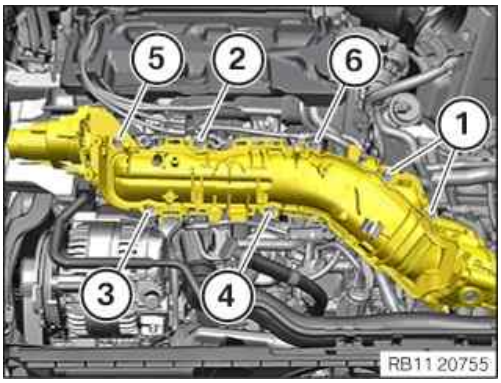
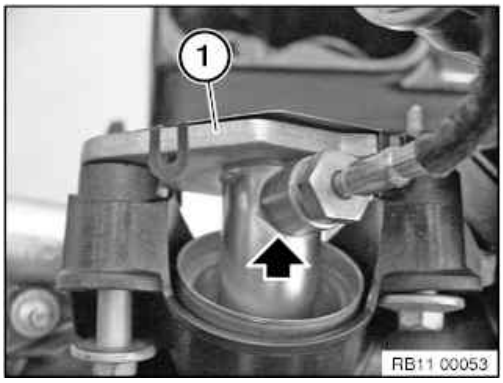


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

23 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

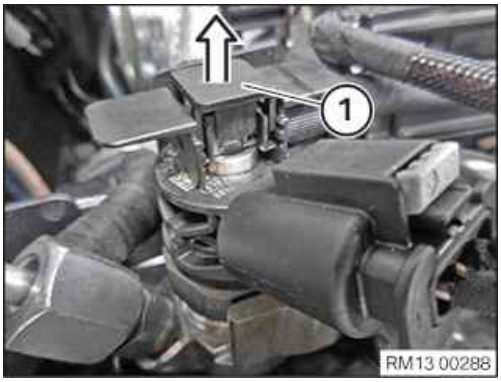
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

24 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

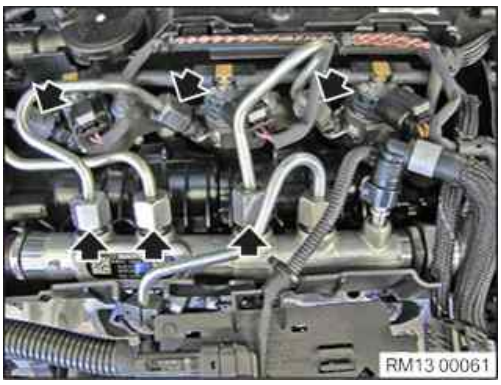
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

25 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

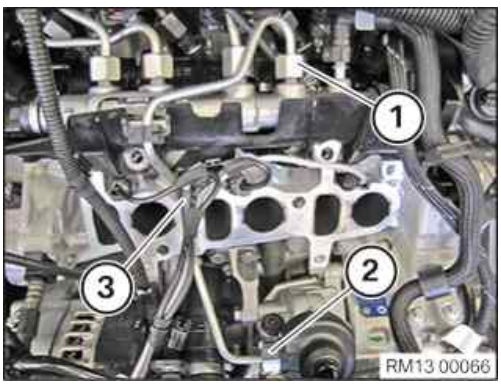
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

26 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

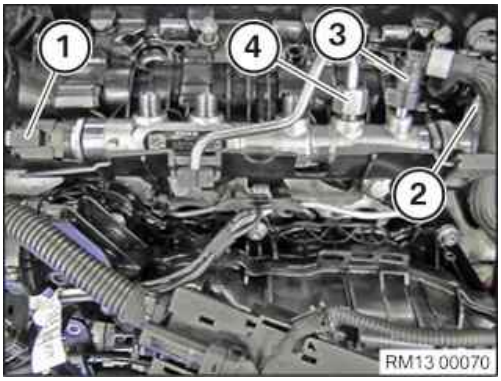
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

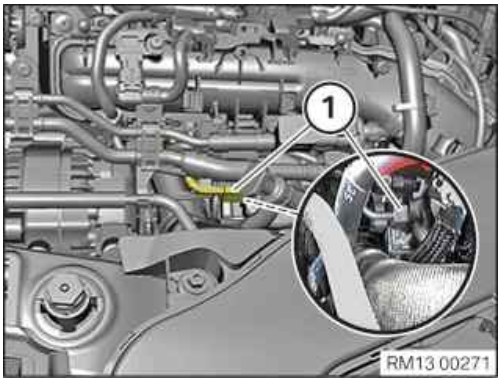
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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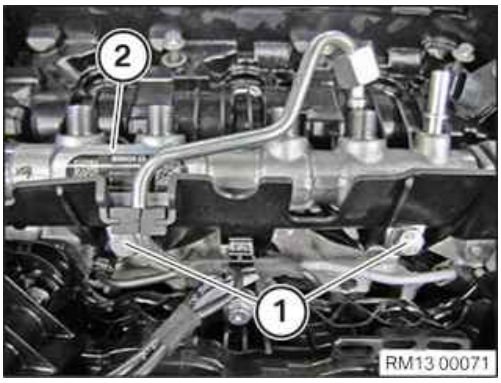

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

27 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

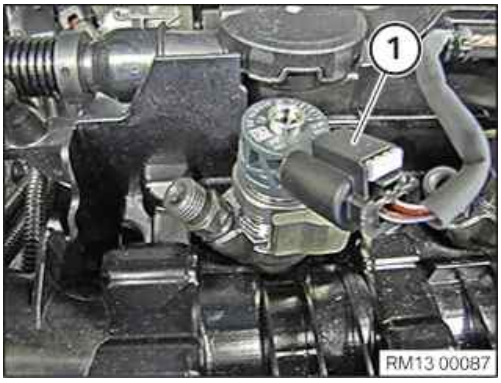
Electrostatic discharge.

Damage to or destruction of electrical components.

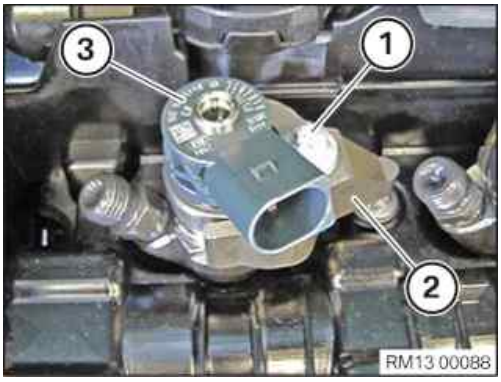
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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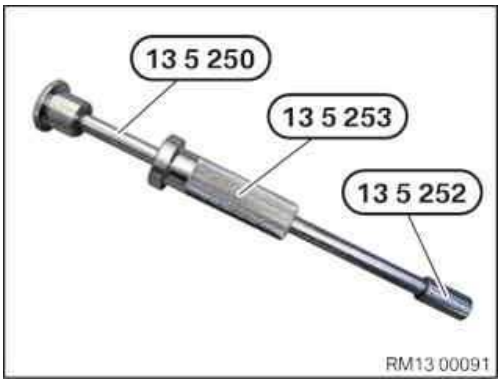
RISK OF DAMAGE

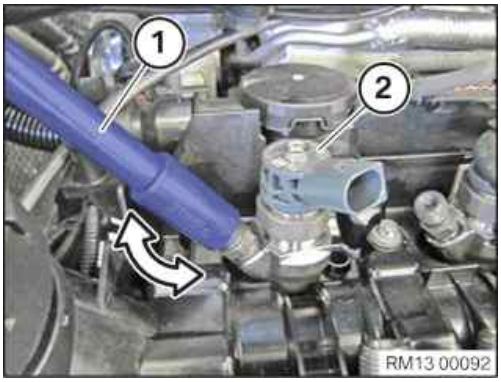
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

28 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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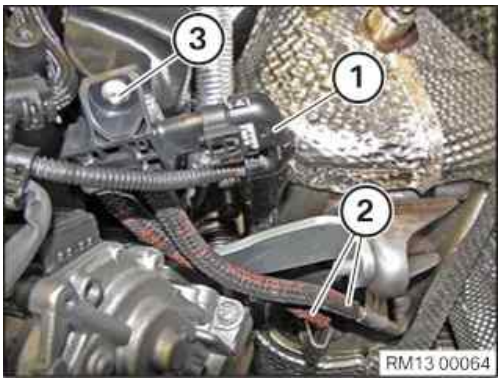
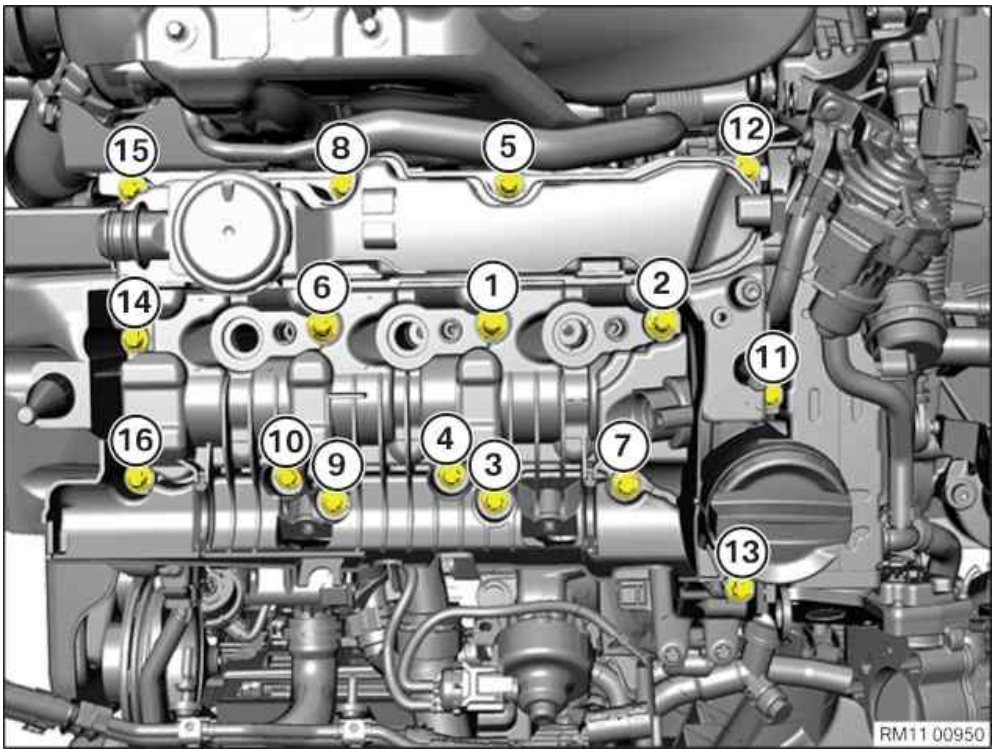


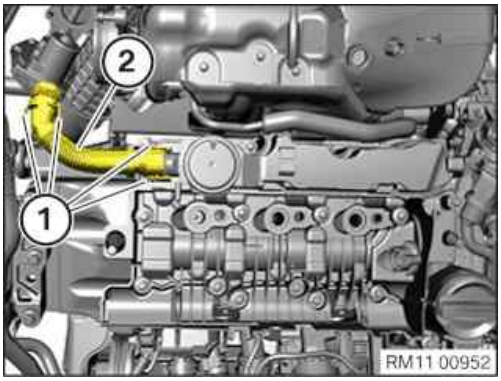
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

29 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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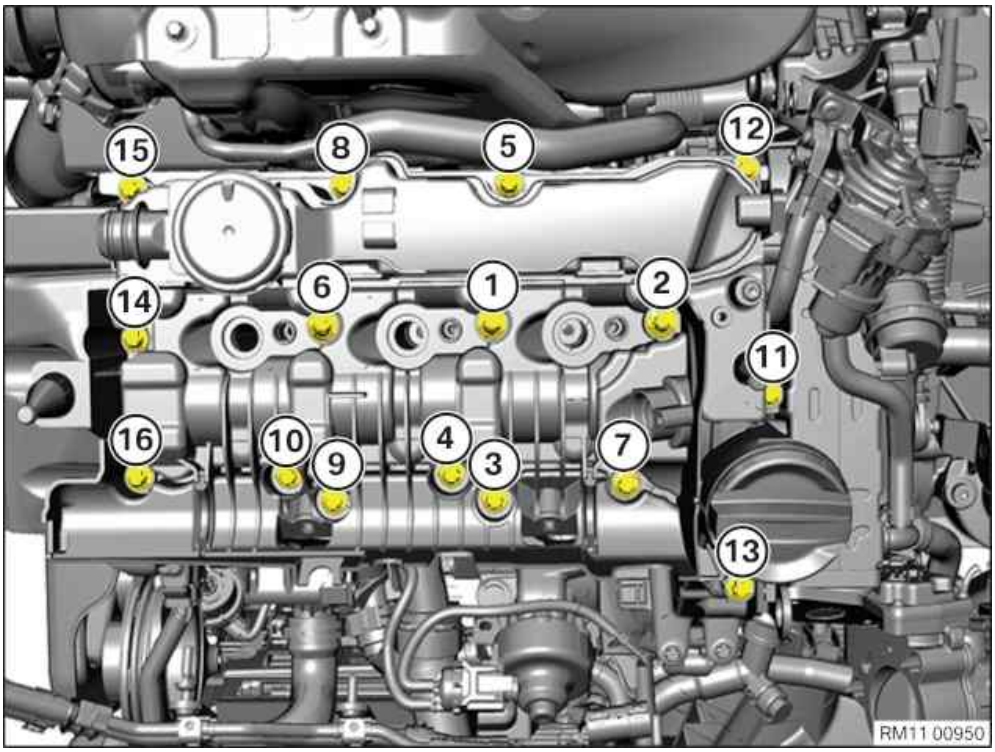


- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

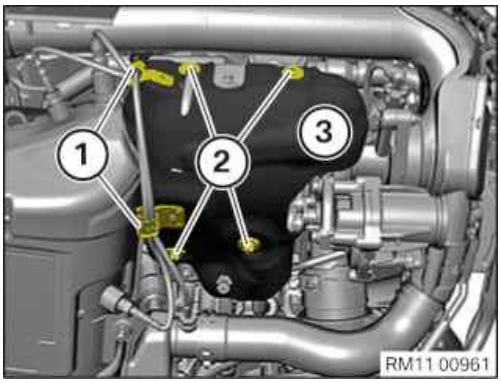
30 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

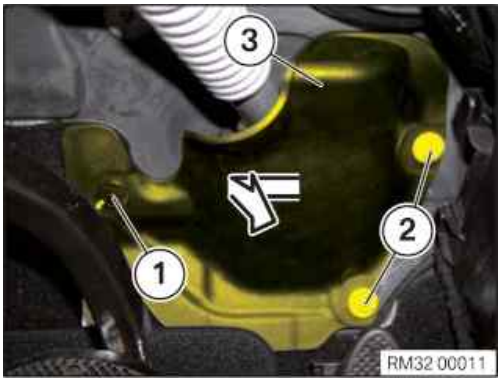
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).

31 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!

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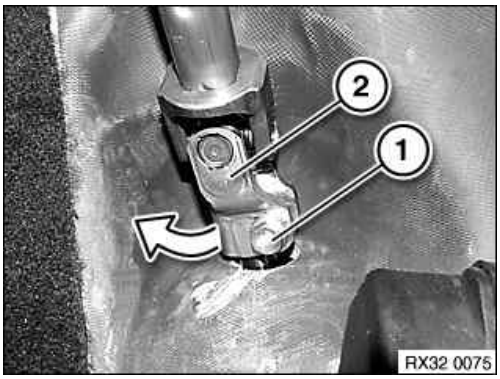
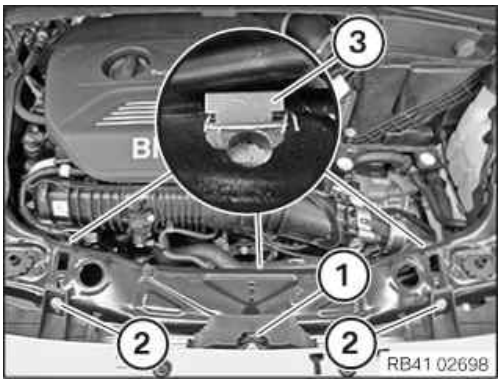


- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

32 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

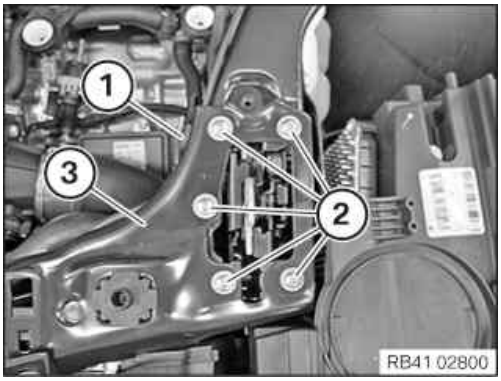
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

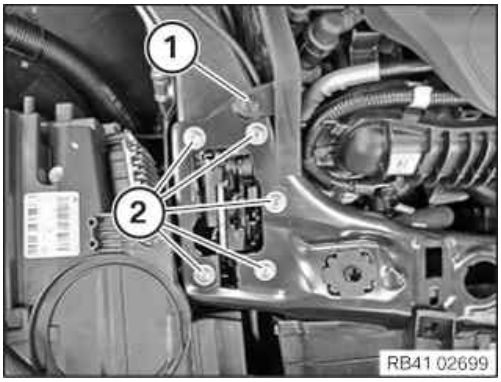


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

33 – Securing radiator on left and right

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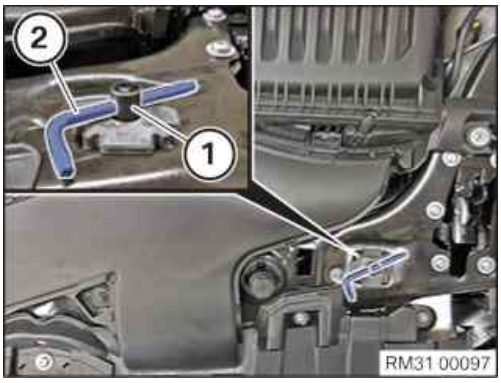


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

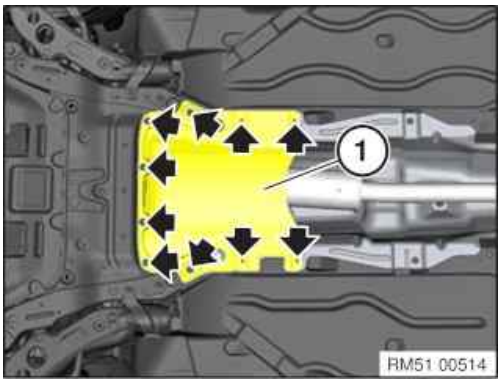
34 – Remove the front left and right wheel

▶ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

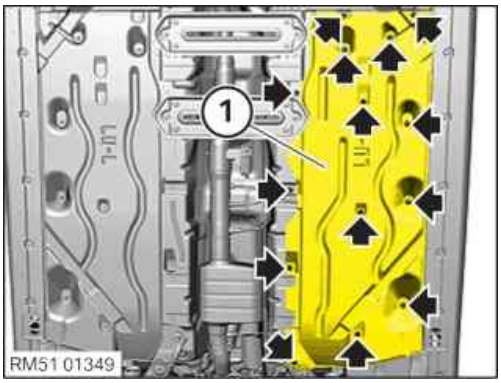
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

35 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

36 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

37 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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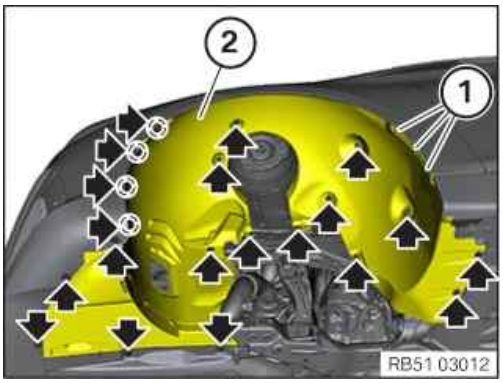
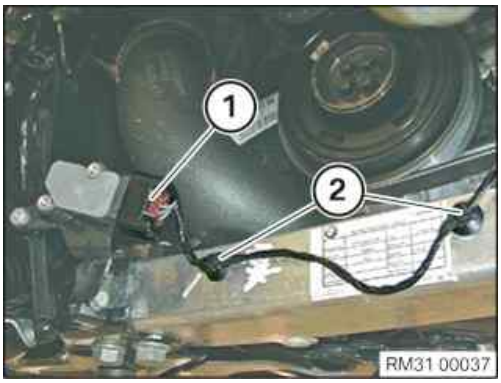
▶ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

38 – With right installation: Detaching ride height sensor cable



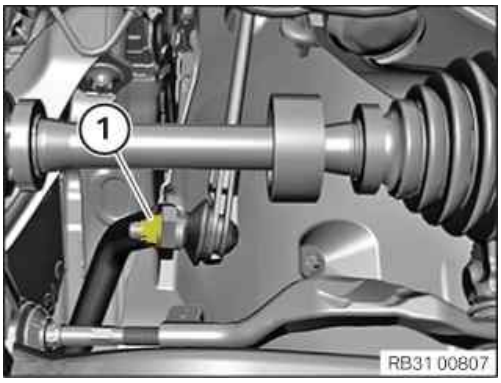
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

39 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

40 – Detaching rubber mount from front axle support

- Spray rubber mount (1) with lubricant and release from holder on front axle support.

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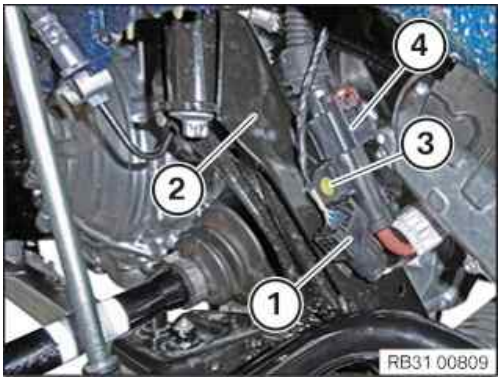
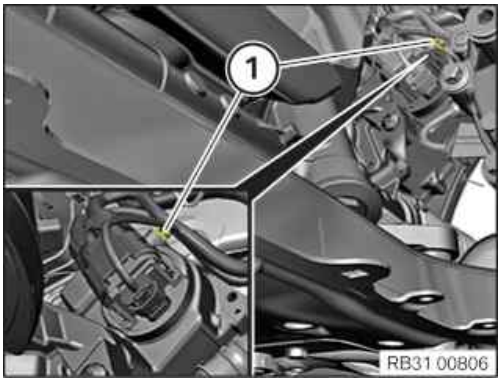
41 – Disconnecting plug connections from steering gear

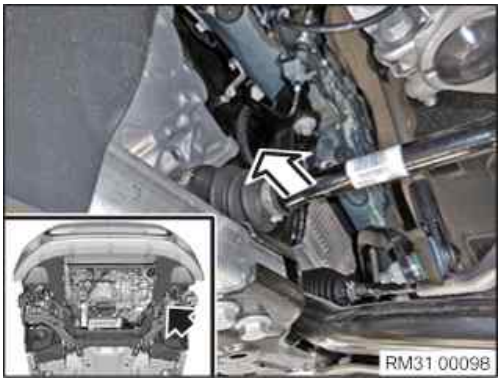
▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

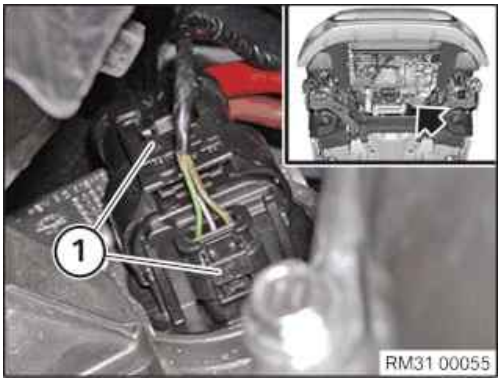


- Disconnect wiring harness (1) from steering gear.



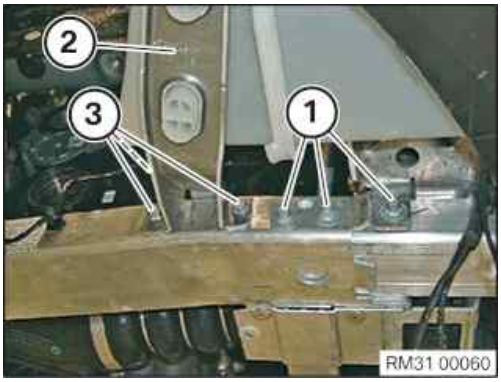
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

42 – Releasing the mounted part from the front axle support



- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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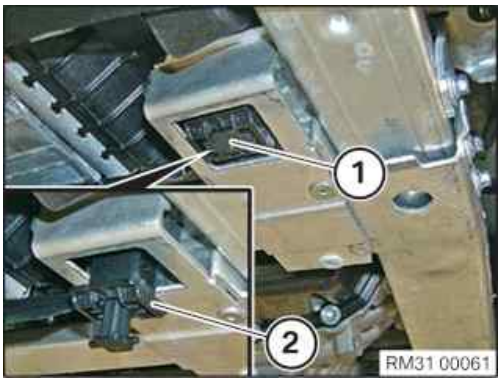
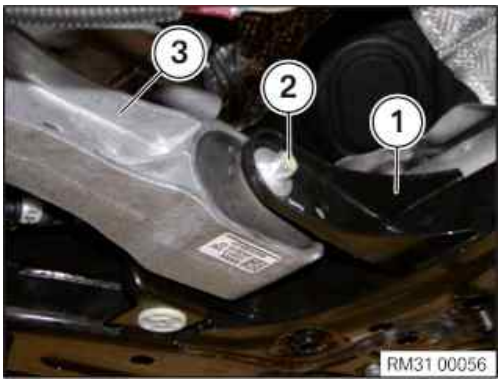


NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



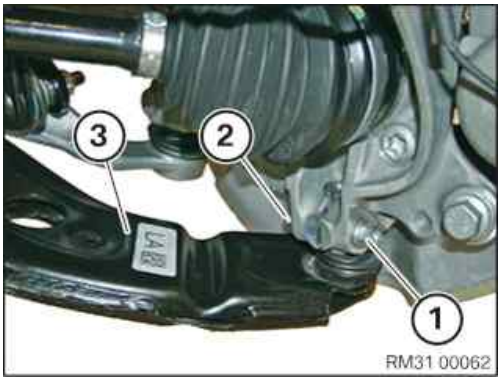
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

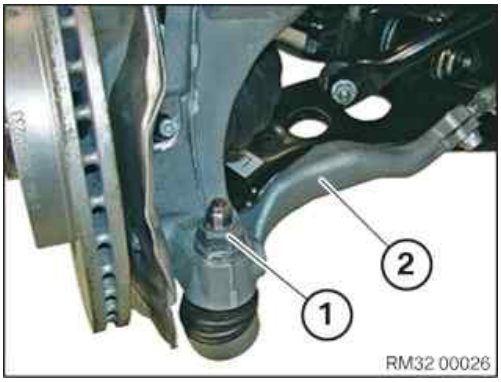
43 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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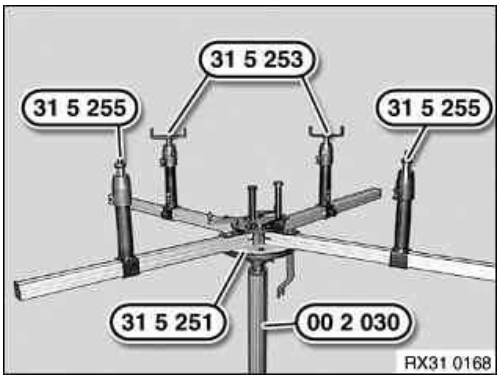
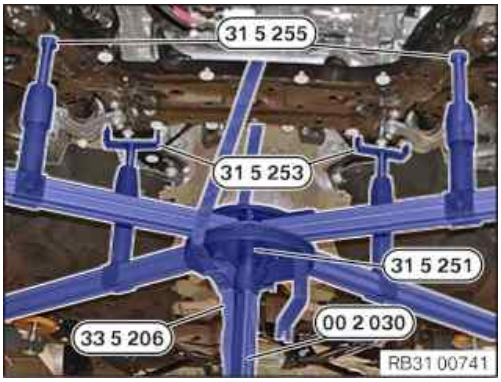


- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

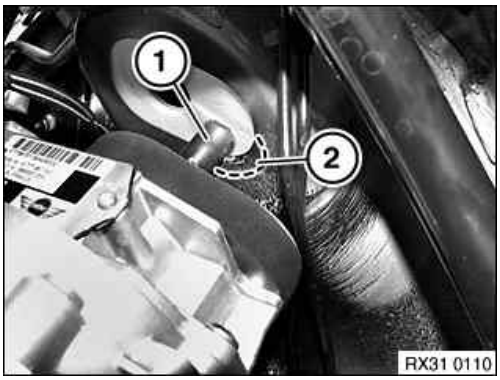
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

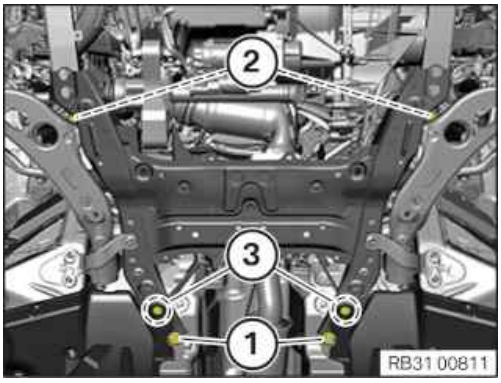


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.

For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

44 – Removing the connecting support from the tunnel in front and back

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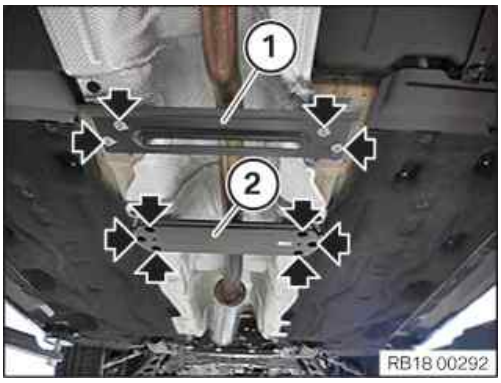
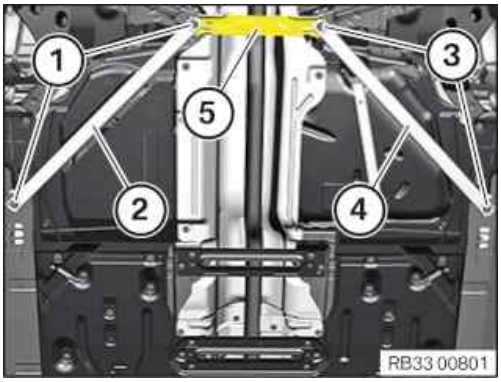


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

45 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

46 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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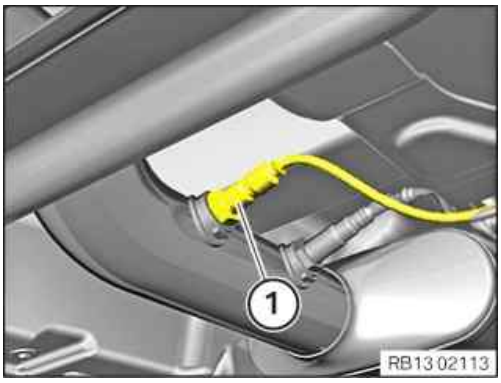
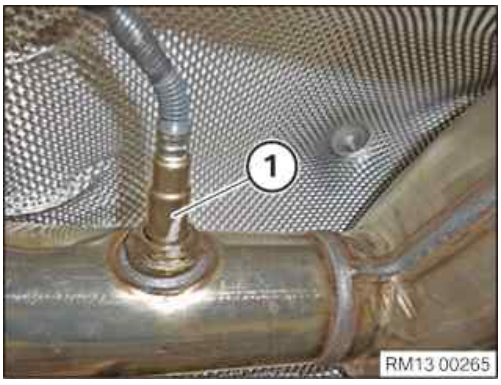
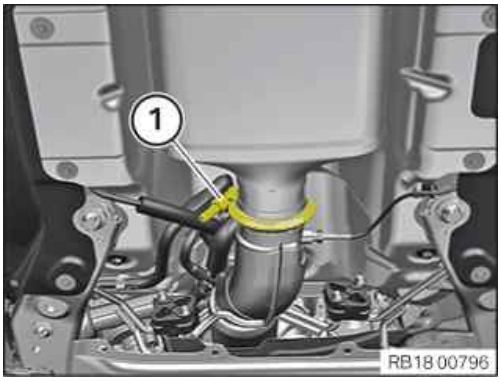


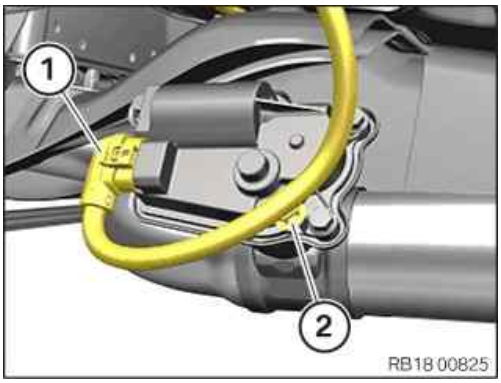
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



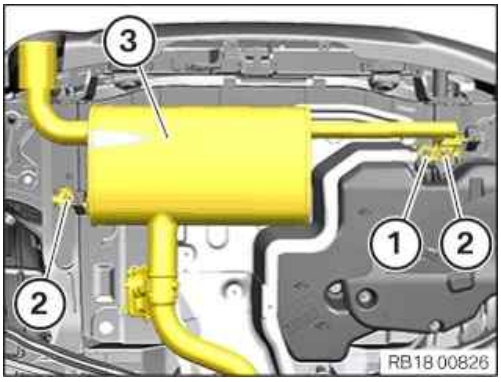
- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Unlock and disconnect connector (1).
- Loosen clamp (2).



- Loosen screw (1).
- Loosen nuts (2).
- Lower the exhaust system (3) with an auxiliary person, guide out and remove.

47 – Removing starter motor

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

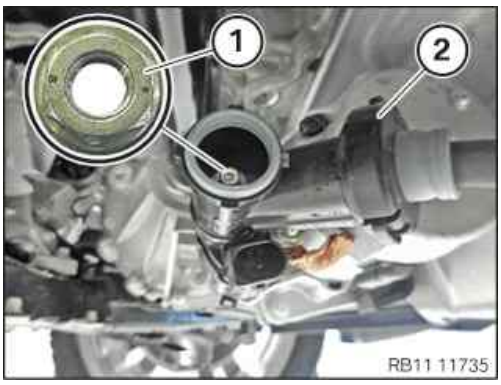
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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- Loosen screws (1).
- Feed out starter motor and remove.

48 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

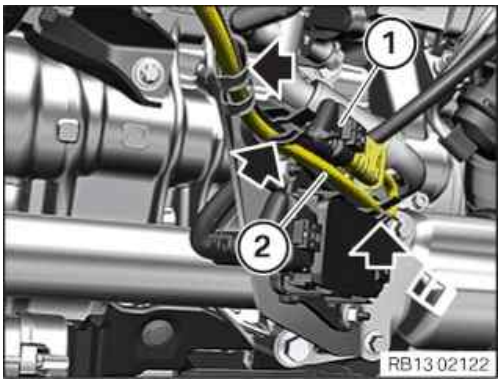
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

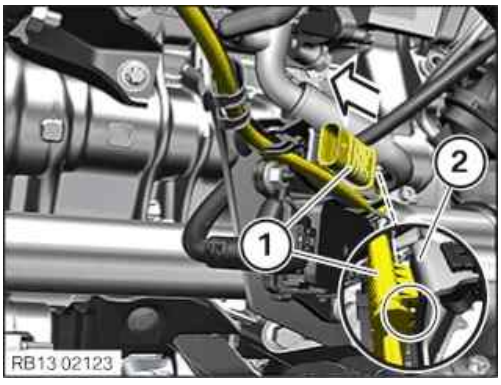
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.

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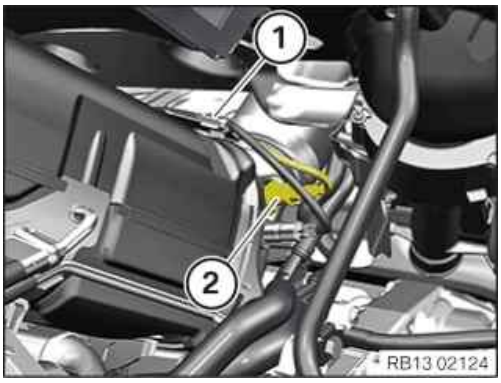


- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

49 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

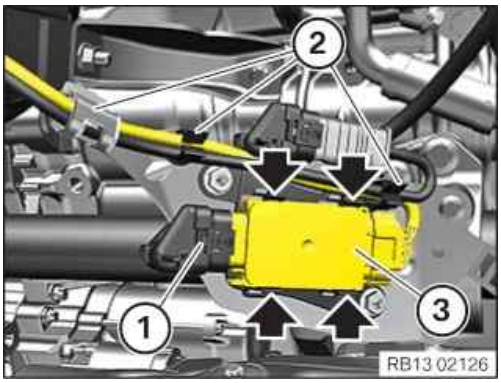
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

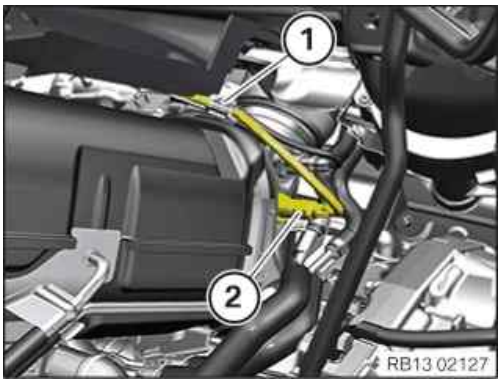
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

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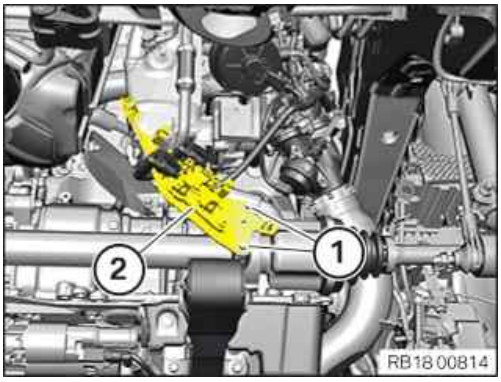
50 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

51 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

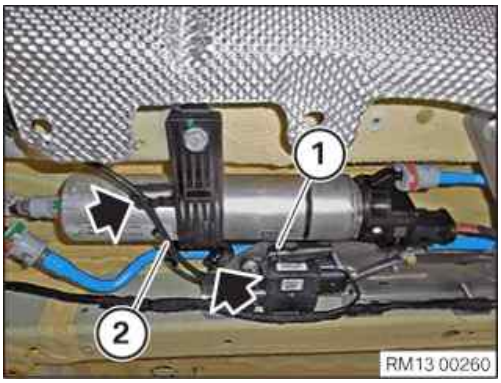
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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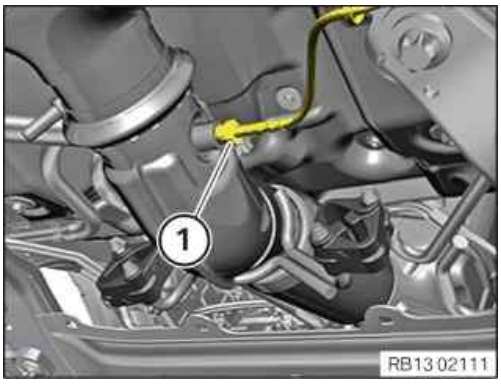
- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

52 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

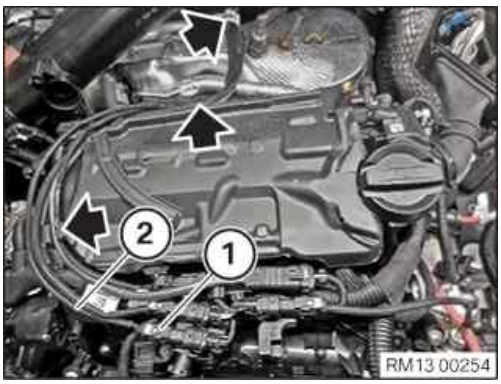
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Feed the cable (2) from the temperature sensor out of the clamps (arrows) and remove it.

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- Release the exhaust temperature sensor (1) with conventional tools (2).

- Feed out and remove exhaust temperature sensor (1).

53 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and disconnect the plug connection (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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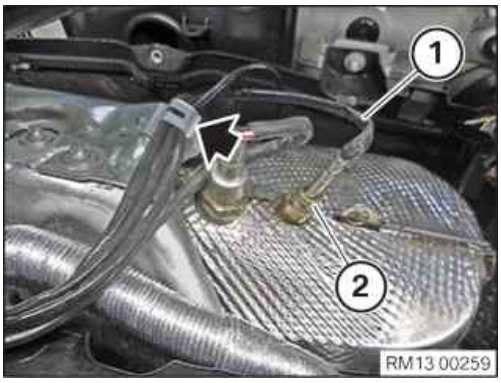


- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

54 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

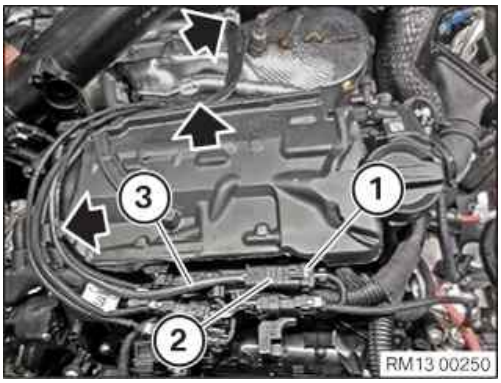
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

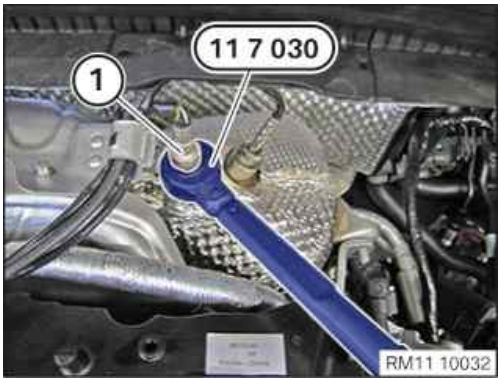
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Detach the connector (2) from the holder .
- Feed out and remove cable (3) out of the oxygen control sensor from the clamps (arrows).



- Release the front oxygen control sensor (1) using special tool **0 491 075 (11 7 030)** .
- Feed out and remove the control sensor (1).

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55 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

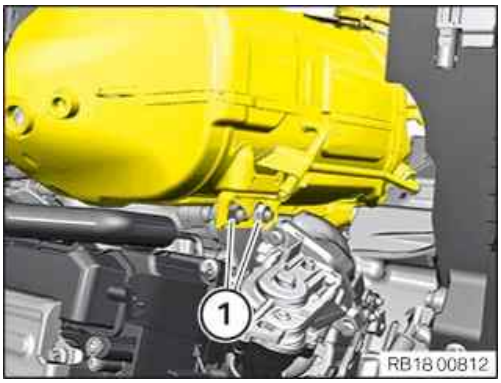
CAUTION

Heavy component.

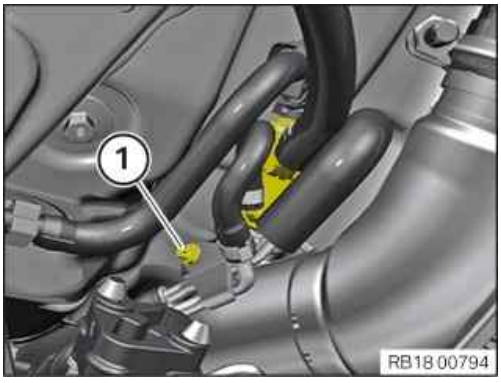
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen nuts (1).



- Loosen screw (1).

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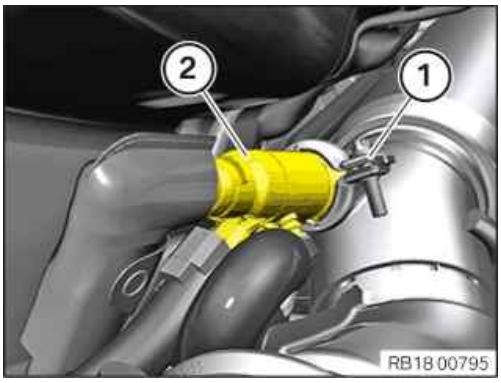
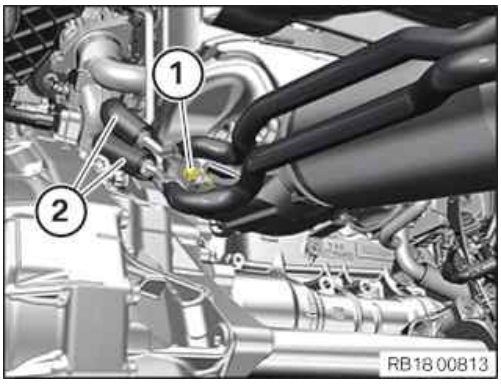
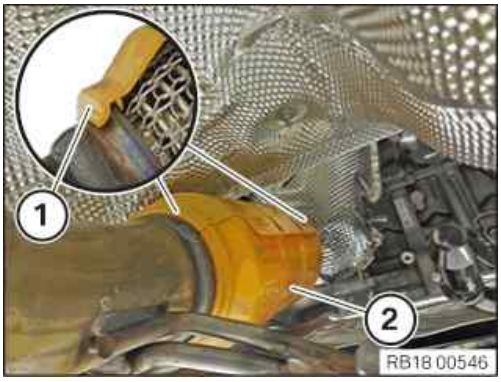


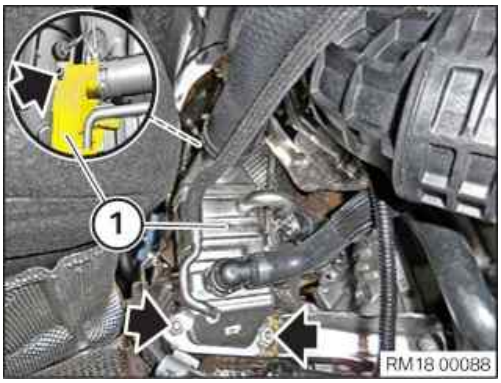
- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



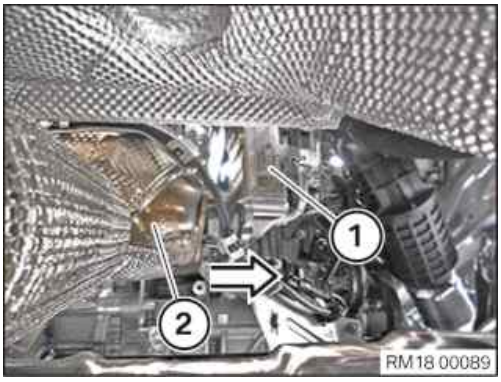
- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Detach nuts (arrows) from low pressure exhaust-gas recirculation cooler (1).



- Feed out low pressure exhaust-gas recirculation cooler (1) from diesel particulate filter (2) in direction of arrow and set aside.

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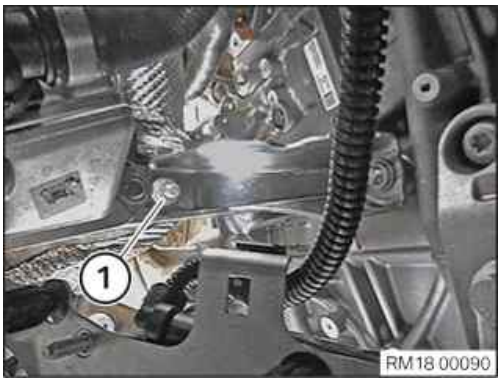
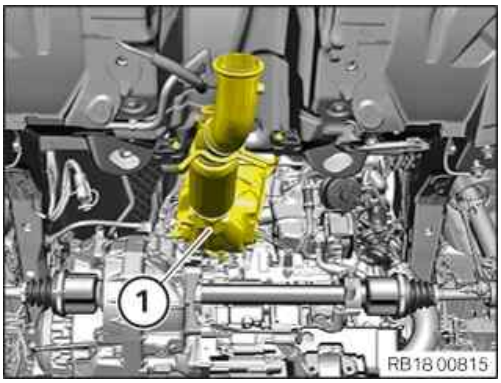


- Unfasten nut (1).



- Feed out diesel particulate filter (1) toward the bottom and remove.

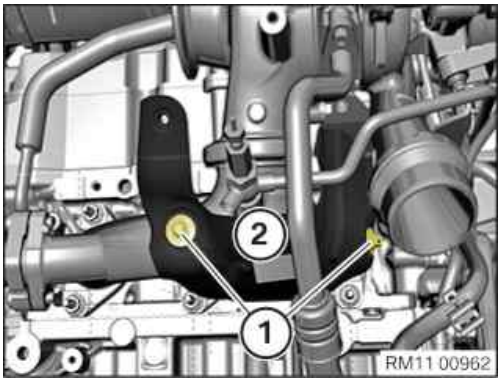
56 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

57 – Removing heat shield from rear exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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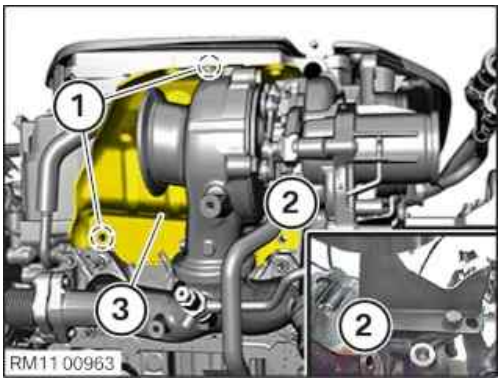
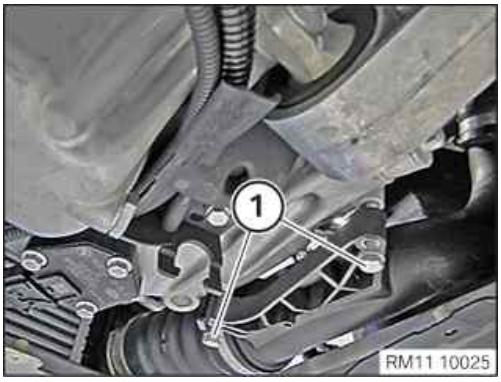


- Loosen screws (1).
- Loosen screw (2).

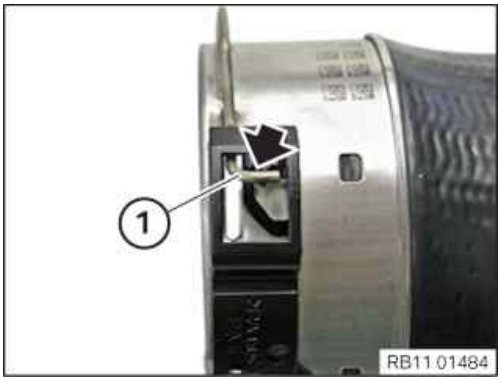
  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

58 – Remove right charge-air line

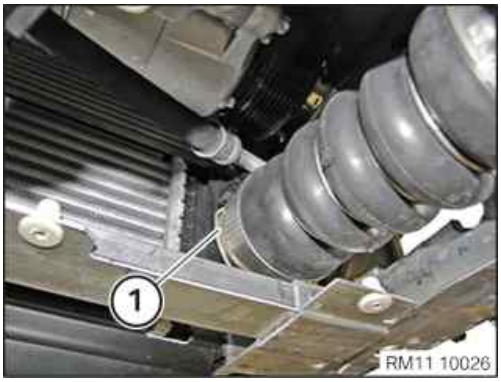


- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.



- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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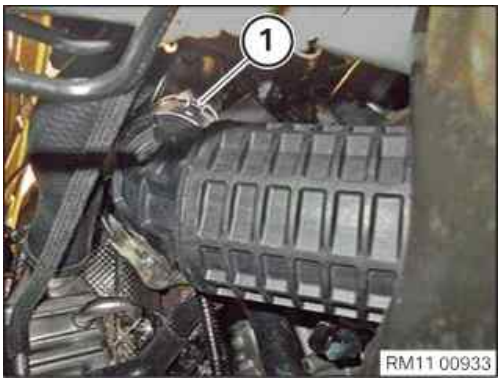

- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

59 – Remove exhaust turbocharger

- Release screw (1) from beneath with a long extension.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).
- Disconnect the oil return line (2) toward the bottom and set it aside.

- Release banjo bolt (1) of oil feed line from exhaust turbocharger and place to one side.

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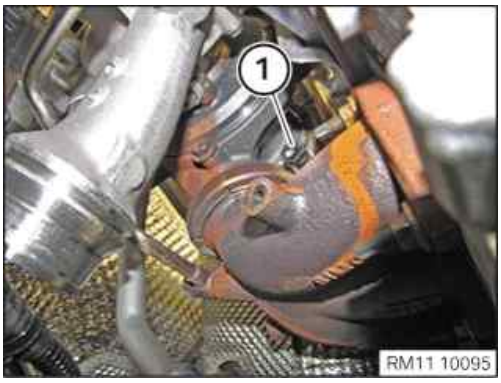


- Release screw (1) and remove V-clip.
- Pull exhaust turbocharger up and remove.
- Remove seal between exhaust turbocharger and exhaust manifold.

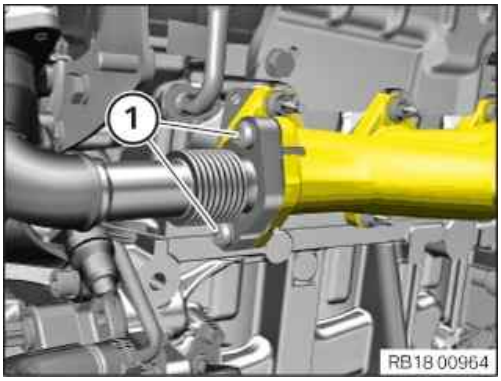
60 – Remove exhaust manifold

WARNING

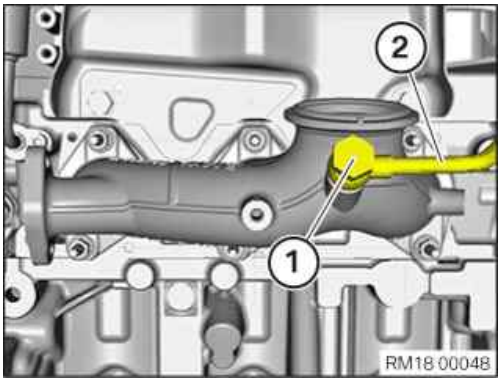
Hot surfaces.

Risk of burning!

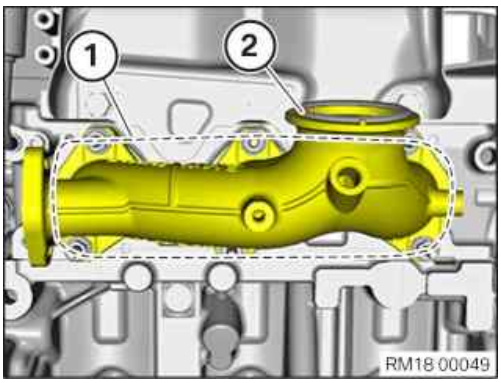
- Perform all work only on components that have cooled down.



- Loosen screws (1).



- Unscrew the banjo bolt (1).
- Feed out exhaust gas pressure pipe (2) and place to one side.



- Evenly release nuts along the dashed line (1) from outer to inner side.
- Feed out exhaust manifold (2) and remove.

61 – Removing the acoustic cover for the engine at the front

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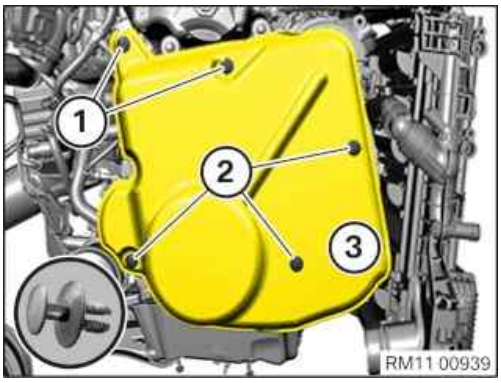


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

62 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

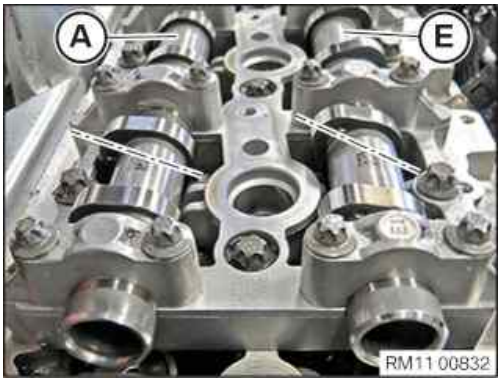
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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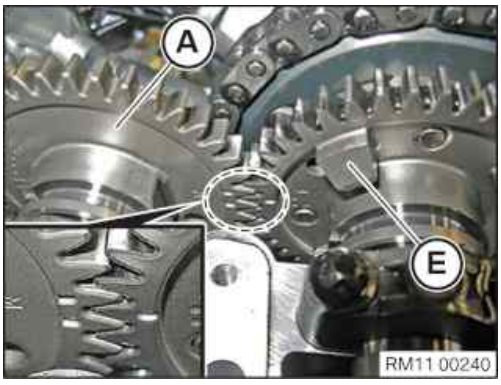
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

63 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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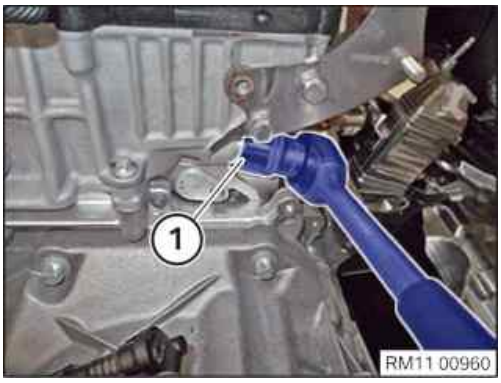
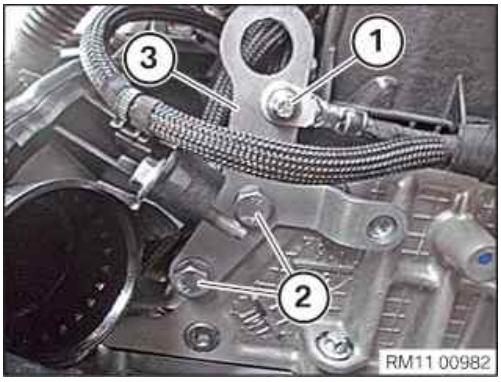


TECHNICAL INFORMATION

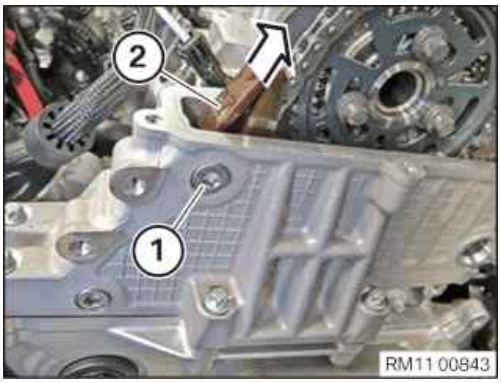
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

64 – Remove the timing chain guide rail

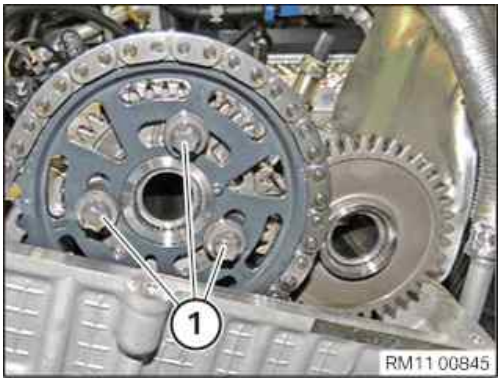


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

65 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

66 – Removing the camshaft support

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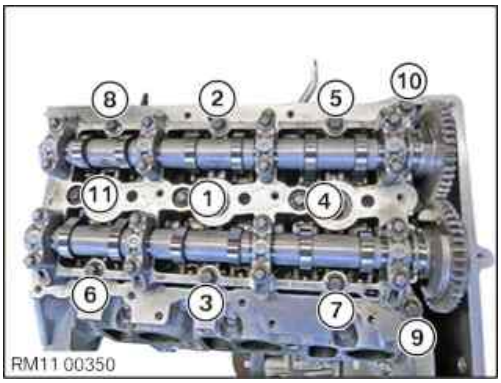
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

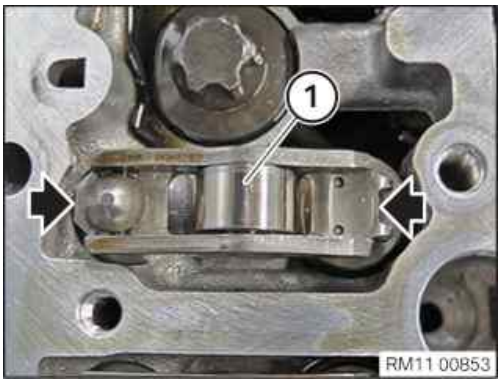
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

67 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

68 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

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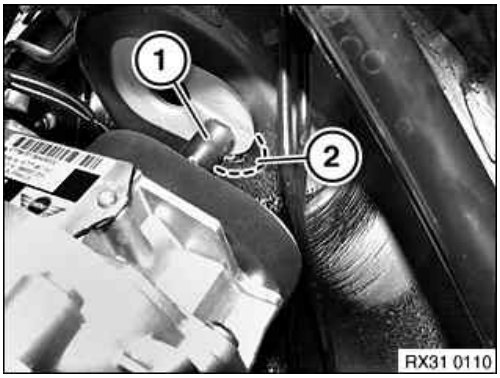
69 – Remove cylinder head.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

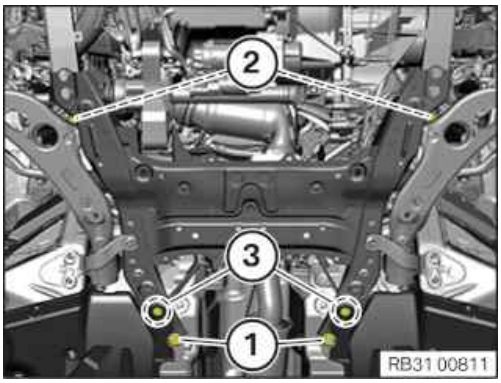


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

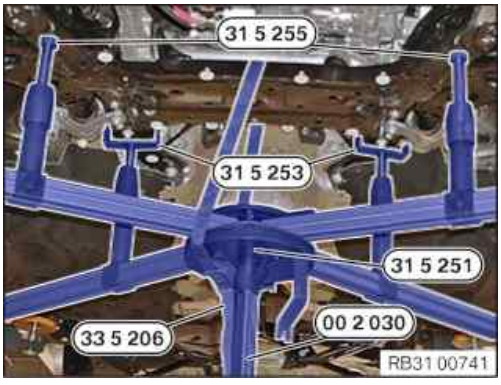
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and set it aside.

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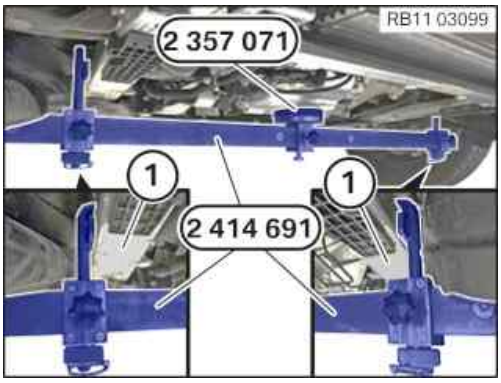
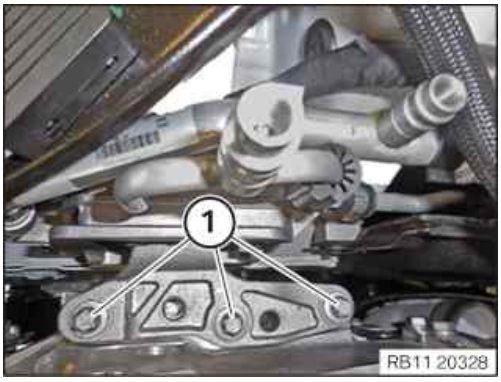
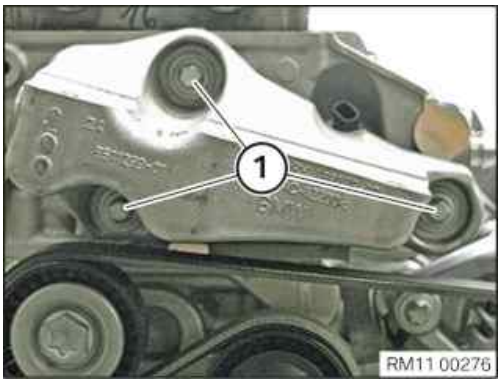


- Prepare special tool **2 414 691** together with the special tool **2 357 071**.
- Attach special tool **2 414 691** to front axle support and correctly align the special tool **2 357 071** under the oil sump and tighten.
- Turn special tool **2 414 691** at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools**2 414 691** and **2 357 071**.

- Remove all glow elements with special tool **0 491 068 (11 6 050)** or a standard tool.



- Loosen screws (1).



- Loosen screws (1).

- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm

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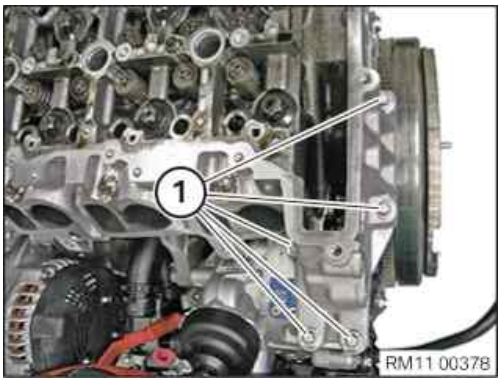
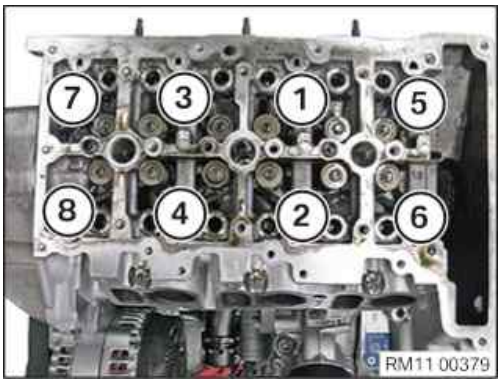
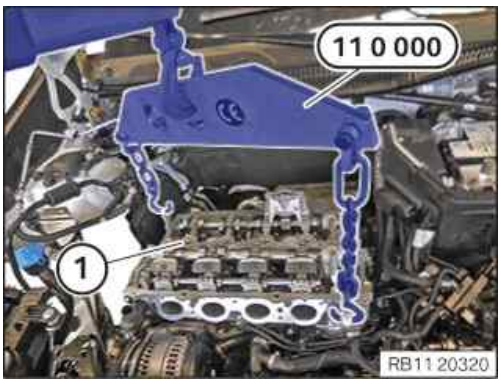


- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

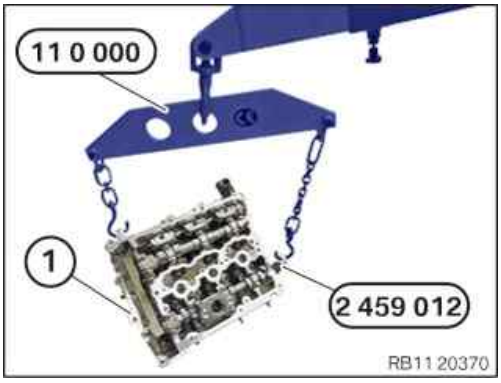
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.



- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

70 – Check the flatness of the cylinder head

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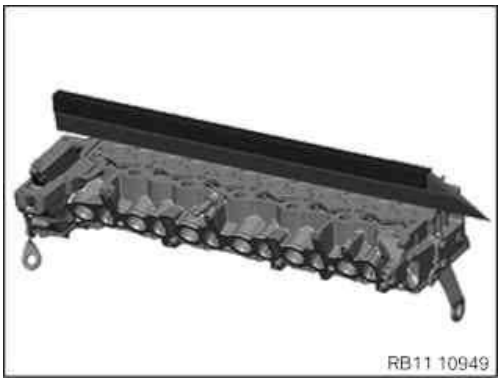
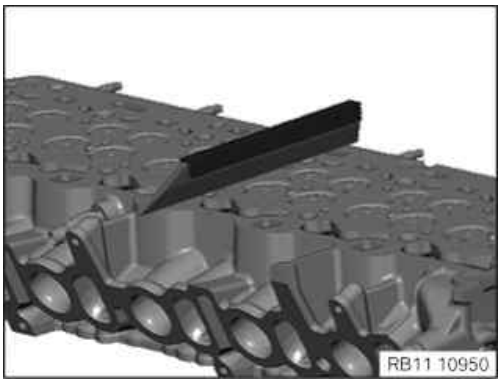


- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

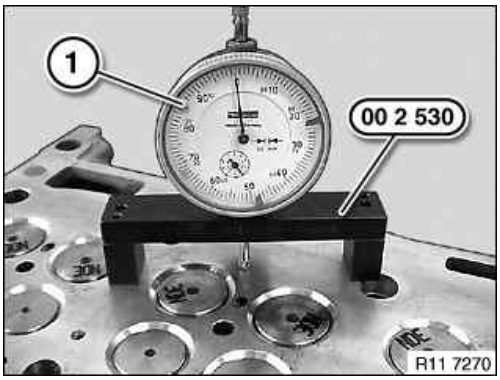


- Check the flatness of the cylinder head crosswise using a straightedge.

Cylinder head flatness

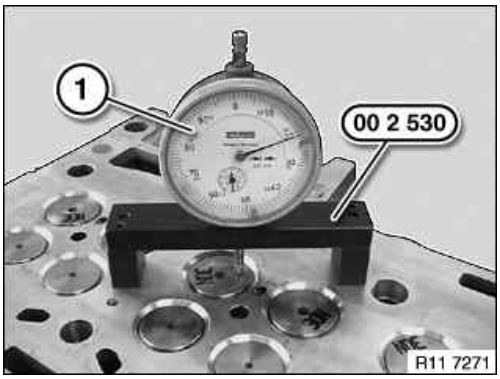
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

71 – Checking the valve underprotrusion



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".

Check



- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

MAIN WORK

72 – Checking cylinder head for watertightness

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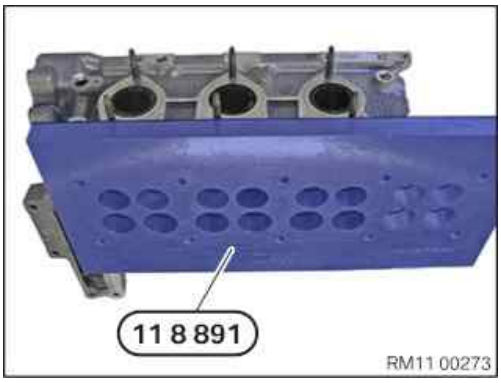
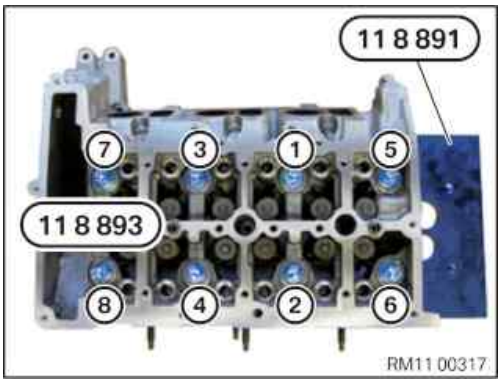


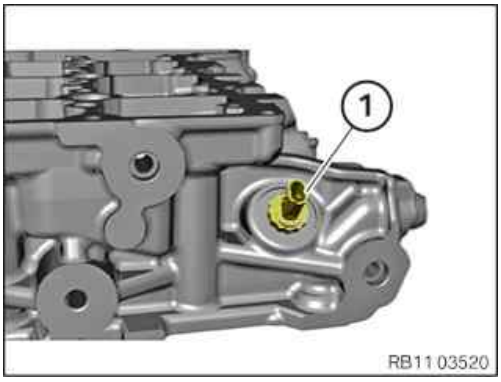
- **Set of special tools 0 496 183 (11 8 890)required.**
- Attach base plate to cylinder head with seal **0 496 184 (11 8 891)**.



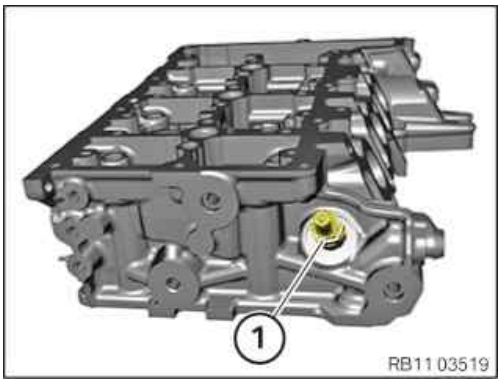
- Install and tighten special tool on cylinder head **0 496 184 (11 8 891)** using screws **0 496 186 (11 8 893)** in order (1) to (8).

Special tool to cylinder head

Special tool		Tightening torque	20 Nm



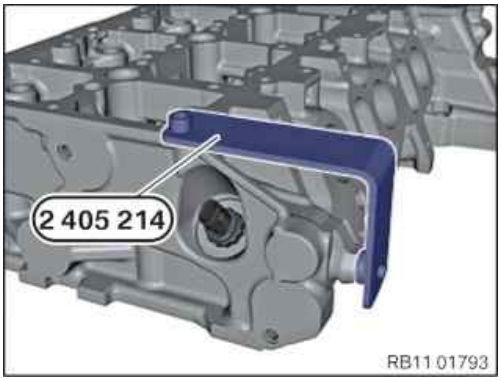
- Remove coolant temperature sensor (1) with special tool **0 496 142 (11 8 850)**.



- Install valve (1) from special tool in cylinder head.
- Tighten valve (1).

Special tool to cylinder head

Special tool		Tightening torque	20 Nm



- Seal coolant duct to cylinder head using special tool .
- Tighten down screw.

Standard screw connection M6

M6		8 Nm

Check

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- Heat up the cylinder head.

Check for cylinder head watertightness

Temperature of the cylinder head	60 °C

- Connect compressed air to valve (1).

Check for cylinder head watertightness

Testing pressure	max. 3,0 bar

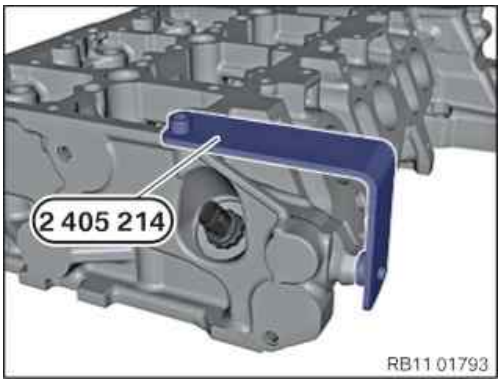
- Check the cylinder head in for tightness in a water bath.

Result

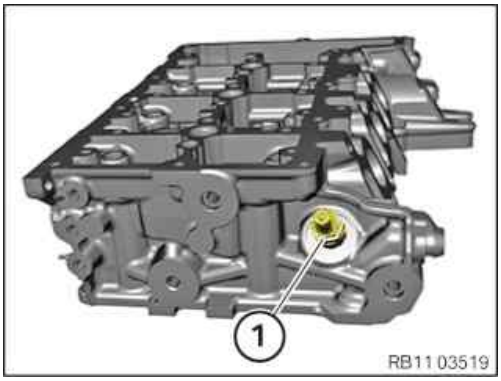
» Air bubbles develop.

Measure

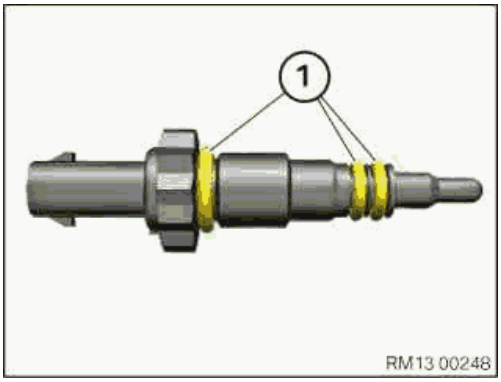
- Check cylinder head at the point of exit of the air bubbles for damage, repair or renew if required.



- Remove the special tool from the cylinder head.



- Remove valve (1).



- When reusing coolant temperature sensor sealing rings (1), check for damage, renew if necessary.

  Parts: Sealing ring

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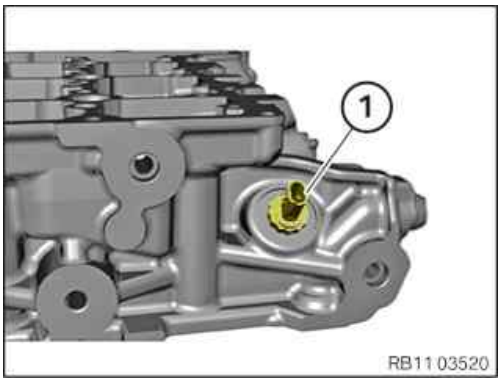
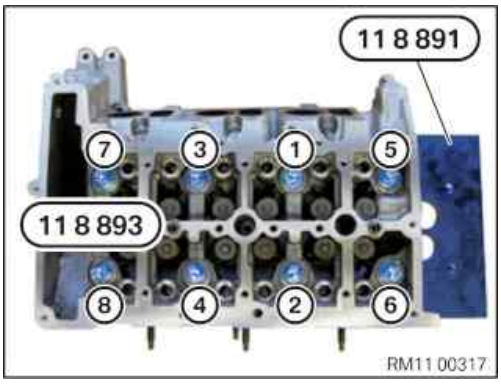


- Install coolant temperature sensor (1) and tighten using special tool **0 496 142 (11 8 850)**.

Coolant temperature sensor at cylinder head

Temperature sensor		Tightening torque	3,5 Nm



- Loosen screws **0 496 186 (11 8 893)** on cylinder head in order (8) to (1)and remove **0 496 184 (11 8 891)**.

POSTPROCESSES

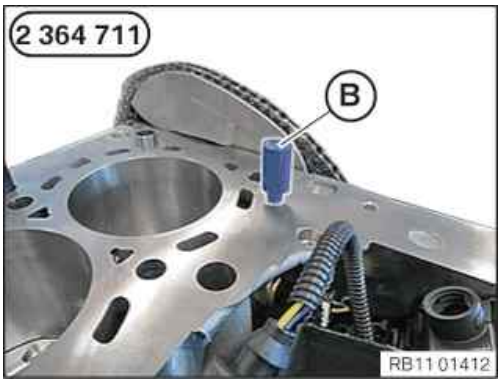
73 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

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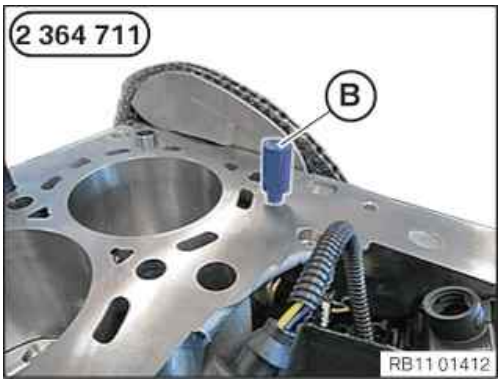
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

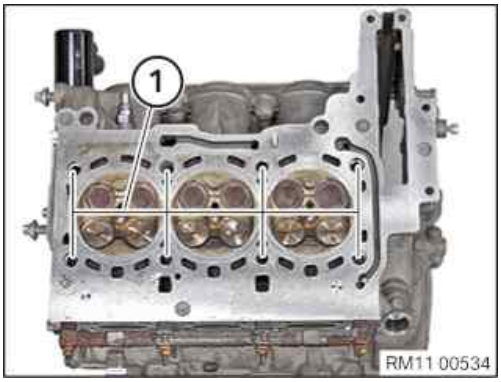
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

74 – Renewing the cylinder head gasket



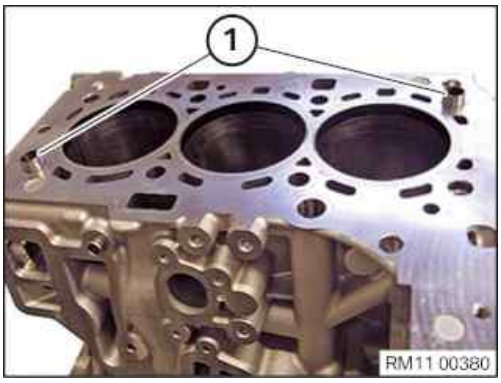
RISK OF DAMAGE

Damage to the surface.

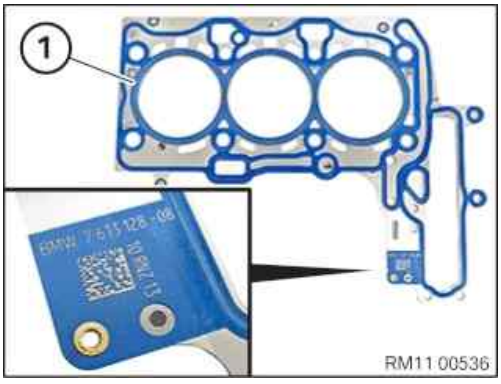
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).



- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**

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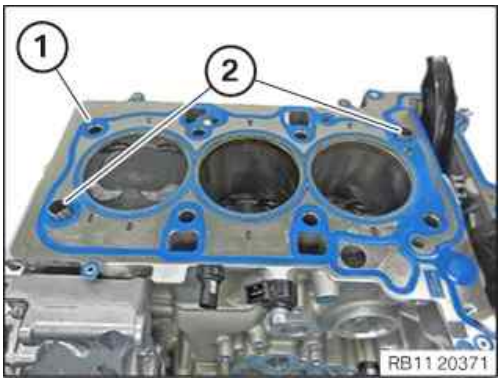


- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

75 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

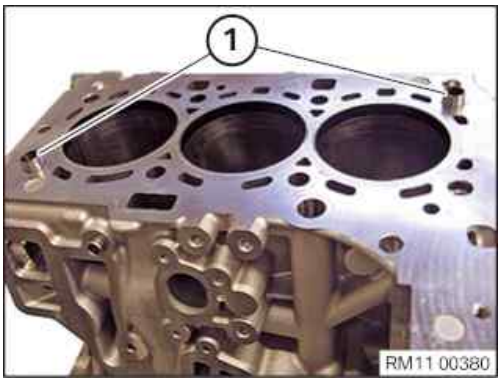
Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

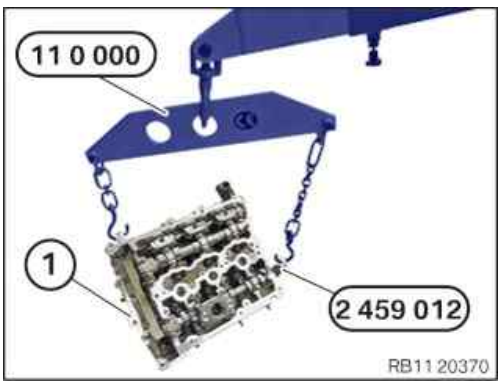
TECHNICAL INFORMATION

Do not remove bolt coating.



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.

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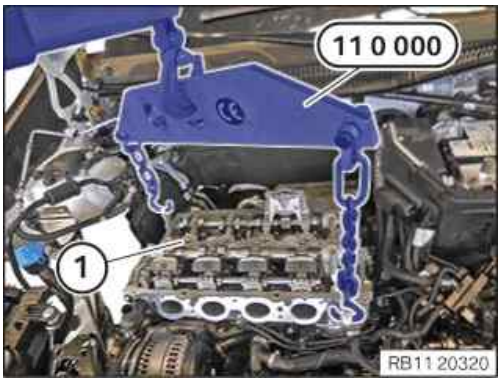


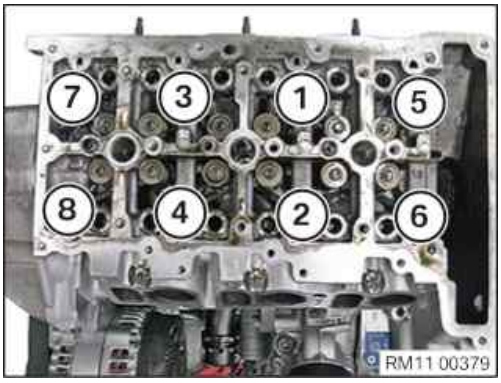
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Fit new cylinder head bolts.

  Parts: Cylinder head bolts

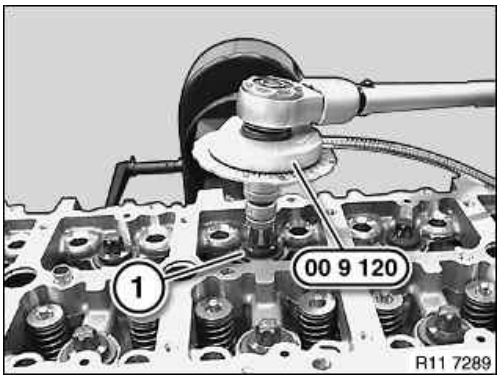
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

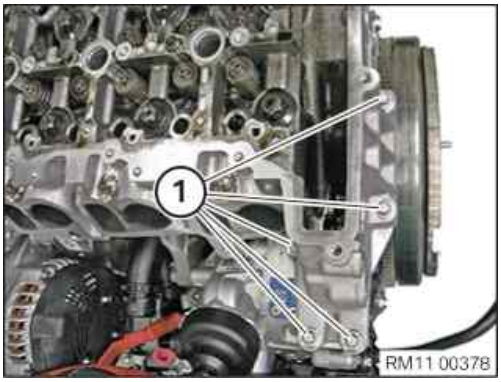
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

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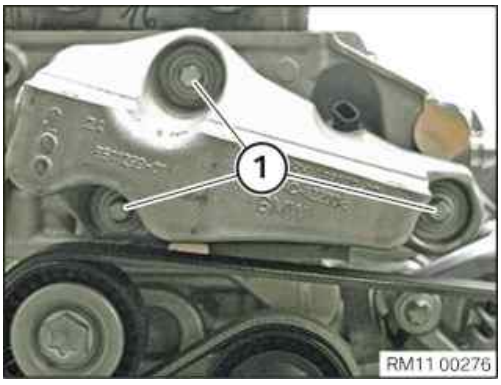
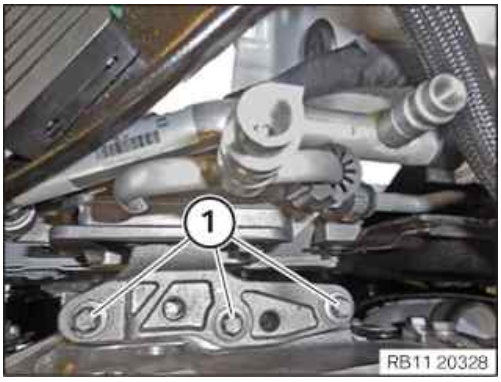
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.



- Tighten the screws (1).

Engine support to cylinder head

M10X45		Tightening torque	41 Nm



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

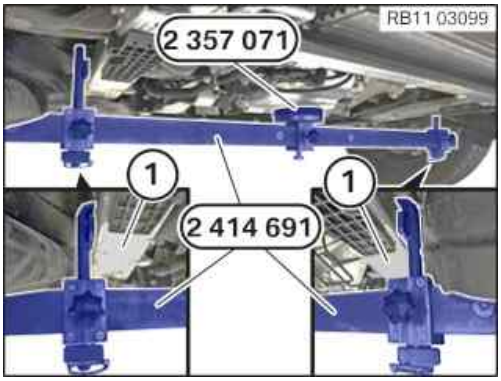
Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Disassemble special tool **2 414 691** using special tool **2 357 071**.

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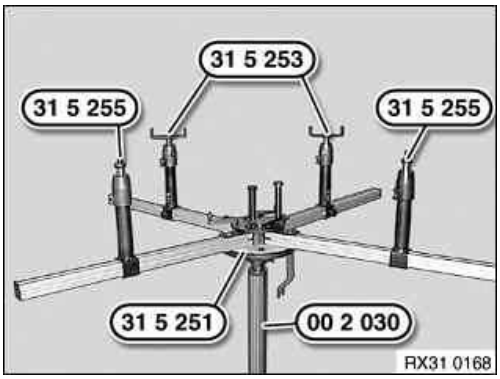
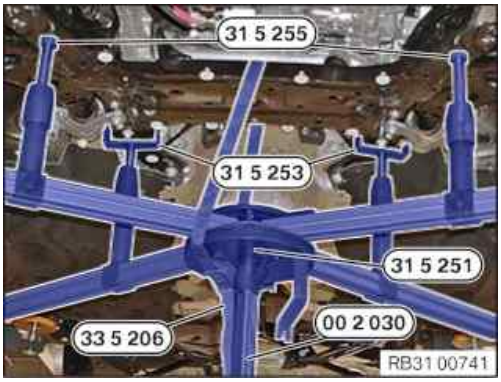


- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

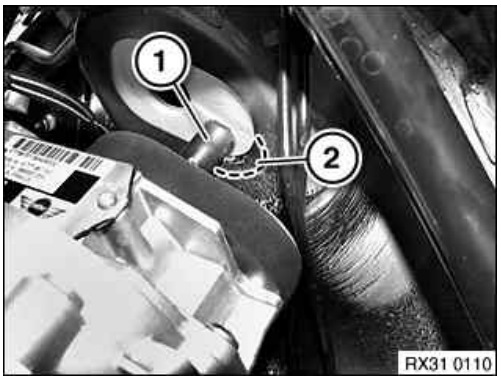
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

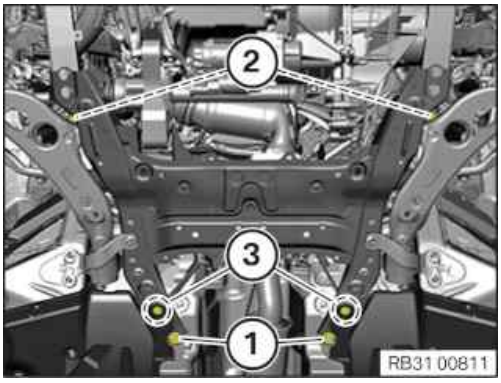


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

76 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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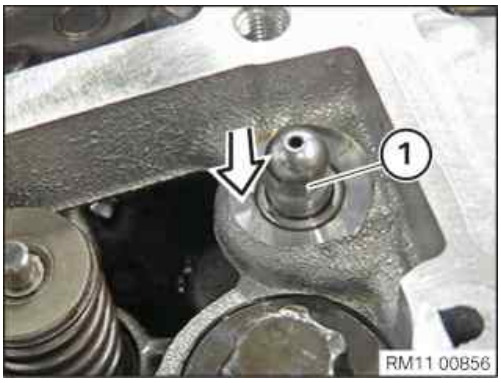
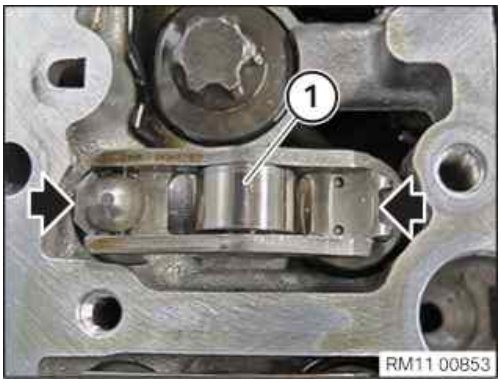


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

77 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.



- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

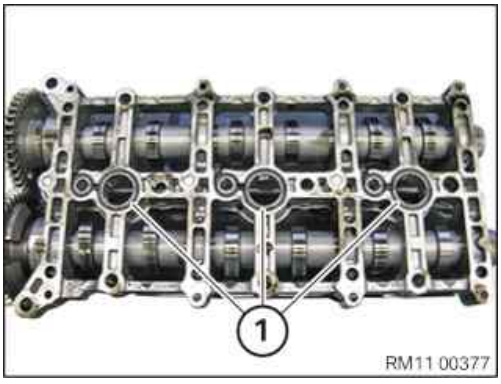
78 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Renew the seals (1) on the camshaft support.

  Parts: Seals

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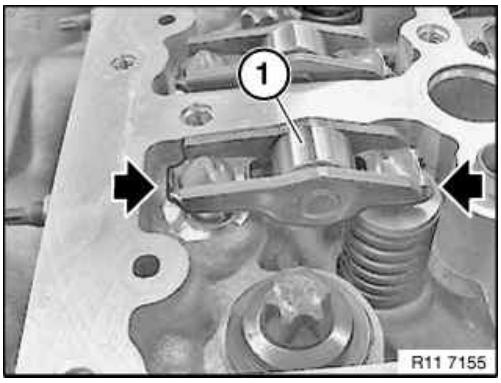
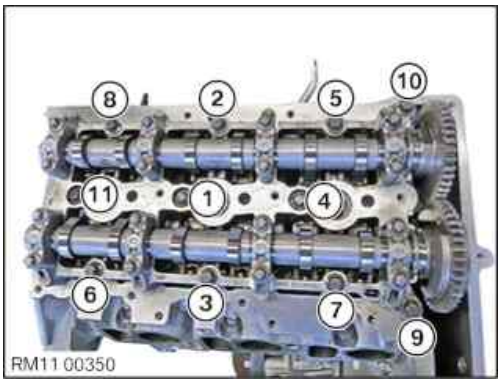


- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.

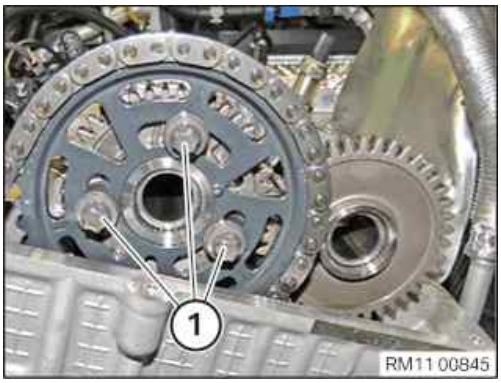


- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

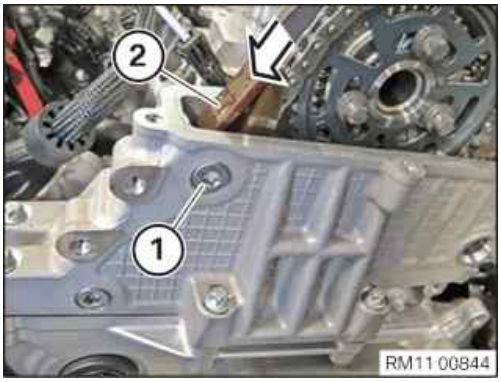
M7x35		Tightening torque	13 Nm

79 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

80 – Install the timing chain guide rail



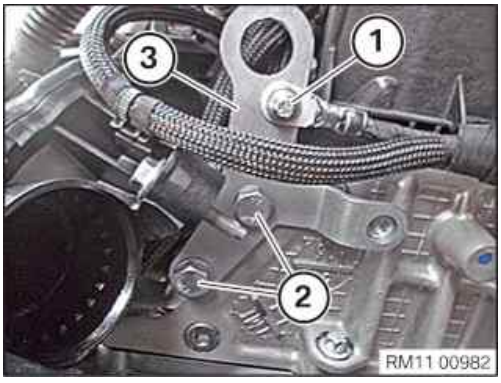
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

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81 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

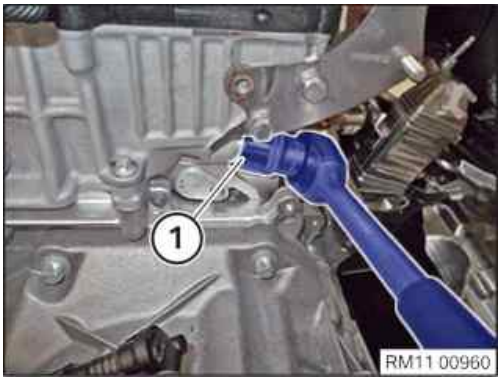
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

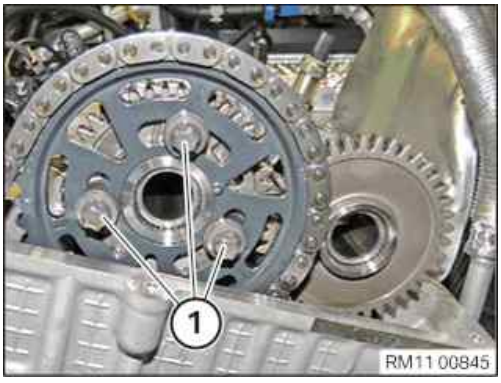


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

82 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

83 – Removing the special tool to secure the exhaust camshaft

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- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

84 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

85 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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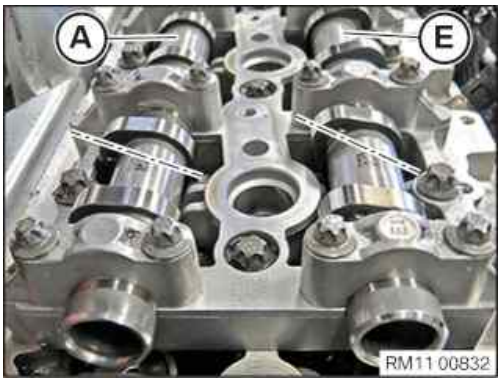
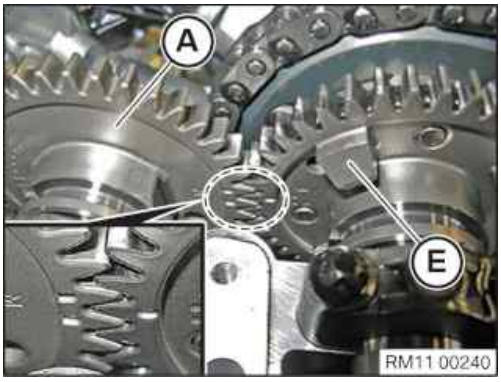


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

86 – Install the acoustic cover for the engine at the front

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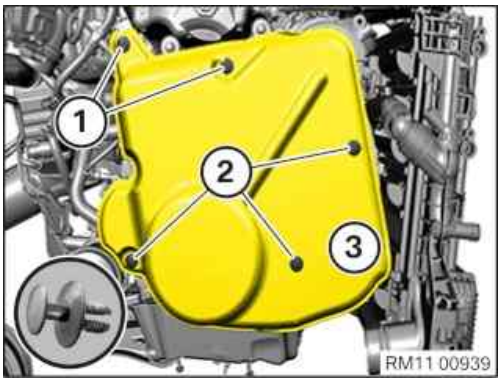


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

87 – Installing exhaust manifold

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

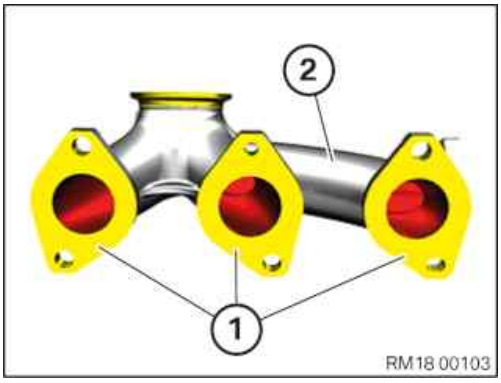
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean the connection points (1) on the exhaust manifold (2) with the special tool **0 495 102 (11 4 470)**.

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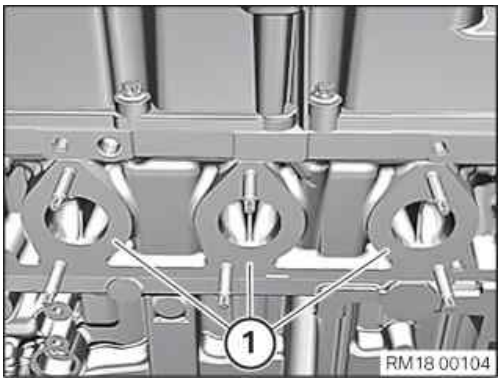
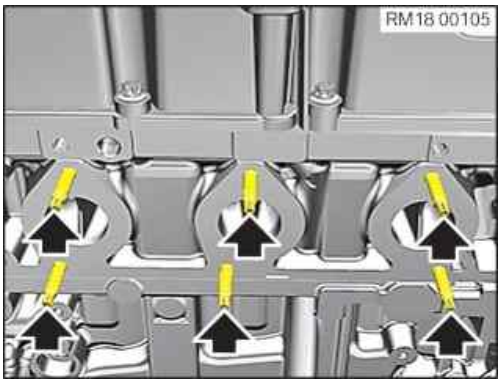
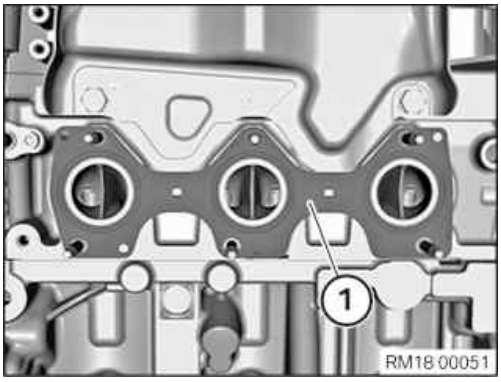


- Clean the connection points (1) on the cylinder head with the special tool **0 495 102 (11 4 470)**.



- Check the stud bolts (arrows) on the cylinder head for **correct** fit.



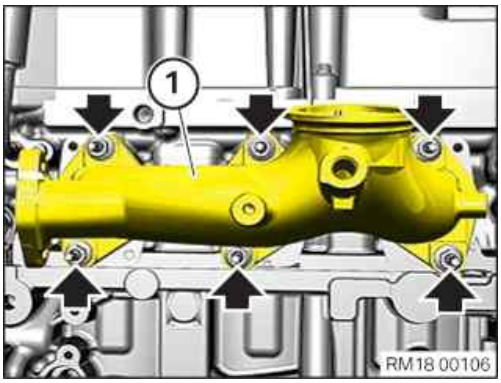
TECHNICAL INFORMATION

The **coated side of the** seal must be mounted facing towards the exhaust manifold.

- Renew the gasket (1).

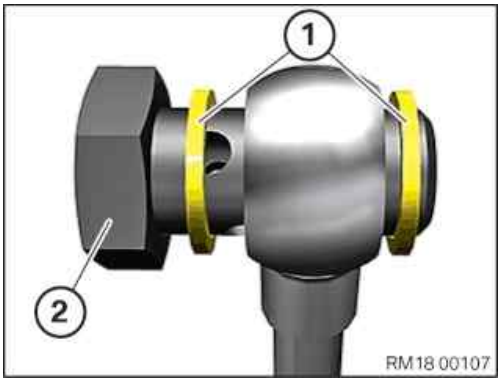
  Parts: Gasket
- Insert and install the gasket (1).
- Insert and install the exhaust manifold (1).
- Renew the nuts (arrows).

  Parts: Nuts
- Hand-tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.
- Tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.



Exhaust manifold to cylinder head

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm



- Renew the sealing rings (1) from the banjo bolt (2).

  Parts: Sealing ring

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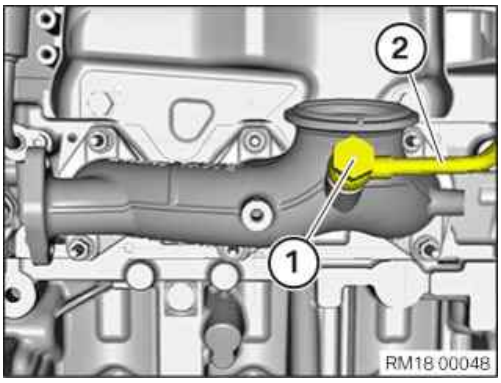
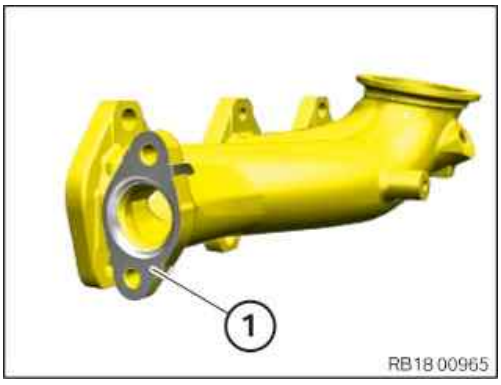


- Insert and install the exhaust gas pressure pipe (2).
- Tighten the banjo bolt (1).

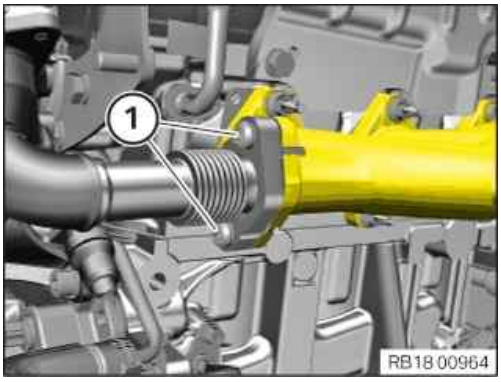
Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt		Renew sealing rings.	30 Nm



- Renew seal (1) between exhaust-gas recirculation cooler and exhaust manifold.

  Parts: Gasket



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

88 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

89 – Installing exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the exhaust turbocharger

Inadequate initial filling of exhaust turbocharger leads to dry running.

- Make sure the initial filling is correct when replacing exhaust turbocharger.
- Fill the exhaust turbocharger with the suitable additive (see electronic Parts Catalogue).

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

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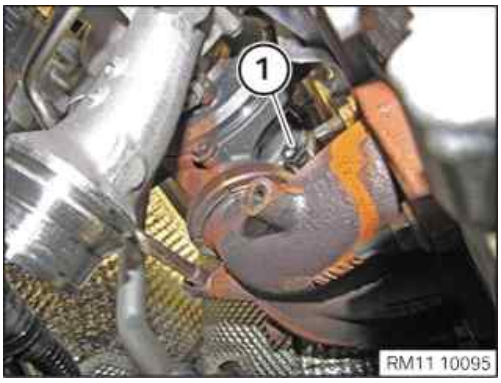

- Renew gasket.

  Parts: Gasket
- Position seal on exhaust manifold.
- Guide the exhaust turbocharger in from the top and position it.
- **Ensure that gasket is correctly seated.**
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Renew sealing rings.

  Parts: Sealing ring
- Position oil feed line with banjo bolt (1) and sealing rings and tighten hand-tight.

  There are 2 sealing rings fitted on the banjo bolt (1).
- Align oil feed line and tighten banjo bolt (1).

  The oil feed line must not sit on the exhaust turbocharger.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

- Renew gasket.

  Parts: Gasket
- Position oil return line (2) with **seal** on exhaust turbocharger.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Feed in and tighten screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

90 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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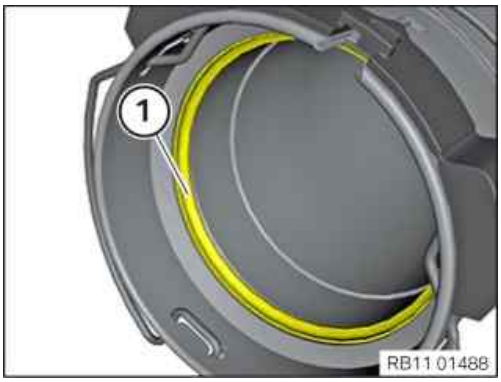
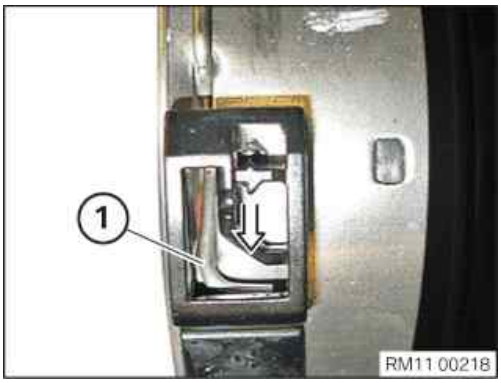
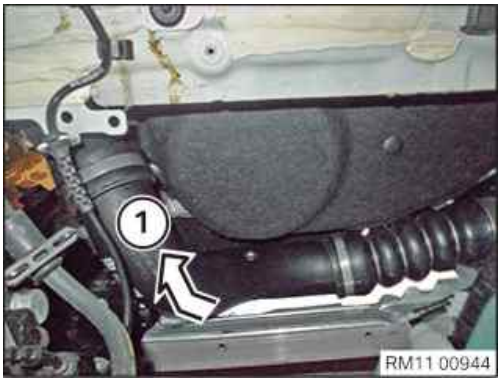


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

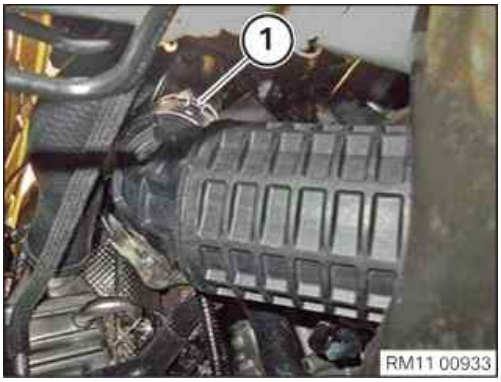
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

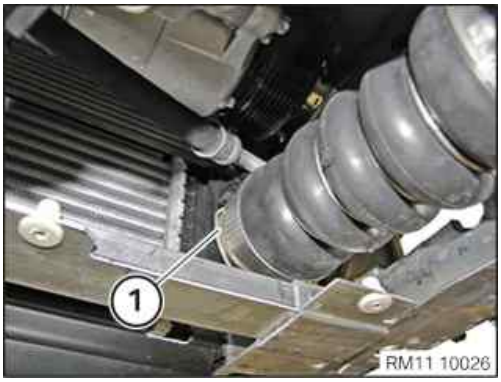


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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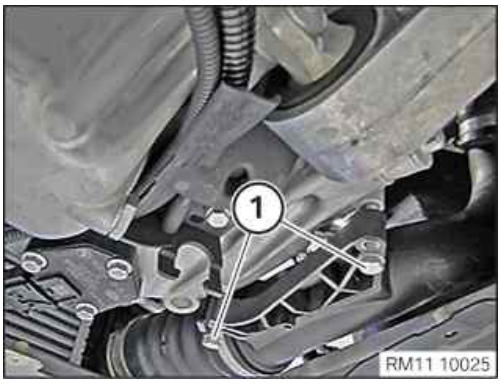
- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm



- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

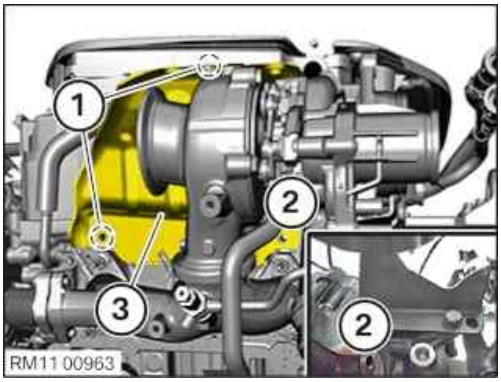
91 – Installing heat shield on exhaust turbocharger at the rear

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

92 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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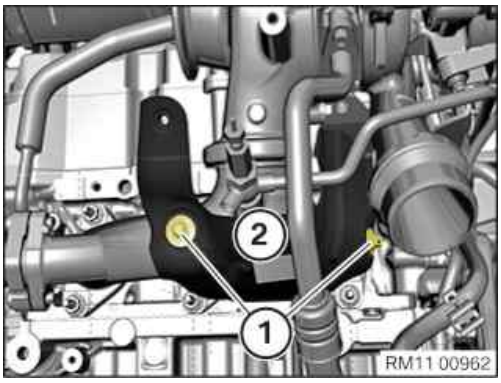


- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

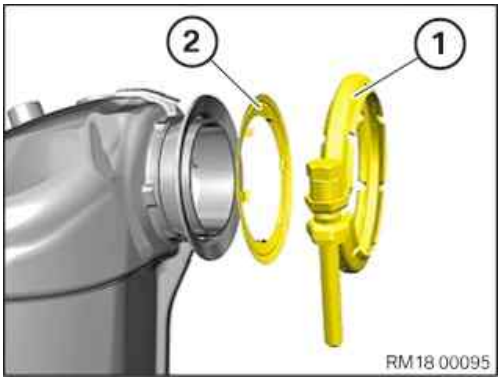
93 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

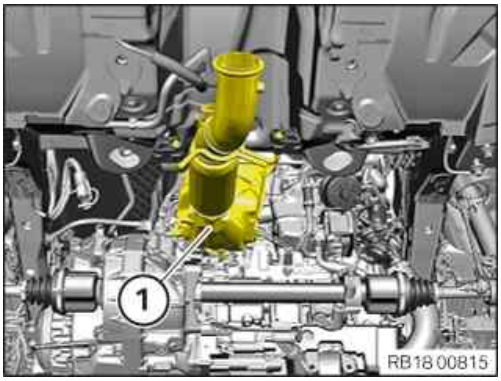


- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

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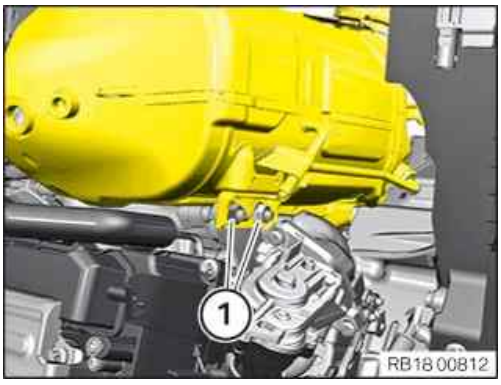
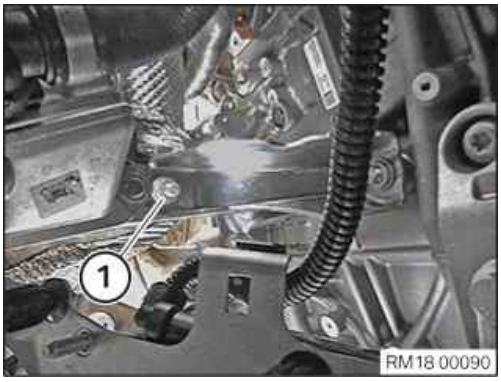
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Tighten the nut (1) hand-tight.

- Remove fitting aid (1) for the flexible tube.

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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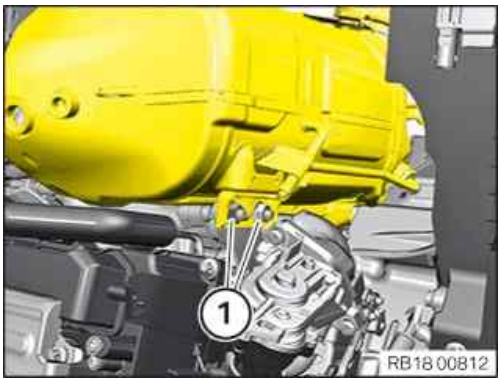
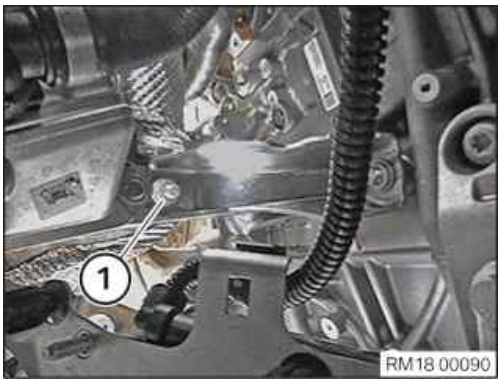


- Tighten nuts (1).

Diesel particle filter to holder

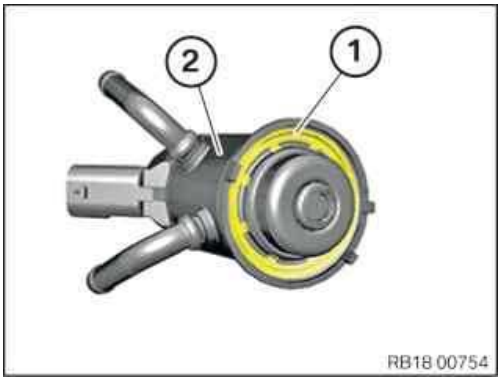
M8 hexagon nut		Tightening torque	19 Nm



- Tighten nut (1).

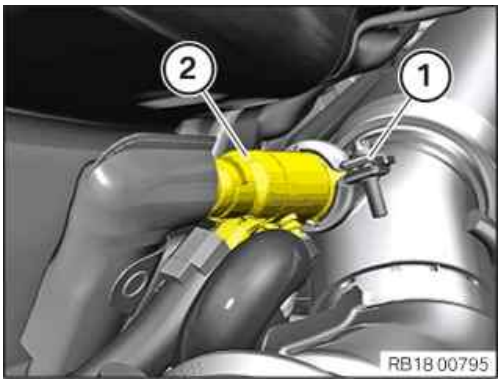
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

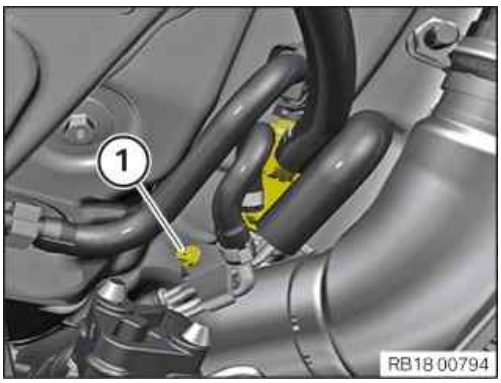


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

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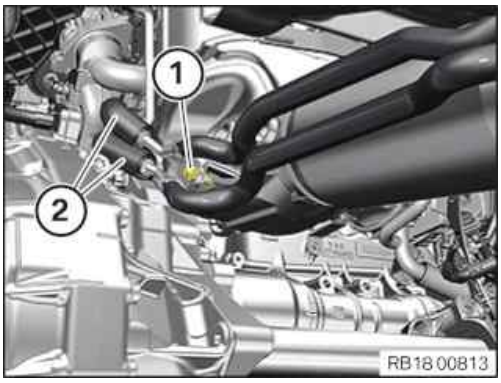
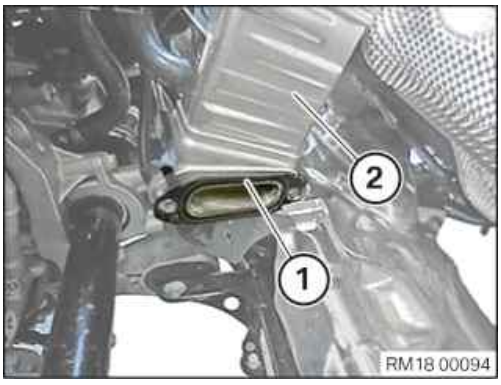


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

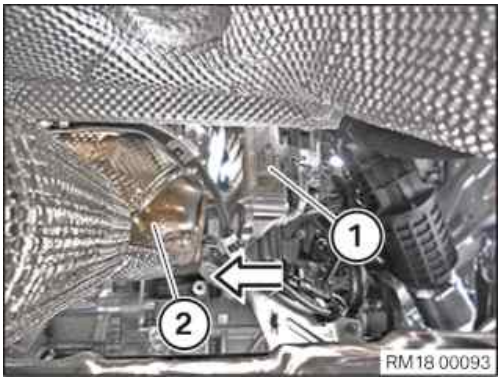
Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

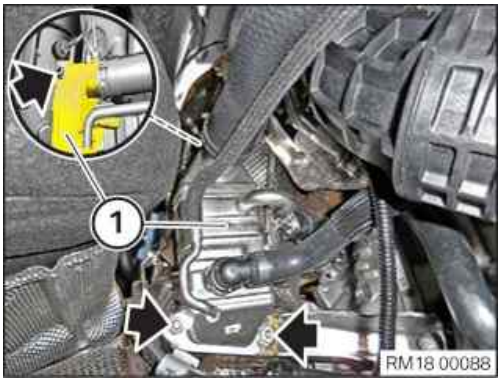


- Replace seal (1) of the low pressure exhaust-gas recirculation cooler (2).

  Parts: Gasket



- Feed in and install the low pressure exhaust-gas recirculation cooler (1) in at the diesel particulate filter (2) in the direction of arrow.

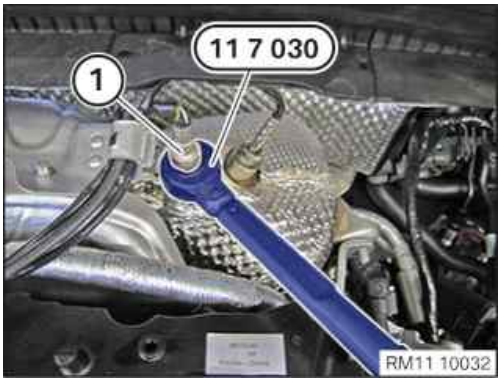


- Tighten nuts (arrows) of the low pressure exhaust-gas recirculation coolers (1).

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Flange nutM8		Tightening torque	19 Nm

94 – Install the control sensor



- Feed in front oxygen sensor (1) and install.
- Tighten the front oxygen sensor (1) with the special tool **0 491 075 (11 7 030)**.

Control sensor

Control sensor		Tightening torque	50 Nm

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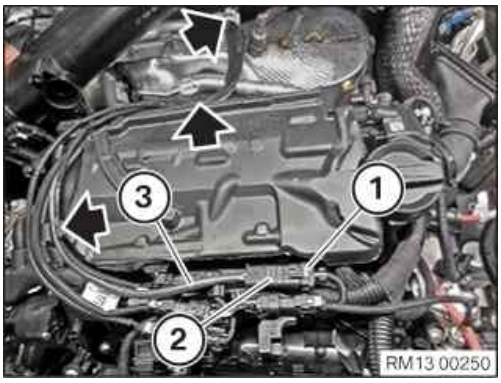
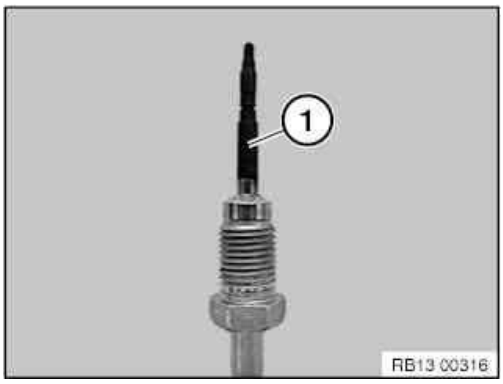


- Feed in and install cable (3) from the oxygen control sensor into the clamps (arrows).
- Secure connector (2) on holder.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

95 – Install the exhaust-gas temperature sensor on the diesel particulate filter



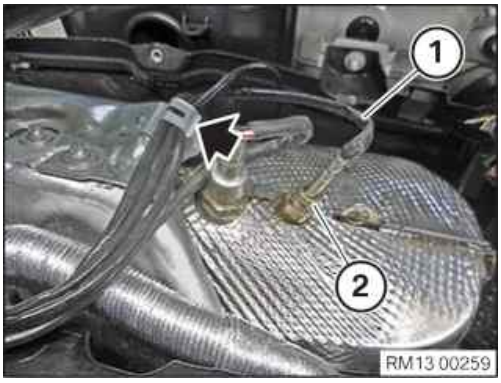
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

96 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

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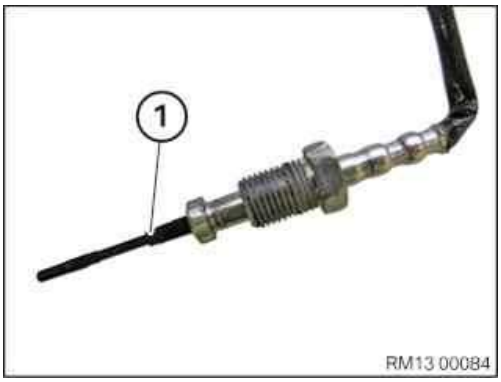


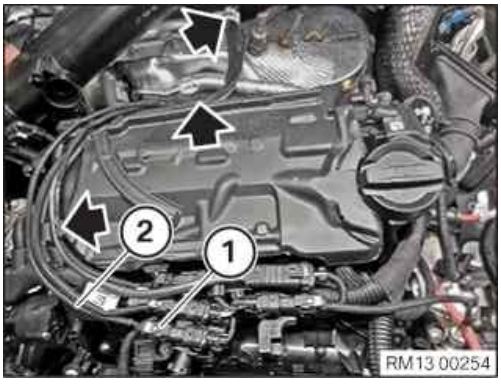
- Make sure the gauge tip (1) is not damaged during installation.

- Feed in and install the exhaust temperature sensor (1).

- Tighten the exhaust temperature sensor (1) with conventional tools (2).

Exhaust temperature sensor to diesel particulate filter

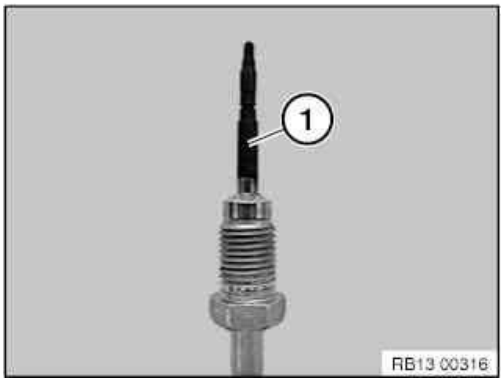
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

97 – Installing exhaust temperature sensor on catalytic converter



RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.

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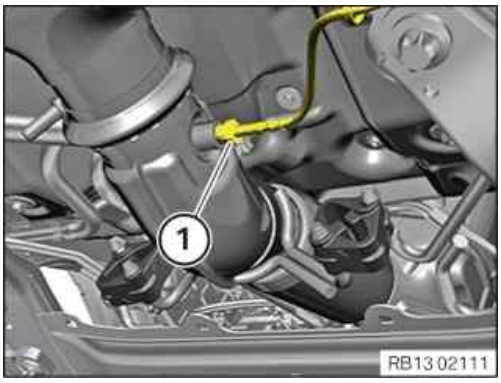
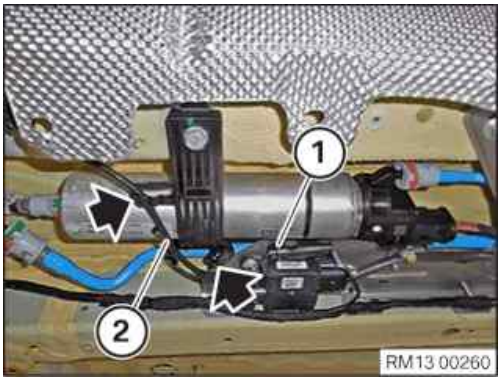


- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

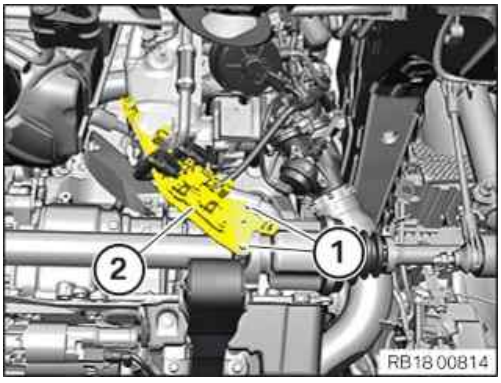
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

98 – Install holder for oxygen sensor

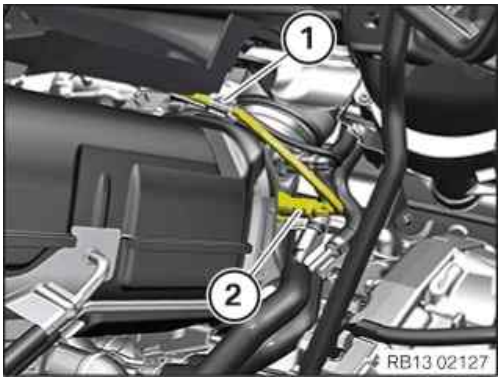


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

99 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm

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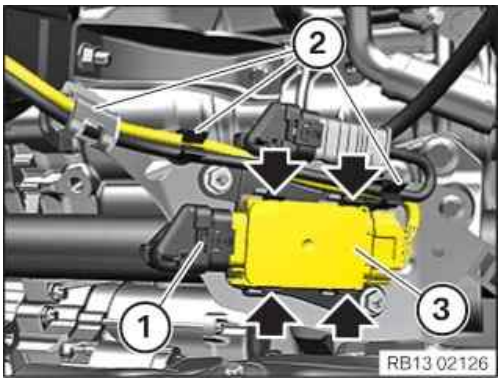


- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

100 – Install the monitoring sensor

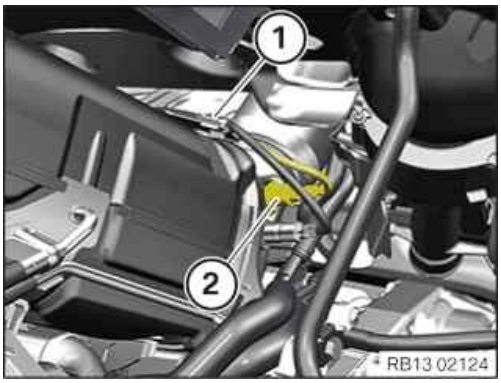
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

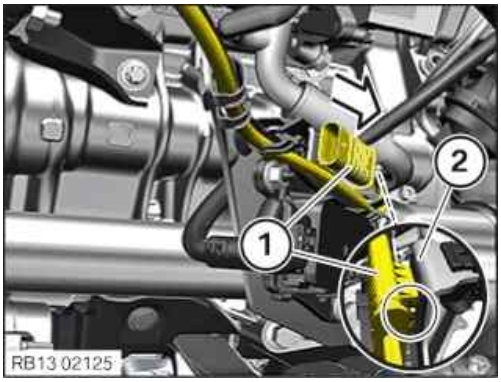


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

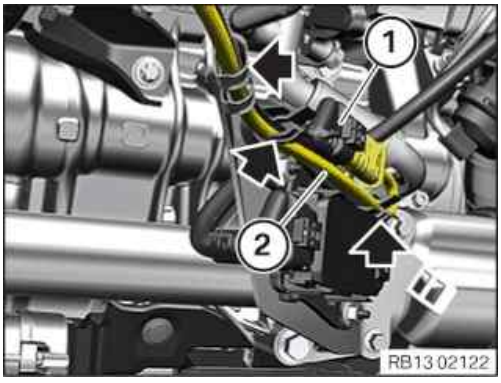
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

101 – Installing starter motor

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CAUTION

Improper routing of the positive battery cable.

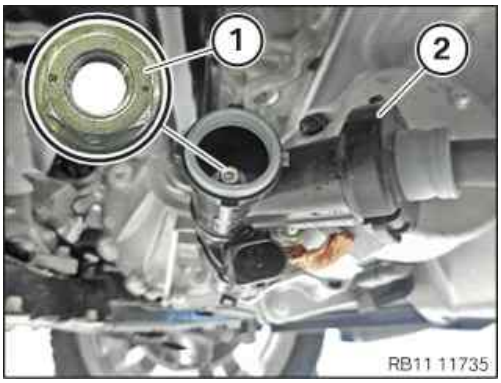
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

102 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

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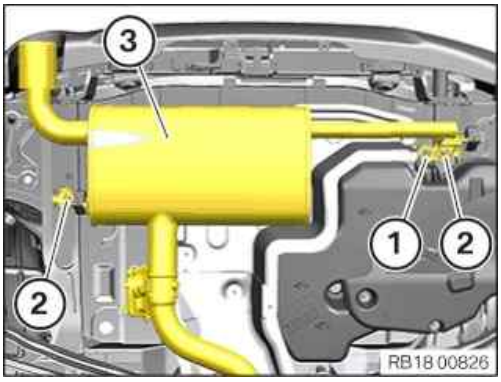
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert and install the exhaust system (3) with the help of another person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

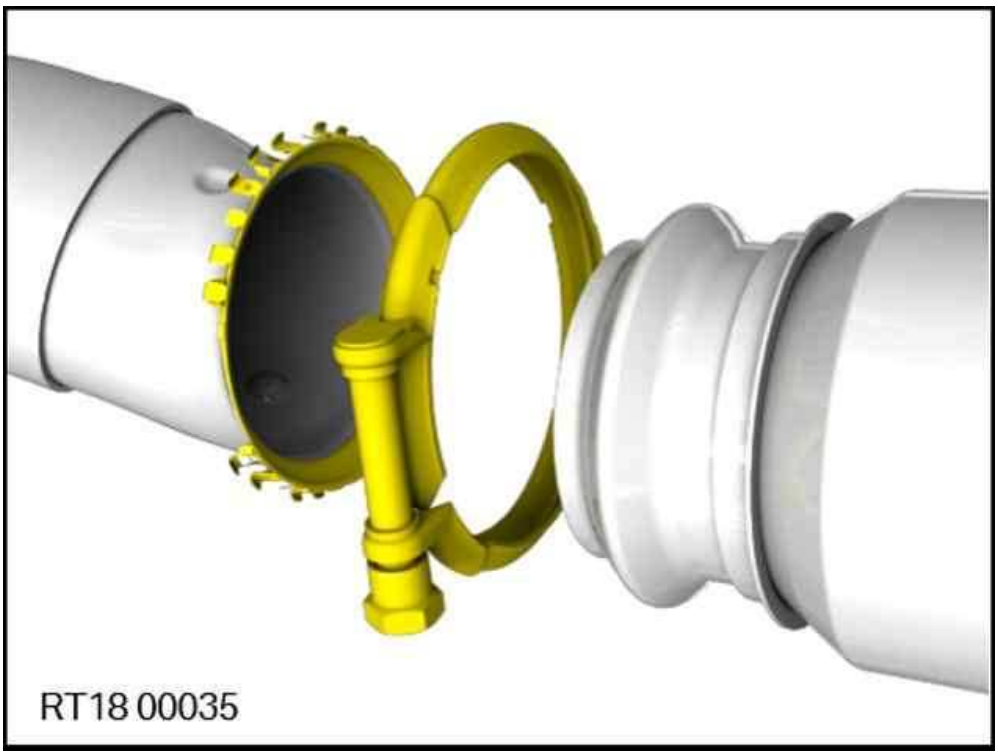
- Tighten down screw (1).

Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

▸ **Install the V-clip**

V-band clamp



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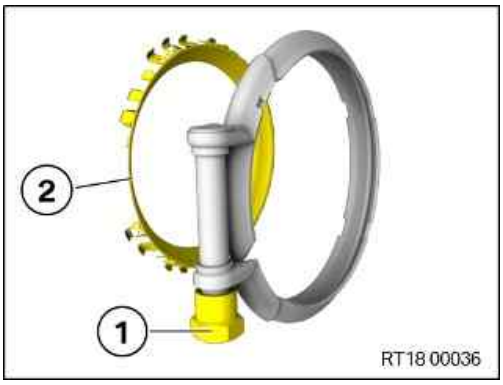
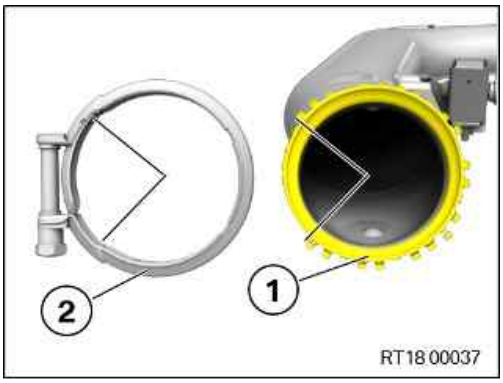
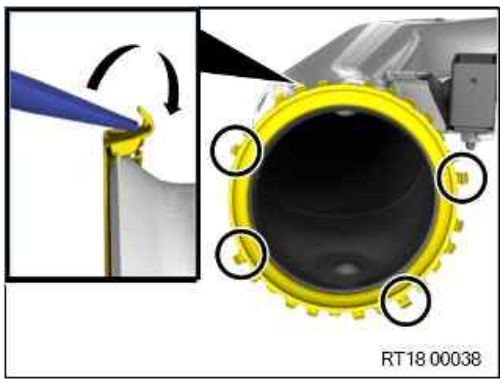


- Unscrew the nut (1) and remove the sealing ring (2).

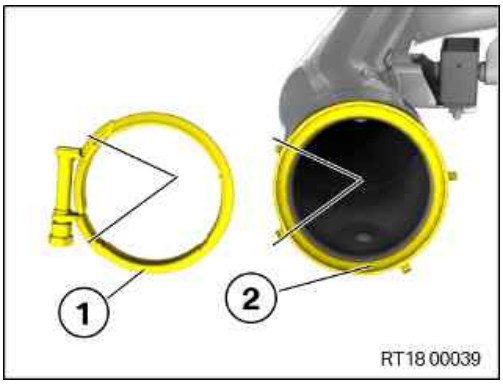


- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).

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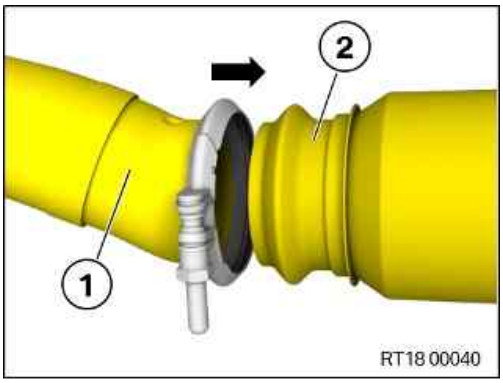
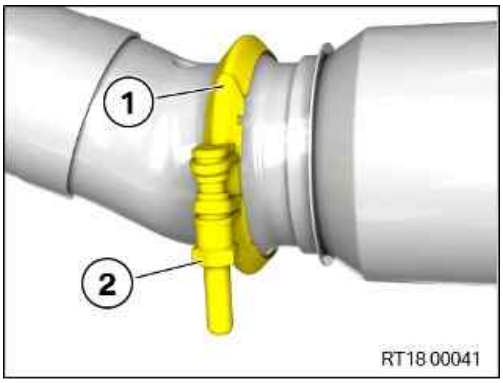


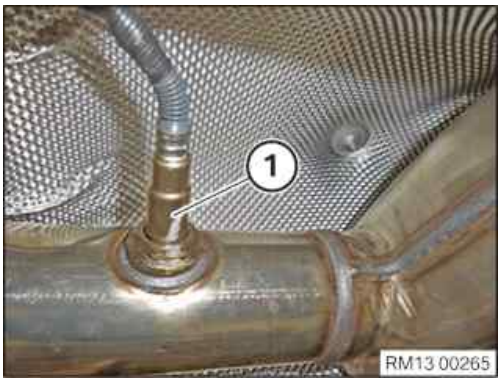
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

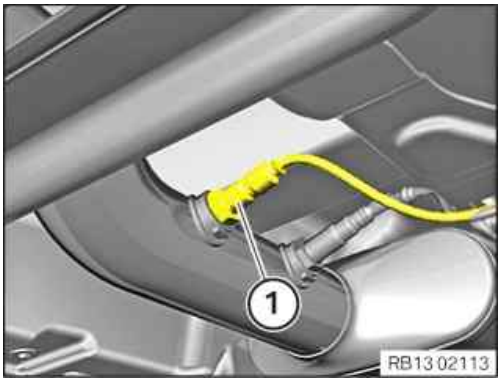
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Guide in, position and tighten the diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

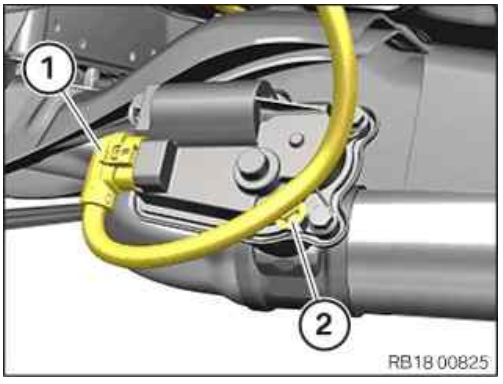
Sensor		Tightening torque	50 Nm



- Guide in, position and tighten the nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

103 – Install the cross-member with torsion struts

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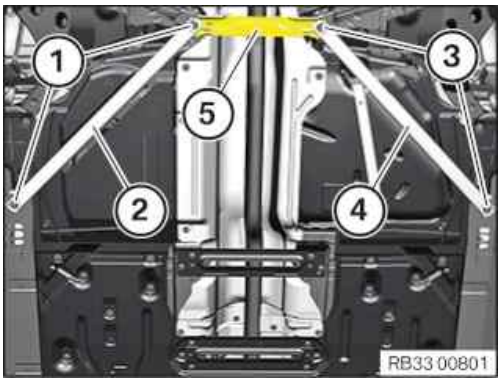


- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

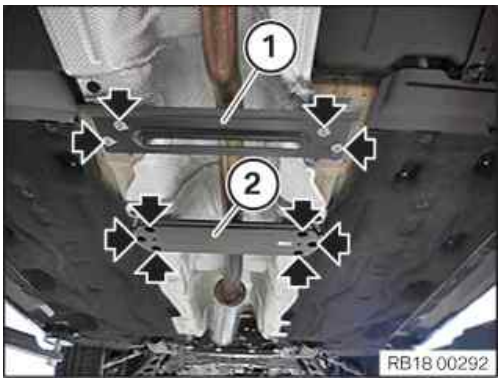
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

104 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

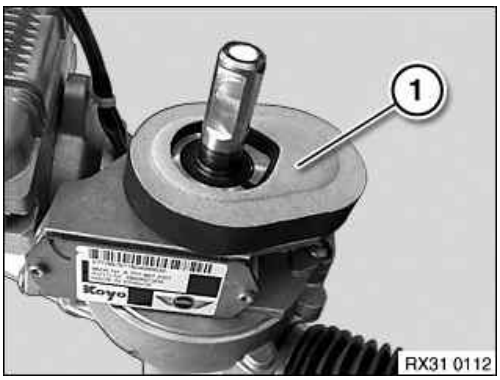
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

105 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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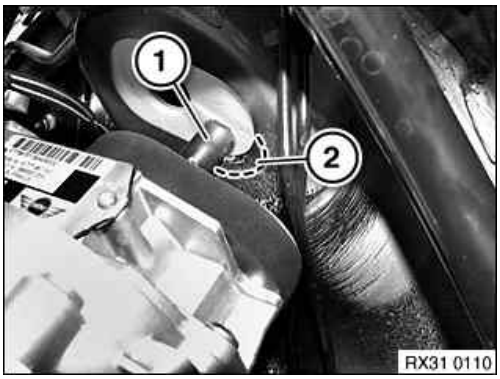
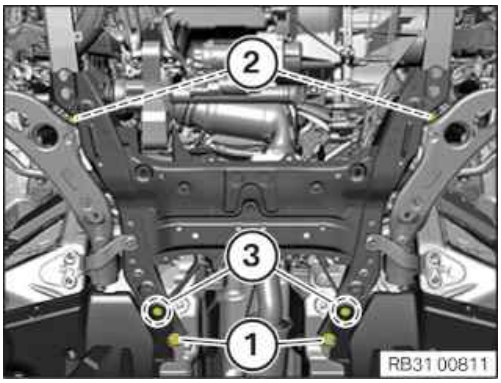


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

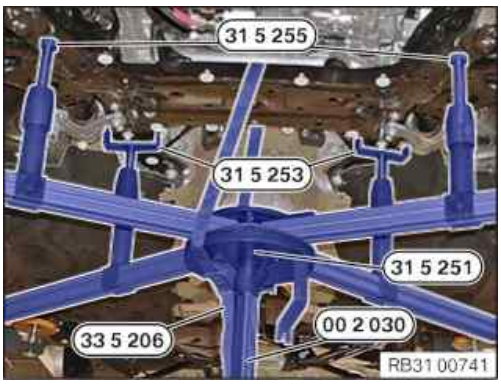
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.

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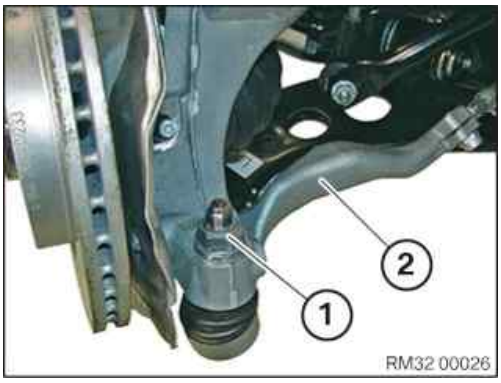


NOTICE

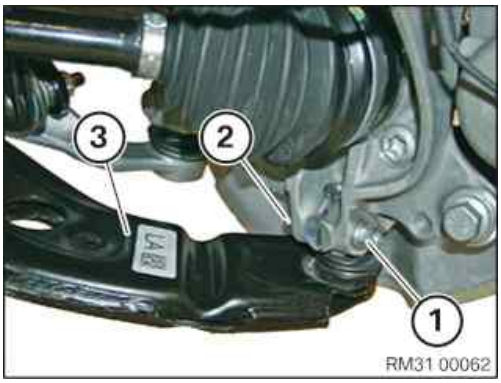
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

106 – Install the mounted parts on the front axle support

NOTICE

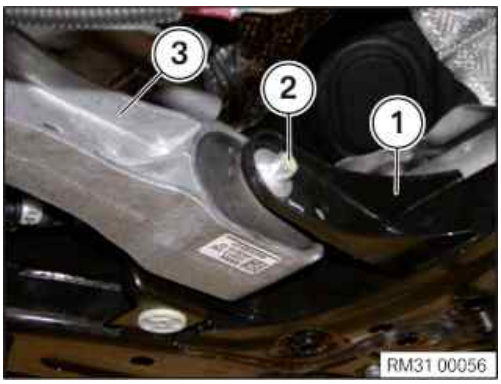
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

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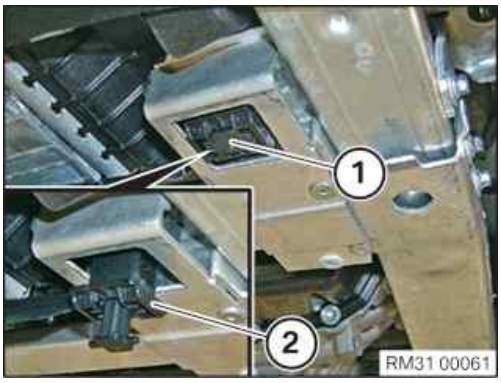
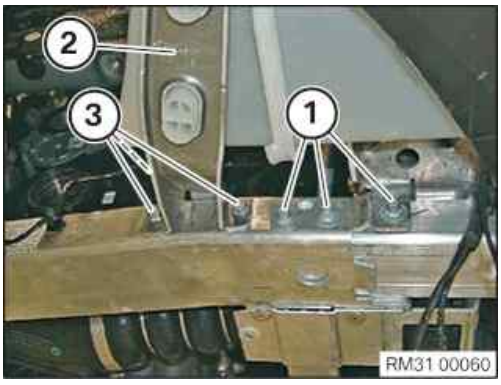


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

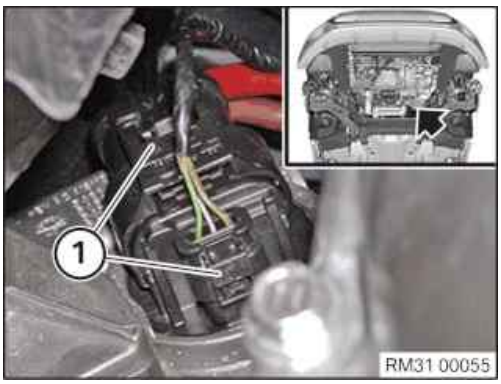
Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

107 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.

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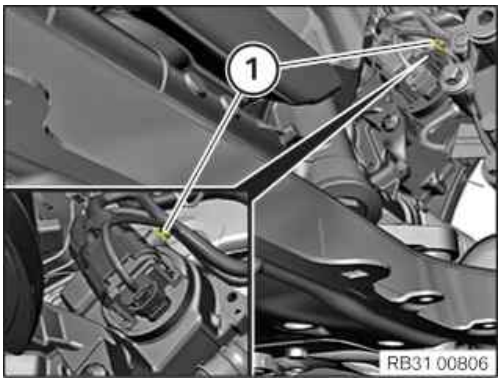
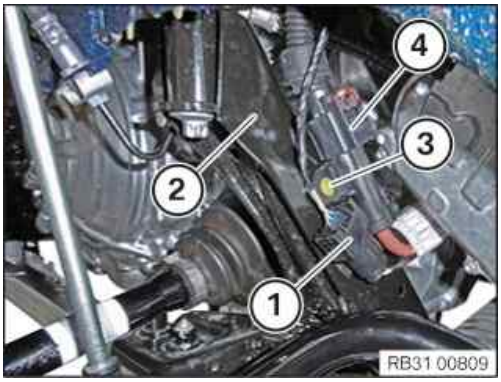


- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

108 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

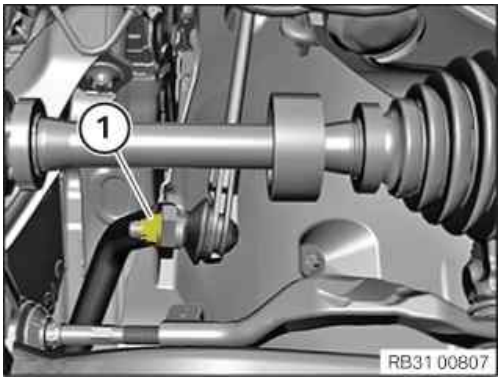
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

109 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

110 – With right installation: Securing the cable for the ride height sensor

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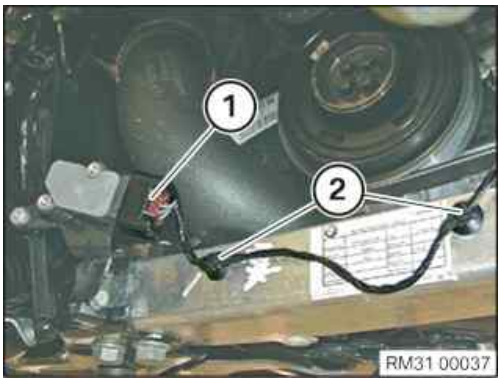


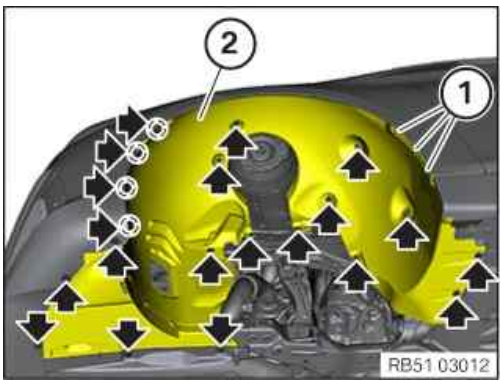
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

111 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▶ **Installing the front wheel arch cover**



- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

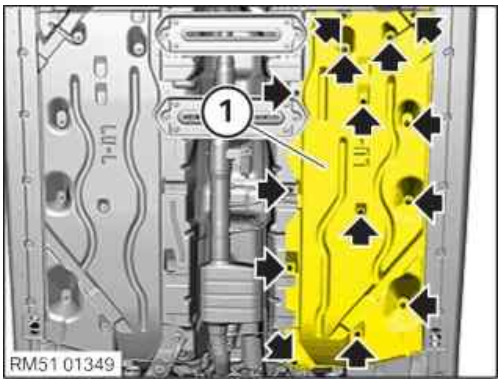
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

112 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

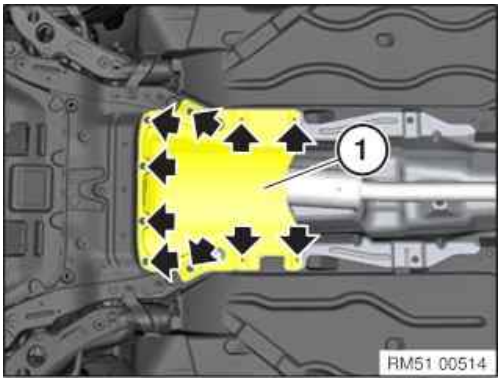
Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

113 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

114 – Mount the front left and right wheels

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▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

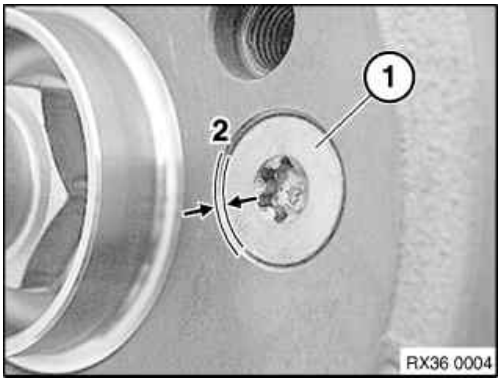
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

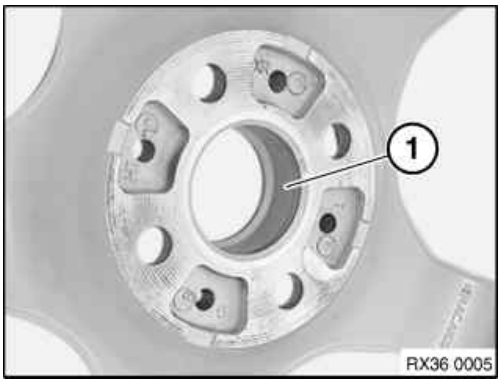
  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

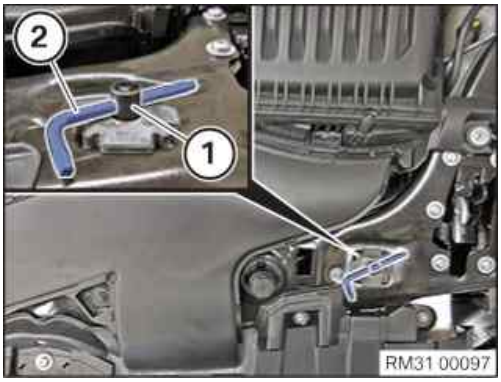
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

115 – Removing fastener for left and right radiator



NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

116 – Secure the steering shaft at the bottom on the steering gear

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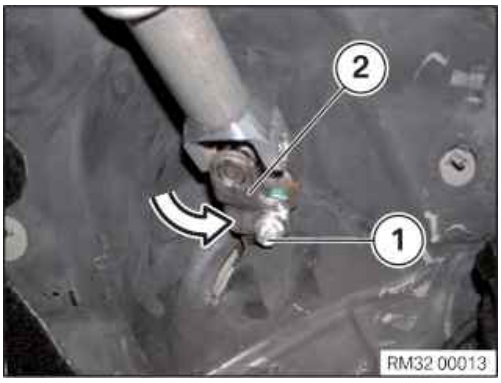
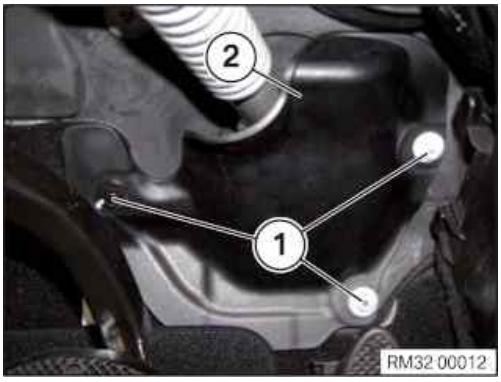


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

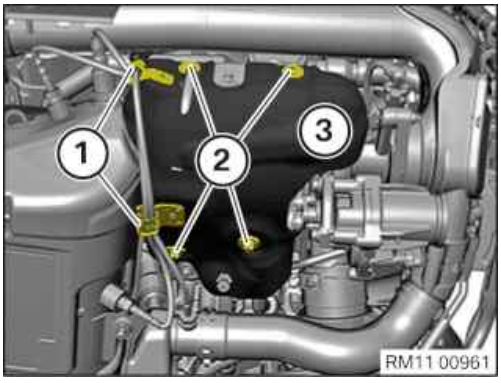
117 – Install the heat shield on the exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



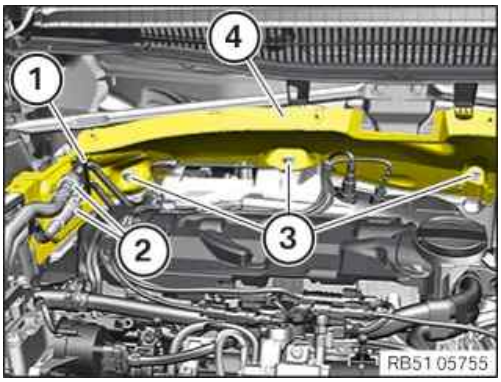
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

118 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

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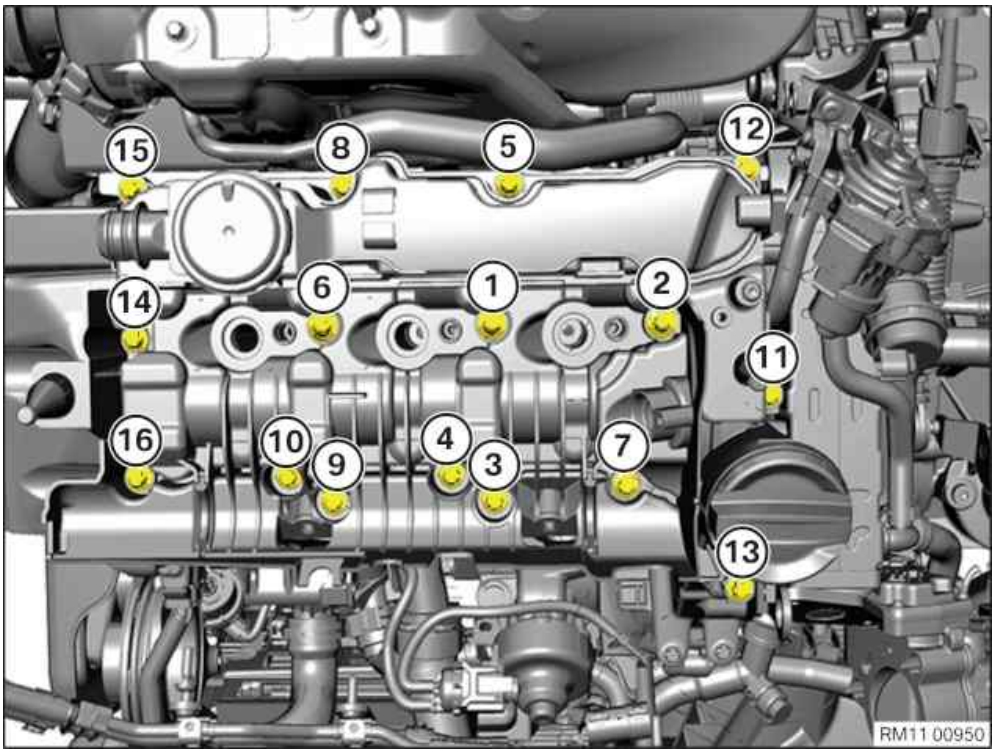
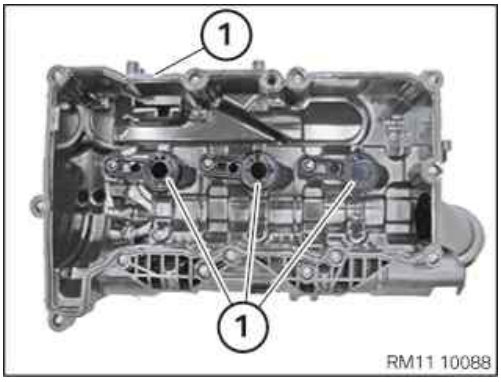
119 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover

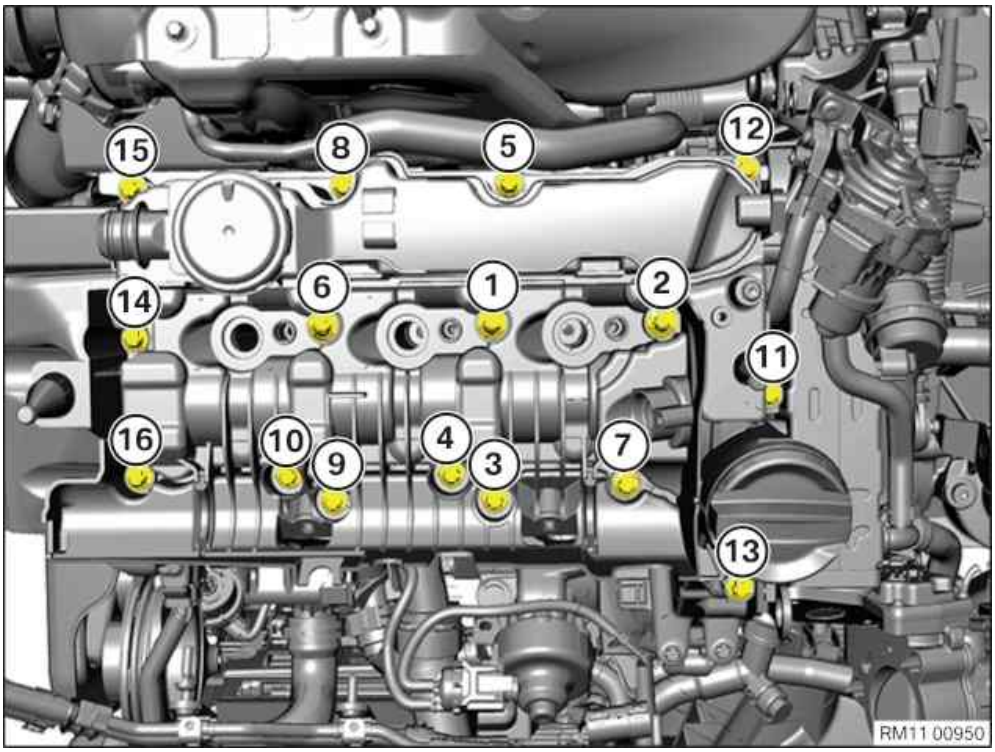


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm

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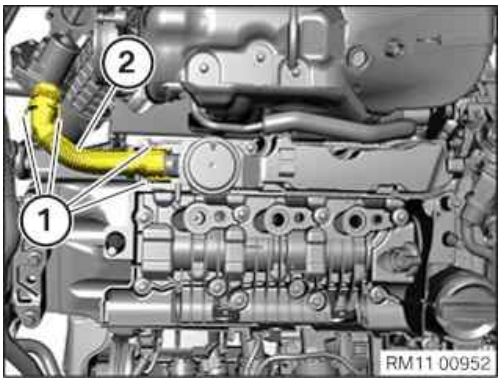
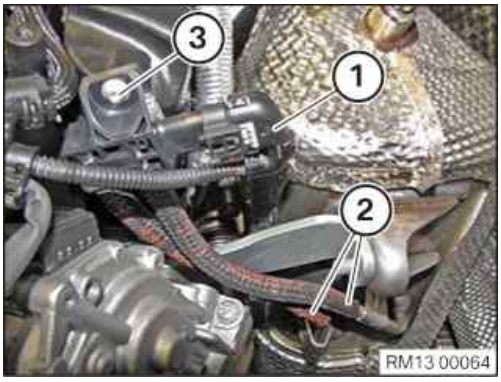


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

120 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

121 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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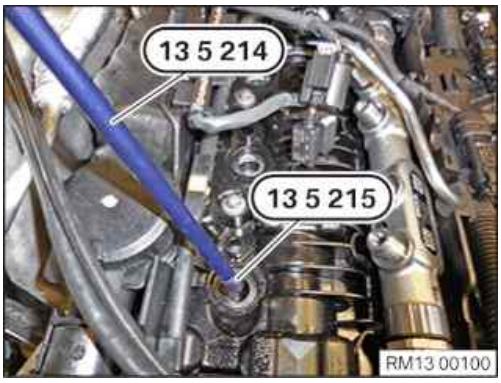
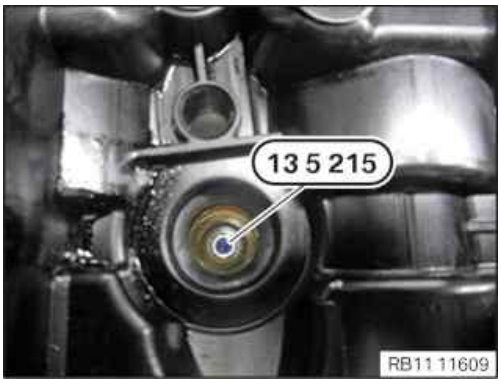


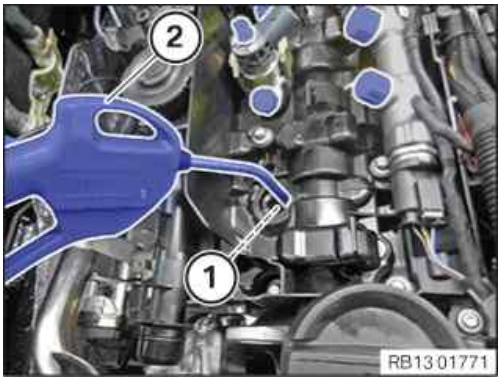
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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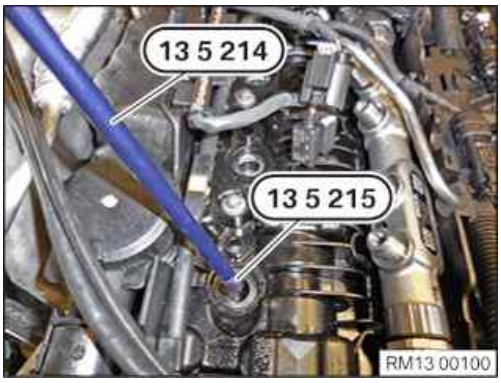


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

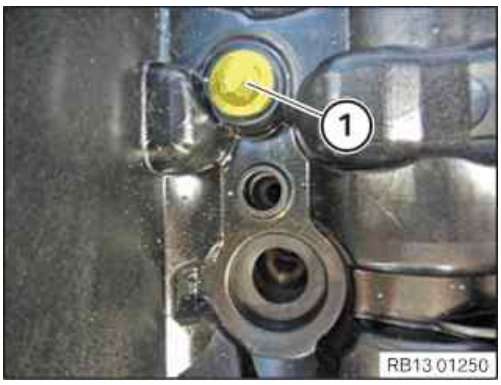
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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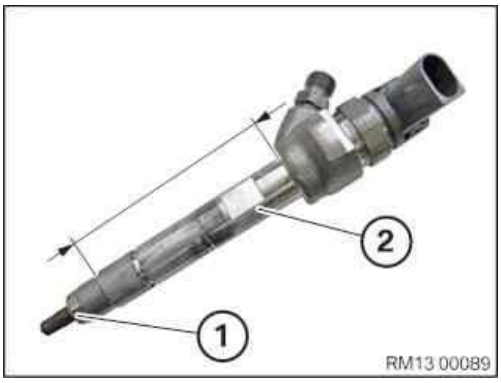


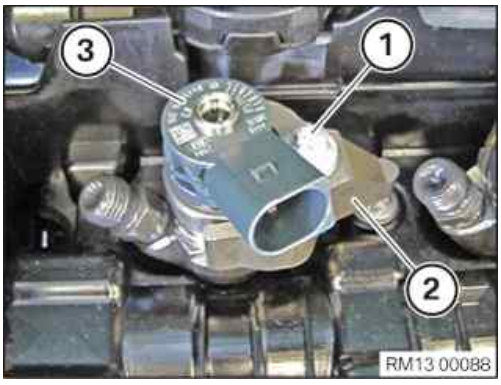
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

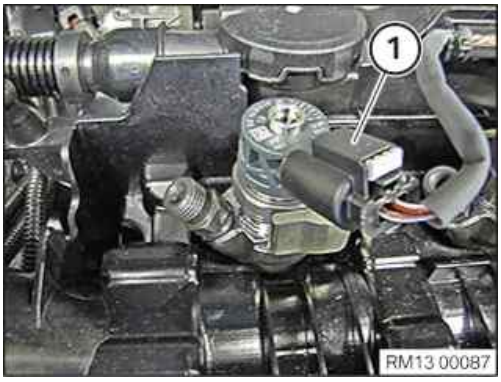
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

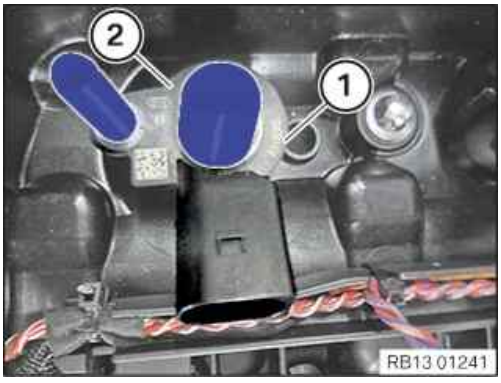
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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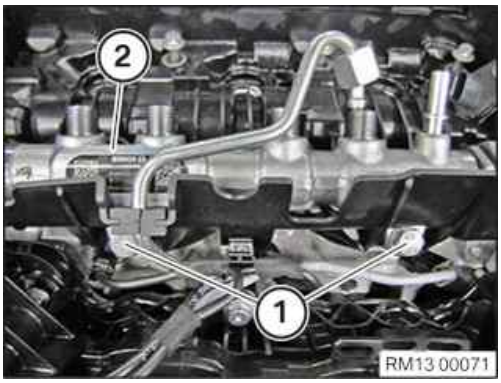
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

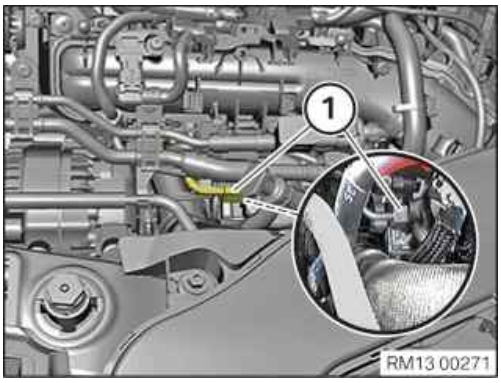
122 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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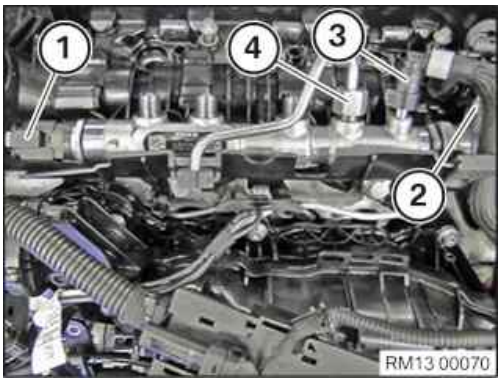

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

123 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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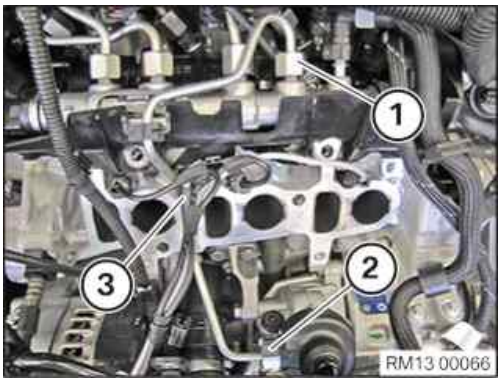

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

124 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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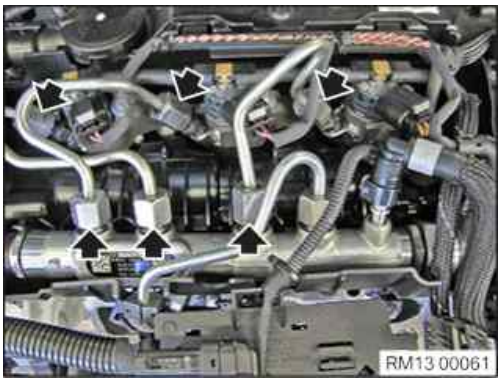

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

125 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

126 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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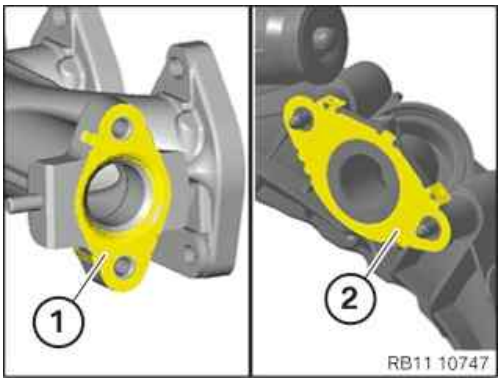
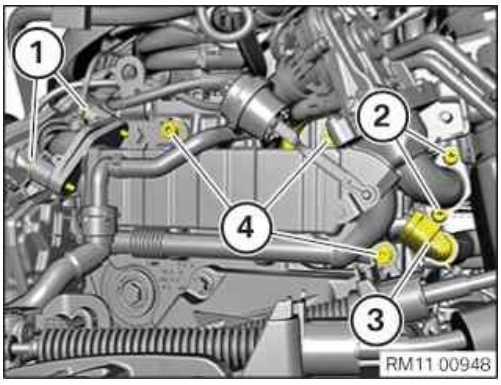


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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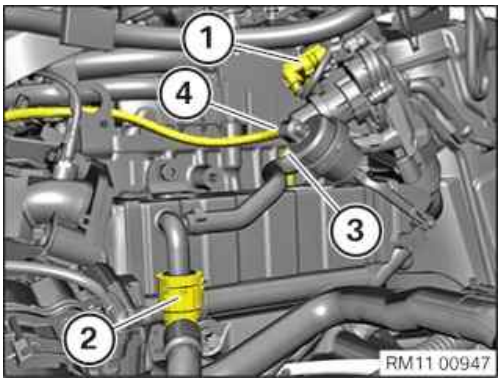


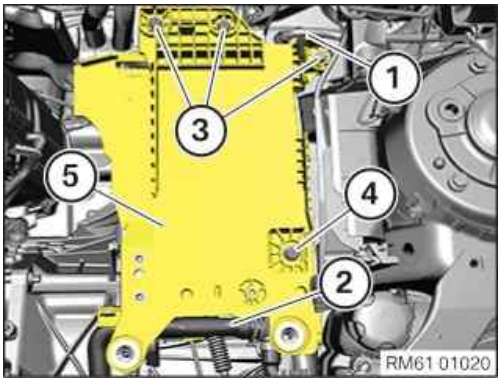
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

127 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

128 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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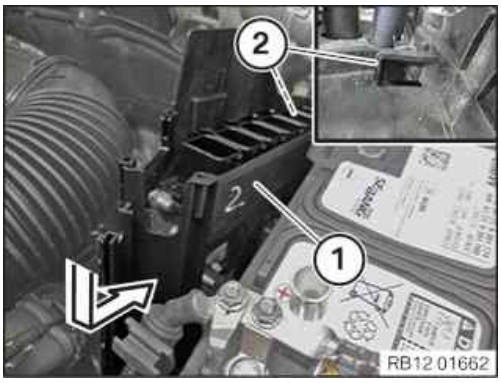
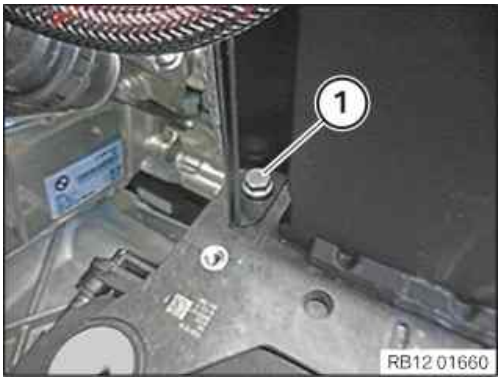


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

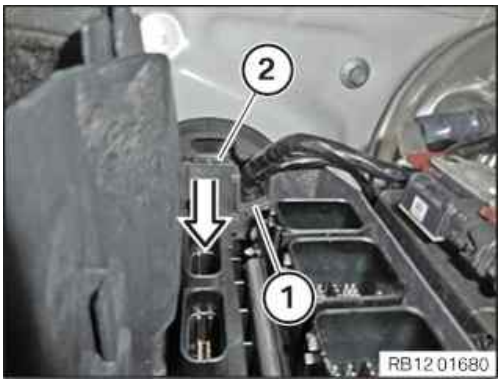
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



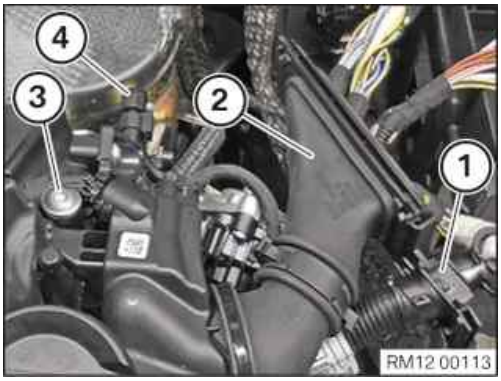
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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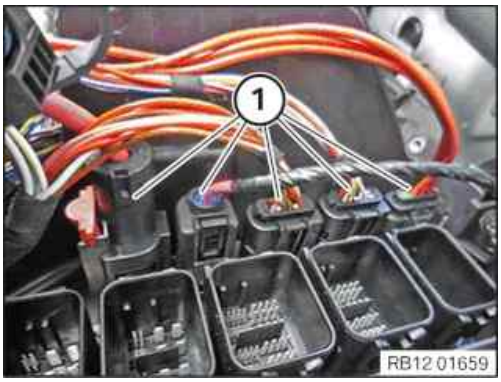
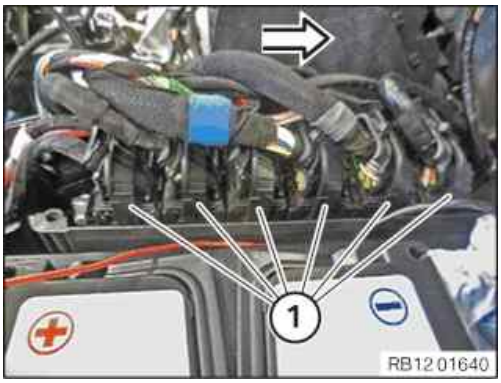
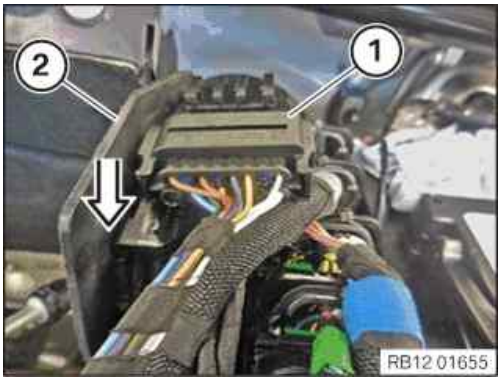


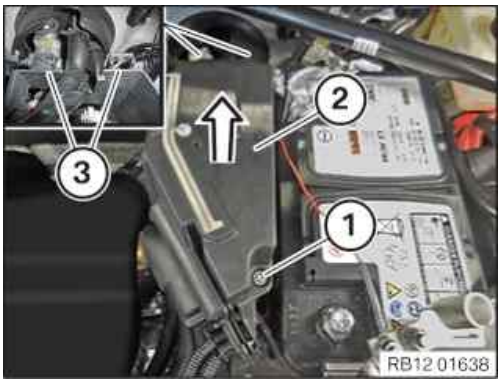
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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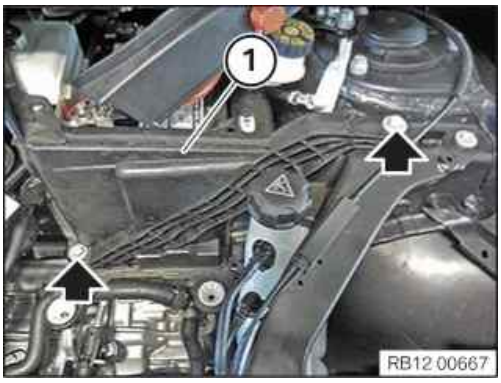


- Feed in and install tension strut (1).
- Tighten screws (arrows).

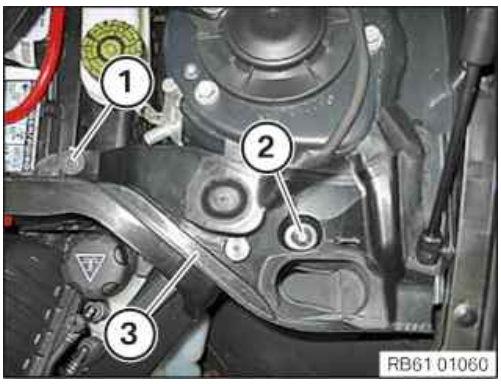
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

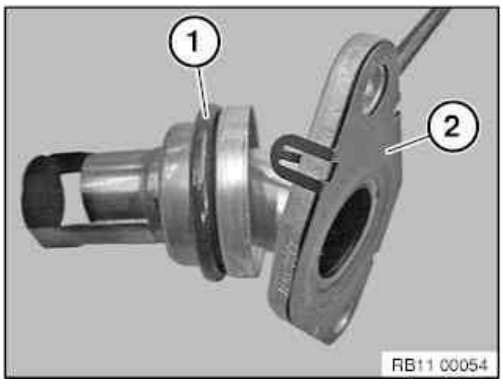


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

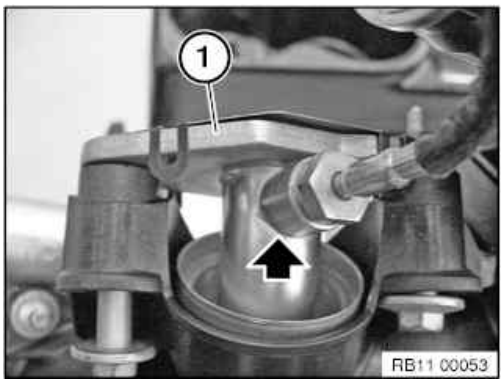
129 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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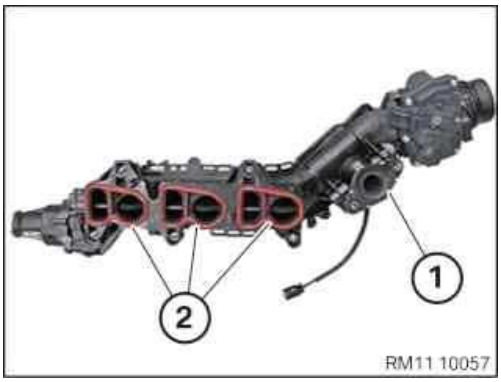
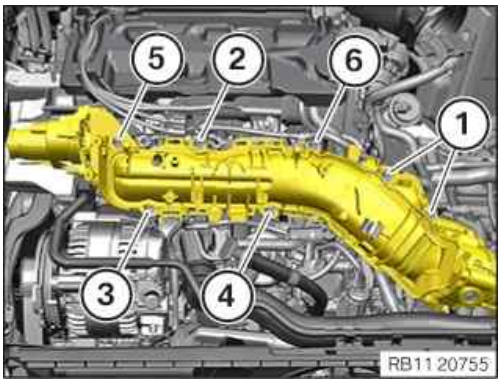


- Renew gaskets (2).

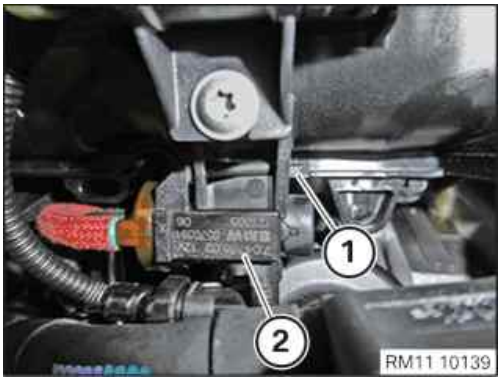
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



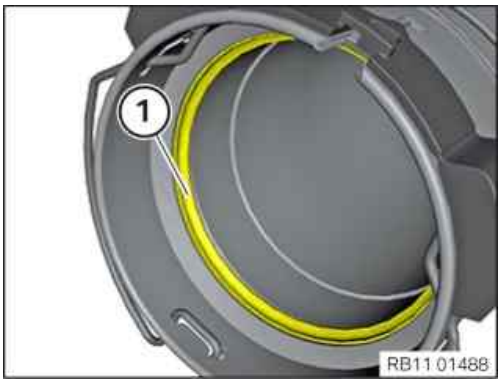
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

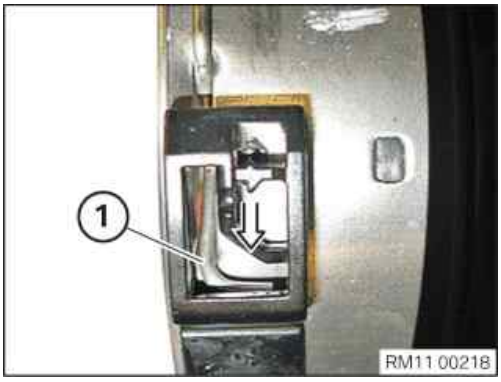


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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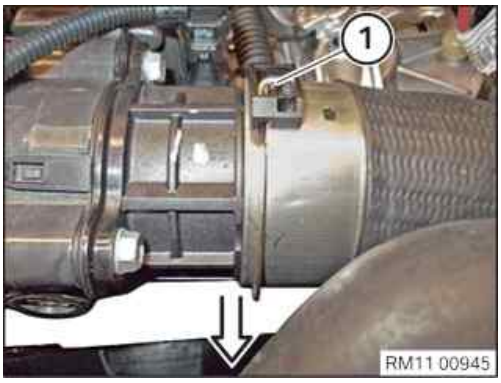
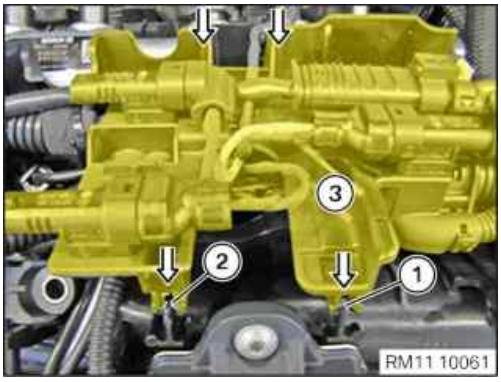


- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

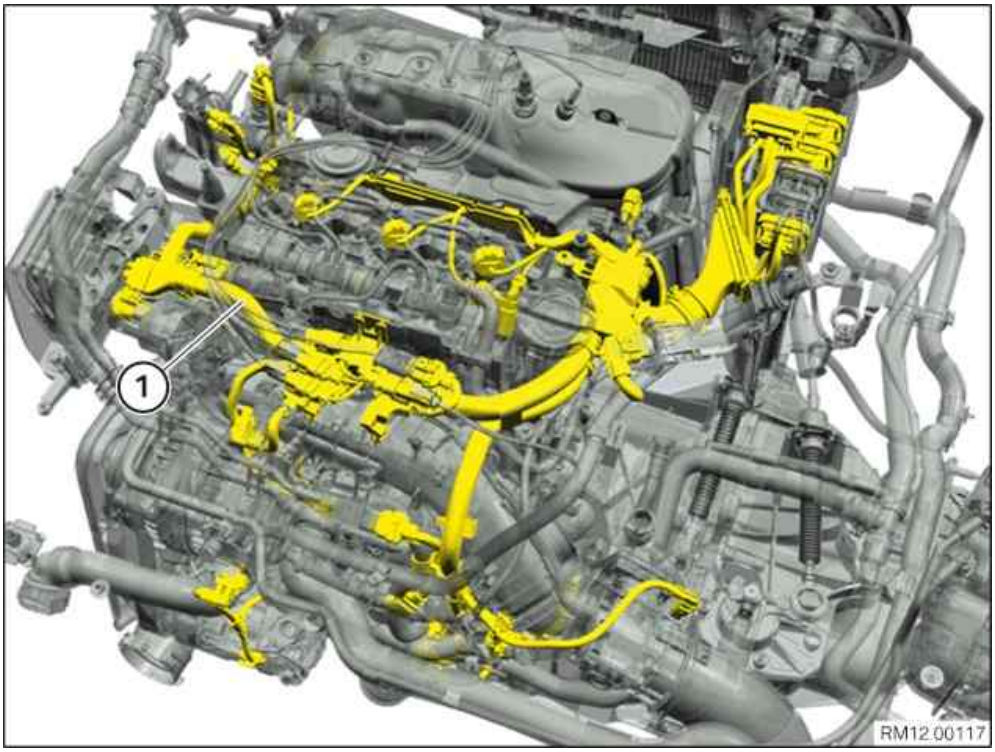
130 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

131 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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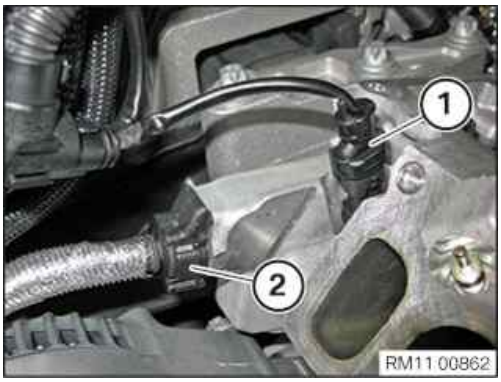
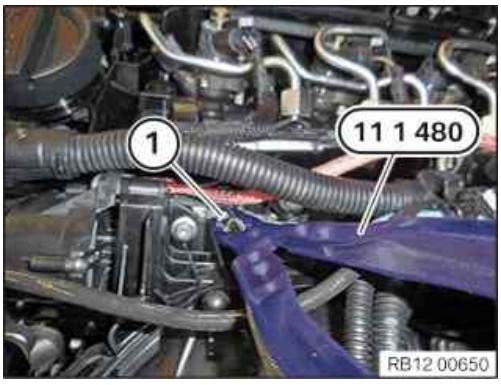
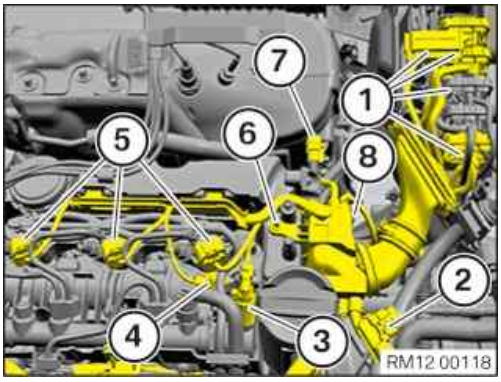


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

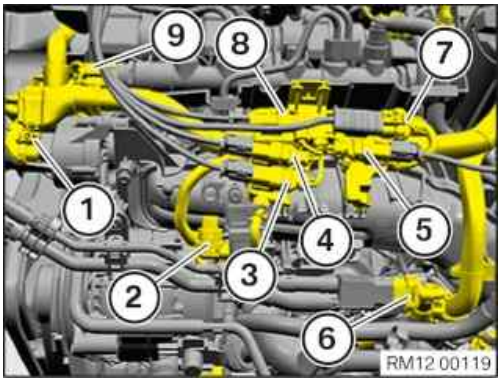


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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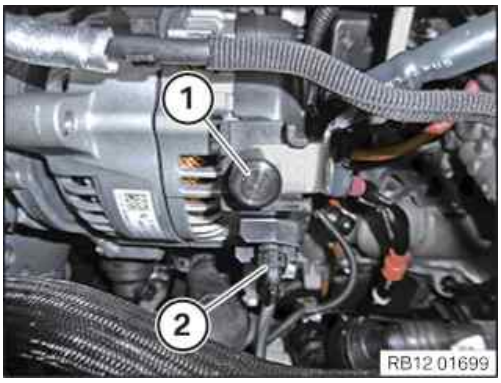
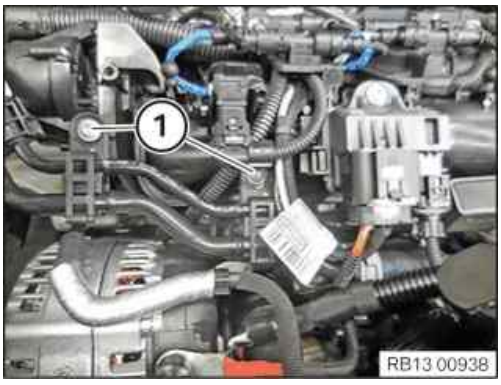


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

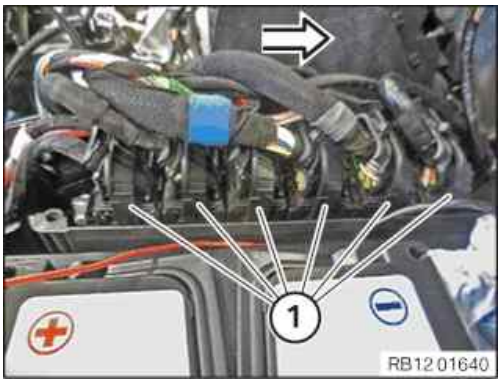


- Position fuel lines.
- Tighten the screws (1).

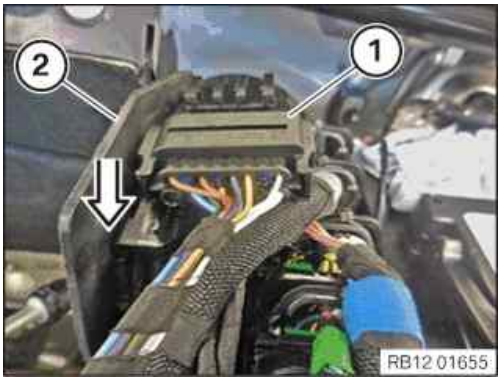
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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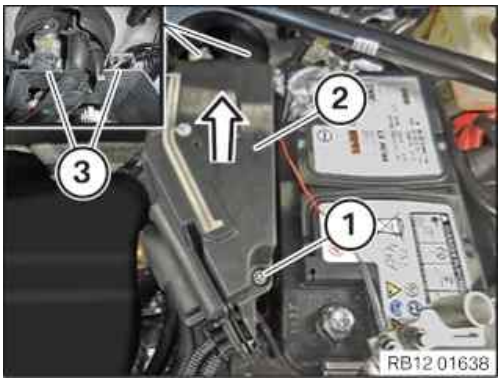
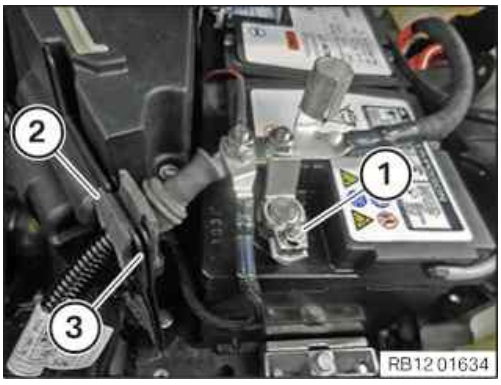


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

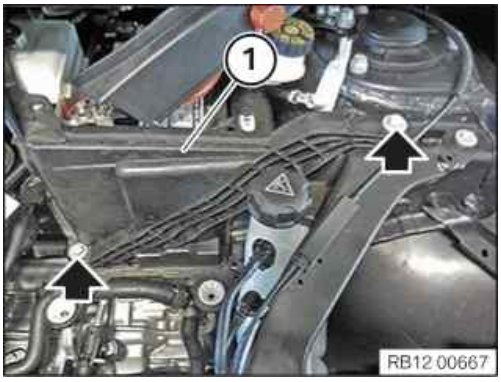
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

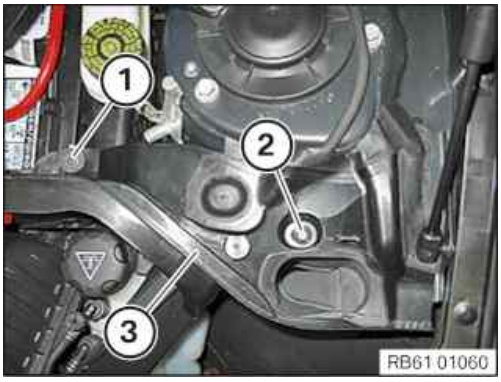
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm

132 – Installing clean air pipe

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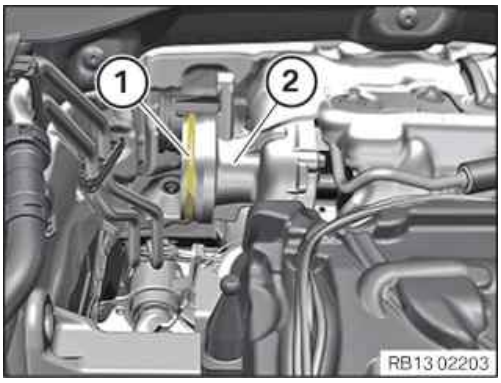
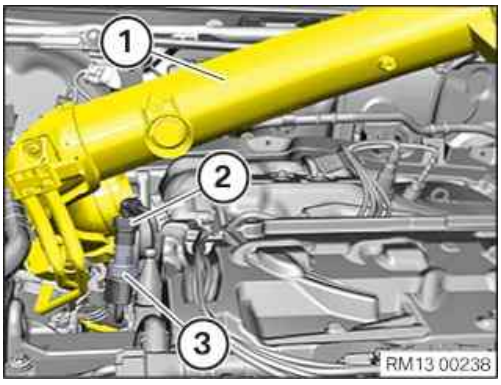


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



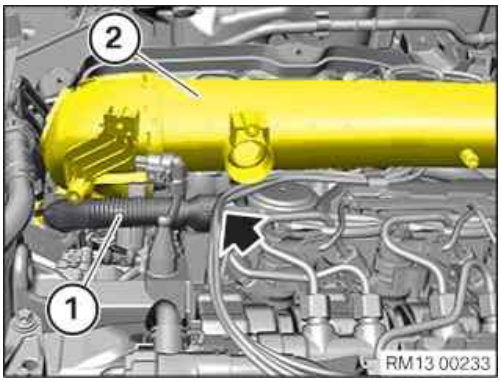
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

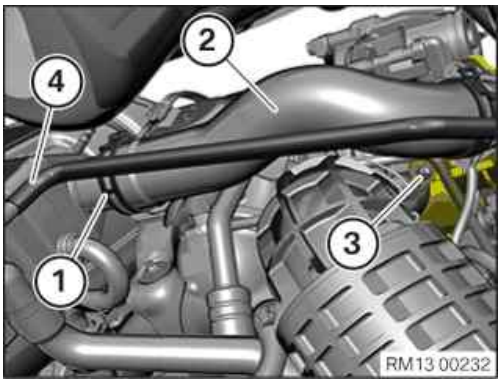
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

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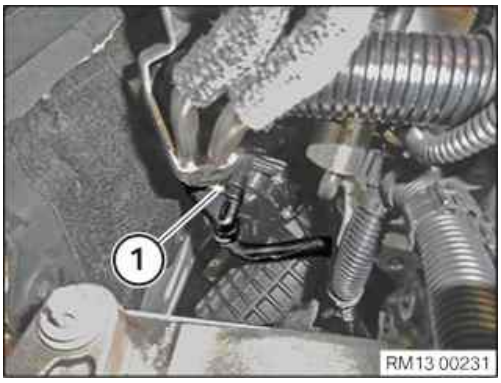
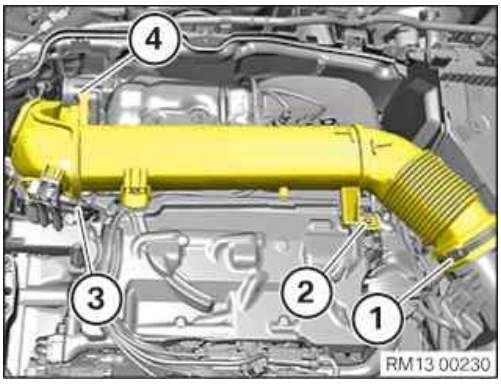


- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

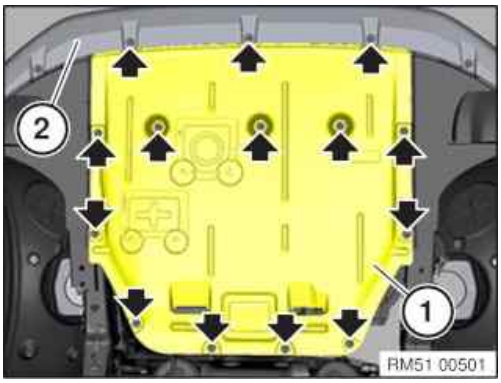
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

133 – Installing the front underbody protection

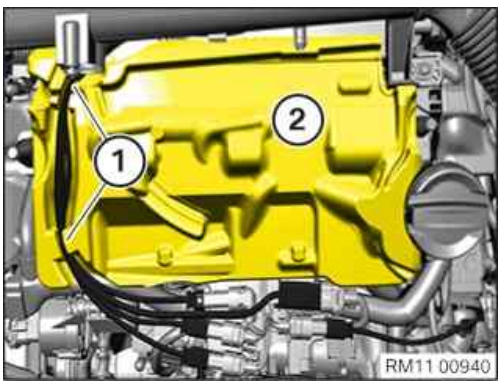


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

134 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

135 – Install resonator

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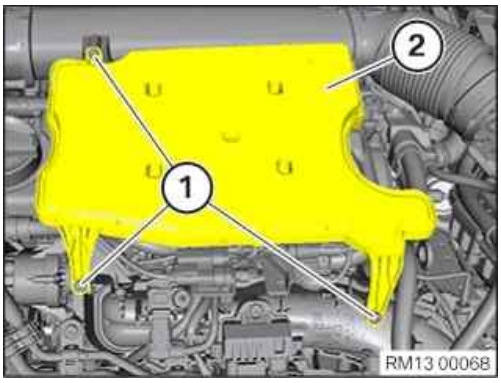

- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

136 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

137 – Install the rear cowl panel cover

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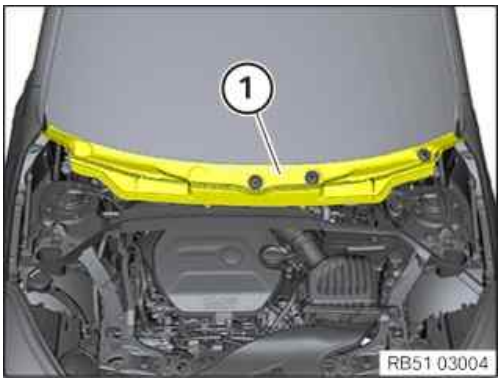
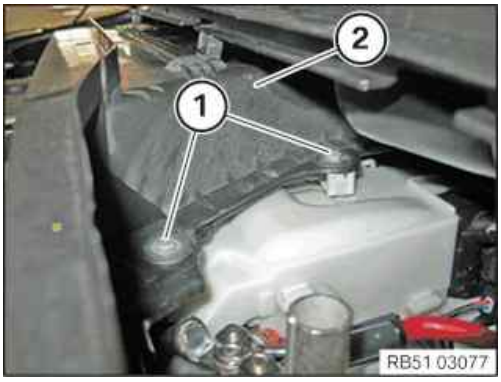


- Feed in and engage the rear cowl panel cover (1).

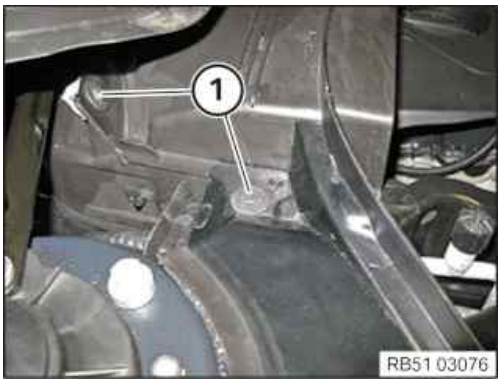
138 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

139 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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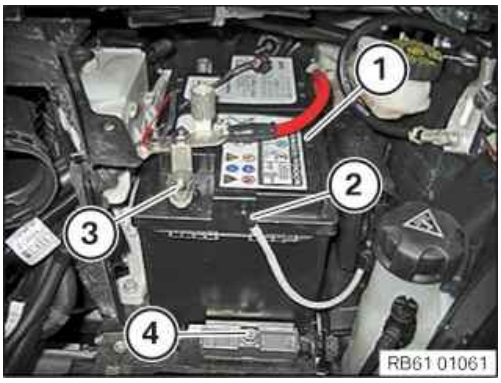


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

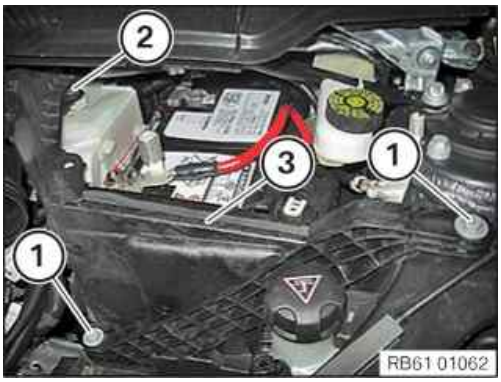
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

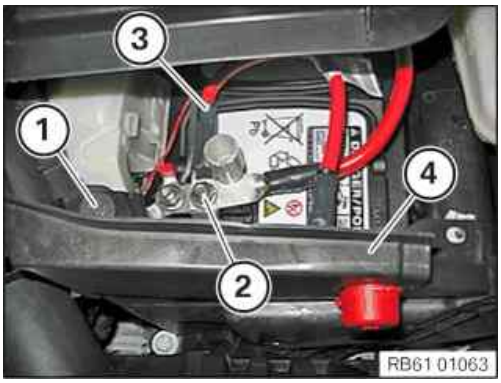
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

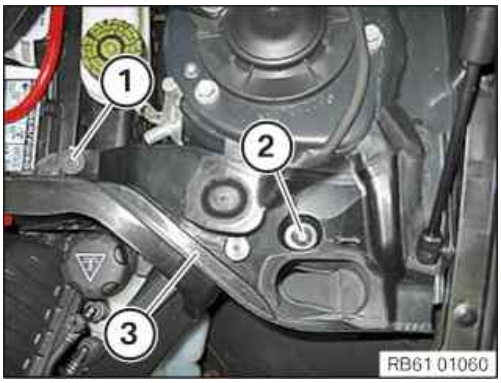
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

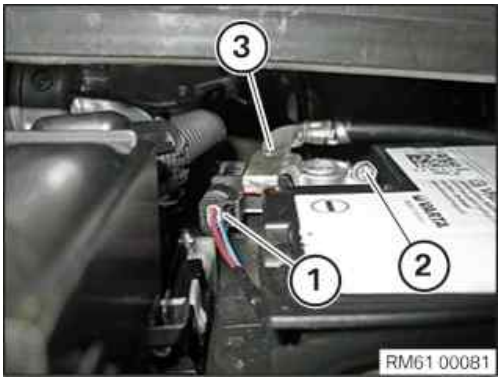
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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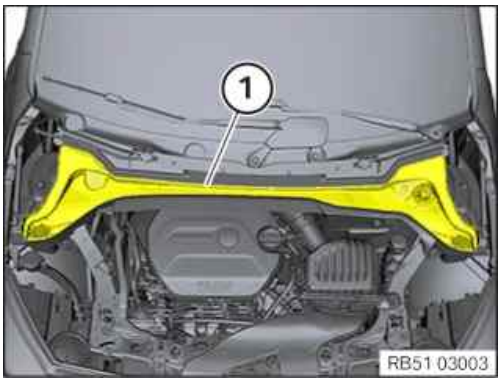
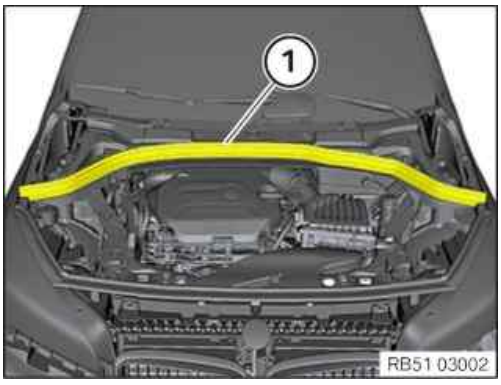


- Feed in the cowl panel cover (1).



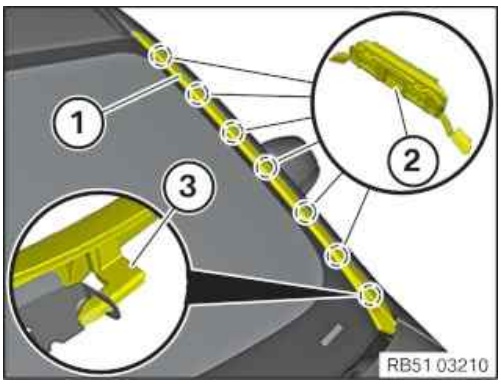
- Press the gasket (1) in a downwards direction.

140 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

141 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

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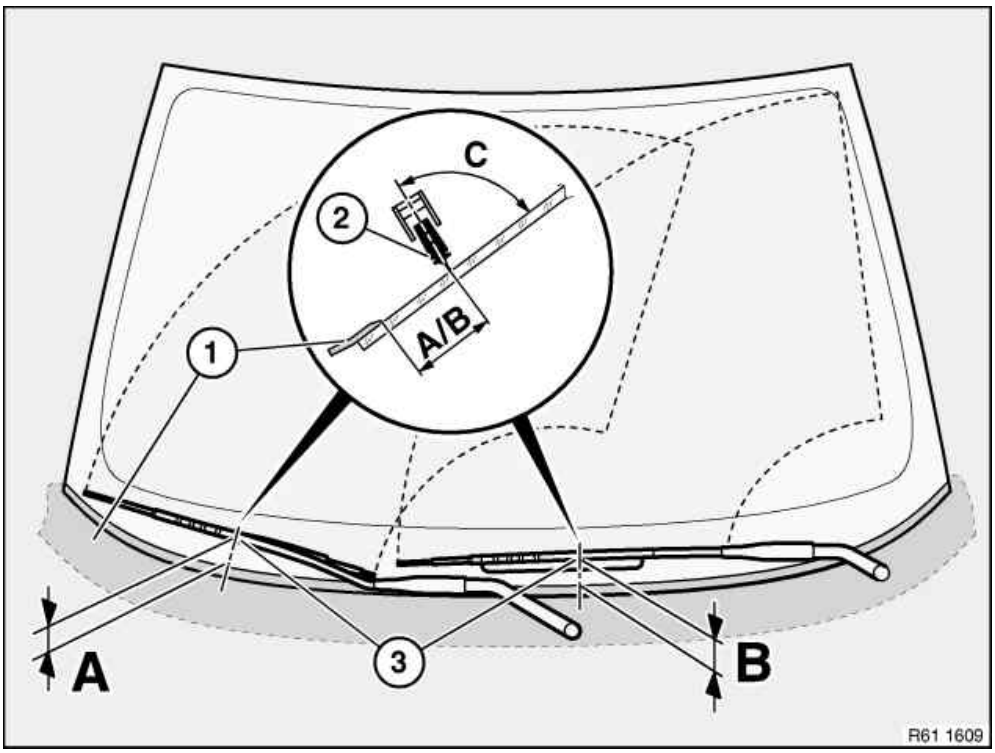
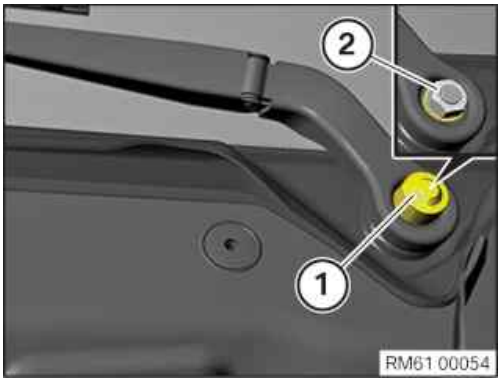
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

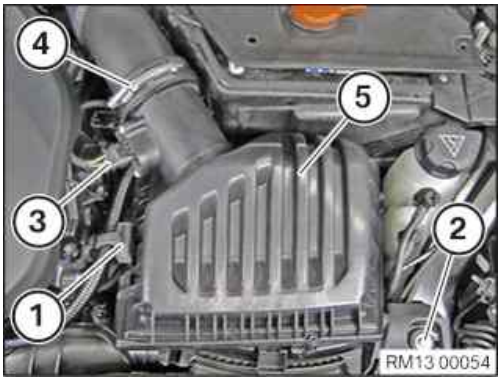
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

142 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

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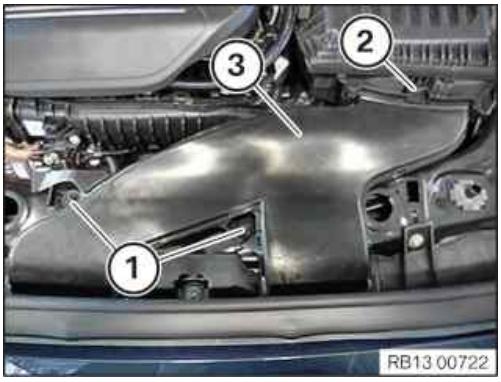
143 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

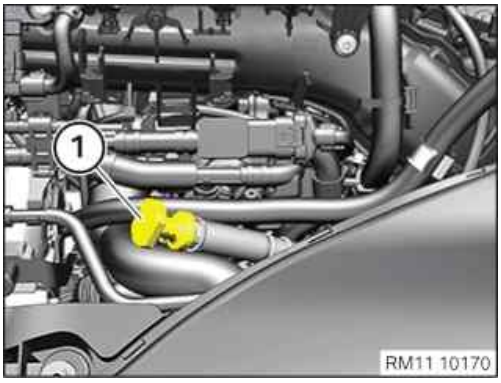
144 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

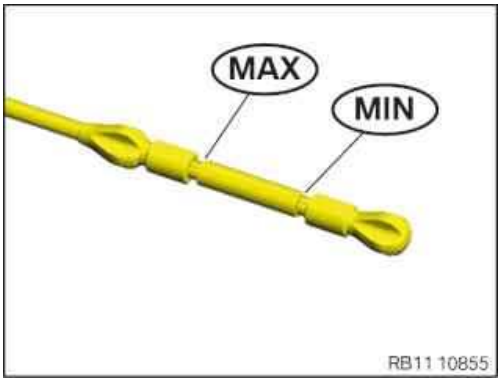


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

145 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Bracing strut to top cross connection — Used in step 32

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 32

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 32

M6x20		Tightening torque	12 Nm

Rear end of front axle support to body — Used in step 69 105

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 69 105

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 69 105 113

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 69

M8		Tightening torque	21,5 Nm

Special tool to cylinder head — Used in step 72

Special tool		Tightening torque	20 Nm

Standard screw connection M6 — Used in step 72 80

M6			8 Nm

Coolant temperature sensor at cylinder head — Used in step 72

Temperature sensor		Tightening torque	3,5 Nm

Cylinder head to crankcase — Used in step 75

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 75

M8x40		Tightening torque	19 Nm

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Engine support to cylinder head

Used in step 75

M10X45		Tightening torque	41 Nm

Right engine mount to cylinder head

Used in step 75

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Glow elements to cylinder head

Used in step 75

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 78

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 80

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 80

M8		Tightening torque	19 Nm

Chain tensioner piston to cylinder head

Used in step 81

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 82

M7x17.			17 Nm

Exhaust manifold to cylinder head

Used in step 87

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 87

Hollow bolt		Renew sealing rings.	30 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 87 126

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust turbocharger to exhaust manifold

Used in step 89

V-band clamp		Tightening torque	19 Nm

Oil feed line to exhaust turbocharger

Used in step 89

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Oil return line to turbocharger

Used in step 89

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 89

M8x16		Tightening torque	22 Nm

Charge air line to crankcase

Used in step 90

M6x25		Tightening torque	5 Nm

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Charge air duct to oil sump — Used in step 90

M6		Tightening torque	8 Nm

Heat shield for exhaust turbocharger — Used in step 91 92 117

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 91

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 93

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 93

M8 hexagon nut		Tightening torque	19 Nm

SCR metering module V-clip to exhaust system — Used in step 93

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter — Used in step 93

Torx bolt BM6x16		Tightening torque	8 Nm

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter — Used in step 93

Flange nutM8		Tightening torque	19 Nm

Control sensor — Used in step 94

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter — Used in step 95 96

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 97

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft — Used in step 98

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter — Used in step 99

Sensor		Tightening torque	50 Nm

Monitoring sensor — Used in step 100

Sensor		Tightening torque	50 Nm

Starter motor to transmission — Used in step 101

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 101

M8		Tightening torque	13,5 Nm

Exhaust system to body — Used in step 102

M8	Replace nuts.	Tightening torque	19 Nm

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Exhaust bracket on body

Used in step 102

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter

Used in step 102

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 102

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 102

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 103

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body

Used in step 104

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 104

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing

Used in step 105

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 105

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 106

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 106

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 106

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 106

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 107

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 109

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 111

Screw		Tightening torque	2,5 Nm

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Wheel arch cover to body

Used in step 111

Plastic nut		Tightening torque	3 Nm

Underbody panelling, side

Used in step 112

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 112

Plastic nut		Tightening torque	2,6 Nm

Brake disc to front wheel hub

Used in step 114

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

Used in step 114

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 114

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 116

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 116

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 118

Oval-head screw		Tightening torque	5 Nm

Cylinder head cover to cylinder head

Used in step 119

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 120

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 120 132

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 121

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 121

Screw		Jointing torque Angle of rotation	8 Nm 120 °

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Rail on cylinder head cover — Used in step 122

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail — Used in step 122 123

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail — Used in step 124

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 126

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler — Used in step 126

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 126

M8x20		Tightening torque	19 Nm

Battery holder to engine support — Used in step 127

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray — Used in step 128

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 128 131

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 128 131

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 128 131

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 128 131

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 128 131

		Tightening torque	3 Nm

Battery cover — Used in step 128 131 139

Screw			2,8 Nm

Intake plenum to cylinder head — Used in step 129

M6		Tightening torque	11 Nm

Positive battery cable to alternator — Used in step 131

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 131

TS6x20		Tightening torque	5 Nm

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Exhaust gas pressure sensor — Used in step 132

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 132

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 132

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 132 142

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 133

			3 Nm

Resonator to manifold and clean air pipe — Used in step 135

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 138

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 139

M8 screw		19 Nm

Positive battery terminal — Used in step 139

NutM6		5 Nm

Trailing link — Used in step 139

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 139

Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 139

NutM6		5 Nm

Windscreen wiper arm — Used in step 141

Combination hexagon nut		Tightening torque	35 Nm

Intake silencer housing to lock bridge — Used in step 142

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 143

M6		Tightening torque	8 Nm

Overview of Special Tools

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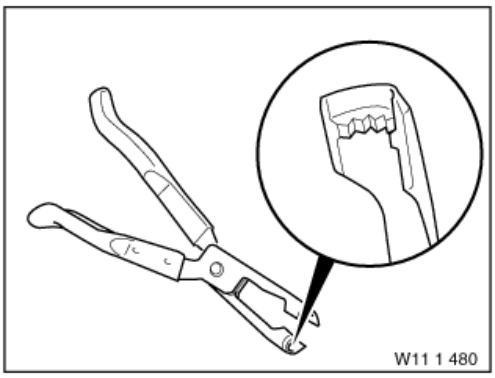
0 490 796 (11 1 480) Pliers



Common	Used in step 20
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common	Used in step 24 25 26 122 123 124
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

2 413 106 Fastener

Common	Used in step 24 25 123 124
Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

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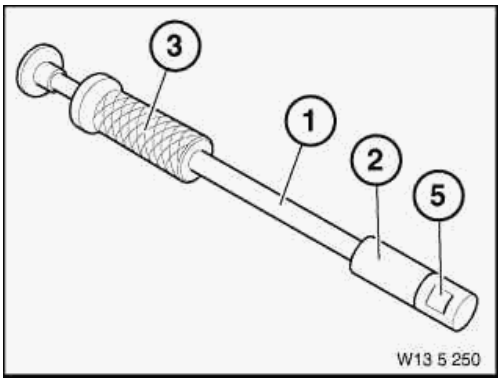
0 493 321 (13 5 250) Puller



Common

Used in step 27

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common

Used in step 27

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common

Used in step 27

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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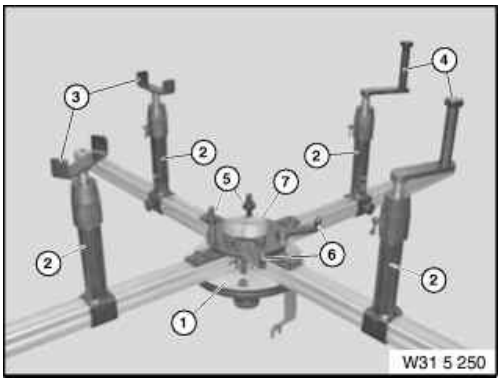
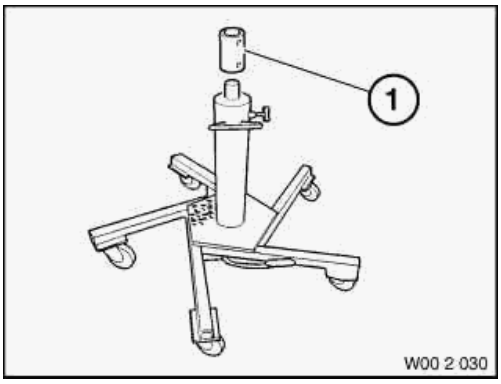
0 495 817 (31 5 251) Basic body



Common Used in step 43 69 75 105

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



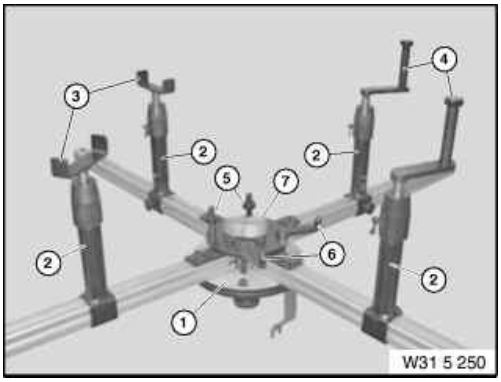
Common Used in step 43 69 75 105

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 821 (31 5 255) Adapter



Common Used in step 43 75

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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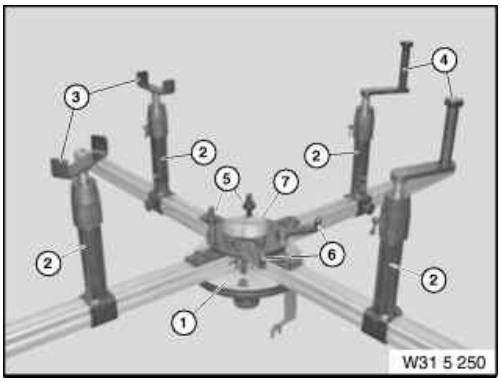
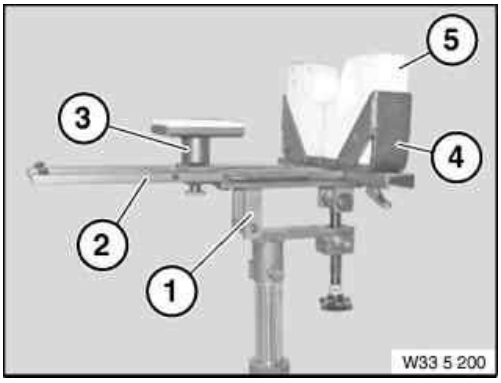
0 495 819 (31 5 253) Adapter



Common	Used in step 43 75
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt



Common	Used in step 43 69 75 105
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

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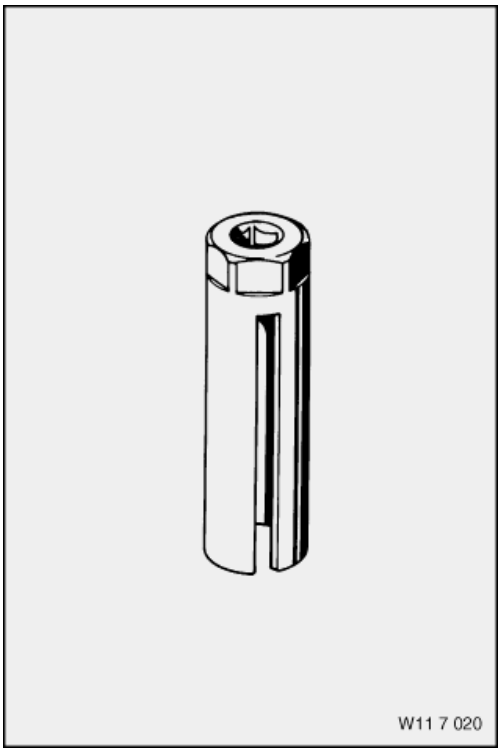
0 491 074 (11 7 020) Socket wrench insert



Common	Used in step 48 49 100
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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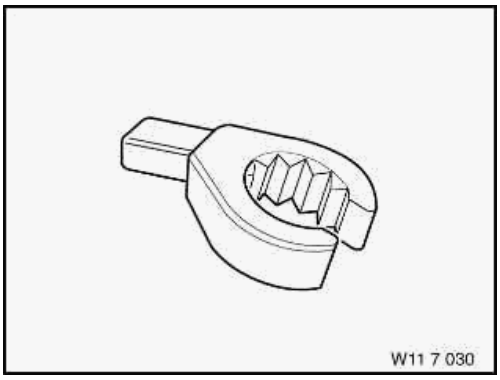
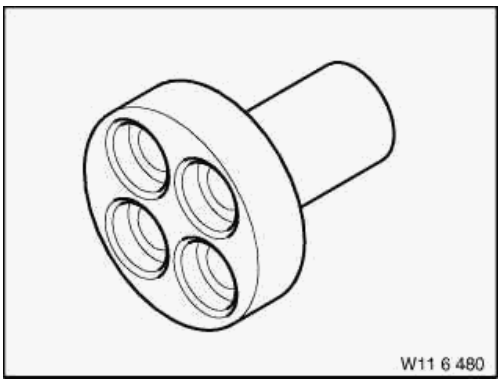
0 491 075 (11 7 030) Socket wrench insert



Common	Used in step 54 94
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

0 493 380 (11 6 480) Connector



Common	Used in step 62 85
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 62 84 85
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common	Used in step 62 83 85
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 67 68

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

2 414 691 Support

Common

Used in step 69 75

Usage	To support the engine when the engine support is removed.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	2357071
SI-Number	01 12 16 (406)

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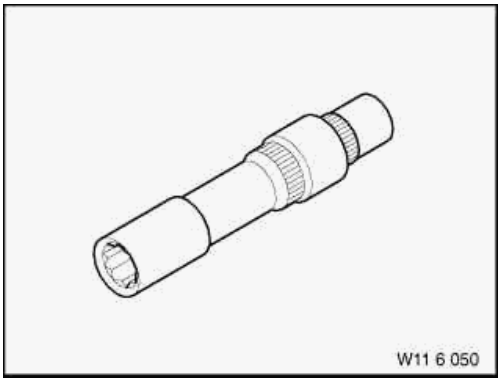
2 357 071 Panel

Common	Used in step 69 75
Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

0 491 068 (11 6 050) Socket wrench insert



Common	Used in step 69 75
Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 459 012 Holder

Common	Used in step 69 75
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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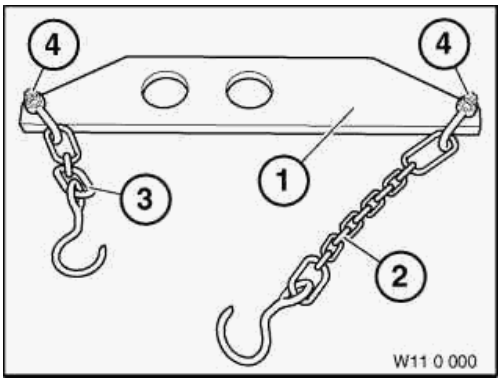
0 490 561 (11 0 000) Lifting gear



Common

Used in step 69 75

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 69

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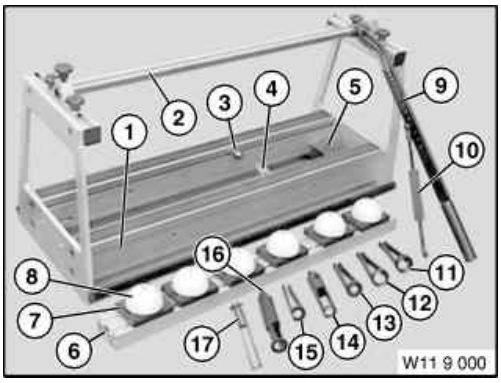

Common

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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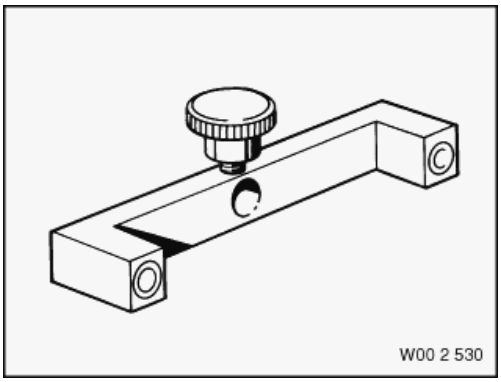
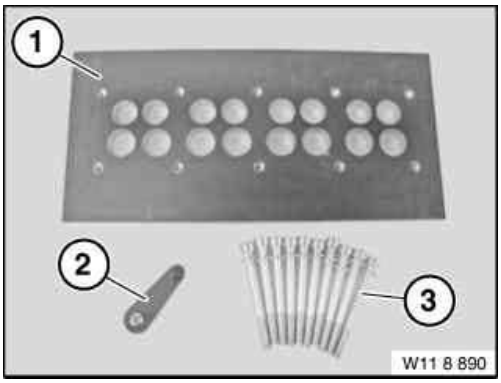
0 490 185 (00 2 530) Bridge



Common Used in step 71

Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

0 496 183 (11 8 890) Device



Common Used in step 72

Usage	(pressure testing fixture) For leakage test on cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 496 187 (11 8 894)		**Gasket** (Gasket for base plate 11 8 891) Only available as part of complete tool set 11 8 890 -> (83 30 0 496 183).	
1	0 496 184 (11 8 891)		**Panel** (base plate with gasket)	
2	0 496 185 (11 8 892)		**Panel** (Adapter plate with valve) Only available as part of complete tool set 11 8 890 -> (83 30 0 496 183).	
3	0 496 186 (11 8 893)		**Screw** (Set of screws) Can only be ordered as part of complete tool 11 9 660 = 0495955	
5	0 496 188 (11 8 895)		**Gasket** (Gasket for adapter plate 11 8 892) Only available as part of complete tool set 11 8 890 -> (83 30 0 496 183).	

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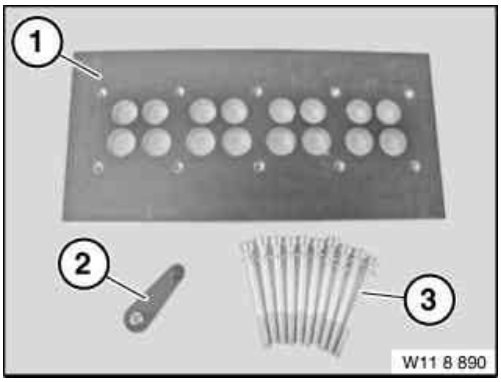
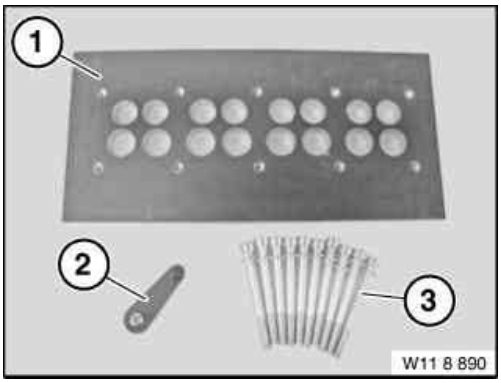
0 496 184 (11 8 891) Panel



Common	Used in step 72
Usage	(base plate with gasket)
Included in the tool or work	0 496 183
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 186 (11 8 893) Screw



Common	Used in step 72
Usage	(Set of screws) Can only be ordered as part of complete tool 11 9 660 = 0495955
Included in the tool or work	0 496 183
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 142 (11 8 850) Socket WAF 46

Common	Used in step 72
Usage	(Long socket SW17 (double hexagon)) For removal and installation of temperature sensor (Stahlwille)
Included in the tool or work	
Storage location	C24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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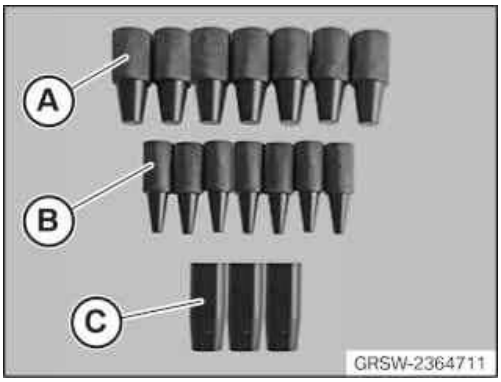
2 364 711 Plug

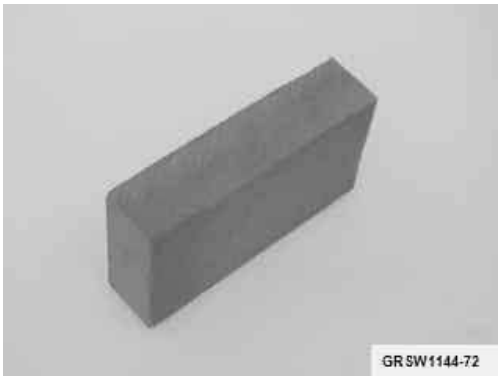


Common	Used in step 73
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common	Used in step 73
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 73
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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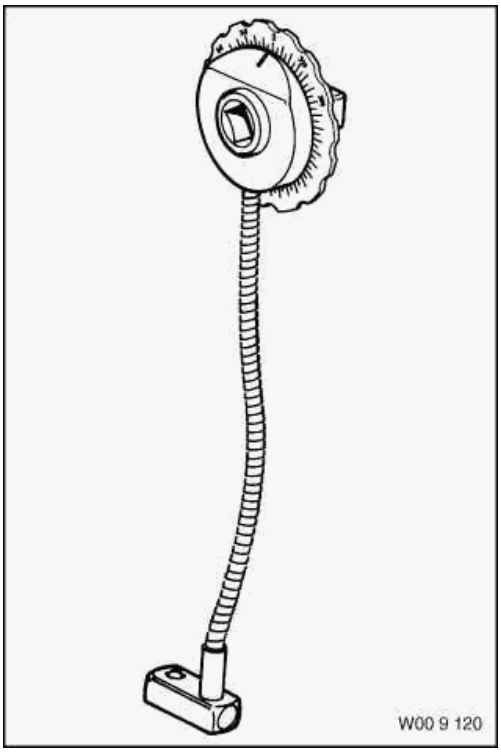
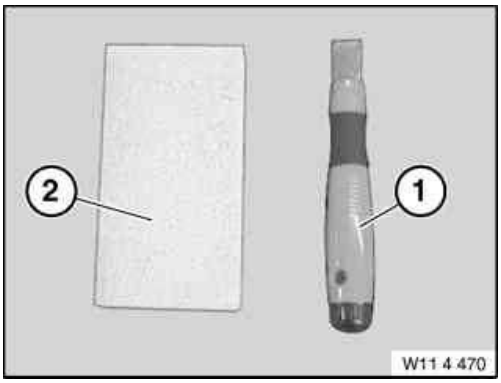
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 75

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 495 102 (11 4 470) Tool



Common Used in step 87

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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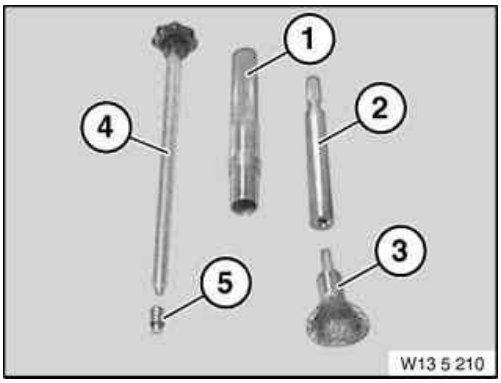
2 344 011 Tool

Common Used in step 114

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

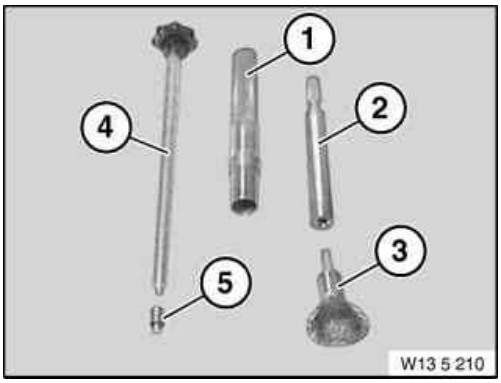
0 493 763 (13 5 215) Plug



Common Used in step 121

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common Used in step 121

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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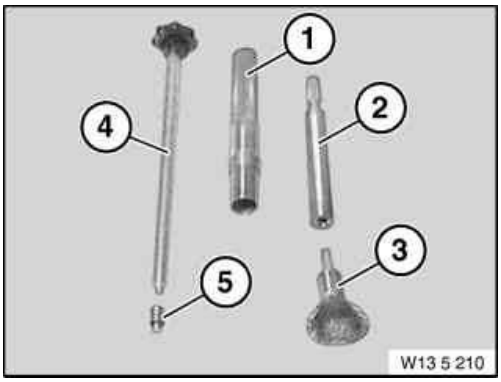
0 493 758 (13 5 210) Tool



Common	Used in step 121
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 34
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud

Common	Used in step 34
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 34
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 34
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud

Common	Used in step 34
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 34
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 34
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud

Common	Used in step 34
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Cylinder head flatness	Used in step 70
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

Valve underprotrusion	Used in step 71
	0,8 (0,7 - 0,9) mm

Check for cylinder head watertightness	Used in step 72
Temperature of the cylinder head	60 °C

Check for cylinder head watertightness	Used in step 72
Testing pressure	max. 3,0 bar

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 126
EGR controller	19 126
Troubleshooting on the exhaust turbocharger	89

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 139
61 12 ... Notes on intelligent battery sensor (IBS)	1 139
61 00 ... Notes for disconnecting and connecting battery	1 139

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	16 27 28 48 49 51 52 53 54

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11 65 020 Turbocharger damage due to blocked oil supply lines 89
11 65 ... Test steps in the event of turbocharger damage 89
17 00 008 Draining and topping up coolant for high-temperature circuit 145
17 00 008 Draining and topping up coolant for high-temperature circuit 145
17 00 008 Draining and topping up coolant for high-temperature circuit 145
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	145
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	145

Operating materials	Used in step
2.0 Grease for wheel centring	114

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	81
Exhaust-gas recirculation cooler seal on exhaust manifold	126
Exhaust-gas recirculation cooler seal on intake plenum	126

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11 12 729 Checking cylinder head on watertightness (B37C)

Special tools required:

- 11 8 890
- 2 289 610

Important!

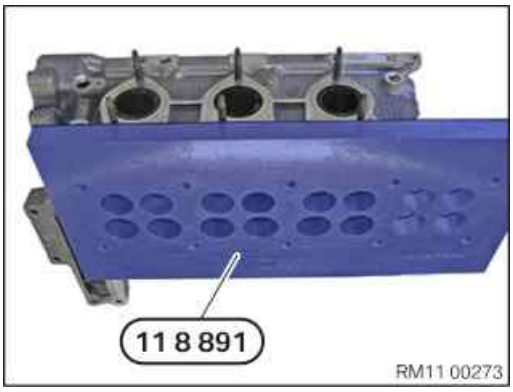
Pressure-test cylinder head to max. **3 bar**.

Heat cylinder head to 60 °.

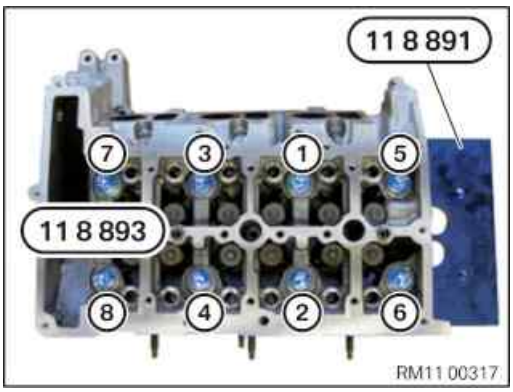
Check for bubble formation in a water bath.

Necessary preliminary tasks:

- Remove cylinder head.
- Remove all glow elements.
- Remove exhaust manifold.



Mount special tool 11 8 890 (11 8 891) on the cylinder head.



Fasten special tool 11 8 890 (11 8 891) with screws 11 8 890 (11 8 893).

Tightening torque: **20 Nm**.

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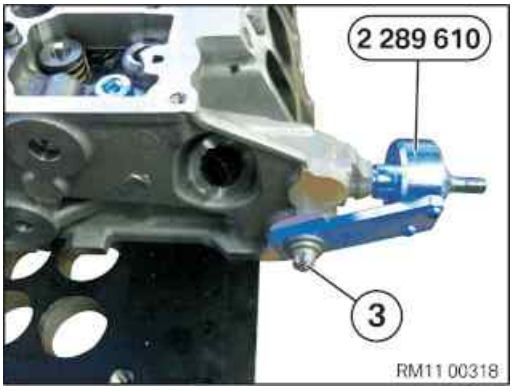

Mount special tool 2 289 610 and secure with screw (1).

Note:
Compressed air at valve (1) max. **3 bar**.

Heat cylinder head to 60 °.

Check for bubble formation in a water bath.

Concluding tasks:

- Remove special tools
- Attach exhaust manifold.
- Install all glow elements.
- Install cylinder head.

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11 12 800 Clean cylinder head intake channels and intake plenums

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

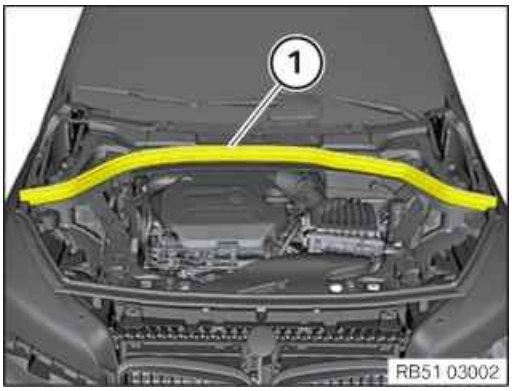
1 – Disconnecting all battery earth leads

- See additional information.

2 – Remove the seal for the rear bonnet

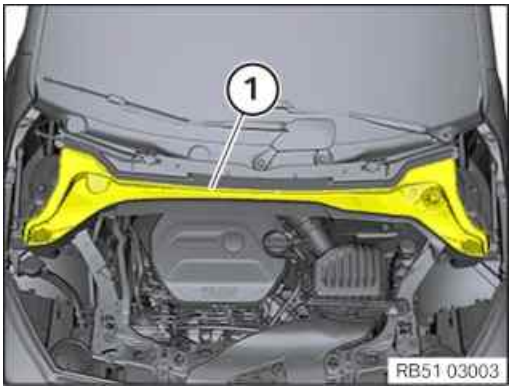
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

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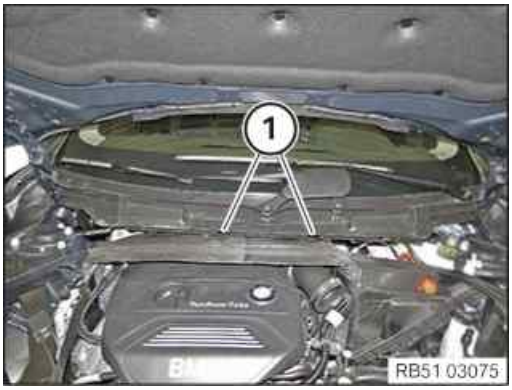
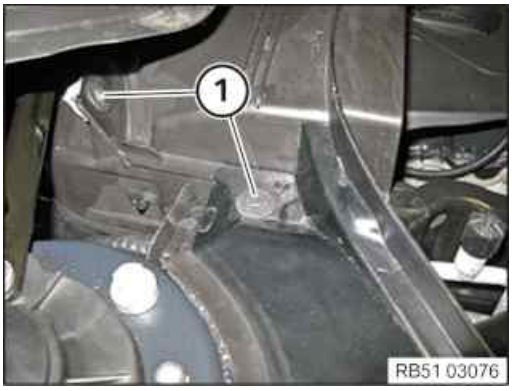
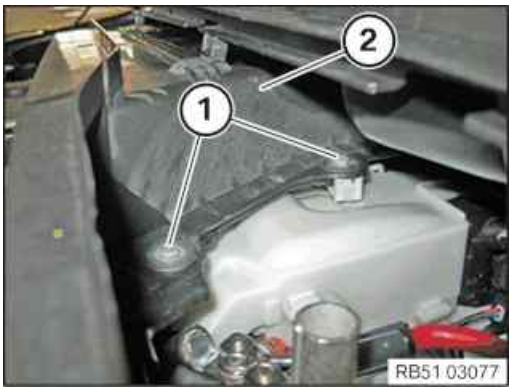
4 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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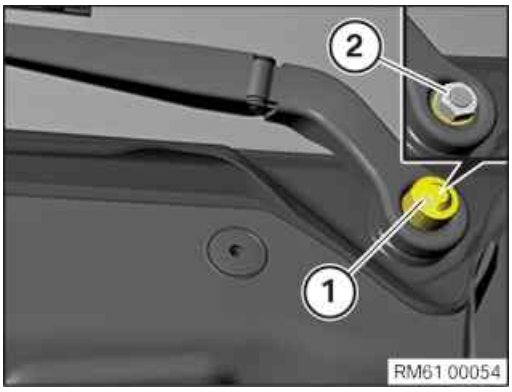
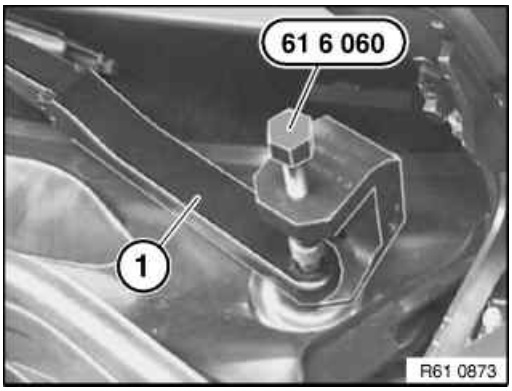


- Remove the protective cap (1).
- Loosen nut (2).



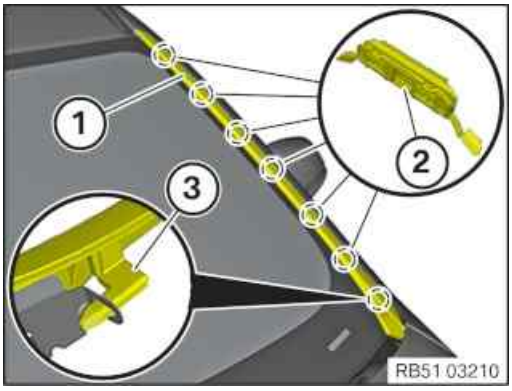
- Pull off the wiper arm (1) using special tool .

6 – Remove the gutter strip on the windscreen on the left and right

NOTICE

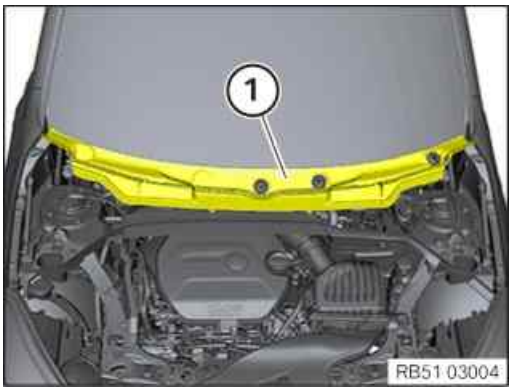
Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

7 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

8 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

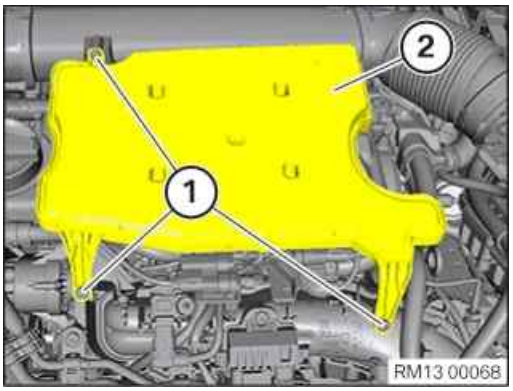
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

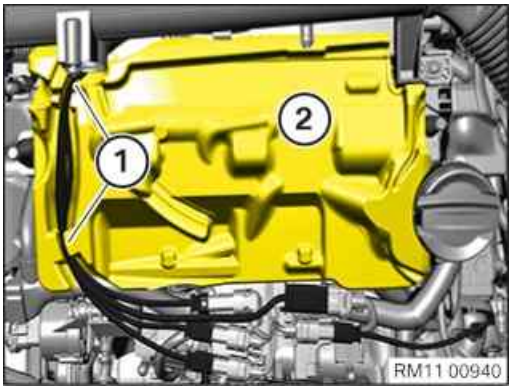
- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

10 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

11 – Remove the intake neck for intake silencer housing

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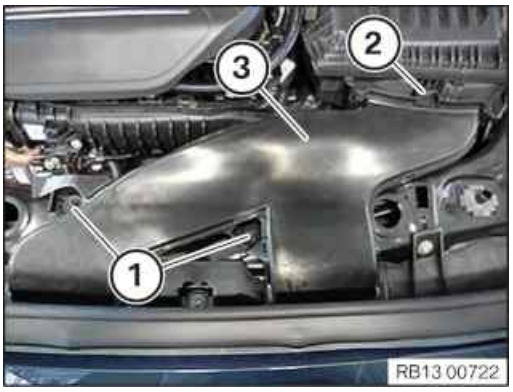
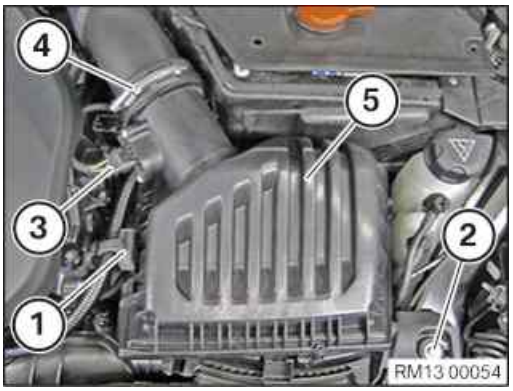


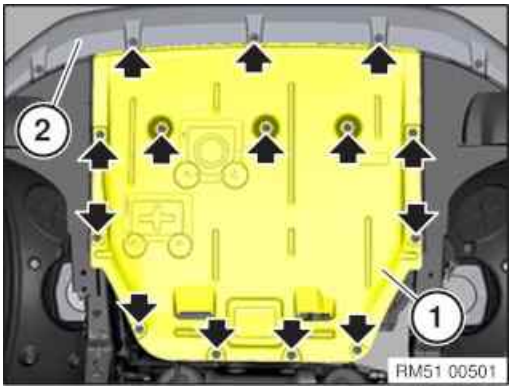
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

12 – Removing intake silencer housing



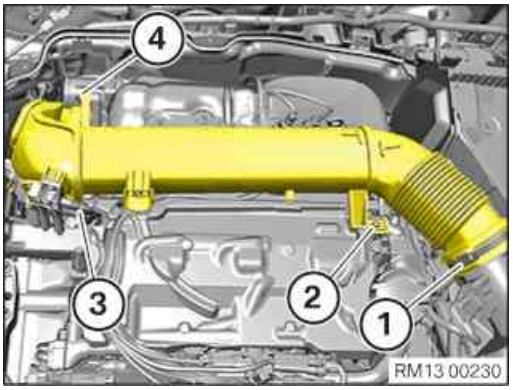
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

13 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

14 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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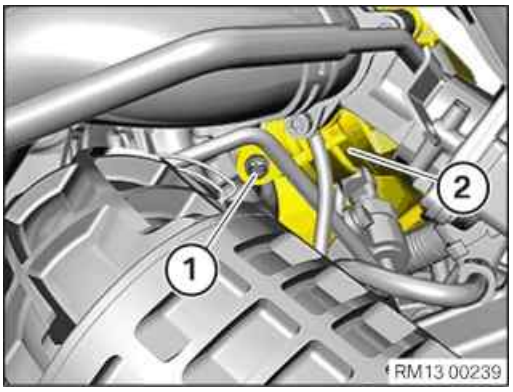
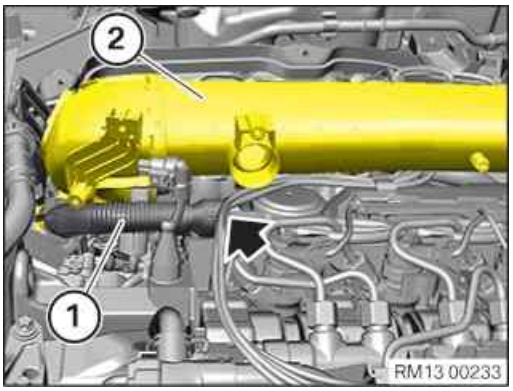


- Unscrew the screw (1) from the clean air pipe (2).

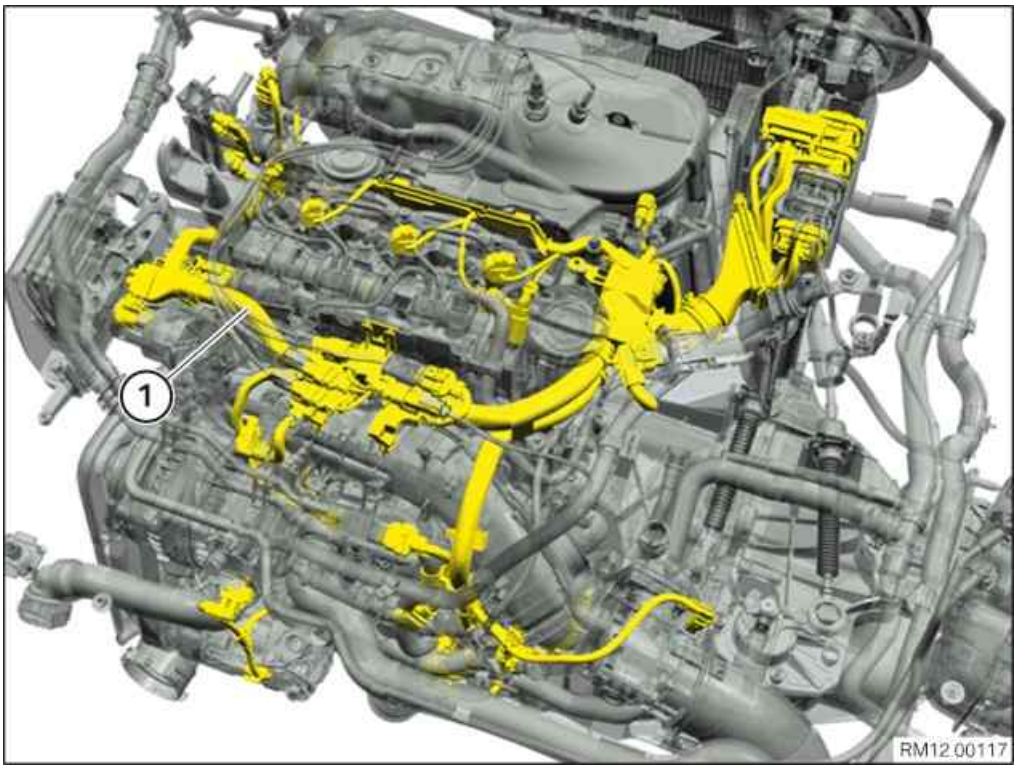


- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

15 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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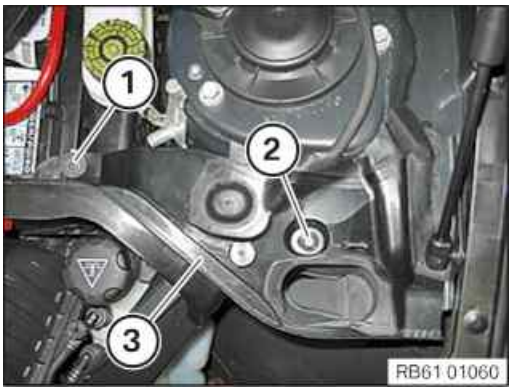
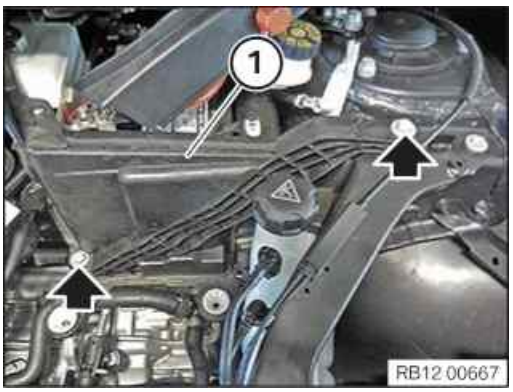
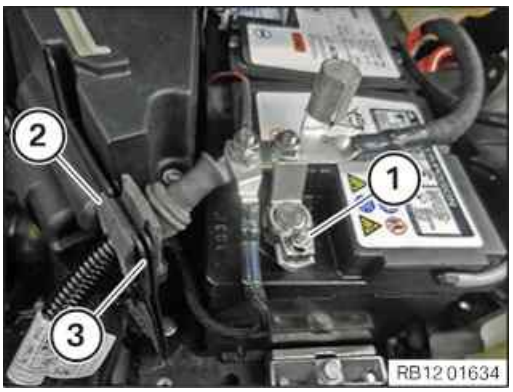


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

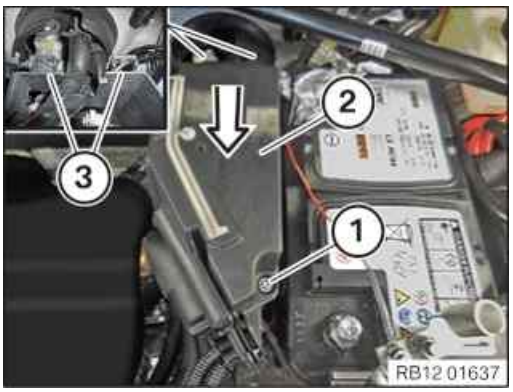
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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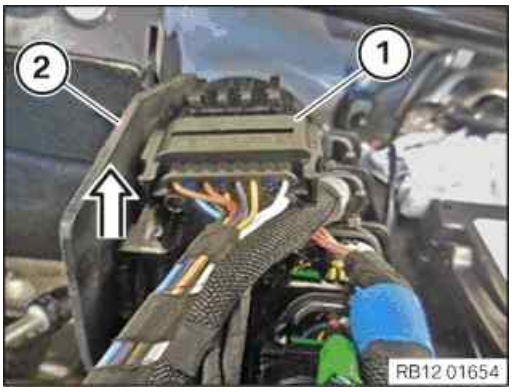
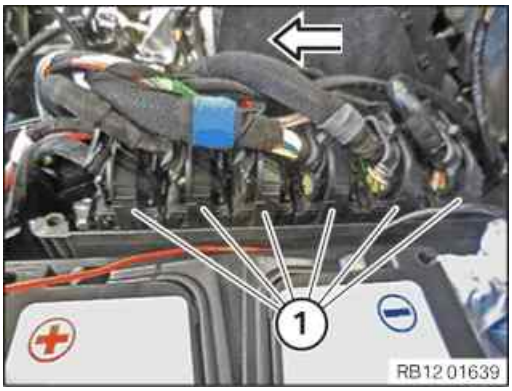
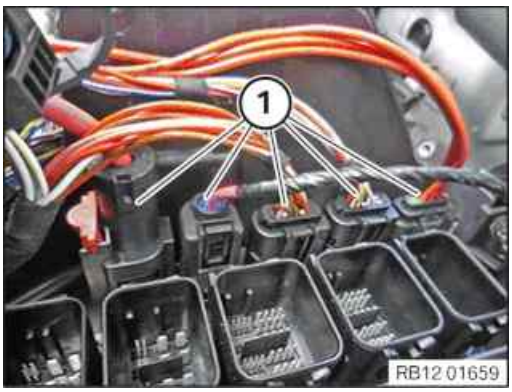


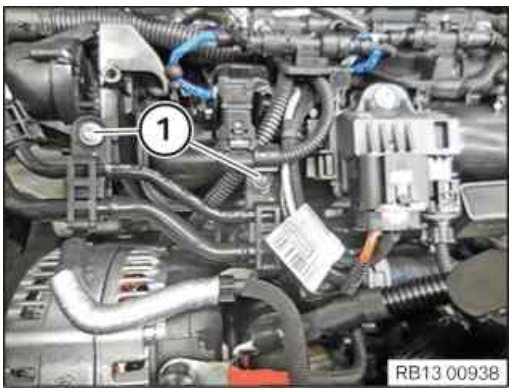
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



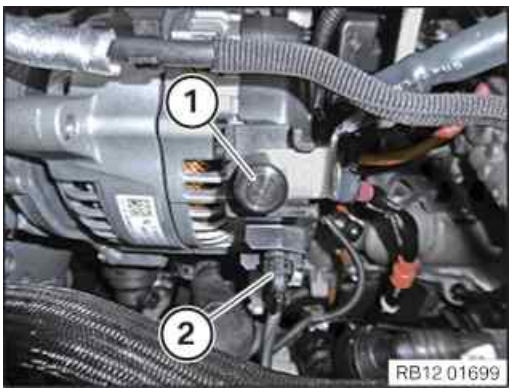
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).



- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

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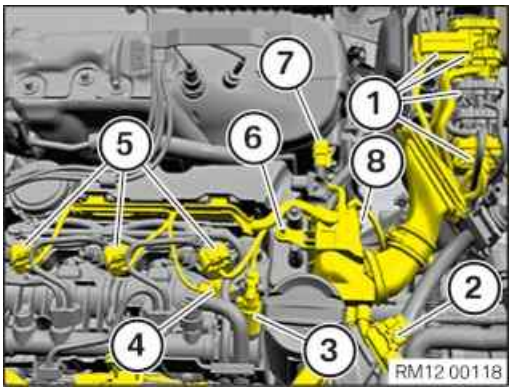
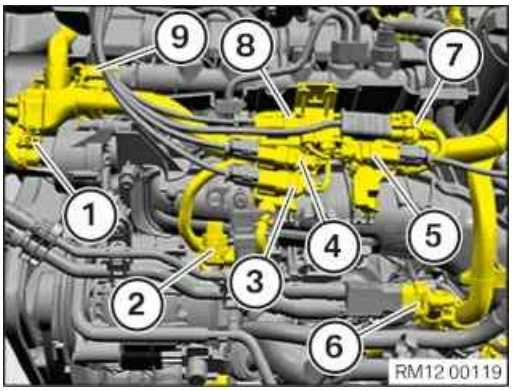
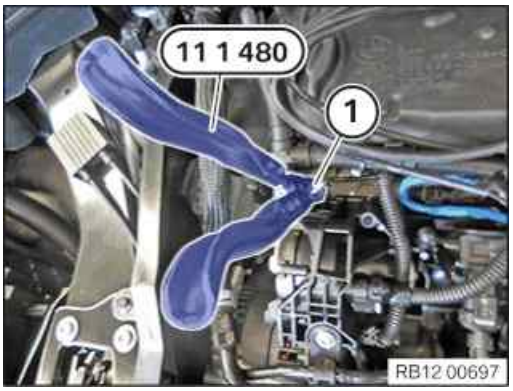


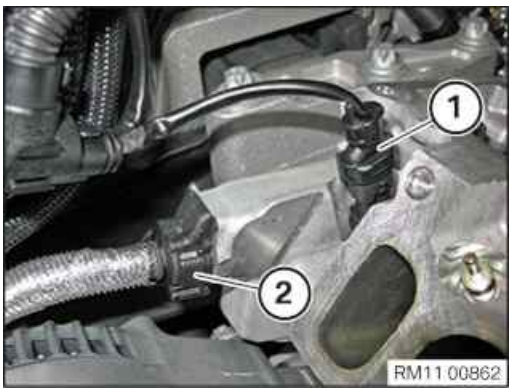
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.



- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

16 – Removing the cable clips from the intake plenum

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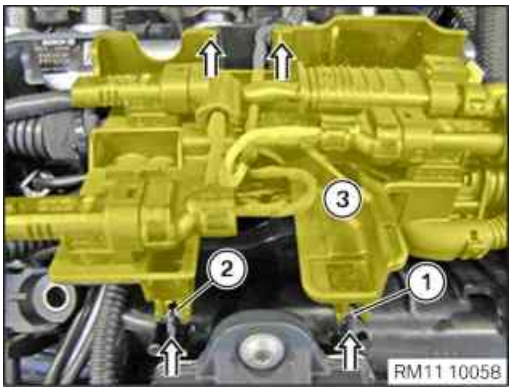


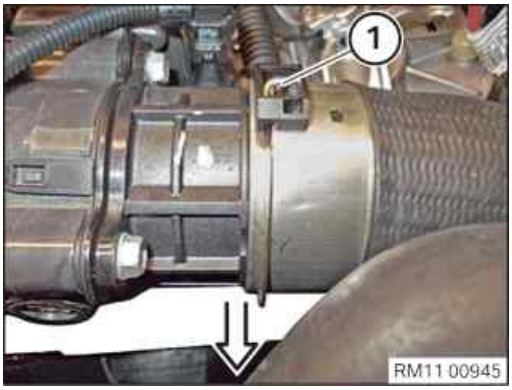
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

17 – Removing the intake plenum

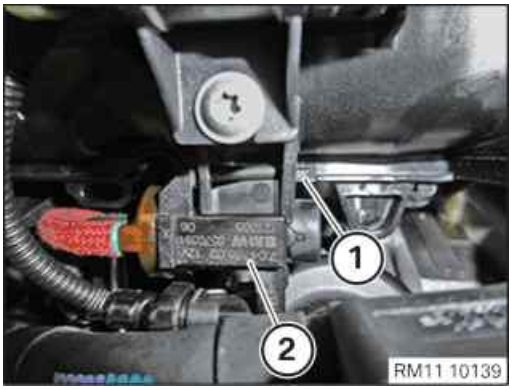
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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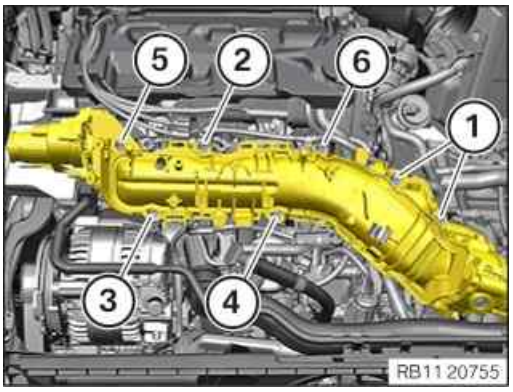
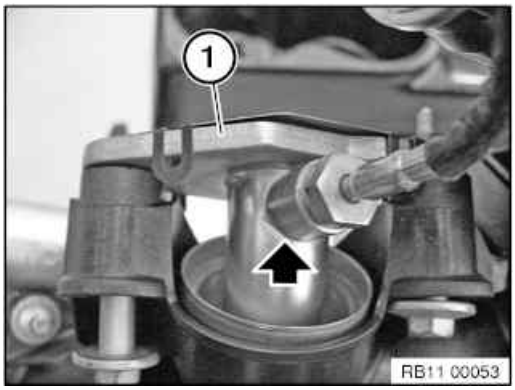
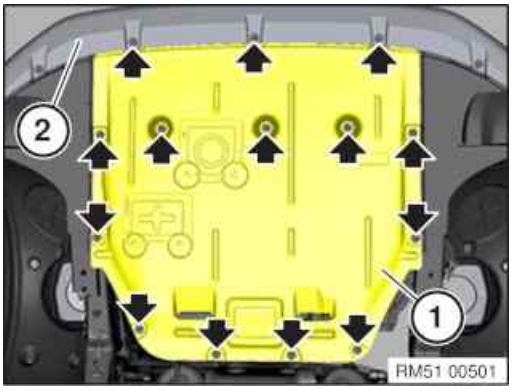


- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

18 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

19 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

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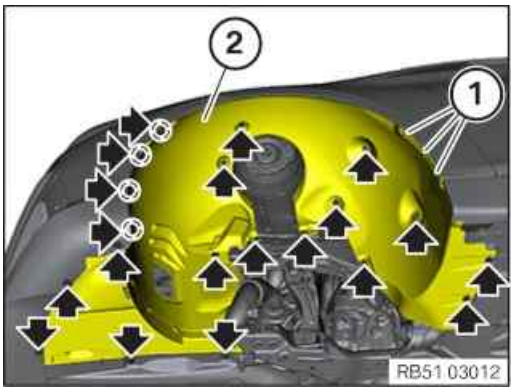
- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

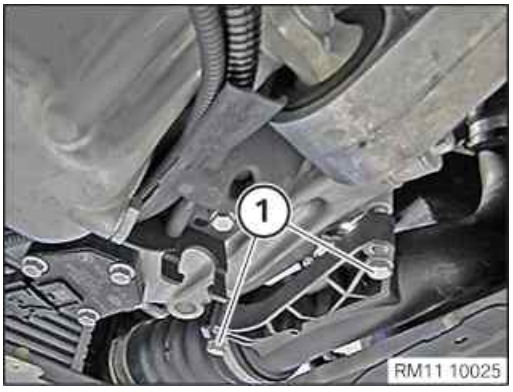
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

20 – Removing the front right wheel arch cover

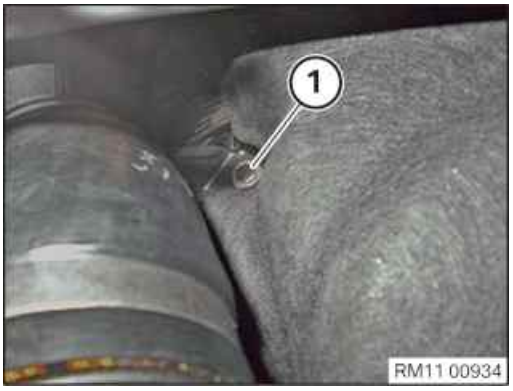


- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

21 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.



- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).

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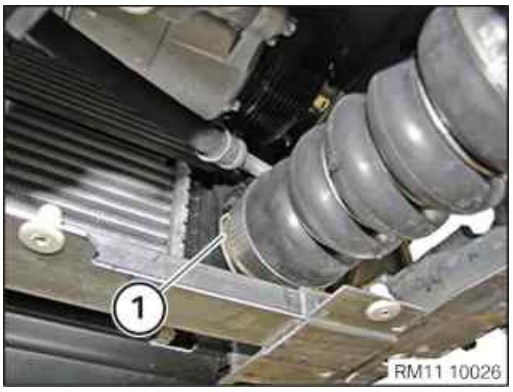
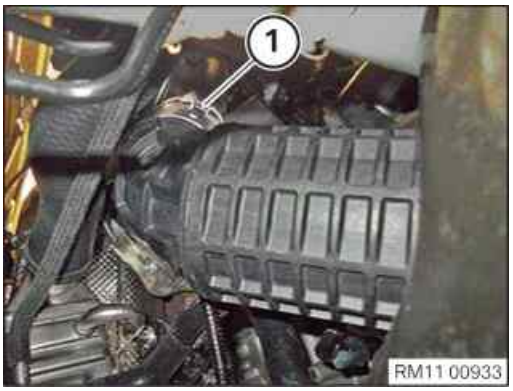
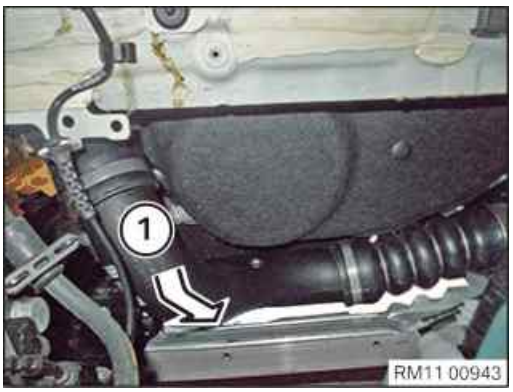


- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

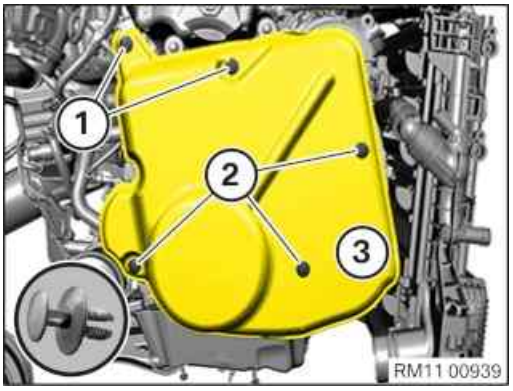


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

22 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

23 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

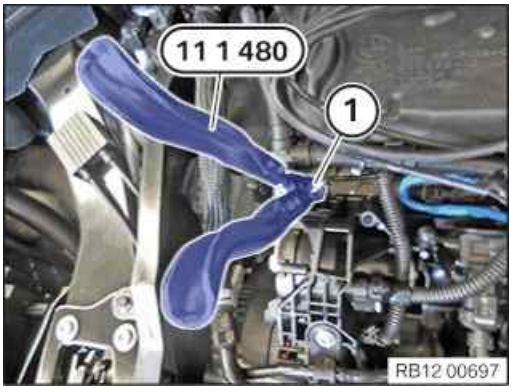
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

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- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

MAIN WORK

24 – Clean the intake system

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
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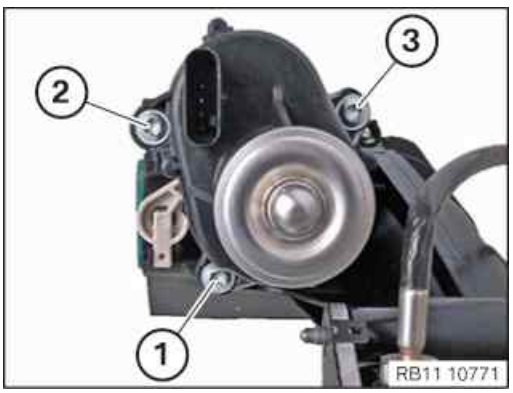
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Loosen screws (1) to (3).

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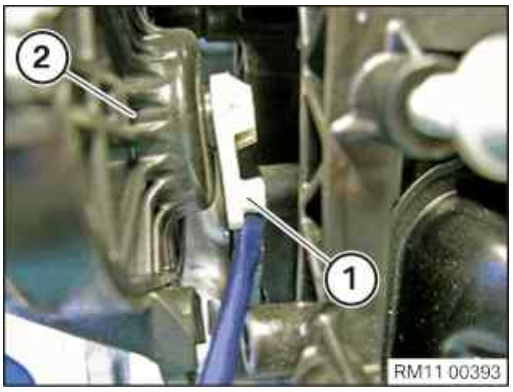
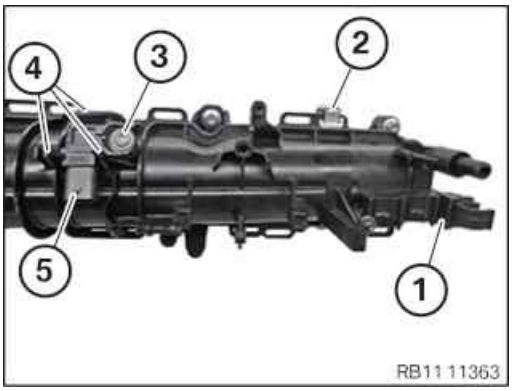
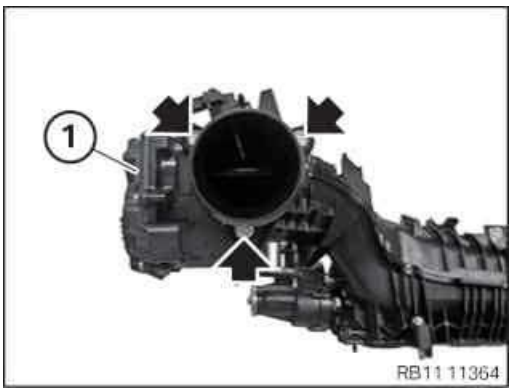


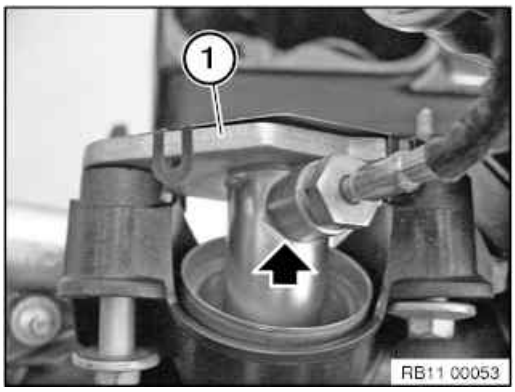
- Carefully release the drive arm (1) from the adjustment lever.
- Remove the swirl-flap controller (2).



- Guide out and remove holder (1).
- Feed out and remove the clamp (2).
- Loosen screw (3).
- Unlock the locks (4).
- Remove the charging pressure sensor (5).



- Remove screws (arrows).
- Remove the throttle bodies (1).



- Remove the exhaust-gas recirculation pipe (1) (arrow).

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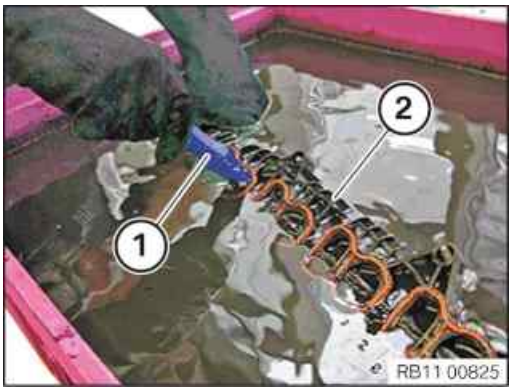


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Mix the cleaning agent in a large collecting vessel.

Cleaning agent

Universal cleaner must be diluted with water.	
Washer fluid	2 parts water, 1 part universal cleaner

Expendable materials: Universal cleaner

- Place the intake system (2) into the collecting vessel.

Clean the intake system

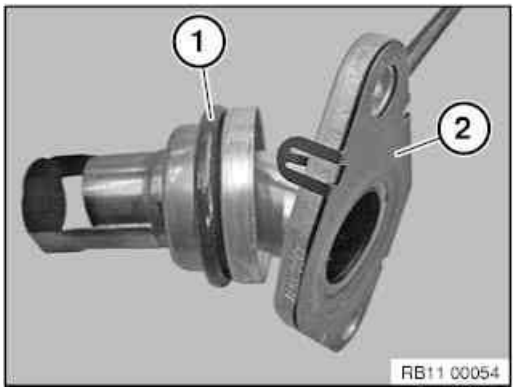
Soaking time of the cleaning agent	1 h

- Clean the intake system (2) with the brushes (1).

Care product

Wheel rim brushes	1x, Set	83192298237

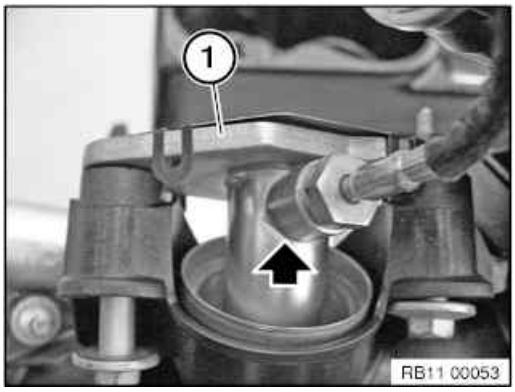
- Then rinse the intake system (2) with water.



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew the gasket (2).

  Parts: Gasket
- Position the seal (2) and clip it in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.
- Position the swirl-flap controller.
- Engage the drive arm of the swirl-flap controller in the adjustment lever of the intake plenum.

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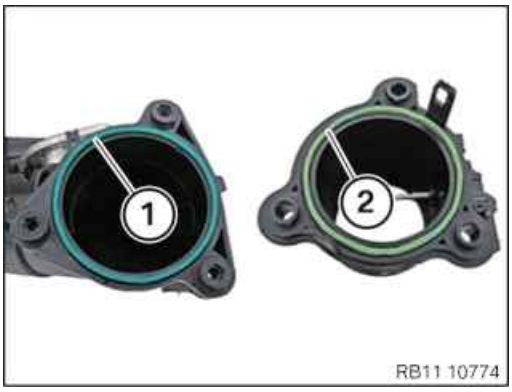
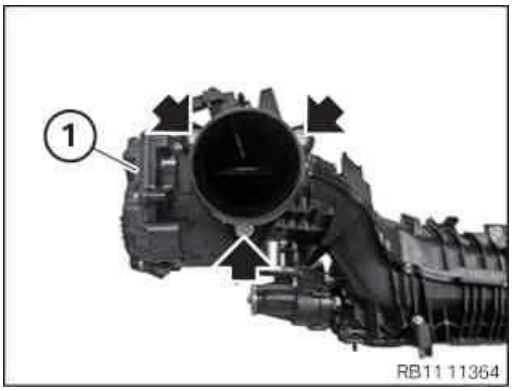


- Renew seal (1) between the intake system and the throttle body.

  Parts: Gasket

- Renew seal (2) between the throttle body and the charge air pipe.

  Parts: Gasket

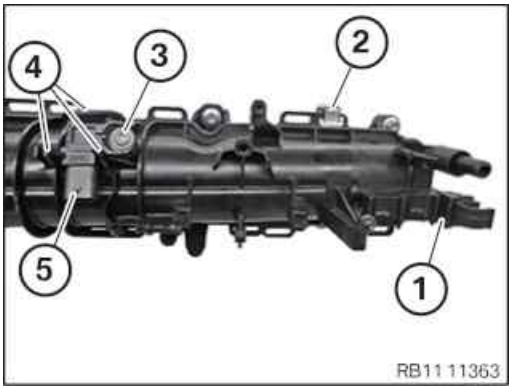


- Feed in and install the throttle body (1).
- Tighten screws (arrows).

Throttle body to intake plenum

6x50		Tightening torque	7 Nm

- Clean the charging pressure sensor and, if necessary, renew it.
- Check the sealing ring (1) for damage and renew where required.
- Lightly coat the sealing ring (1) on the charging pressure sensor with lubricant for the installation.



- Insert and install the charging pressure sensor (5).
- Lock the locks (4).

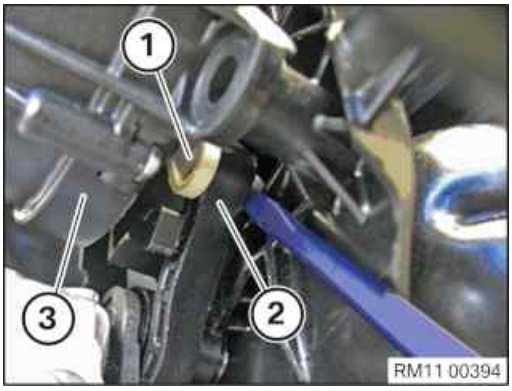
  The locks (4) must engage audibly.

- Tighten down screw (3).

Charging pressure sensor to intake plenum

6x20		Tightening torque	5 Nm

- Feed in and install the clamp (2).
- Insert and install the holder (1).



- Position swirl-flap controller (3).
- Carefully engage the drive arm (1) in the adjustment lever (2).
- Install the swirl-flap controller (3).

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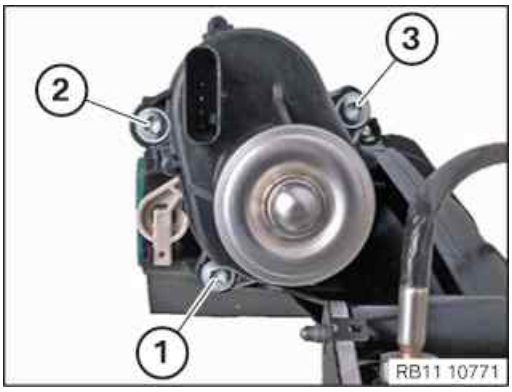


- Tighten screws in the order (1) to (3).

Swirl-flap controller to intake plenum

M6 x 16	Tighten the bolts in alternating order until flush.	4 Nm

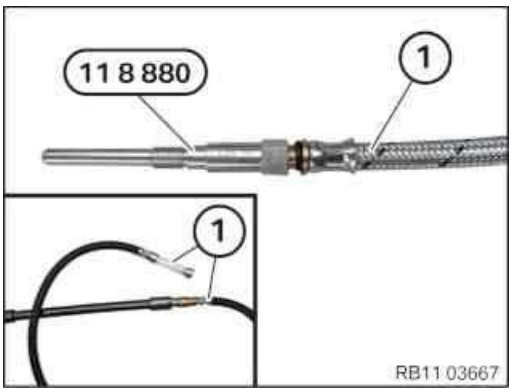
25 – Turn the piston to top dead centre

RISK OF DAMAGE

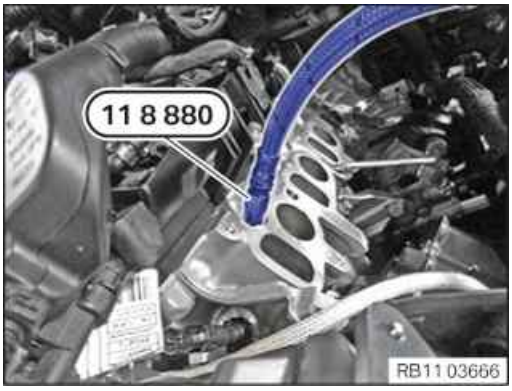
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Connect TDC gauge (1) from set of special tools **2 302 630** to special tool **0 496 146 (11 8 880)**.



- Install special tool **0 496 146 (11 8 880)** in place of the glow element.

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- Fit special tool **0 493 380 (11 6 480)**.

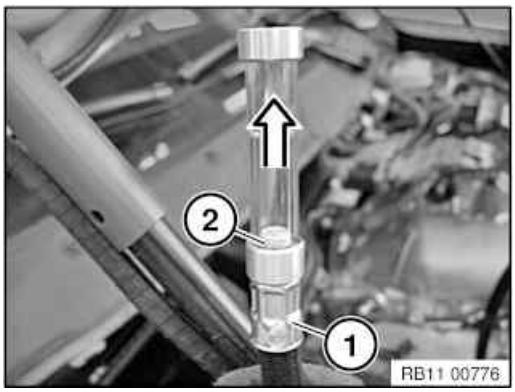
RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Turn the engine by hand using special tool **0 493 380 (11 6 480)**.



- Turn the engine by hand.
- When the piston moves up, the journal (2) in the special tool (1) also moves up.
- In the top dead centre, the piston and also the journal (2) are positioned at the highest point in the special tool (1).
- Turn the piston to the top dead centre.

» The valves are now closed.

RISK OF DAMAGE

Engine damage due to walnut granules in the combustion chamber.

If walnut granules penetrate the combustion chamber while cleaning the intake ports, engine damage may occur.

- Always clean the intake port with valves of the relevant cylinder closed.
- Set the piston of the relevant cylinder to the top dead centre.
- If walnut granules have entered the combustion chamber: Do **not** turn or start the engine by hand. Disassemble the cylinder head and clean all components.

- Engine must not be rotated further.
- Intake valves (1) must be closed while cleaning.

26 – Cleaning intake ports

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

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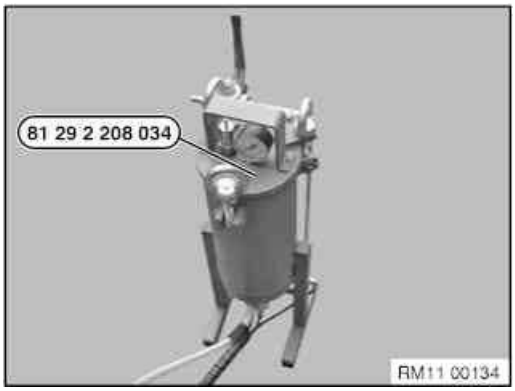
RISK OF DAMAGE

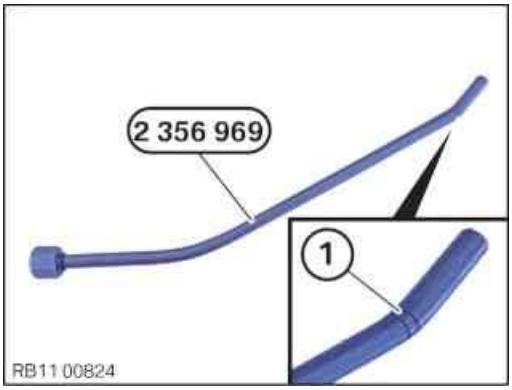
Engine damage due to walnut granules in the combustion chamber.

If walnut granules penetrate the combustion chamber while cleaning the intake ports, engine damage may occur.

- Always clean the intake port with valves of the relevant cylinder closed.
- Set the piston of the relevant cylinder to the top dead centre.
- If walnut granules have entered the combustion chamber: Do **not** turn or start the engine by hand. Disassemble the cylinder head and clean all components.



- Keep the special tool **2 208 034**, the walnut granules and a vacuum cleaner ready.



- Have the special tool **2 356 969** ready.

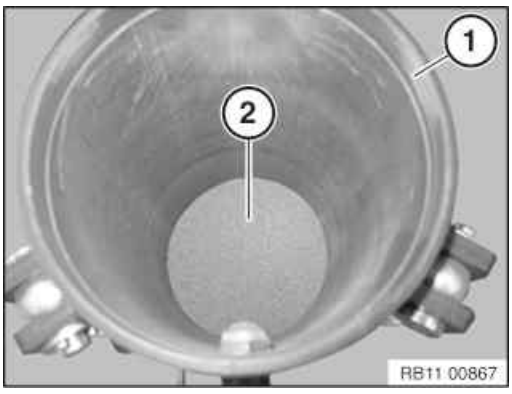
TECHNICAL INFORMATION

The front area of the blasting wand is marked with two notches. These may additionally be highlighted in colour.

During the blasting process, only pull the blasting wand out of the vacuum adapter until the mark becomes visible.

- Observe the mark (1).

- Stage special tools **2 356 966** and **2 356 967**.



- Open blasting device (1).
- Fill in walnut granules (2).

Walnut granules

Quantity for each blasting process	2 l

- Close blasting device (1).

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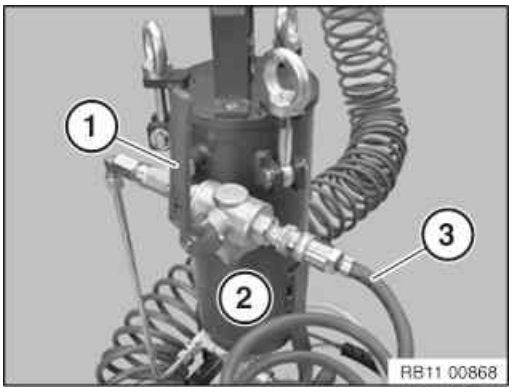
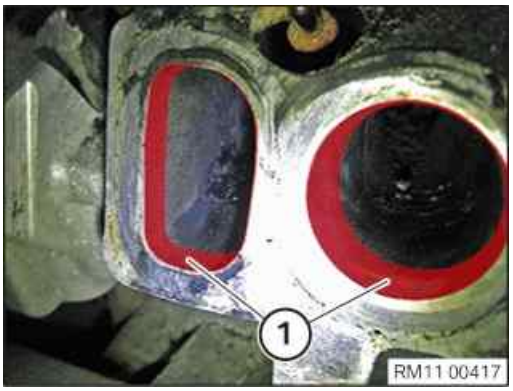


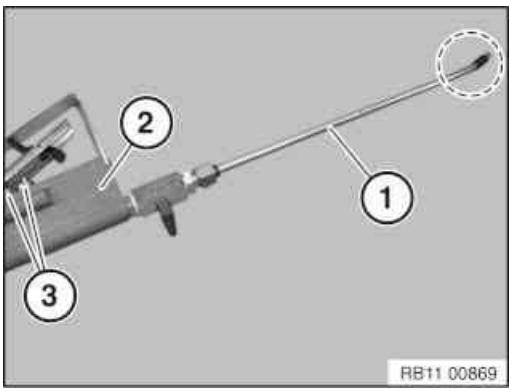
- Close the valve (1) on the blasting device (2).
- Connect compressed air (3).

Cleaning the intake ports

Operating pressure	6 bar ... 8 bar

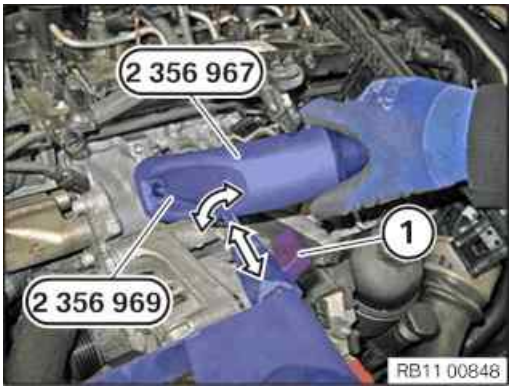


- Clean marked areas (1) with a brush.



- Attach the blasting wand (2) to the blasting device (1).

- Connect the special tool **2 356 967** to a vacuum cleaner.
- Insert the special tool **2 356 967** into the swirl port of cylinder 1.



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Insert the special tool **2 356 969** into the special tool **2 356 967**.
- Open the valve (1).
- Move the blasting wand forwards and backwards and rotate.

  This removes any dirt in the tangential port.

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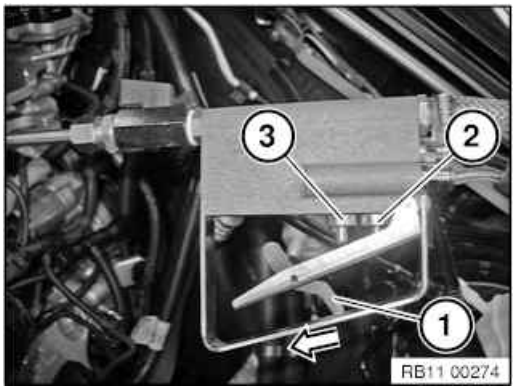


- Slide the locking lever (1) forward in the direction of the arrow.
- To release the compressed air: Actuate valve (2).
- To release the walnut granules and the compressed air: Actuate valves (1) and (2).
- Clean the swirl port.

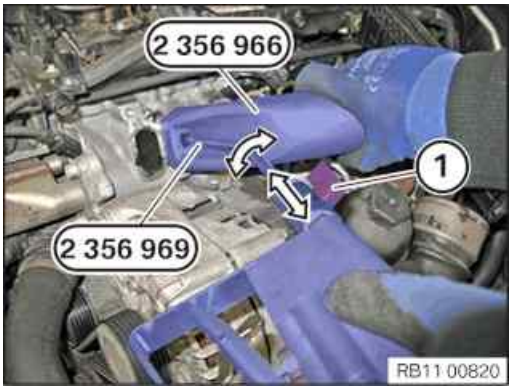
Cleaning the intake ports

Blast duration with walnut granules	Approx. 20 s
Blast duration with pure compressed air for the complete blowing out of walnut granules	Approx. 10 s

- Close the valve on the blasting wand.

» Check the pressure drop at the pressure measuring device.

- Connect the special tool **2 356 967** to a vacuum cleaner.
- Insert the special tool **2 356 967** into the swirl port of cylinder 1.

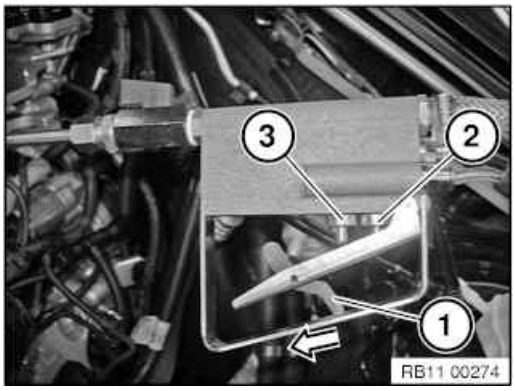


TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Insert the special tool **2 356 969** into the special tool **2 356 967**.
- Open the valve (1).
- Move the blasting wand forwards and backwards and rotate.

  This removes any dirt in the swirl port.



- Slide the locking lever (1) forward in the direction of the arrow.
- To release the compressed air: Actuate valve (2).
- To release the walnut granules and the compressed air: Actuate valves (1) and (2).
- Clean the swirl port.

Cleaning the intake ports

Blast duration with walnut granules	Approx. 20 s
Blast duration with pure compressed air for the complete blowing out of walnut granules	Approx. 10 s

- Close the valve on the blasting wand.

» Check the pressure drop at the pressure measuring device.

- Perform the following steps one after another on all the other cylinders:
  - Turn the piston to top dead centre
  - Cleaning intake ports

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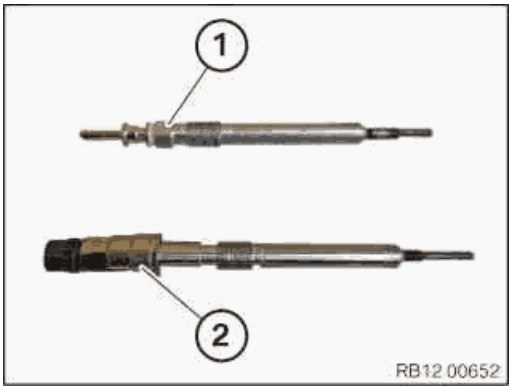
27 – Install glow elements

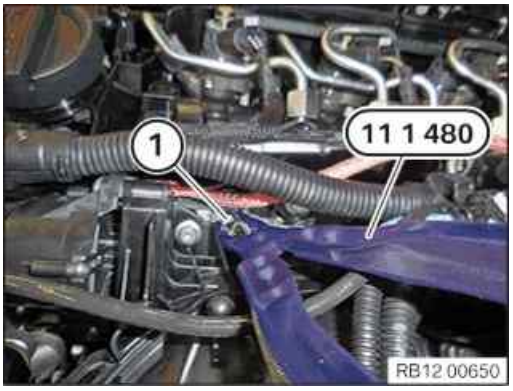


- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

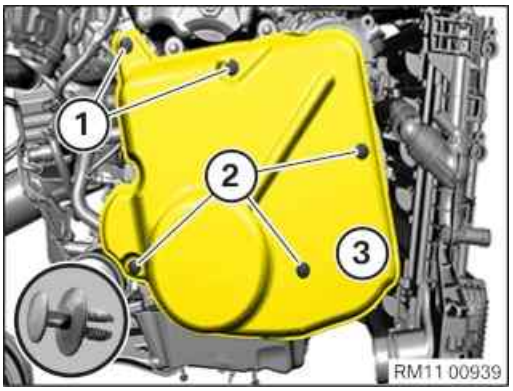
Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

28 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

29 – Install right charge air duct

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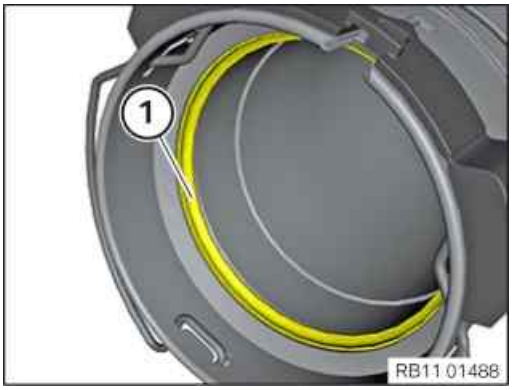
RISK OF DAMAGE

Damage to the exhaust turbocharger.

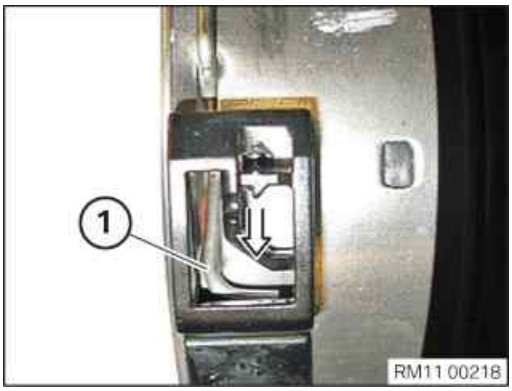
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

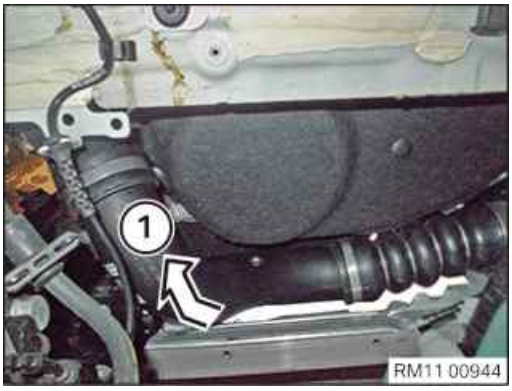


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

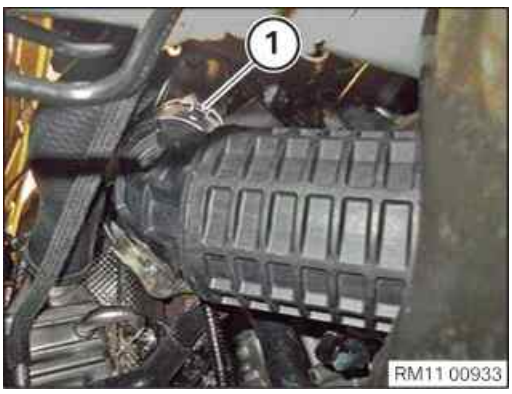
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.

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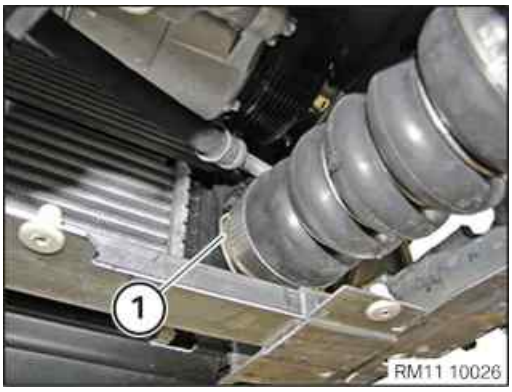


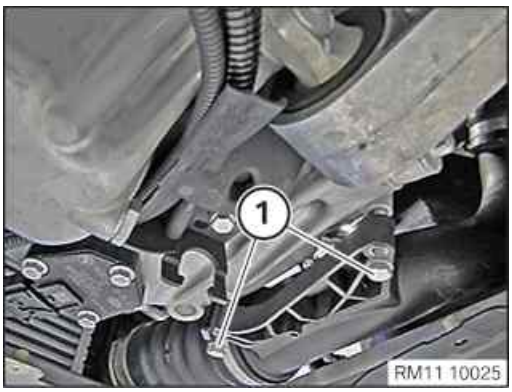
- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

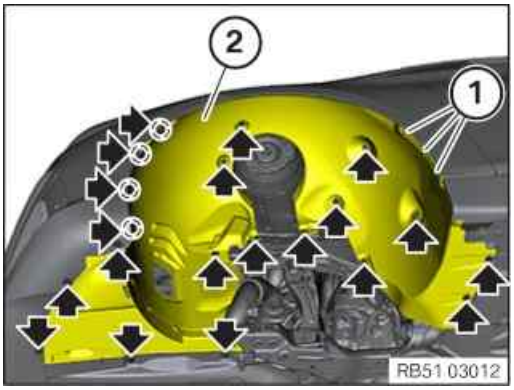


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

30 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

31 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

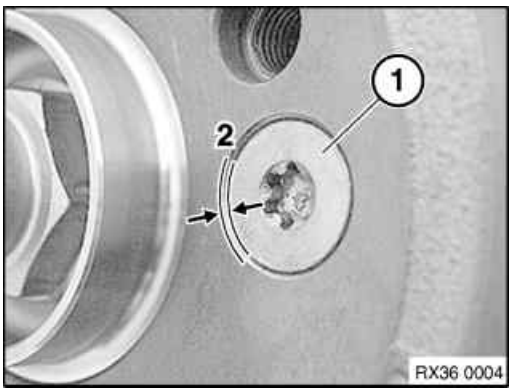
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

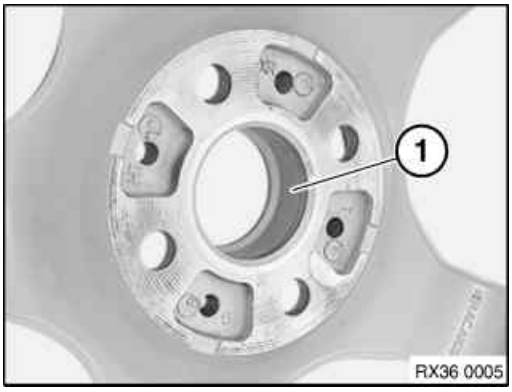


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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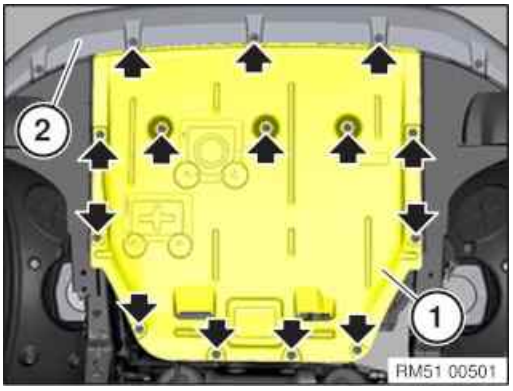
32 – Installing the front underbody protection

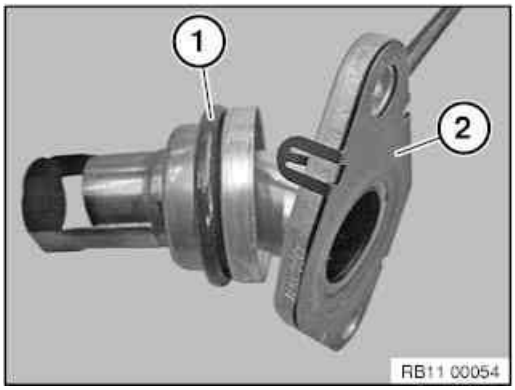


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

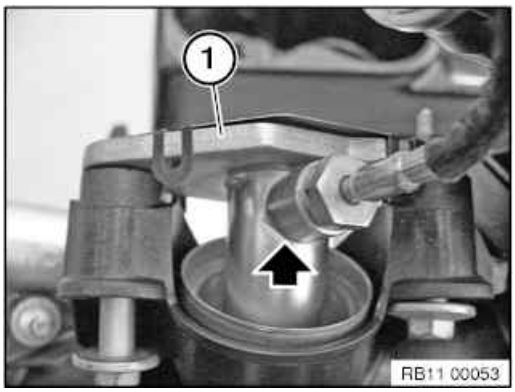
33 – Installing the intake plenum



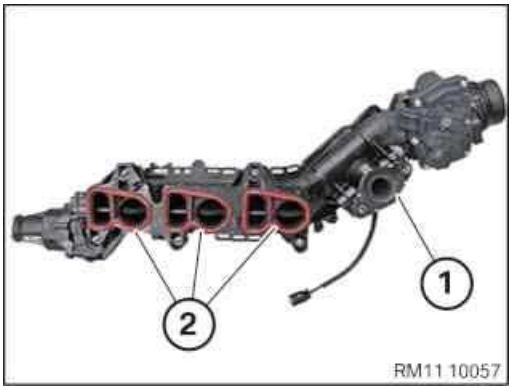
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

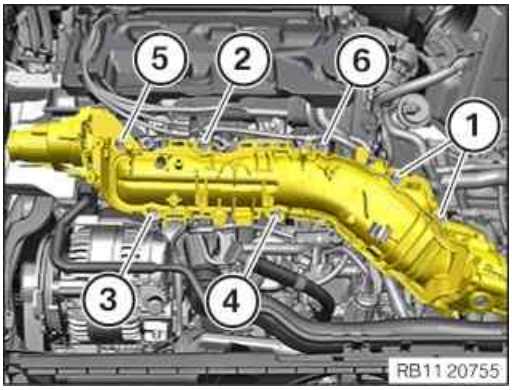


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

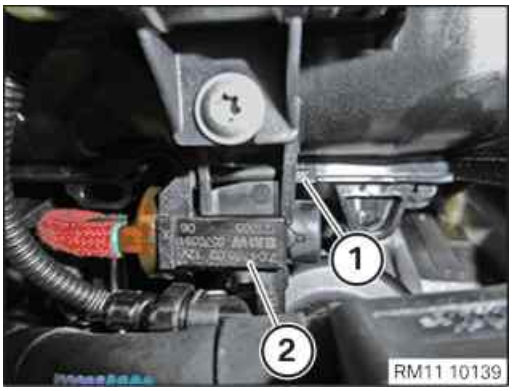
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.

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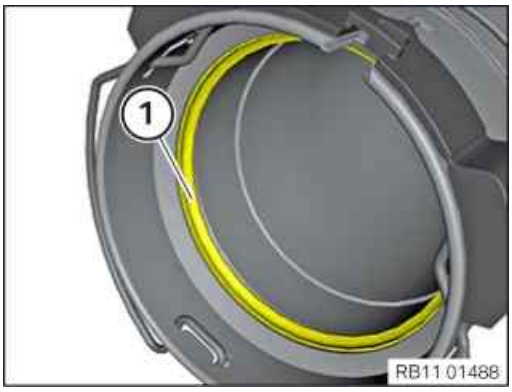
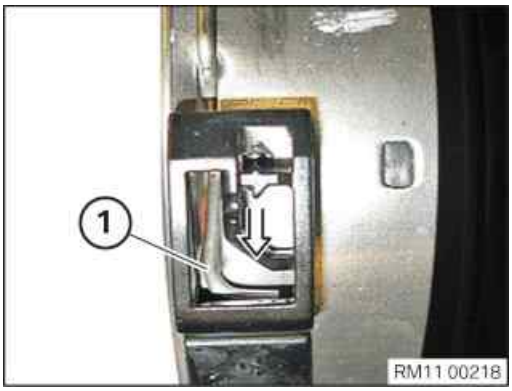
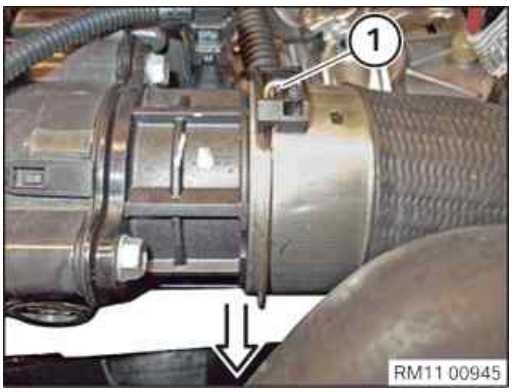


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



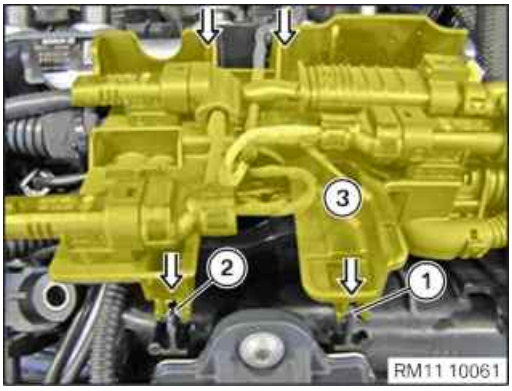
- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

34 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

35 – Fastening the wiring harness section for the intake plenum

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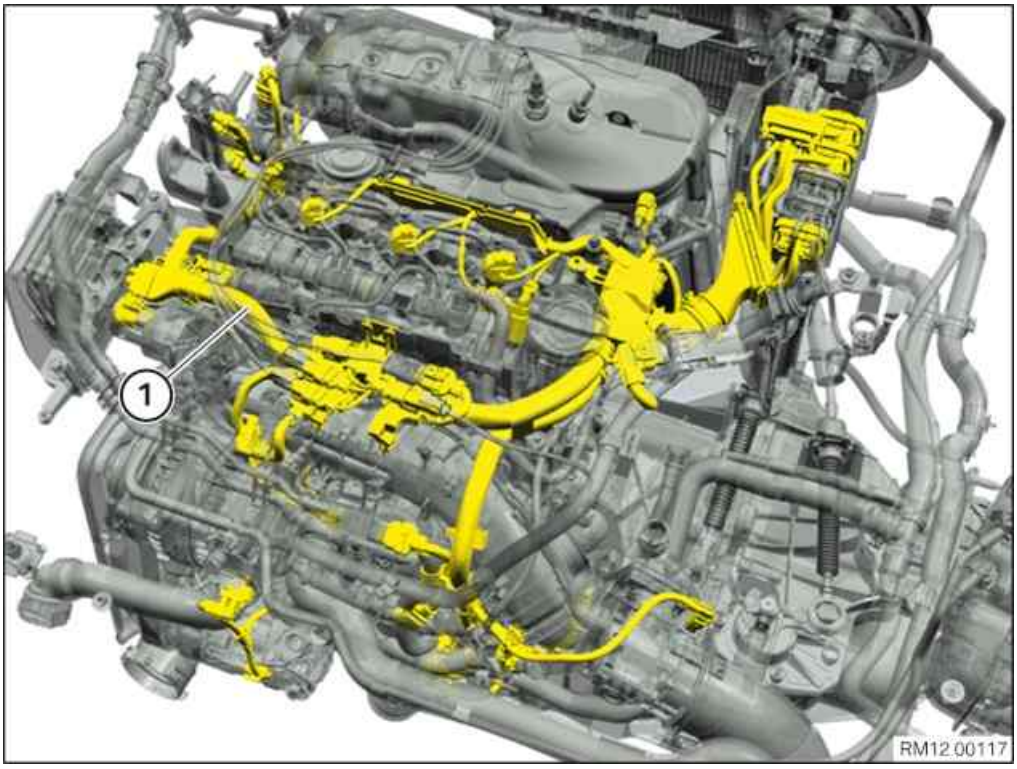
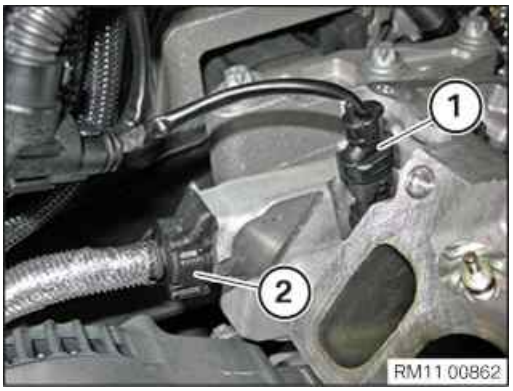
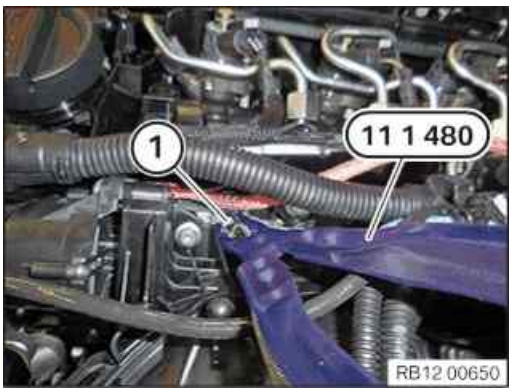
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

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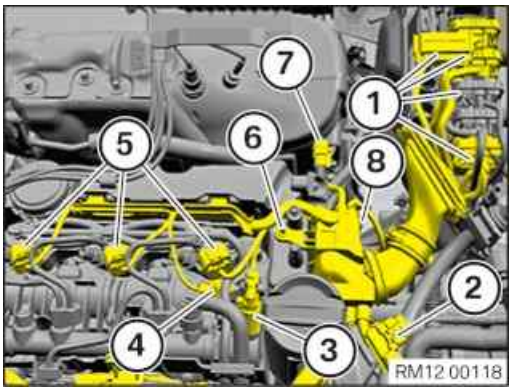
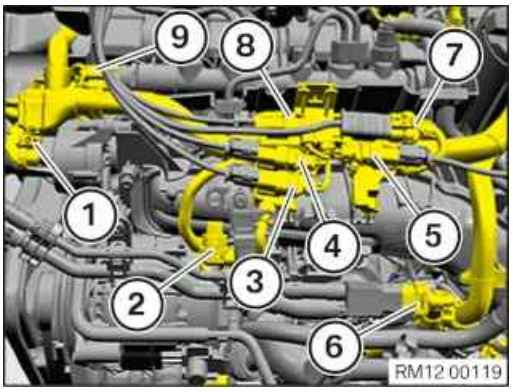


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

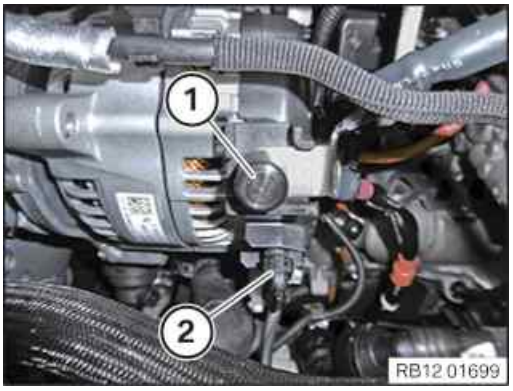
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

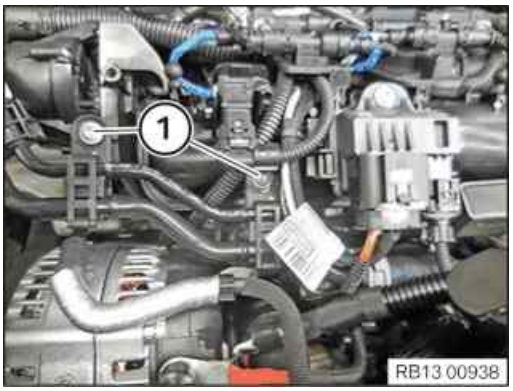


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm



- Position fuel lines.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

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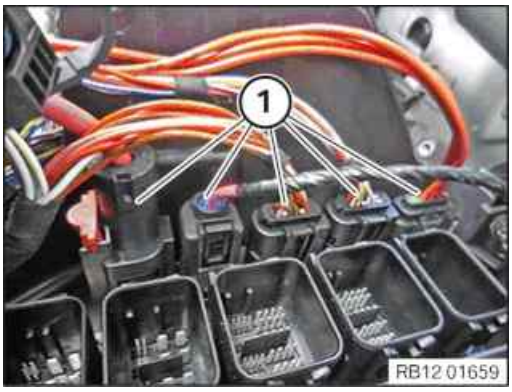
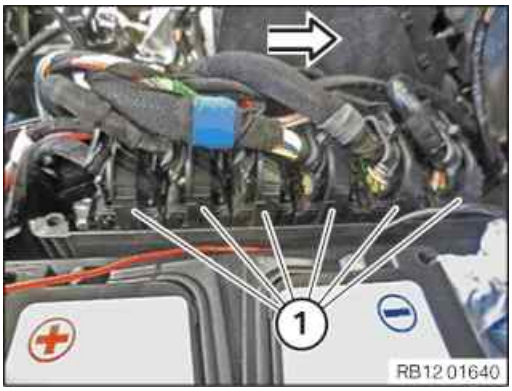
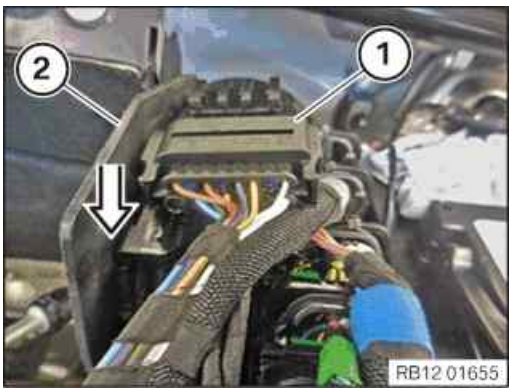


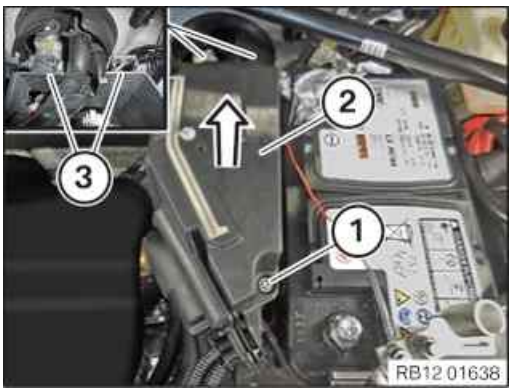
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



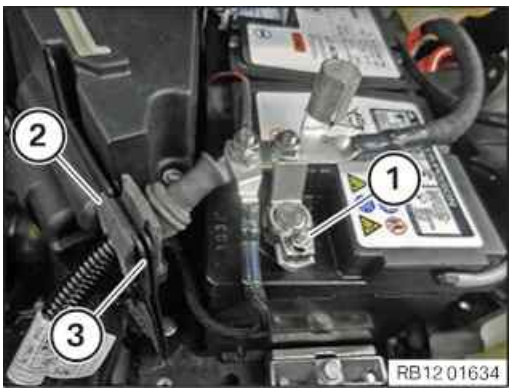
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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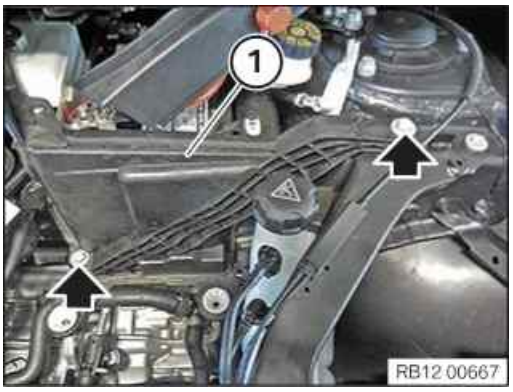


- Feed in and install tension strut (1).
- Tighten screws (arrows).

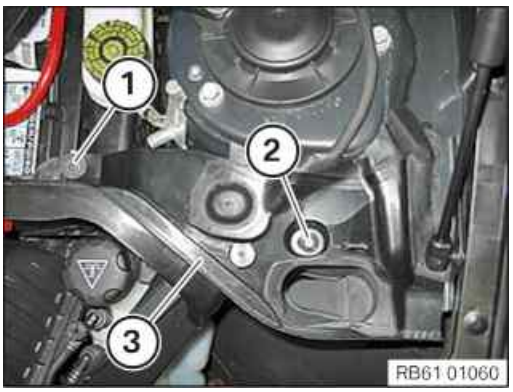
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

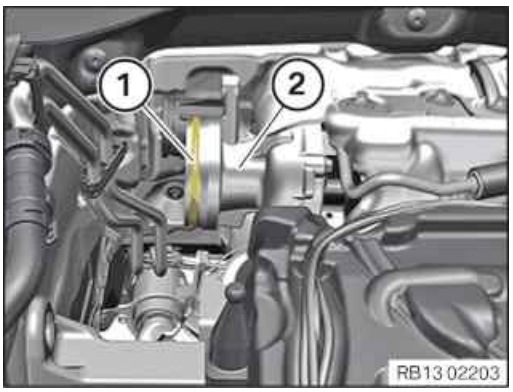


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

36 – Partially securing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.

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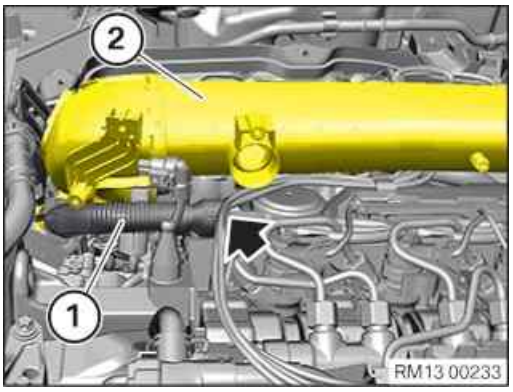
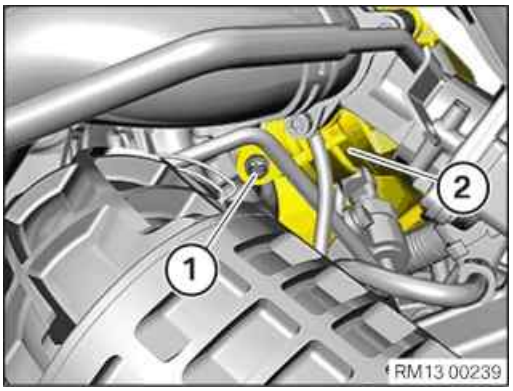


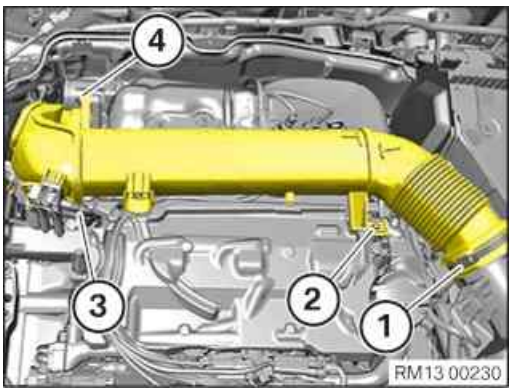
- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

37 – Installing intake silencer housing

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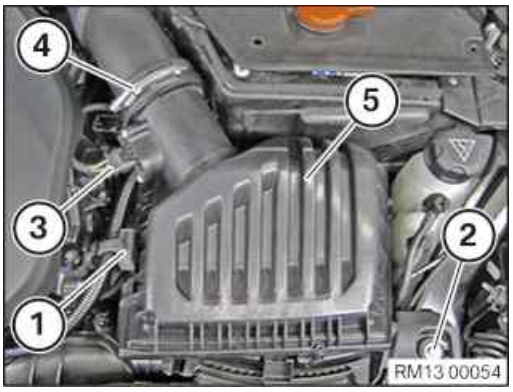


- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

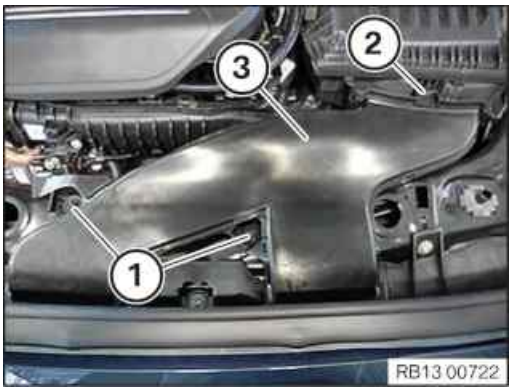
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

38 – Install the intake neck for the intake filter housing



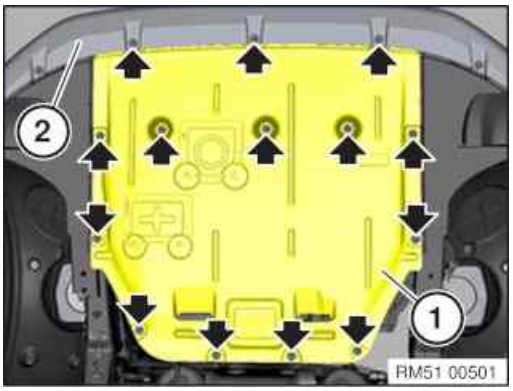
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

39 – Installing the front underbody protection

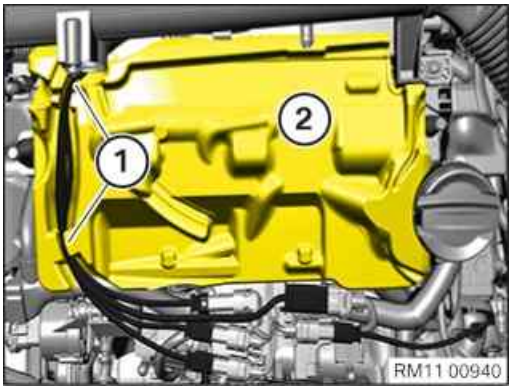


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

40 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

41 – Install resonator

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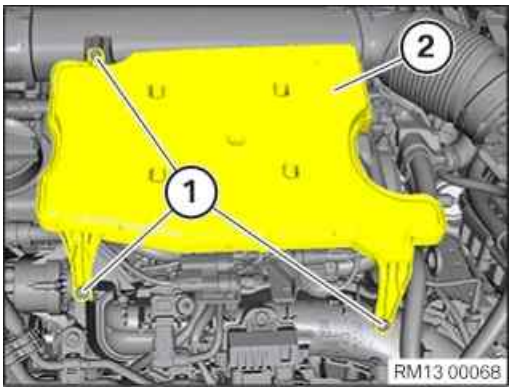

- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

42 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

43 – Installing the upper bulkhead cover

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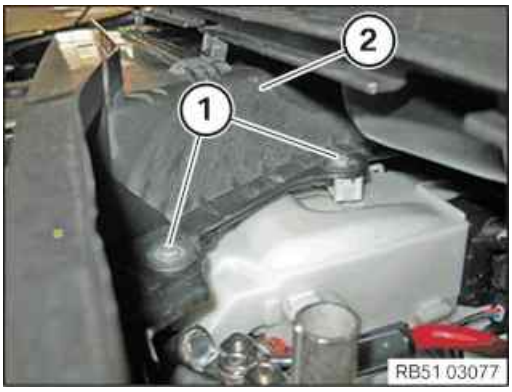
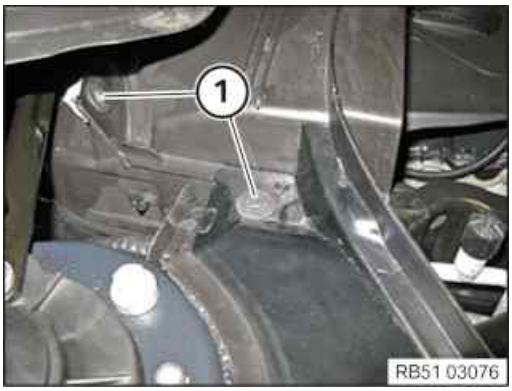


- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

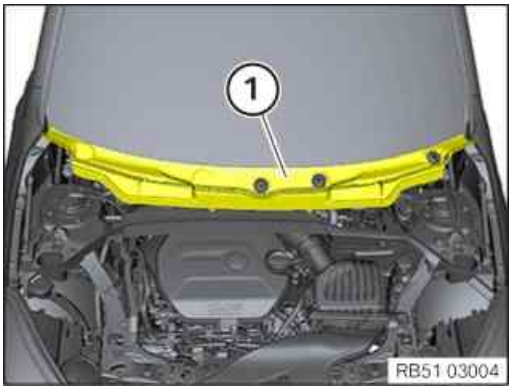
Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

44 – Install the rear cowl panel cover



- Feed in and engage the rear cowl panel cover (1).

45 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**

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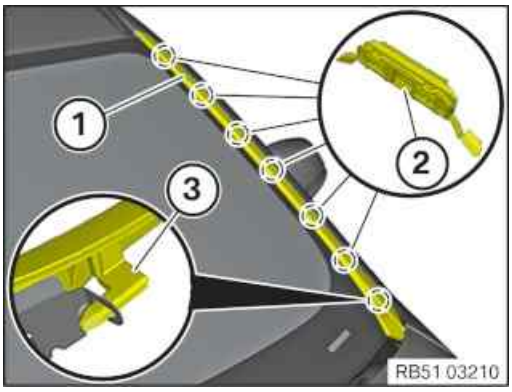


- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

46 – Install left and right wiper arm

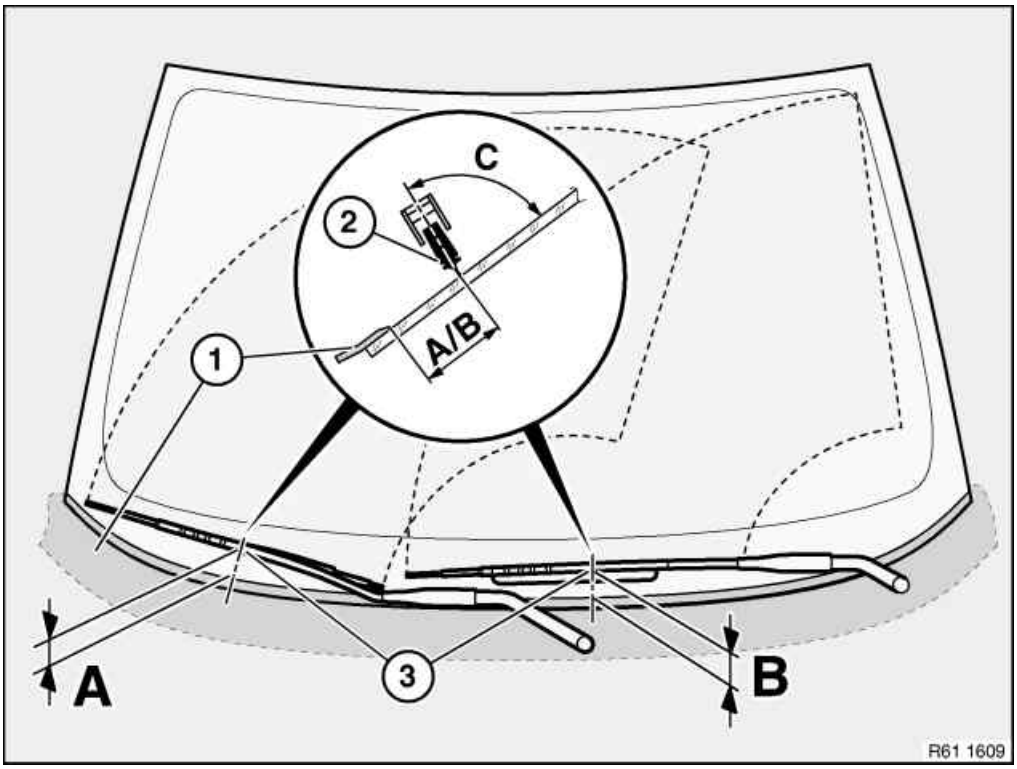
NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

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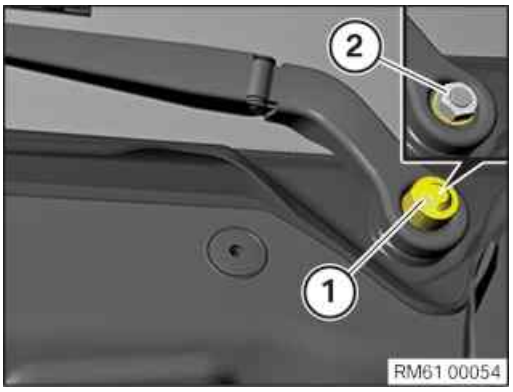


NOTICE

Description is for left component only. Procedure on the right side is identical.

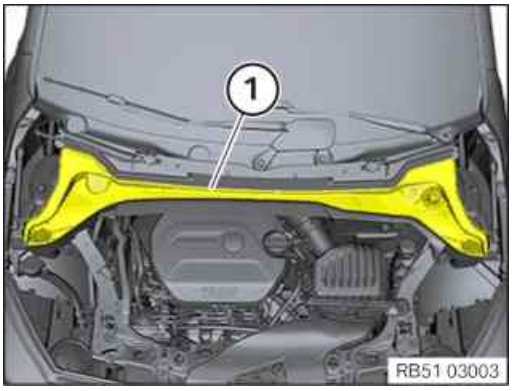
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

47 – Installing front cowl panel cover

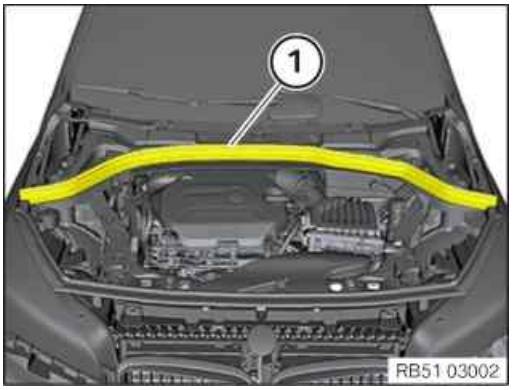


- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

48 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

49 – Disconnecting all battery earth leads

- See additional information.

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50 – Delete adaptations

- Connect diagnosis system.
  - Power train
  - Digital diesel electronics (DDE)
  - Reset adaptations
  - Delete adaptations

Additional Information

Overview of Tightening Torques

Throttle body to intake plenum			Used in step 24
6x50		Tightening torque	7 Nm

Charging pressure sensor to intake plenum			Used in step 24
6x20		Tightening torque	5 Nm

Swirl-flap controller to intake plenum			Used in step 24
M6 x 16	Tighten the bolts in alternating order until flush.		4 Nm

Glow elements to cylinder head			Used in step 27
Glow element		Tightening torque	13 Nm

Charge air line to crankcase			Used in step 29
M6x25		Tightening torque	5 Nm

Charge air duct to oil sump			Used in step 29
M6		Tightening torque	8 Nm

Wheel arch cover			Used in step 30
Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub			Used in step 31
M8	Renew screw.		16 Nm

Wheel bolts			Used in step 31
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front			Used in step 32 39
			3 Nm

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Intake plenum to cylinder head — Used in step 33

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover — Used in step 35

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator — Used in step 35

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 35

TS6x20		Tightening torque	5 Nm

Cover to electronics box — Used in step 35

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 35

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 35

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 35

		Tightening torque	3 Nm

Battery cover — Used in step 35

Screw			2,8 Nm

Clean air pipe to exhaust turbocharger — Used in step 36

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 36

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 36 37

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge — Used in step 37

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 38

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe — Used in step 41

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 43

Screw		Tightening torque	3 Nm

Windscreen wiper arm — Used in step 46

Combination hexagon nut		Tightening torque	35 Nm

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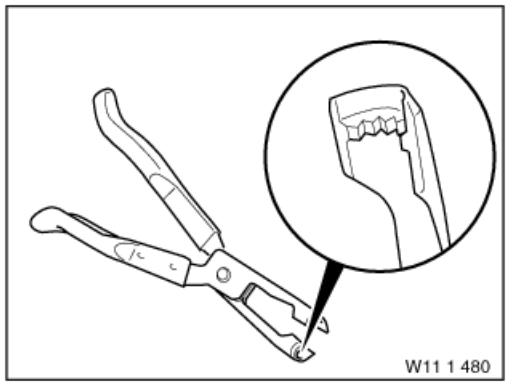
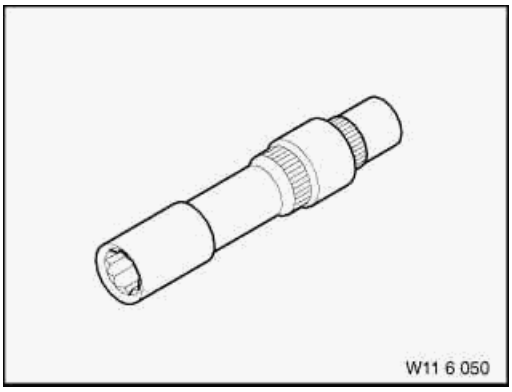
Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common	Used in step 15 23
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 491 068 (11 6 050) Socket wrench insert



Common	Used in step 23 27
Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 302 630 Tester

Common	Used in step 25
Usage	Leitenberger DRV05 with OT gauge OT04 and adapter no.60 from the adapter set. This test requires only a one-time removal of the electrical machine electronics. After removing the spark plugs, the test for the loss of pressure can be carried out. This is essential for E72, as a conventional compression test is uneconomical for the reasons given below. Remove the electrical machine electronics, install the eight hoses for the compression test, install the electrical machine electronics, fill coolant and carry out the compression test. With this, the development of the 8-part hose set for the compression test is not required any more.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	02 03 12 (804)

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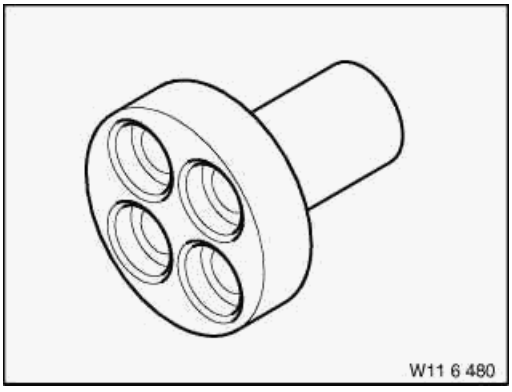
0 496 146 (11 8 880) Adapter

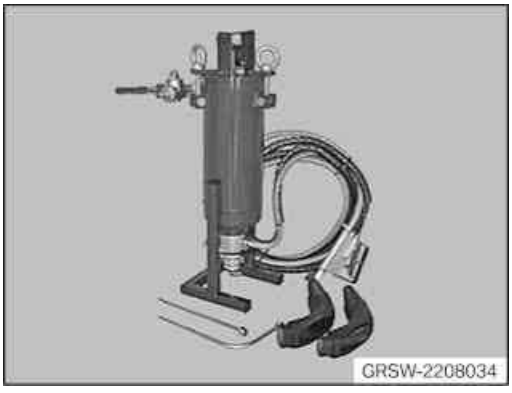
Common	Used in step 25
Usage	For compression testing.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 493 380 (11 6 480) Connector



Common	Used in step 25
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 208 034 Blasting material device



Common	Used in step 26
Usage	For cleaning of the intake ports and the intake valves.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 02 10 (650)

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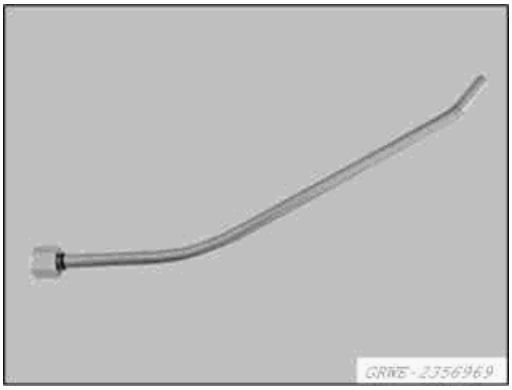
2 356 969 Beam probe



Common	Used in step 26
Usage	For cleaning of the intake ports and the intake valves.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Blasting tool 81292208034
SI-Number	08 25 13 (059)

2 356 966 Vacuum adapter

Common	Used in step 26
Usage	For cleaning of the intake ports and the intake valves.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	2208034
SI-Number	08 25 13 (059)

2 356 967 Vacuum adapter

Common	Used in step 26
Usage	For cleaning of the intake ports and the intake valves.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Blasting tool 81292208034
SI-Number	08 25 13 (059)

2 344 011 Tool

Common	Used in step 31
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

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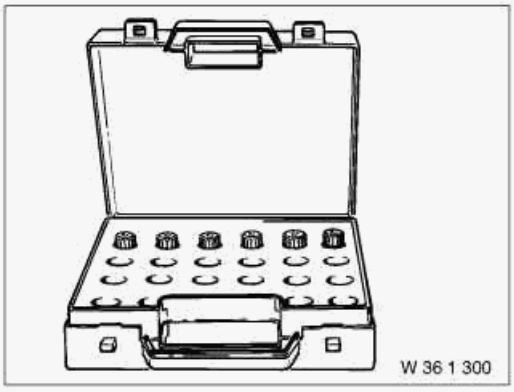
0 495 221 (36 1 323) Wheel stud



Common	Used in step 19
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 19
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 19
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 19
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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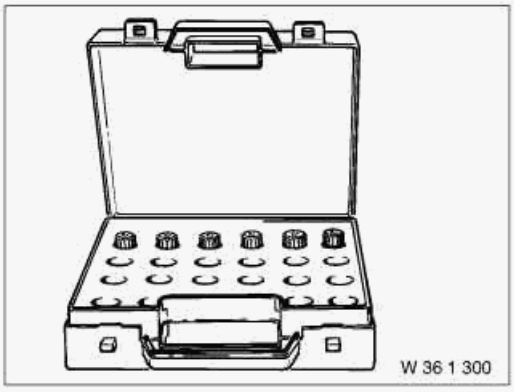
0 495 227 (36 1 329) Wheel stud



Common	Used in step 19
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 19
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 19
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 19
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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Overview Technical Data

Cleaning agent	Used in step 24
Universal cleaner must be diluted with water.	
Washer fluid	2 parts water, 1 part universal cleaner
Expendable materials: Universal cleaner	

Clean the intake system	Used in step 24
Soaking time of the cleaning agent	1 h

Walnut granules	Used in step 26
Quantity for each blasting process	2 l

Cleaning the intake ports	Used in step 26
Operating pressure	6 bar ... 8 bar

Cleaning the intake ports	Used in step 26
Blast duration with walnut granules	Approx. 20 s
Blast duration with pure compressed air for the complete blowing out of walnut granules	Approx. 10 s

Links

Functional descriptions	Used in step
Reset adaptations	50

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 49
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 49
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
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61 20 900 Disconnecting and connecting battery earth lead	1 49

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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 35 ... Notes on ESD protection (Electro Static Discharge)	23

Operating materials	Used in step
2.0 Grease for wheel centring	31

Parts

Parts required

Designation	Used in step
Intake system seal to throttle body	24
Throttle body gasket to charge air pipe with integrated temperature sensor for intake air	24
Charging pressure sensor seal to intake system	24

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11 12 800 Clean cylinder head intake channels and intake plenums

Special tools required:

- 11 8 880
- 11 0 235
- 2 302 630
- 11 6 480
- 11 6 050
- 2 356 969
- 2 356 966
- 2 356 967

Necessary preliminary work:

- Disconnect negative battery lead
- Removing intake plenum
- Remove front right wheel arch panel

Dismantle intake plenum:

- Remove throttle body
- Remove adjuster
- Remove charging pressure sensor
- Remove the temperature sensor for the exhaust-gas recirculation
- If applicable, remove preheating control unit

Wear protective goggles and gloves.

Caution!
Never place electrical components in cleaning agent!

Cleaning intake plenum:

- Wear personal protective clothing/equipment
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (see Section 3.2)
- Place intake plenum in cleaning agent
- Observe application time of at least 1 hour

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Cleaning intake ports: Caution!

Risk of engine damage!

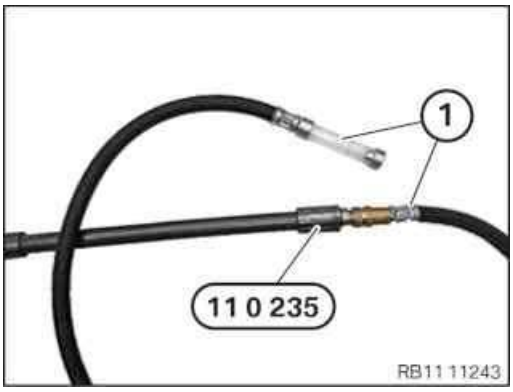
When cleaning the intake ports, it must be ensured that the intake valves of the corresponding cylinder are closed.

Determine the TDC (intake valves closed) using a TDC determination unit via the glow-plug hole.

Start with the 1st cylinder when cleaning the intake ports.

Remove glow-plug cylinder 1.

Screw in special tools 11 8 880 and 11 0 235 .



Connect TDC determination unit (1) from special tool 2 302 630 with special tool 11 0 235 .

Turn the engine with special tool 11 6 480 on the central bolt till cylinder 1 is in TDC position.**Caution!**

Do not crank engine in reverse direction.

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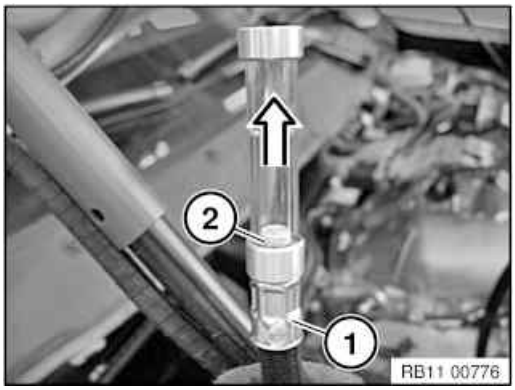
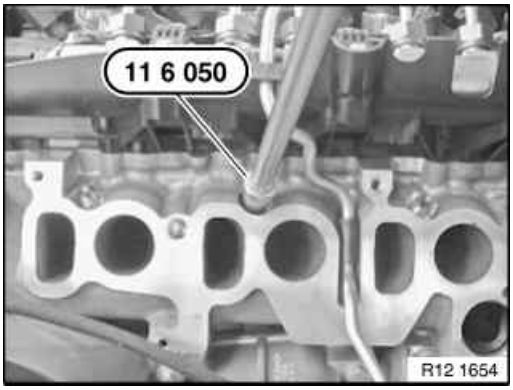


Caution!

Determine the TDC (intake valves closed) using a TDC determination unit (1) via the glow-plug hole.

Turn the engine on the central bolt until cylinder 1 is in TDC position.

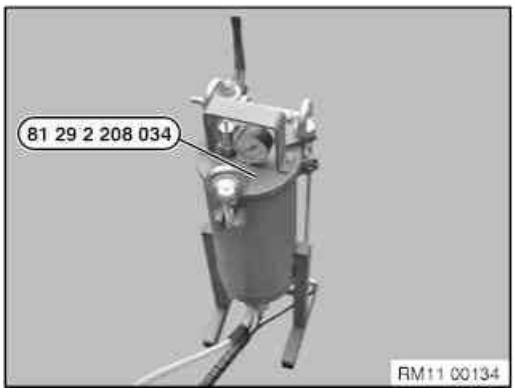


Remove special tools.

Reinstall glow-plug using special tool 11 6 050 .

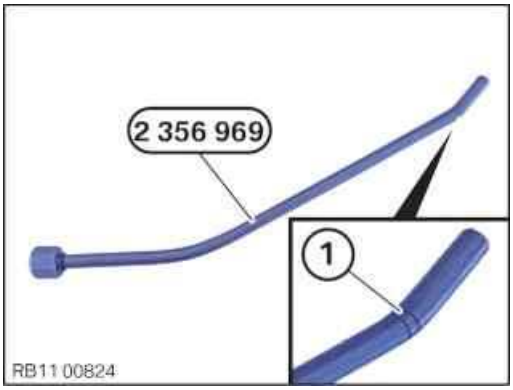
Installation note:

Tightening torque 12 23 1AZ.



The following are required:

- Blasting tool 81 29 2 208 034
- Walnut shell granulate
- Vacuum cleaner



Caution!

Front area of sensors is marked with two notches. These can additionally be highlighted in colour.

During the blasting process, only pull the wands out of the vacuum adapter until the mark becomes visible.

Blasting wand for swirl ports:

- 2 356 969

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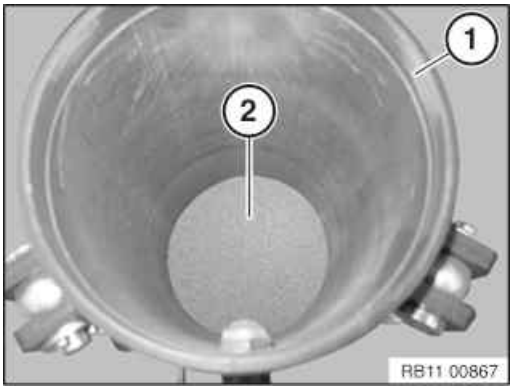
Vacuum adapter for tangential swirl port:

- 2 356 966

Vacuum adapter for swirl port:

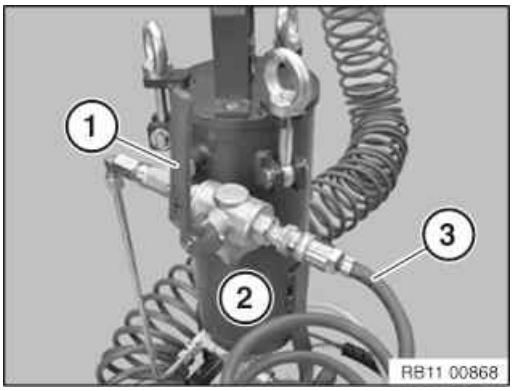
- 2 356 967



Note:
Use 2 litres of granulate per cleaning operation; this corresponds to a blasting duration of approx. 20 seconds.

Open blasting tool (1) and pour in 2 litres of granulate (2).

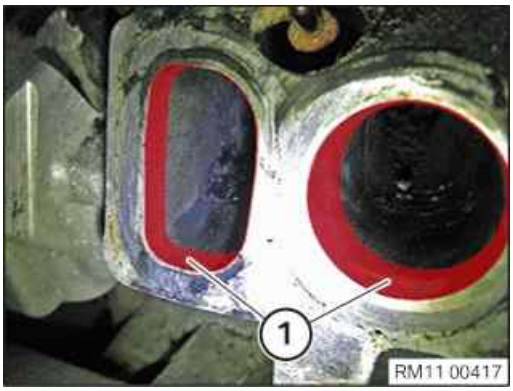
Close the device again.



Note:
Operating pressure 6 - 8 bar.

Close main valve (1) on blasting tool (2).

Connect compressed air (3).



Cleaning the swirl port of 1st cylinder:

Prior to the blasting process, clean the front area of both intake ports (1) of first cylinder with a suitable tool (e.g. plastic scraper, brushes 83 19 2 298 237).

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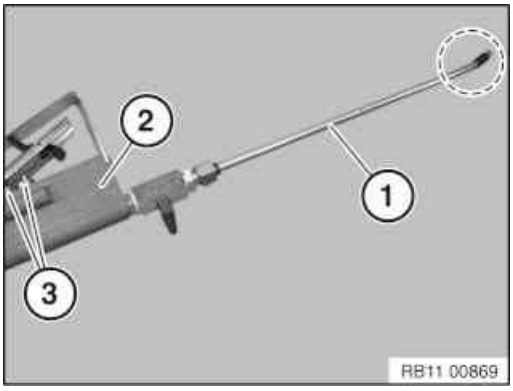


Screw together blasting wand 2 356 969 (1) and actuator (2).

Open blasting tool and pour in 2 l granulate.

Close the device again.

Note:
Actuator (3) has two stages!

In stage one, only compressed air flows through the blasting wand.

In stage two (operation is fully pressed), granulate is added (blasting process).

Connect vacuum adapter 2 356 967 to vacuum cleaner. Hold vacuum adapter 2 356 967 against swirl port at no. 1 cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.

Caution!

Danger of injury!

Risk of damage!

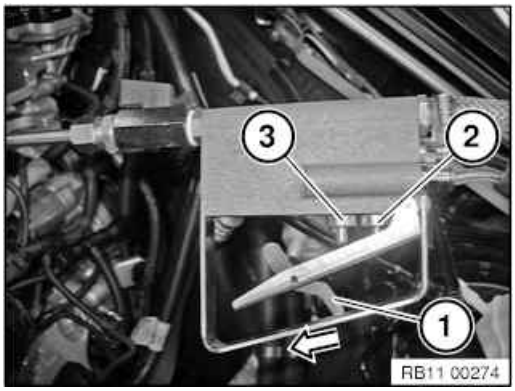
Second person required to assist.

Blasting wand may only be pulled out until the mark becomes visible.

Wear safety goggles.

Insert blasting wand 2 356 969 in the adapter 2 356 967 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.

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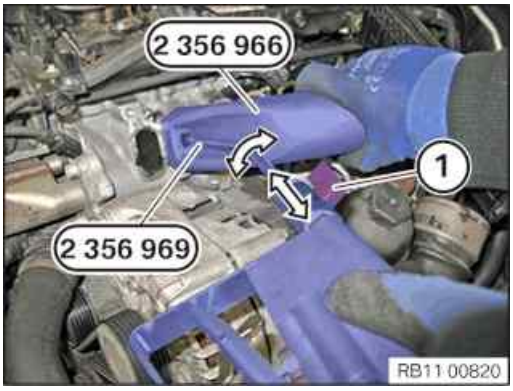
Cleaning the tangential swirl port of 1st cylinder:

Open blasting tool and pour in 2 l granulate.

Close the device again.

Connect vacuum adapter 2 356 966 to vacuum cleaner. Hold vacuum adapter 2 356 966 on swirl port of first cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.



Caution!

Danger of injury!

Risk of damage!

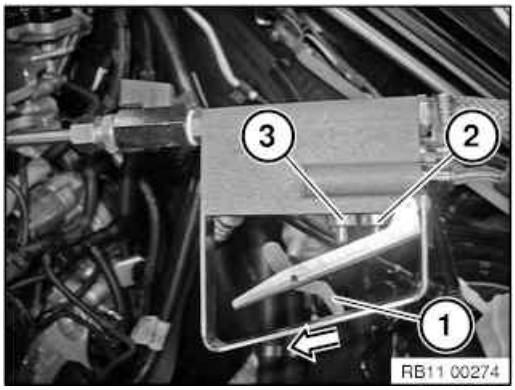
Second person required to assist.

Blasting wand may only be pulled out until the mark becomes visible.

Wear safety goggles.

Insert blasting wand 2 356 969 in the adapter 2 356 966 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.

Cleaning the other cylinders:

Clean the tangential ports and swirl ports of the next cylinder using the same procedure.

Caution!

When cleaning the intake ports, it must be ensured that the intake valves of the corresponding cylinder are closed.

Determine the TDC (intake valves closed) using a TDC determination unit via the glow-plug hole.

Do not crank engine in reverse direction.

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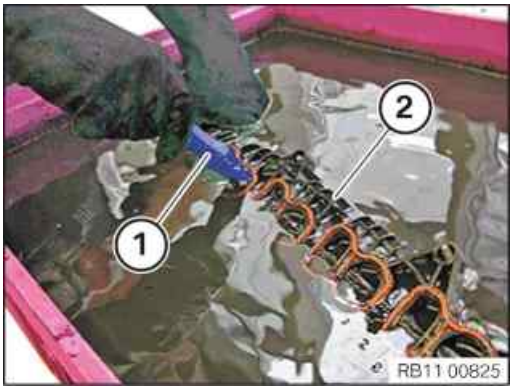

Wear protective goggles and gloves.

Caution!

Do not clean electrical components with a parts cleaning unit or high pressure cleaner!

Cleaning intake plenum:

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings on intake plenum (2) and swirl flap using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with the brush (1) if necessary
- Then clean intake plenum (2) with a parts cleaning unit or a high-pressure cleaner
- Check all seals for damage and renew, if applicable

Observe country-specific waste disposal regulations.

Required follow-up work:

Assemble intake plenum:

- Installing the throttle body
- Install adjuster
- Install the charging pressure sensor
- Install the temperature sensor for the exhaust-gas recirculation
- If applicable, install preheating control unit

- Crank the engine at the central bolt at minimum twice
- Install front right wheel arch panel trim
- Install intake plenum
- Connect battery earth lead

- Reset the quantity correction under:
  - Service functions
  - 01 Drive
  - Digital Diesel Electronics
  - Reset correction values of injectors

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11 12 ... Clean intake plenum (B37, B47)

Necessary preliminary work:

- Remove intake plenum

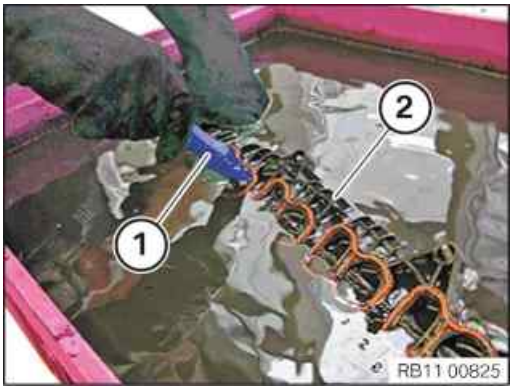
Dismantle intake plenum:

- Remove throttle body
- Remove adjuster
- Remove charging pressure sensor
- Remove the temperature sensor for the exhaust-gas recirculation .
- If applicable, remove preheating control unit

Wear protective goggles and gloves.

Caution!
Never place electrical components in cleaning agent!

- Put on personal protective clothing/equipment!
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (part number: 83 19 2 360 981) mixed
- Place intake plenum in cleaning agent
- Adhere to an application time of at least 1 h



Wear protective goggles and gloves.

Caution!
Do not clean electrical components with a parts cleaning unit or high pressure cleaner.

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings of the intake plenum (2) and swirl flaps using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with brush (1) if necessary
- Clean the intake plenum (2) with a parts cleaning unit or a high-pressure cleaner.
- Check all seals for damage and renew, if applicable.

Pay attention to country specific instructions for disposal.

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Required follow-up work:

Assemble intake plenum:

- Installing the throttle body
- Install adjuster
- Install the charging pressure sensor
- Install the temperature sensor for the exhaust-gas recirculation.
- If applicable, install preheating control unit

- Install intake plenum

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11 12 070 Remove and install/replace acoustic cover

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

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11 12 070 Remove and install/replace acoustic cover

1 – Removing the acoustic cover

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- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

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11 12 100 Removing and installing cylinder head

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Maintain conditions of absolute cleanliness.

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1 – Remove vehicle battery

WARNING

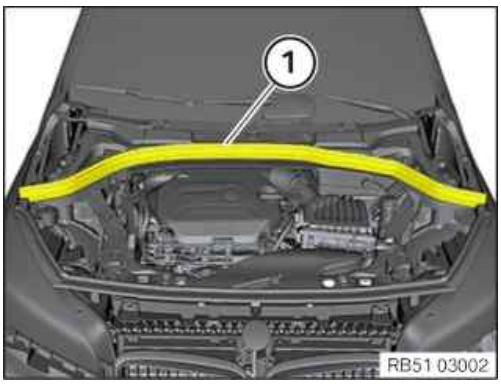
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

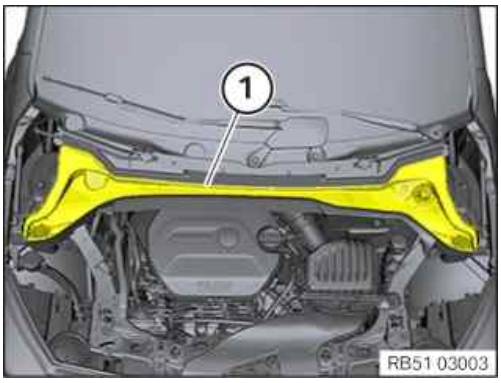
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

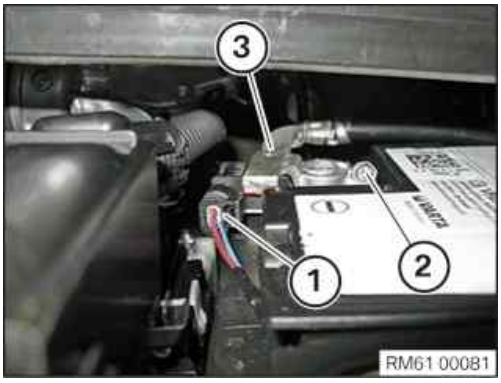
For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).

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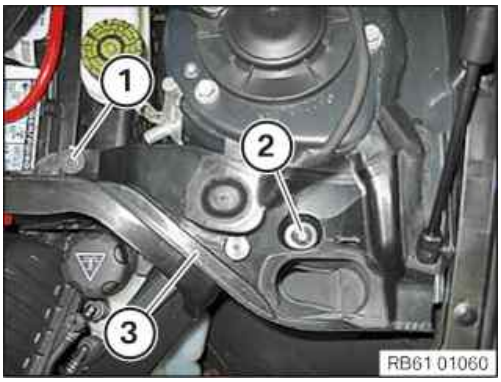
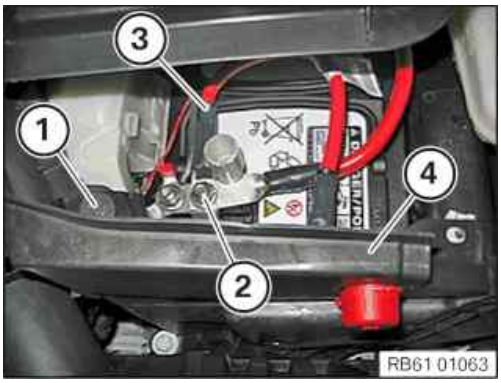
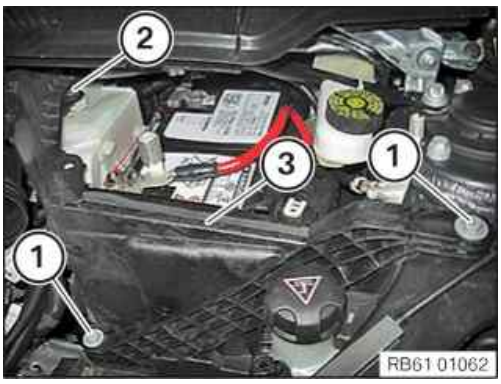


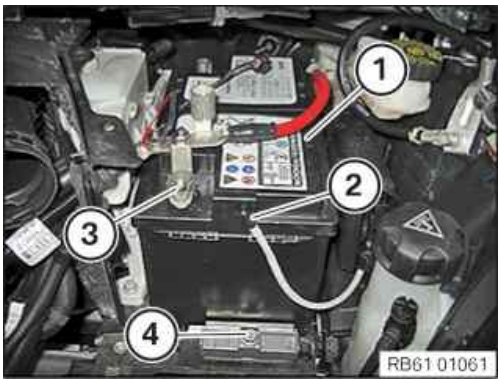
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Removing the upper bulkhead cover

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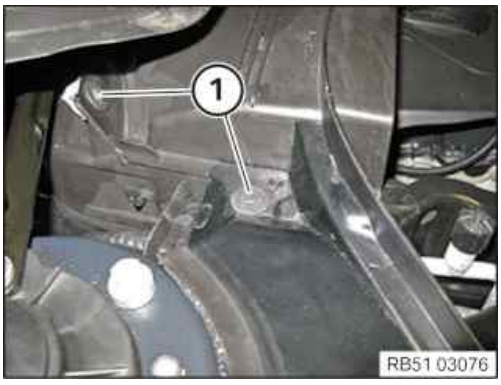
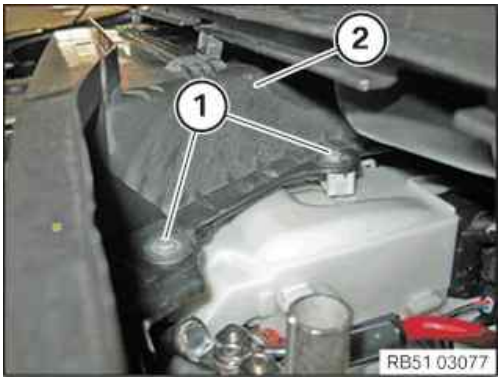
- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

3 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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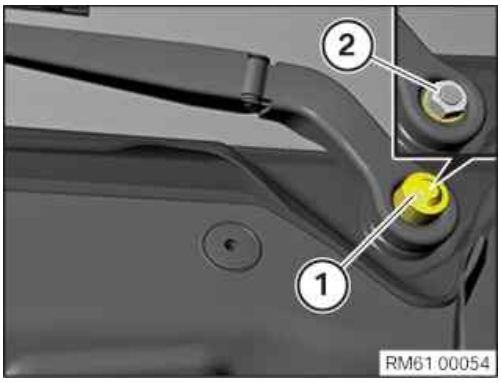
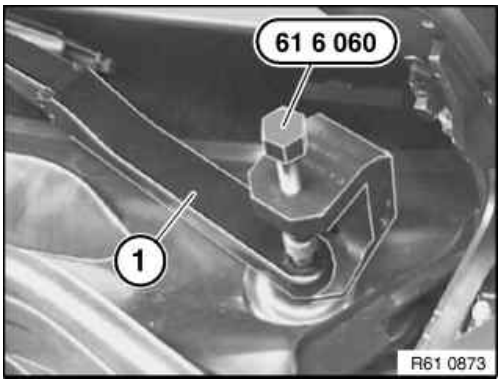


- Remove the protective cap (1).
- Loosen nut (2).



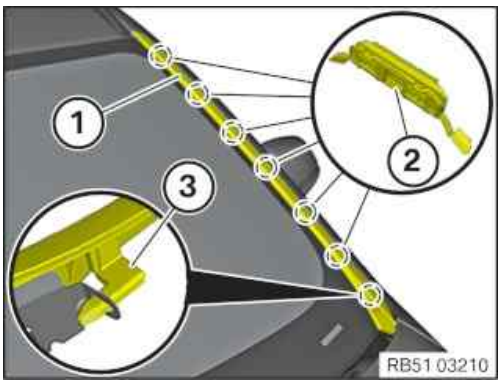
- Pull off the wiper arm (1) using special tool .

4 – Remove the gutter strip on the windscreen on the left and right

NOTICE

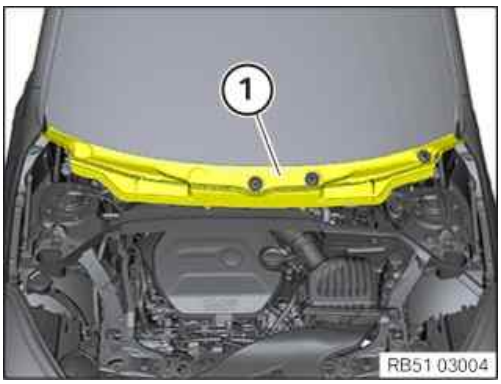
Description is for left component only. Procedure on the right side is identical.

▶ Remove the gutter strip on the windscreen



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

5 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

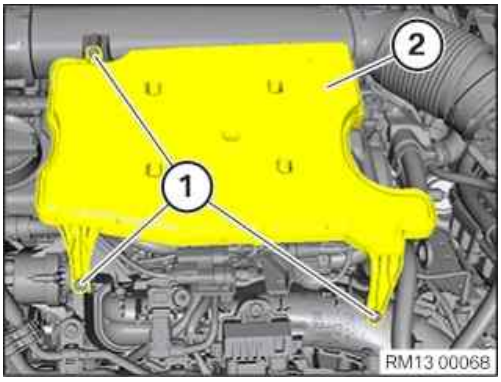
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

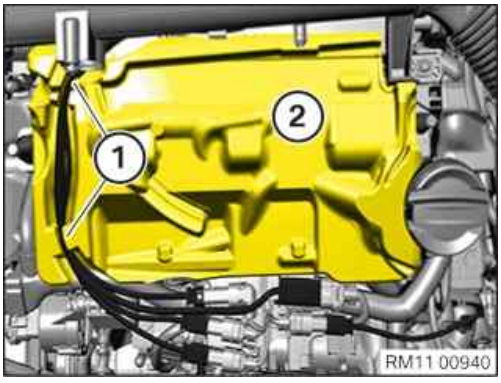
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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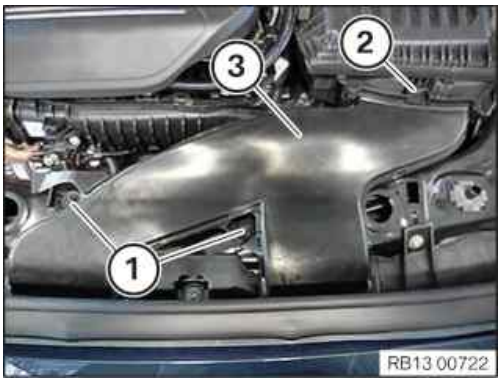
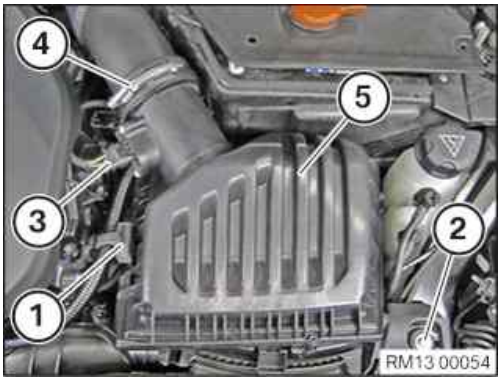


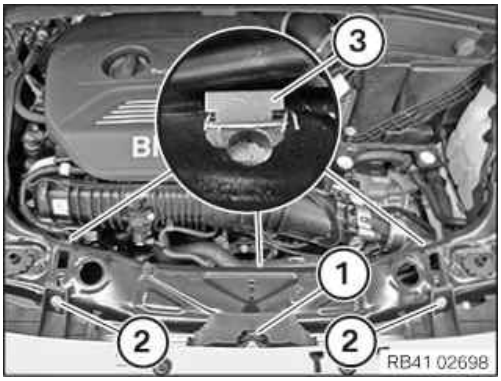
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

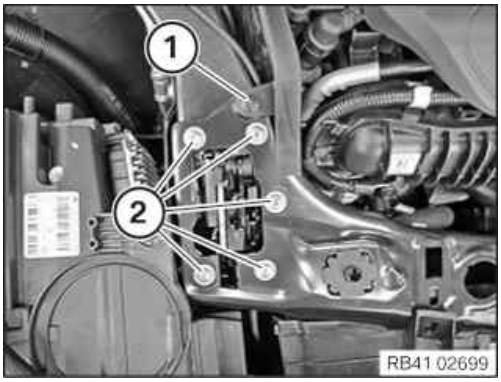


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

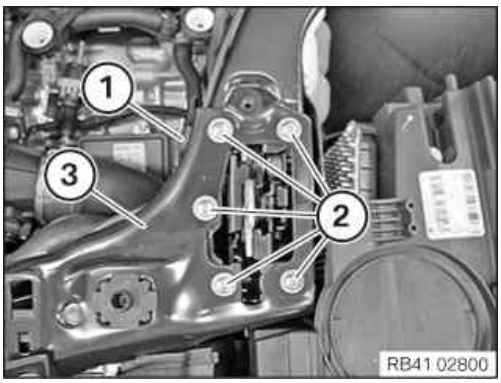
11 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

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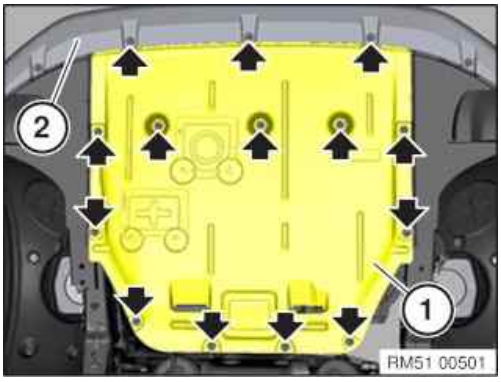
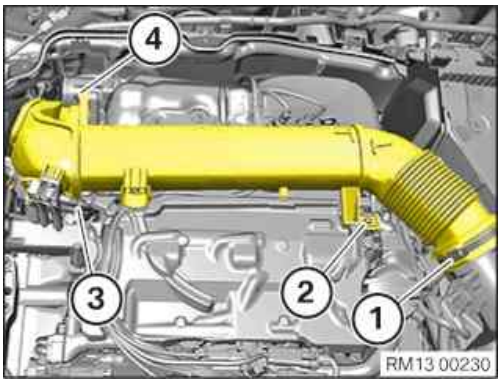
12 – Removing the front underbody protection

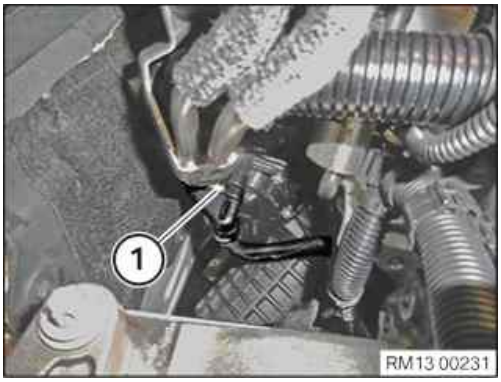


- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

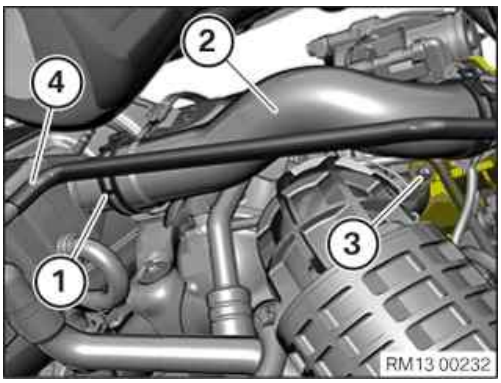
13 – Removing clean air pipe



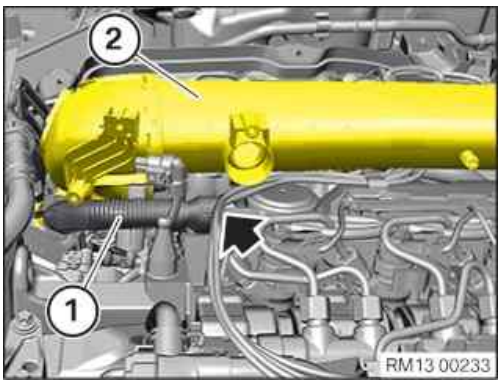
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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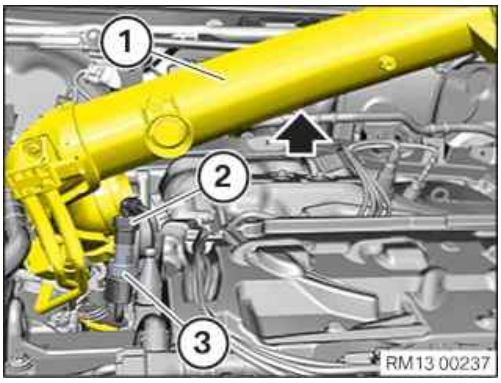

- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

14 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

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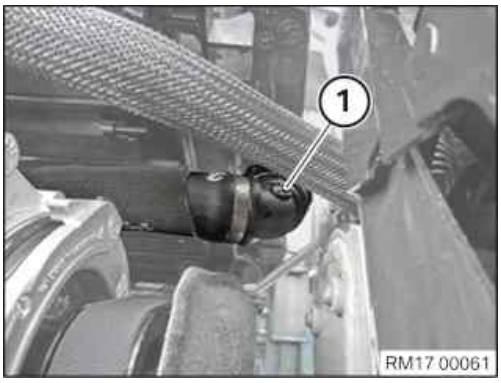
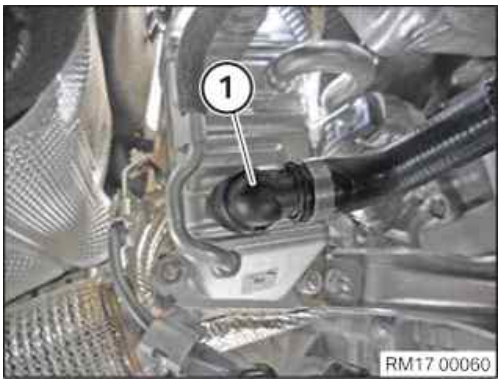


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

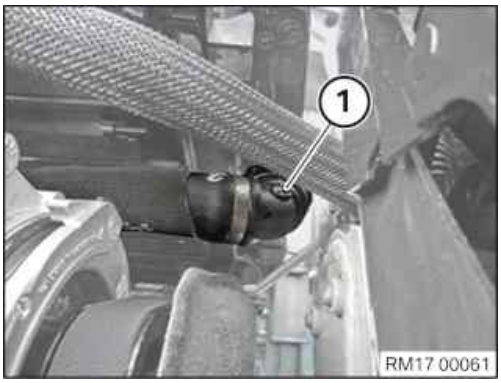


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

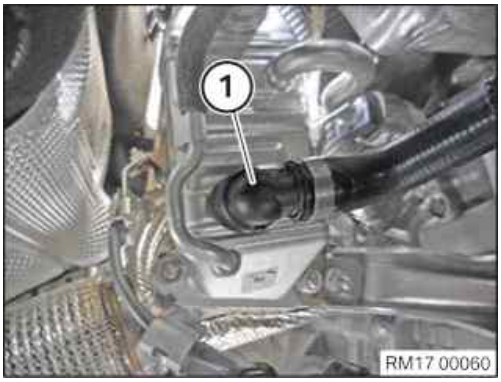
15 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

16 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

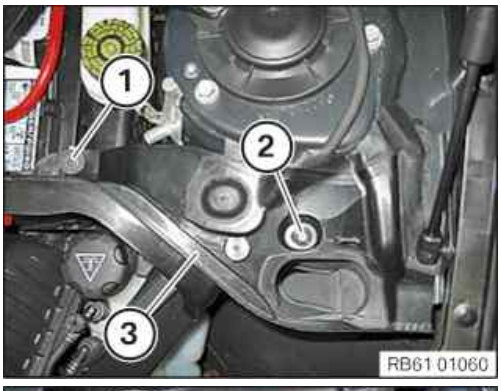
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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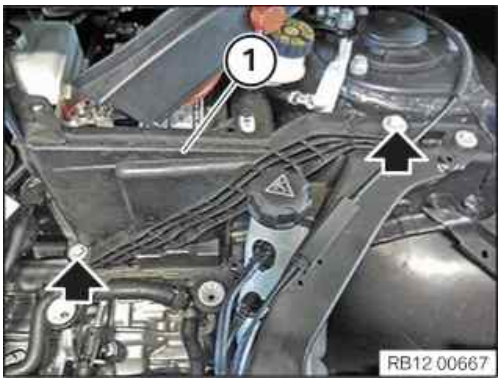
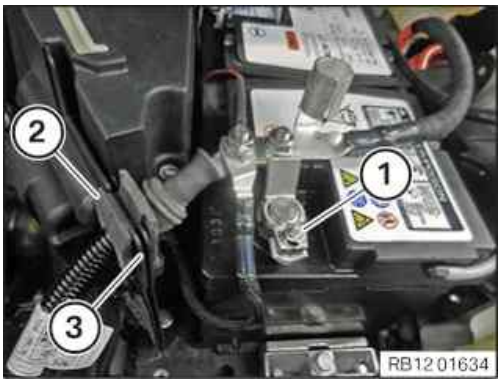
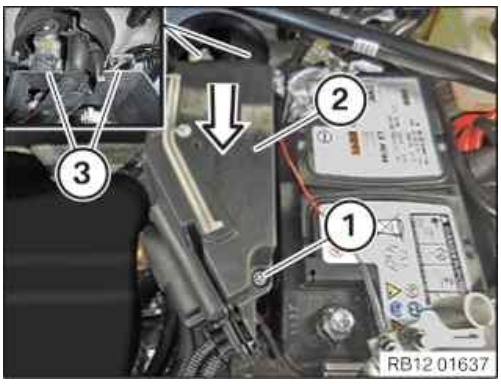


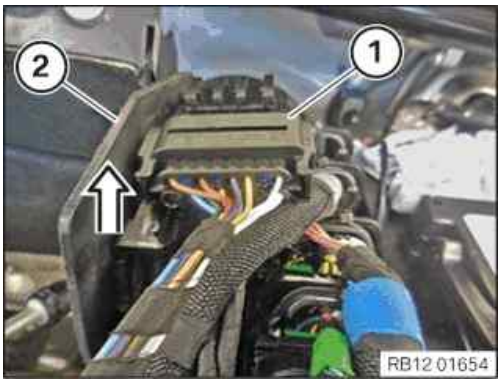
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



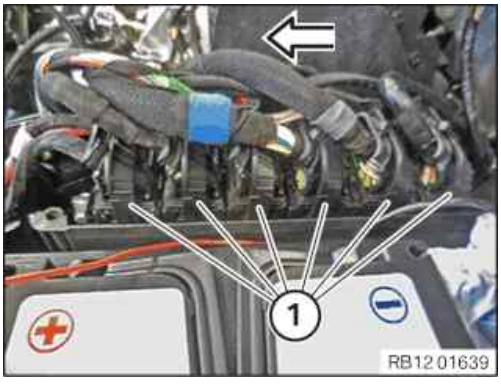
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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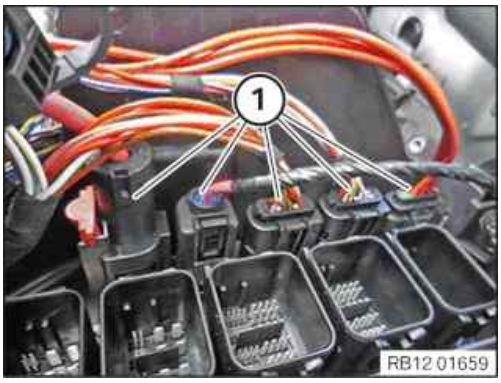
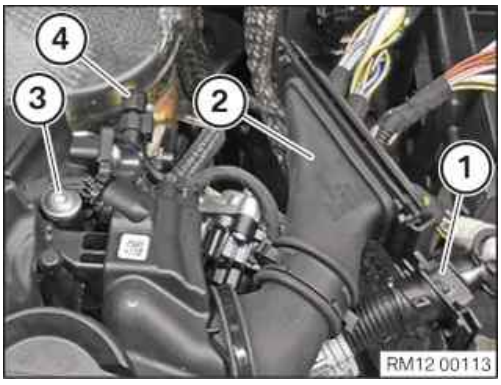
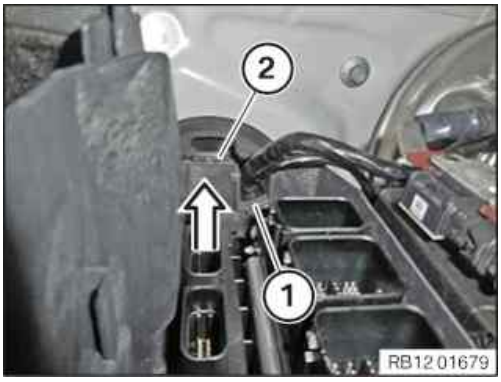


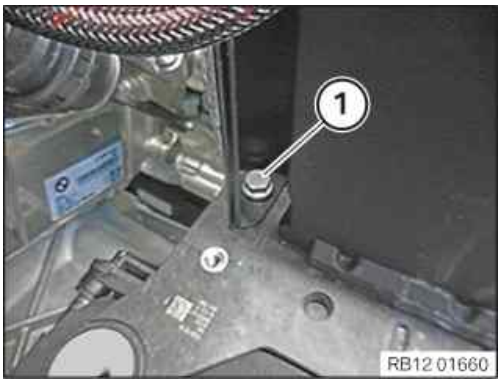
- Unlock and loosen connector (1).



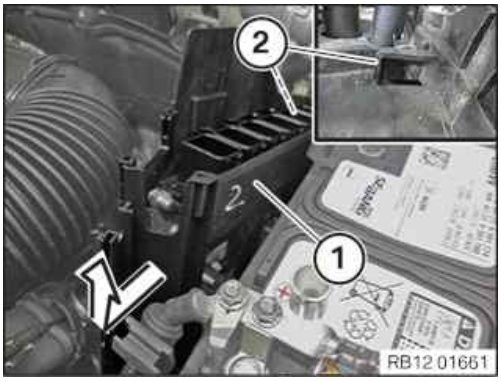
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

17 – Remove battery holder

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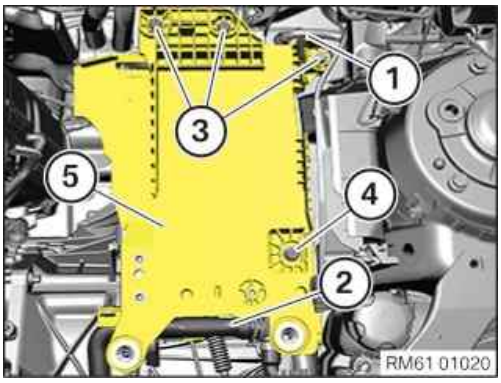
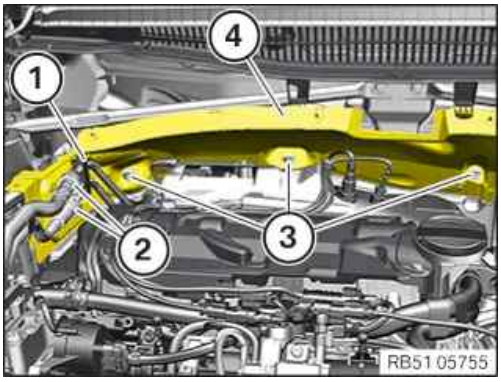


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

18 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

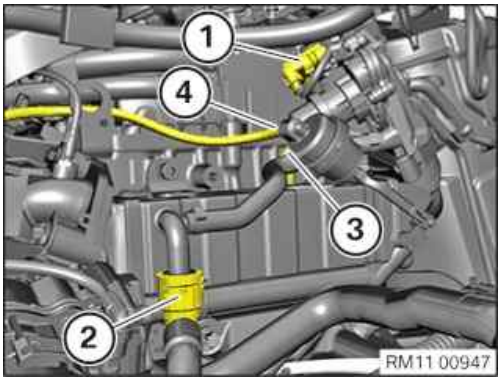
19 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

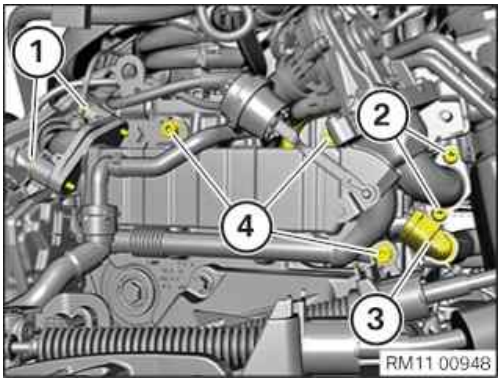
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

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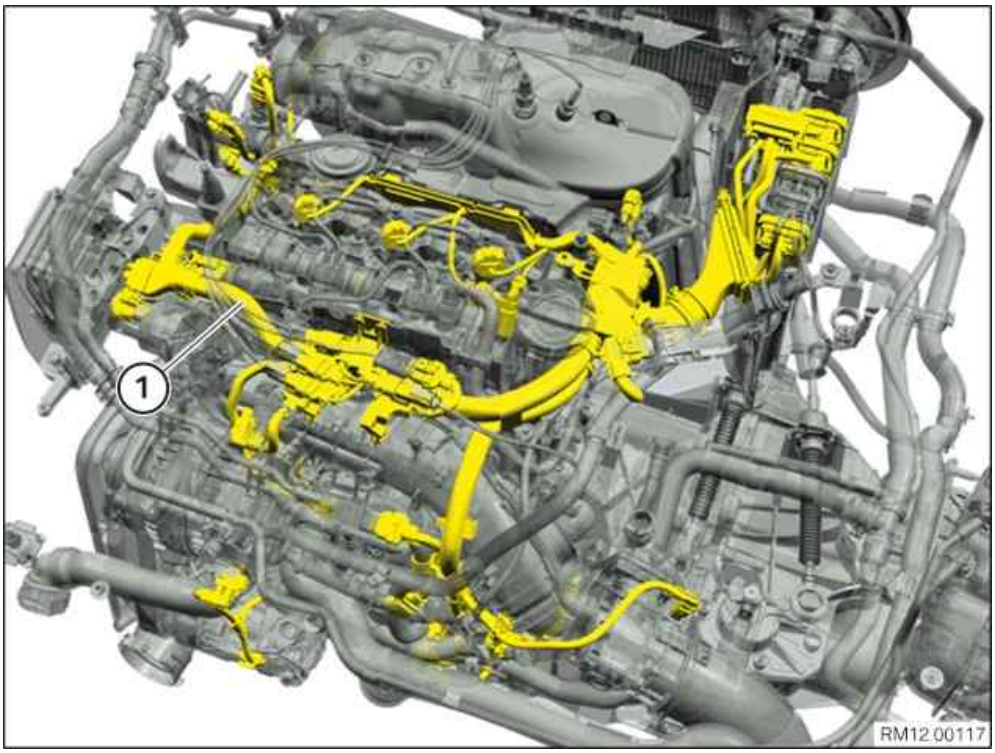
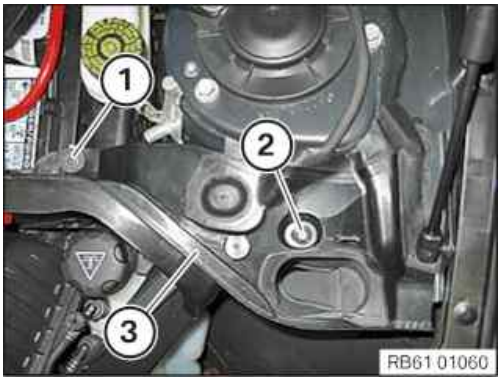
20 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine

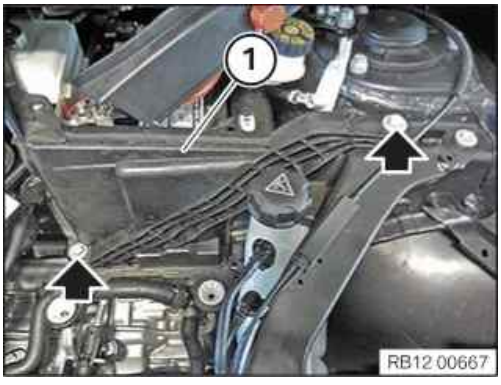


1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.

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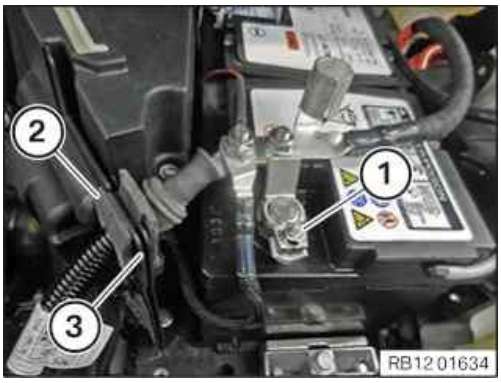
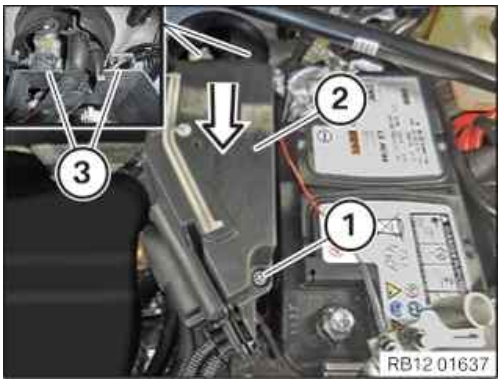
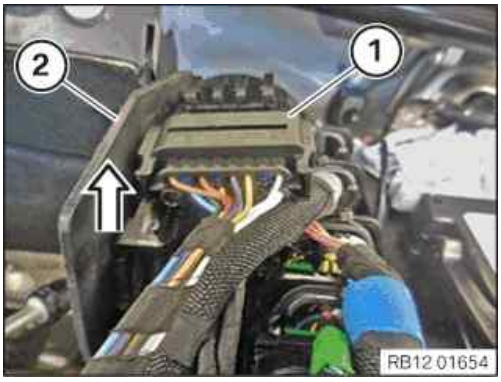


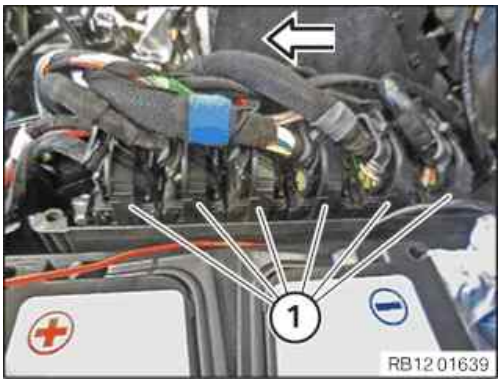
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).

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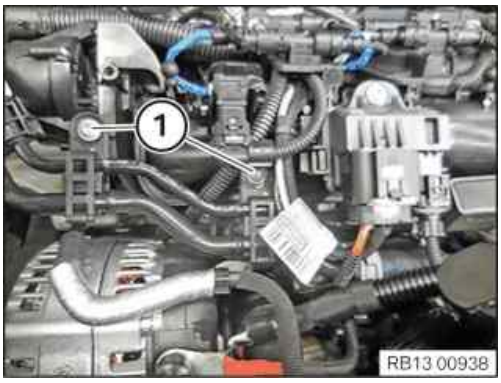
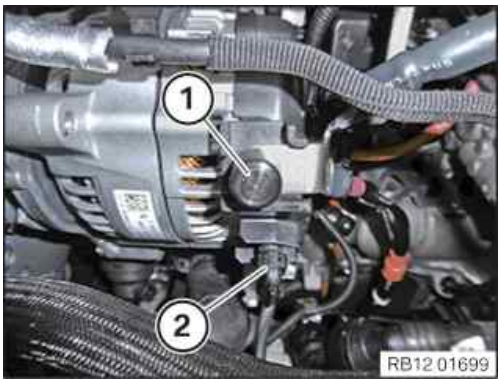
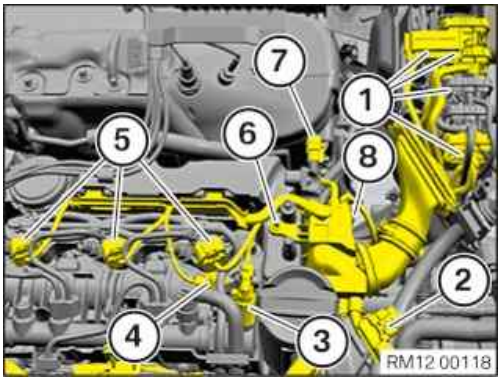


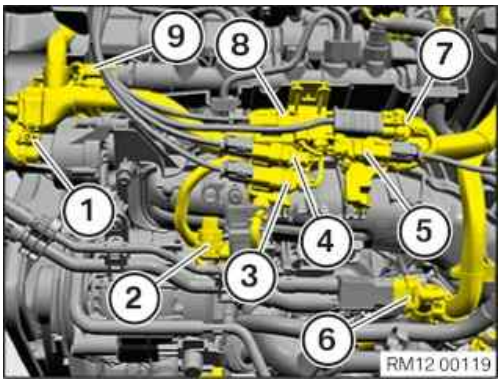
- Loosen screws (1).



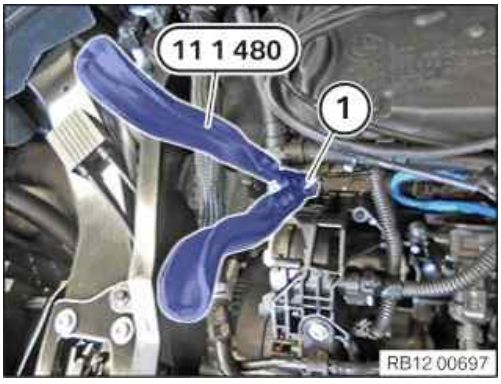
- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.



- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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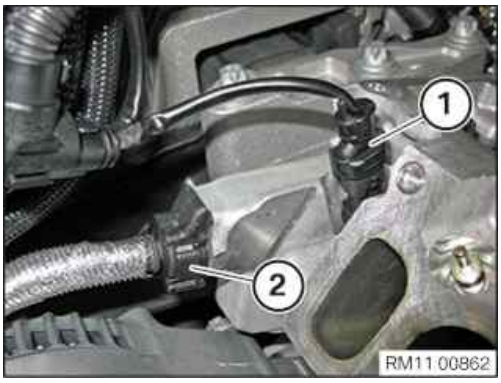
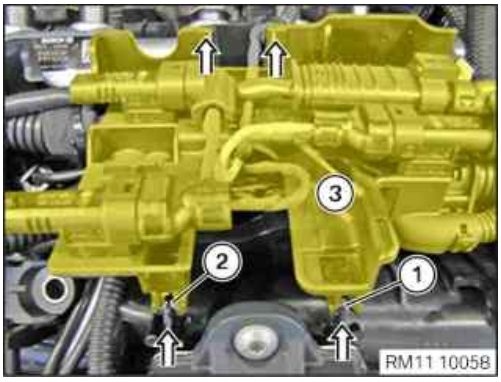


- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

21 – Removing the cable clips from the intake plenum



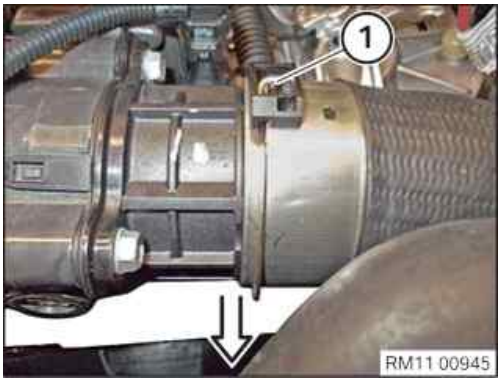
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

22 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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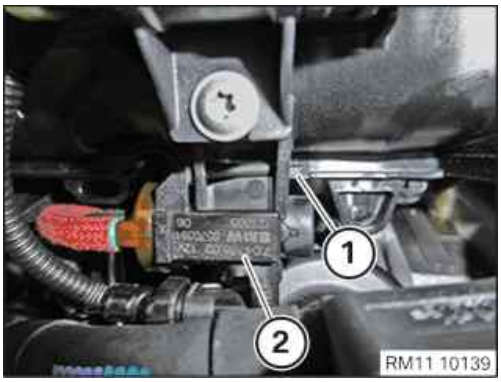
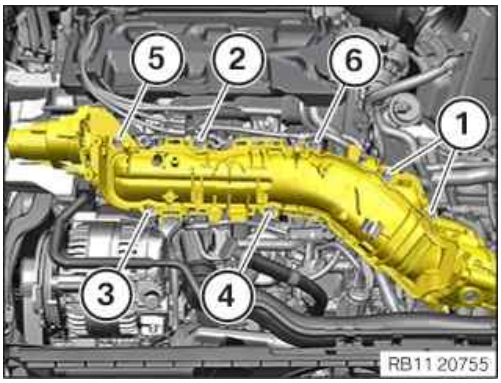
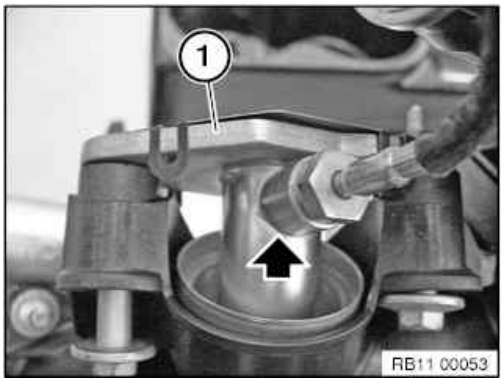


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

23 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

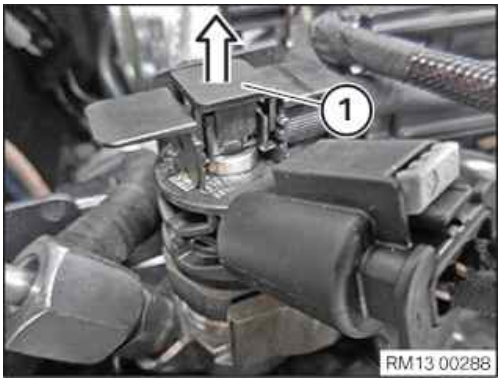
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

24 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

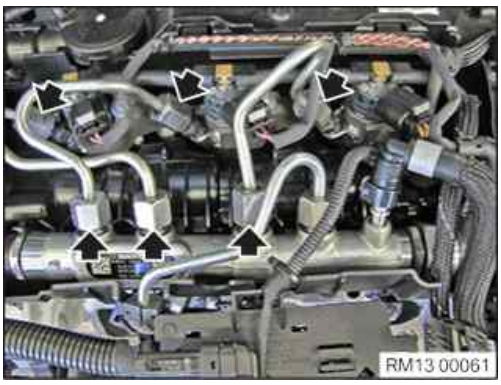
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

25 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

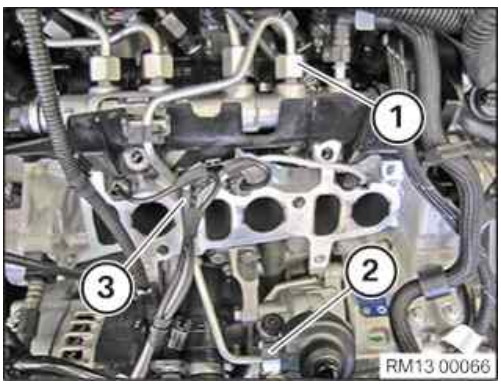
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

26 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

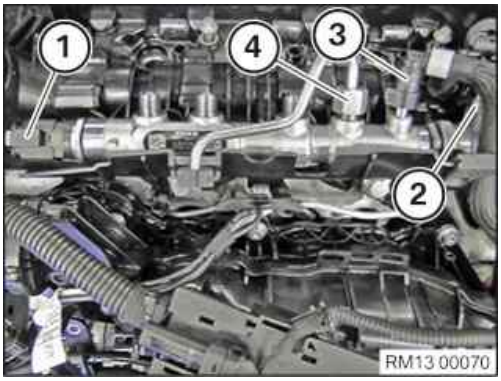
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

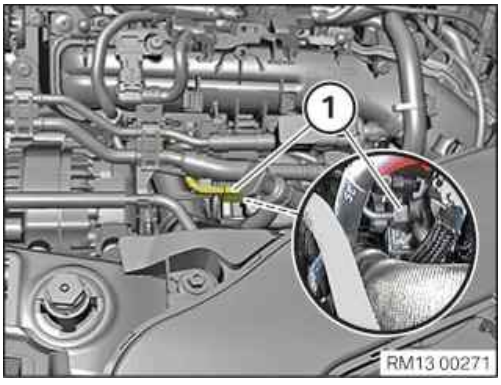
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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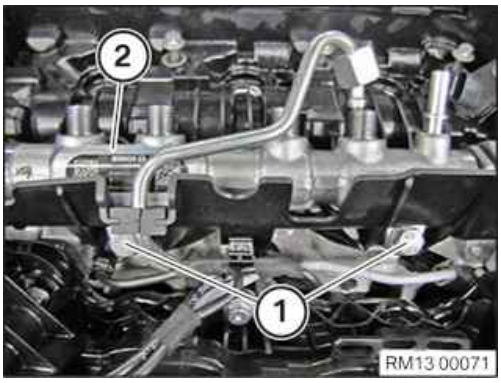

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

27 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

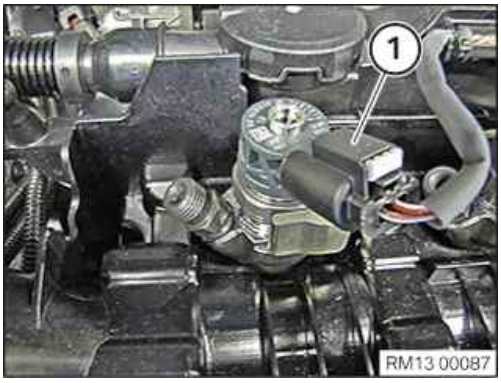
Electrostatic discharge.

Damage to or destruction of electrical components.

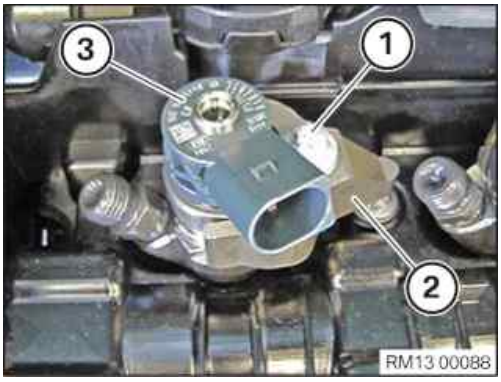
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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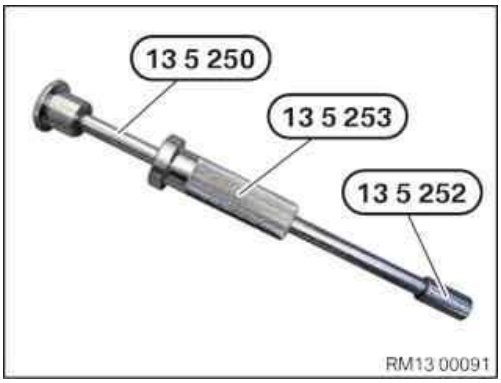
RISK OF DAMAGE

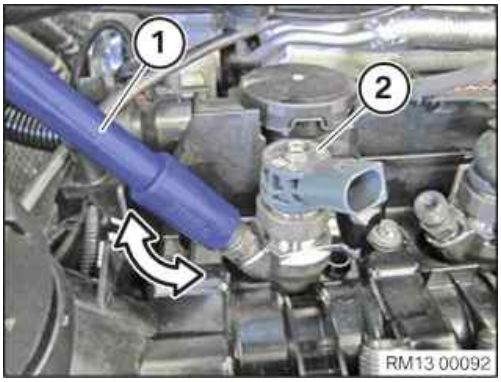
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

28 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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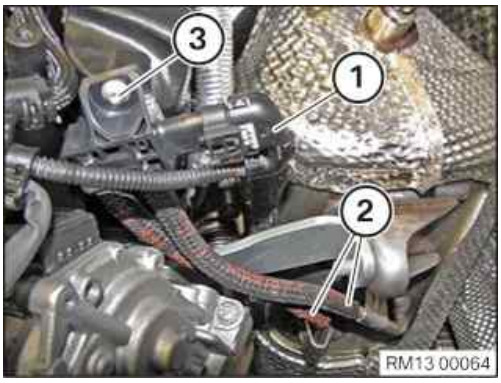
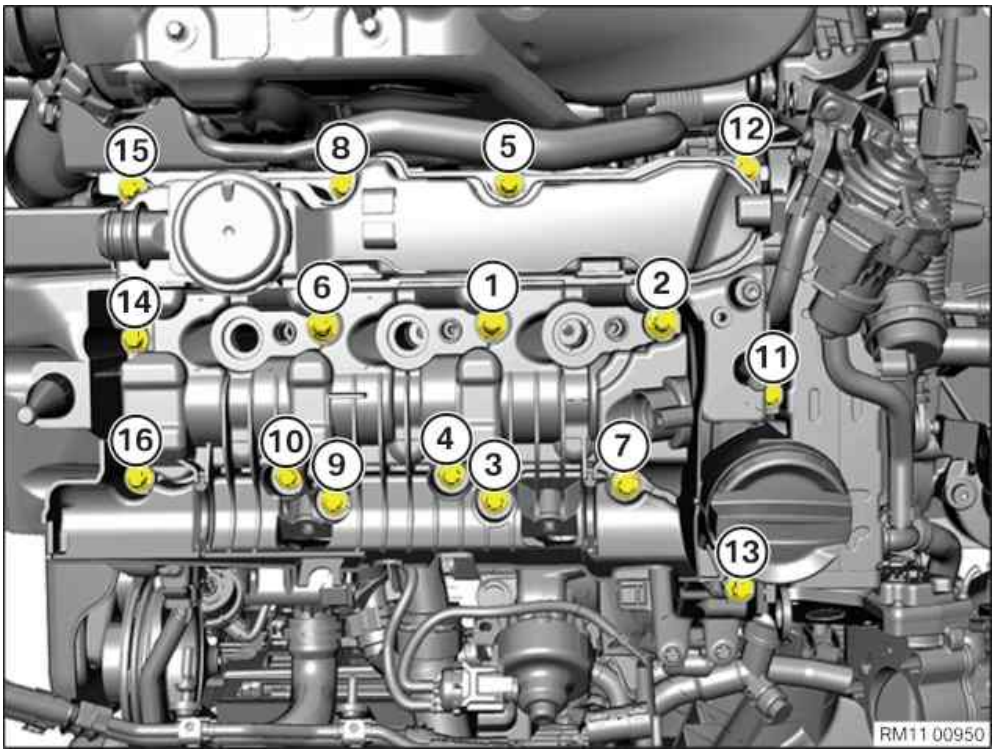


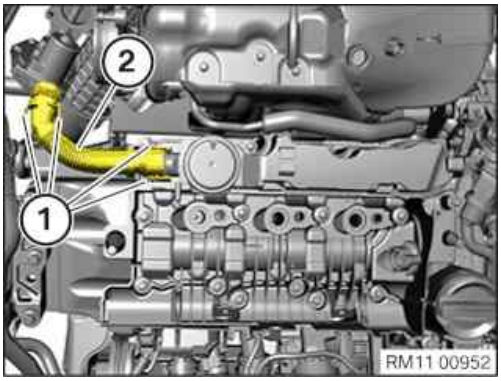
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

29 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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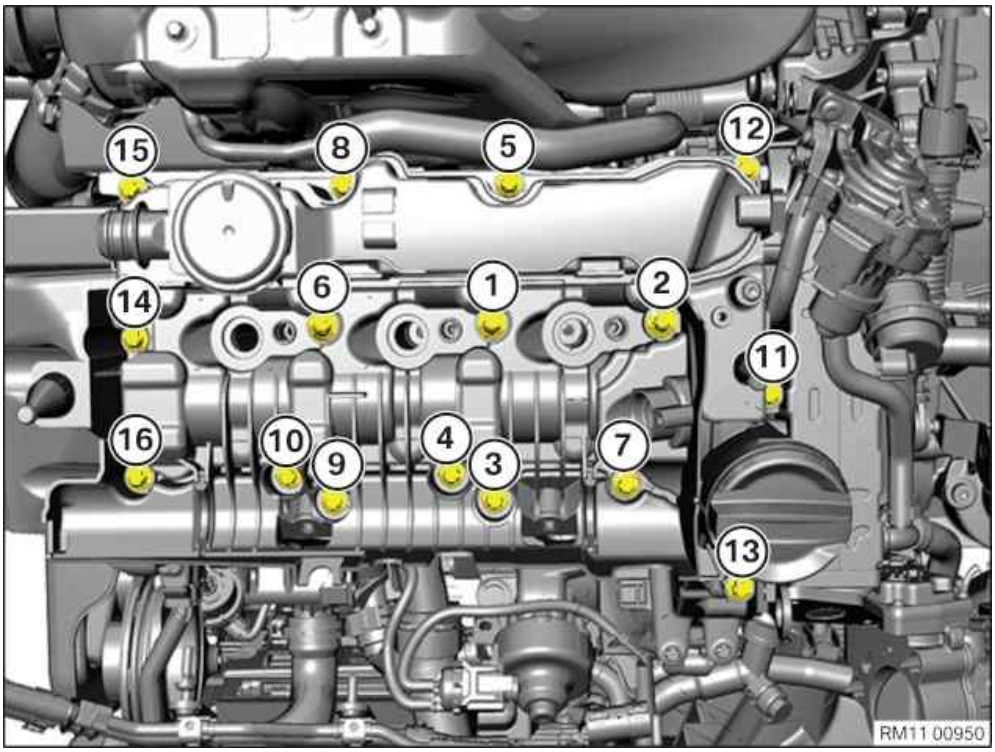


- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

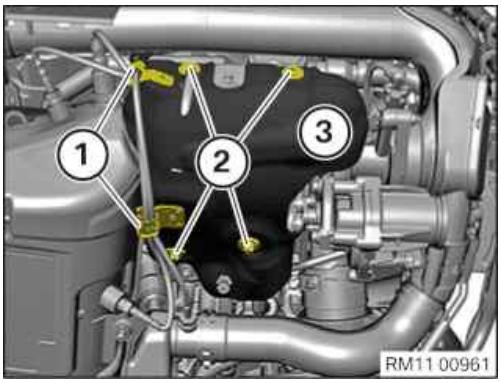
30 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

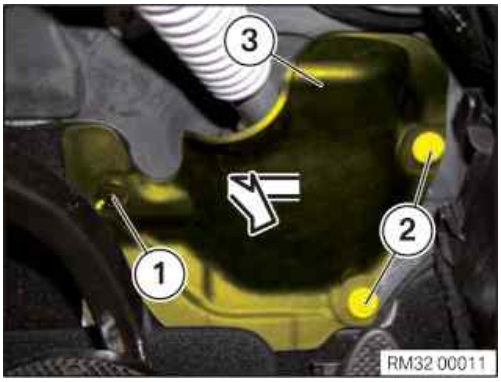
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).

31 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!

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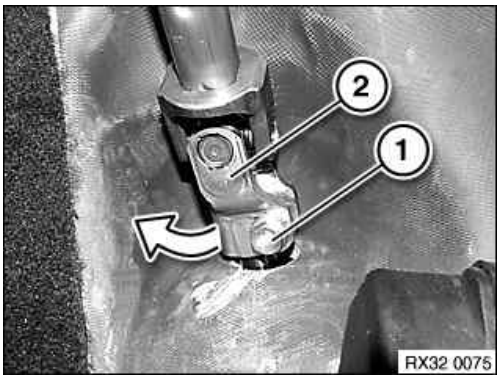
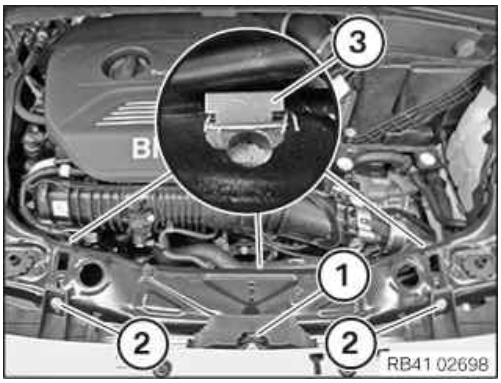


- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

32 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

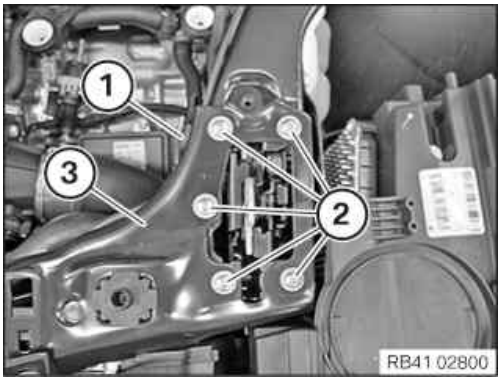
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

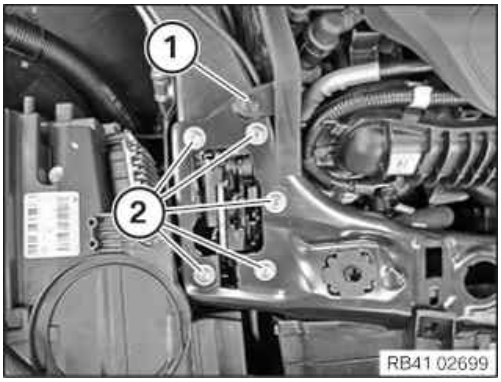


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

33 – Securing radiator on left and right

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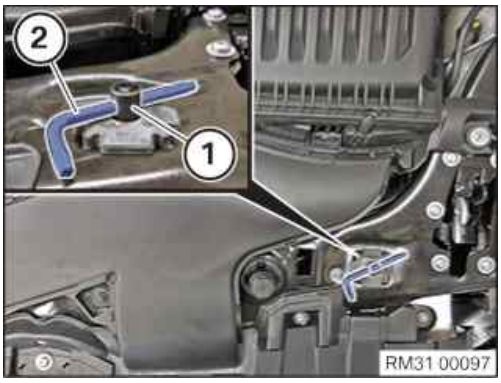


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

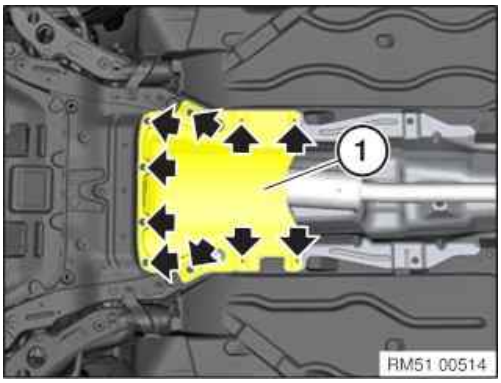
34 – Remove the front left and right wheel

▶ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

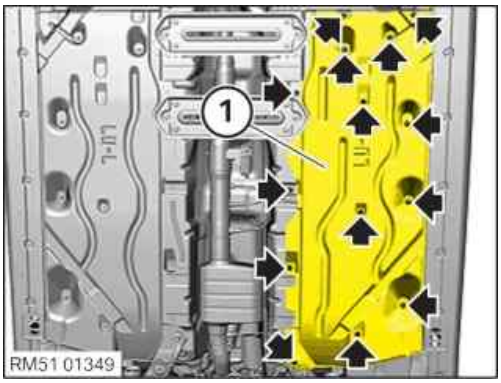
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

35 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

36 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

37 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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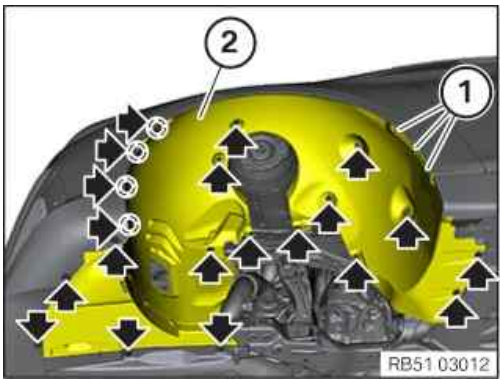
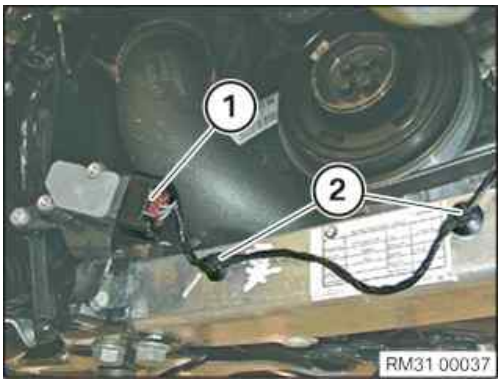
▶ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

38 – With right installation: Detaching ride height sensor cable



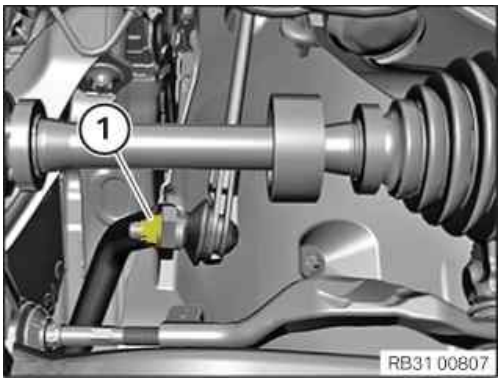
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

39 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

40 – Detaching rubber mount from front axle support

- Spray rubber mount (1) with lubricant and release from holder on front axle support.

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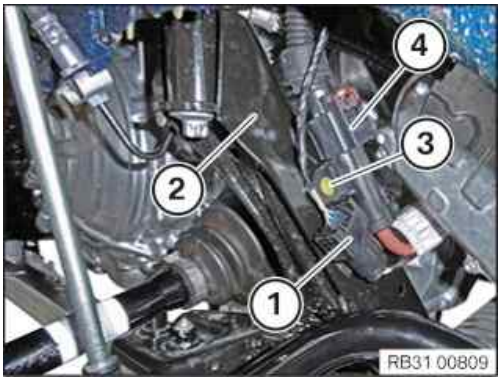
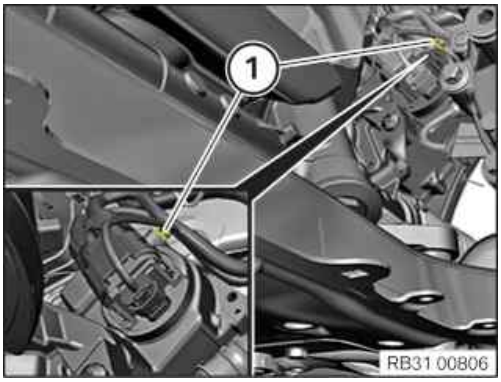
41 – Disconnecting plug connections from steering gear

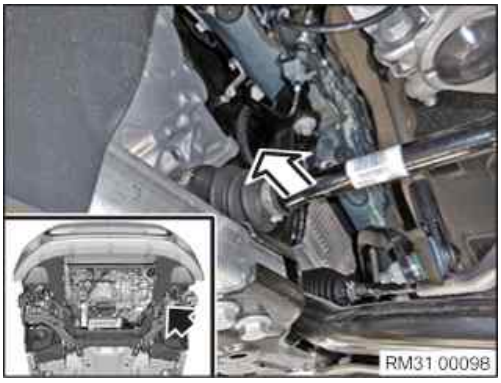
▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

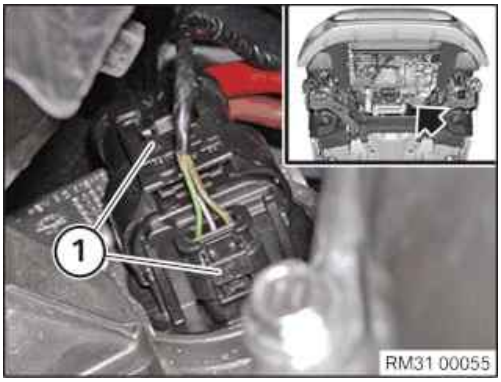


- Disconnect wiring harness (1) from steering gear.



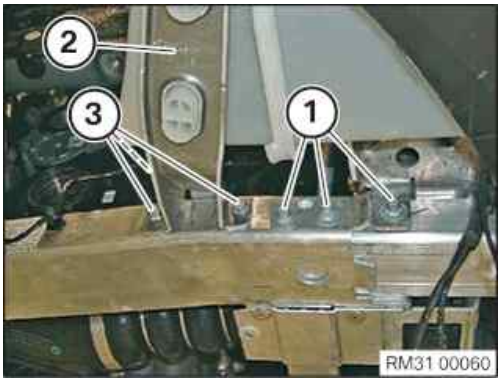
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

42 – Releasing the mounted part from the front axle support



- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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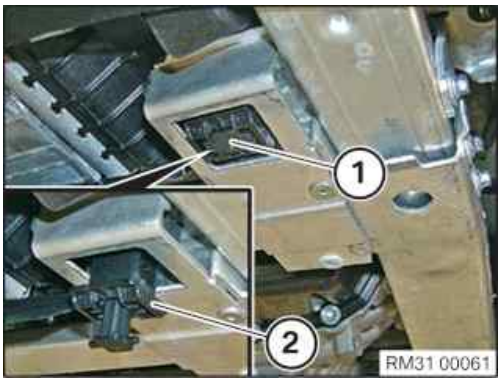
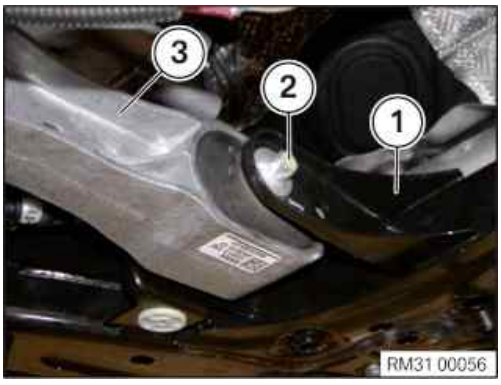


NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



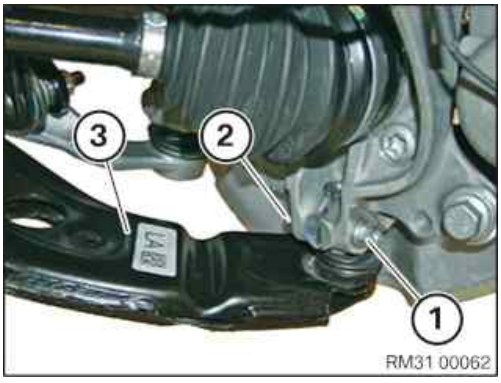
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

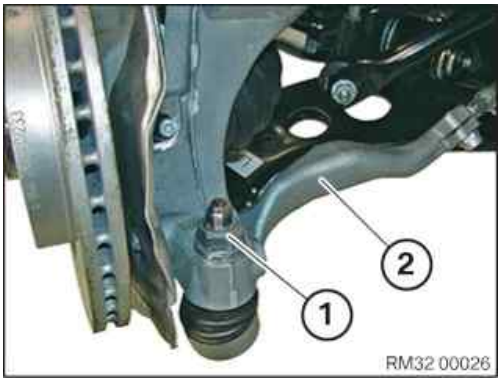
43 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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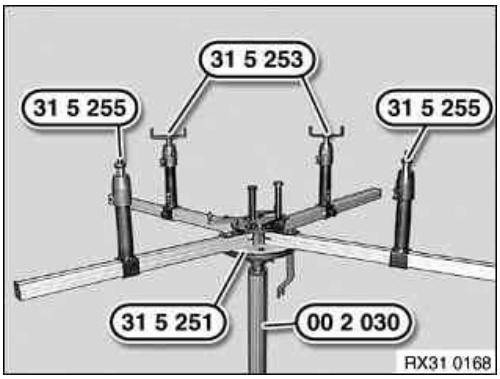
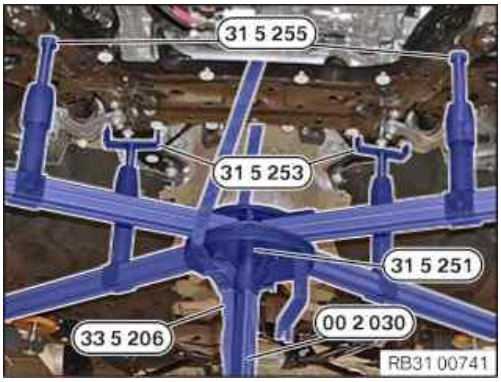


- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

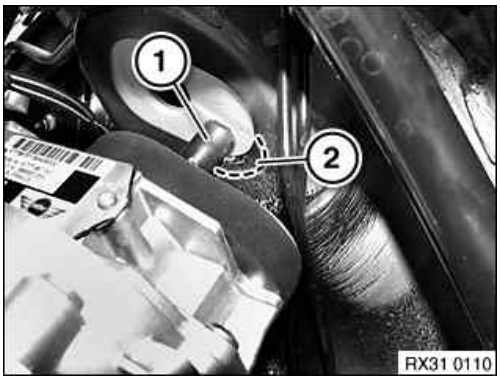
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

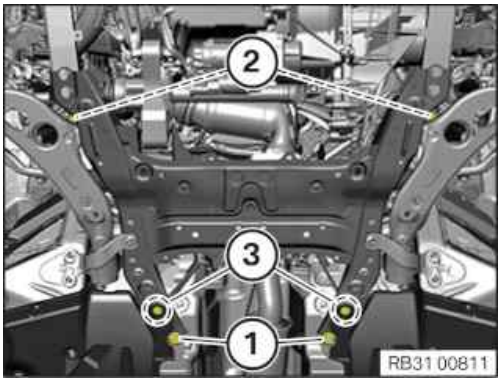


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.

For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

44 – Removing the connecting support from the tunnel in front and back

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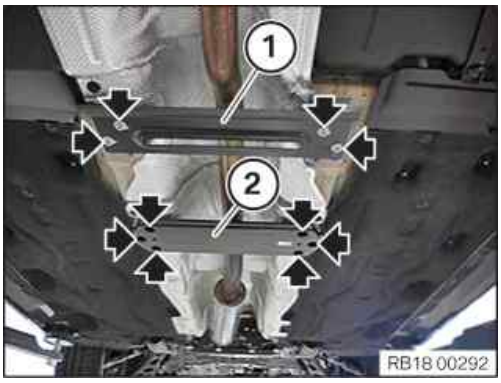
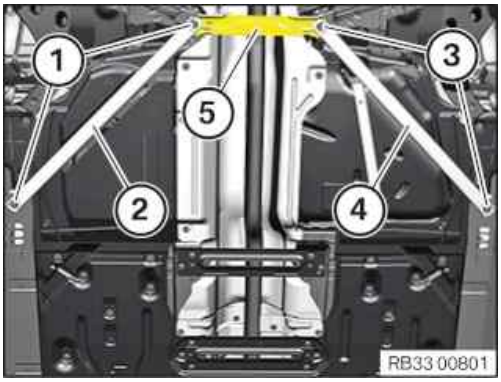


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

45 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

46 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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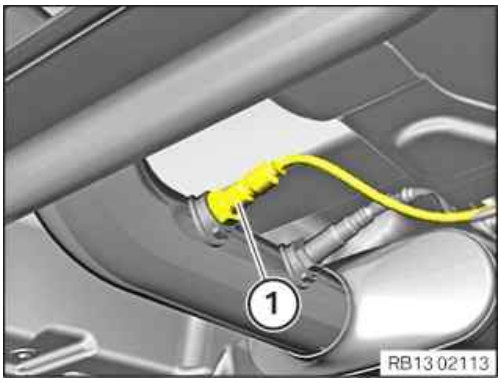
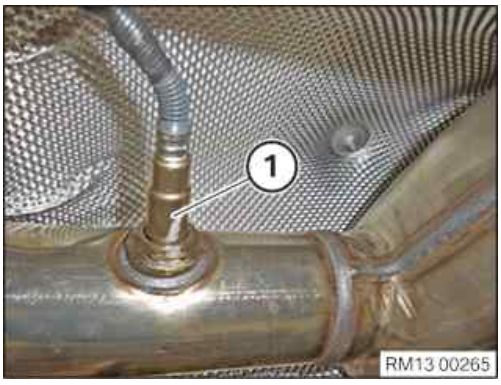
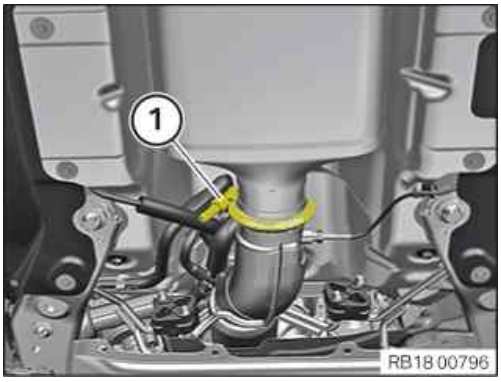


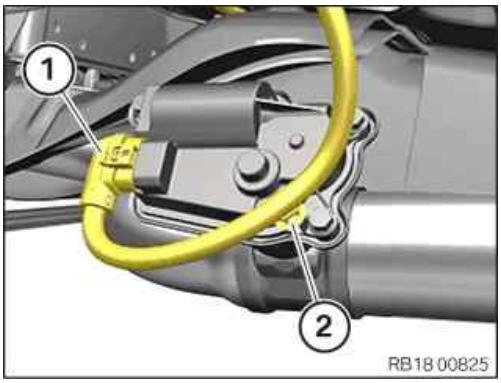
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



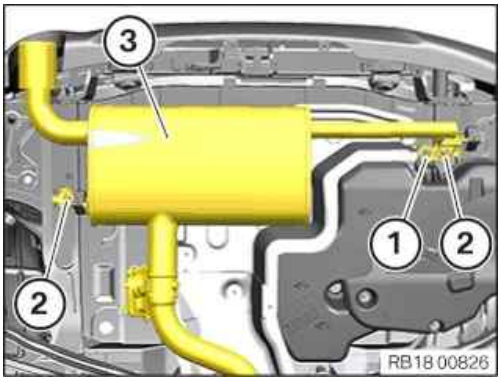
- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Unlock and disconnect connector (1).
- Loosen clamp (2).



- Loosen screw (1).
- Loosen nuts (2).
- Lower the exhaust system (3) with an auxiliary person, guide out and remove.

47 – Removing starter motor

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

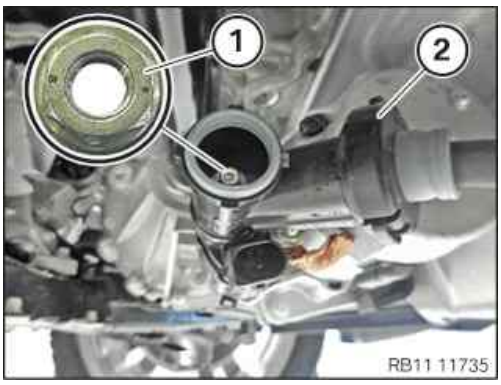
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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- Loosen screws (1).
- Feed out starter motor and remove.

48 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

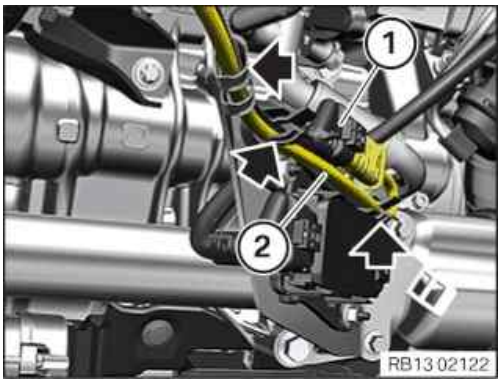
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

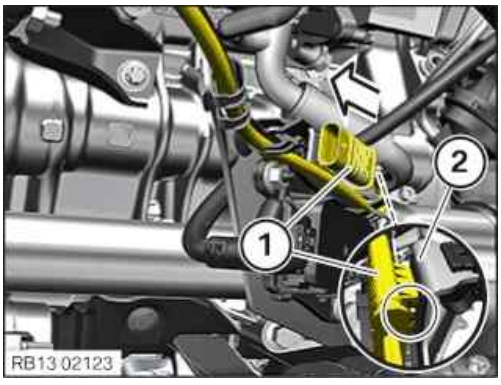
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.

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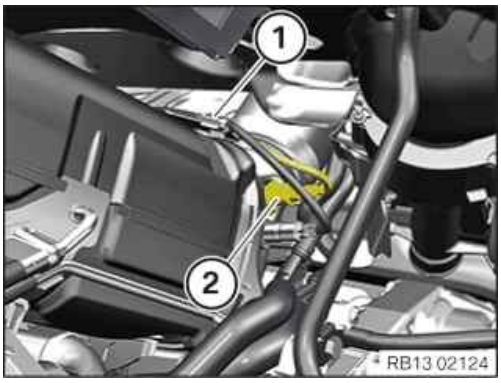


- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

49 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

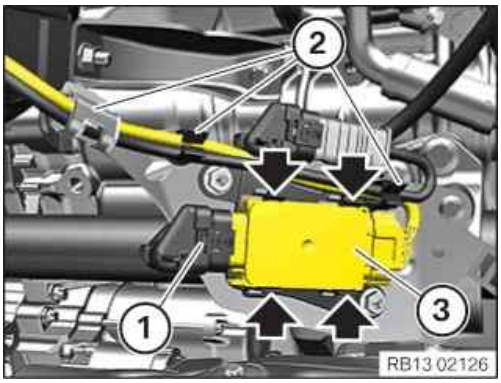
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

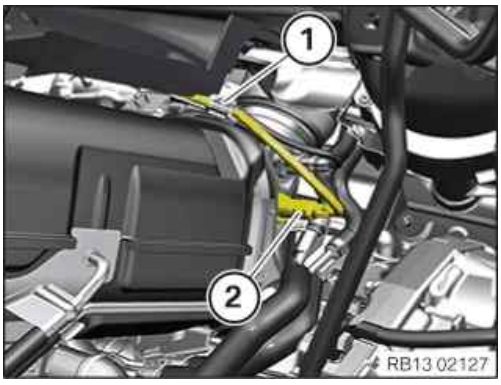
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

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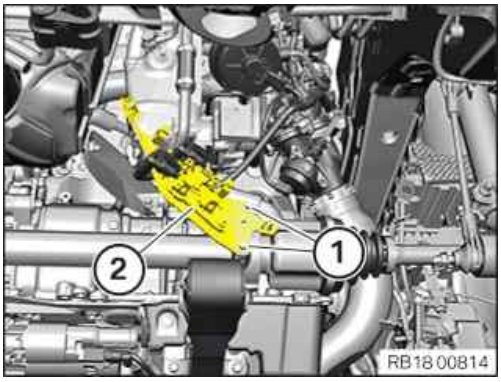
50 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

51 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

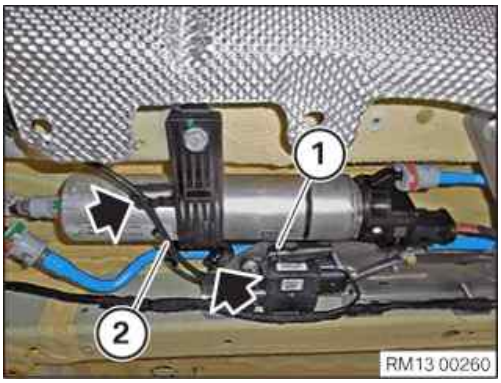
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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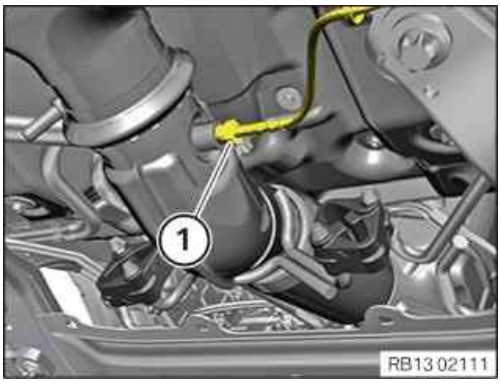
- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

52 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

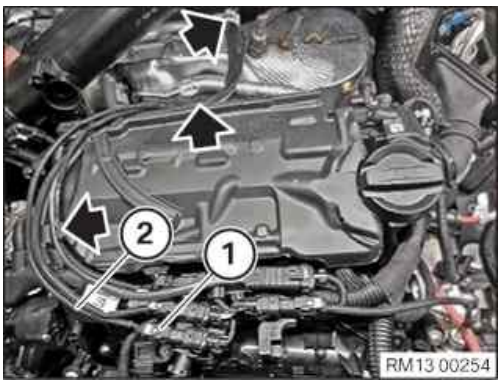
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Feed the cable (2) from the temperature sensor out of the clamps (arrows) and remove it.

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- Release the exhaust temperature sensor (1) with conventional tools (2).

- Feed out and remove exhaust temperature sensor (1).

53 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and disconnect the plug connection (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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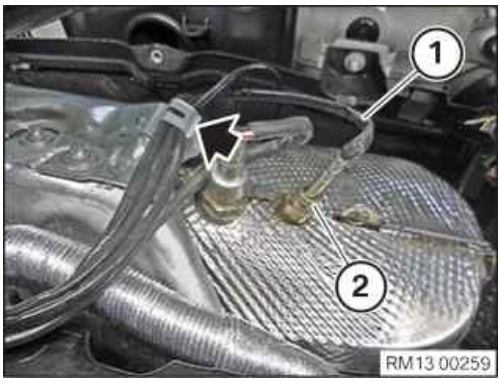


- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

54 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

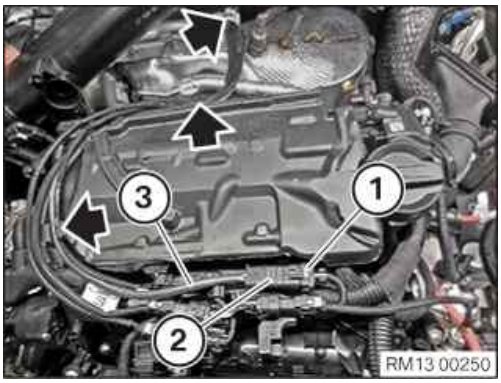
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

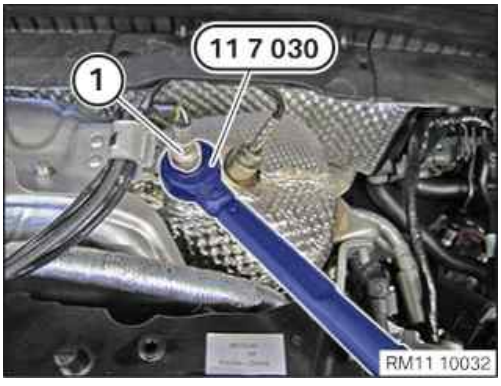
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Detach the connector (2) from the holder .
- Feed out and remove cable (3) out of the oxygen control sensor from the clamps (arrows).



- Release the front oxygen control sensor (1) using special tool **0 491 075 (11 7 030)** .
- Feed out and remove the control sensor (1).

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55 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

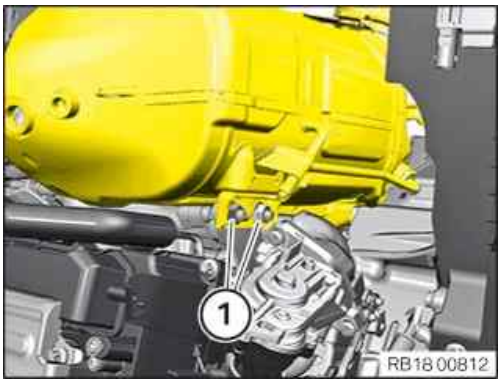
CAUTION

Heavy component.

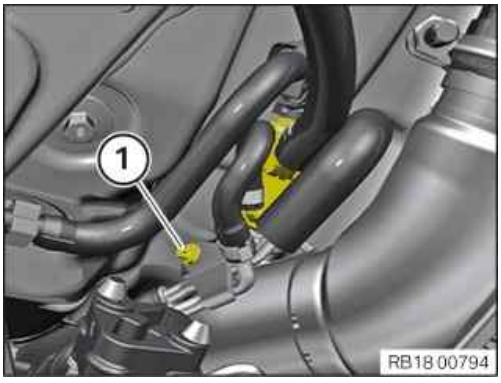
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen nuts (1).



- Loosen screw (1).

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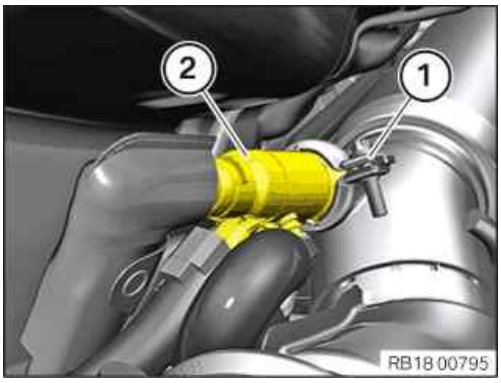
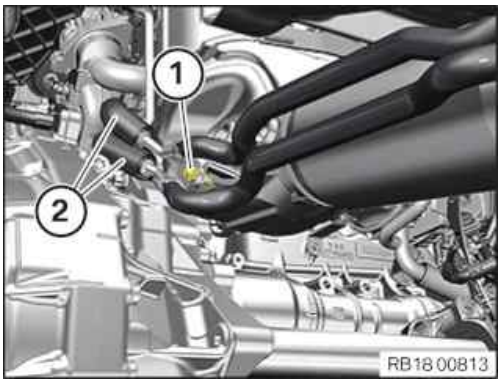
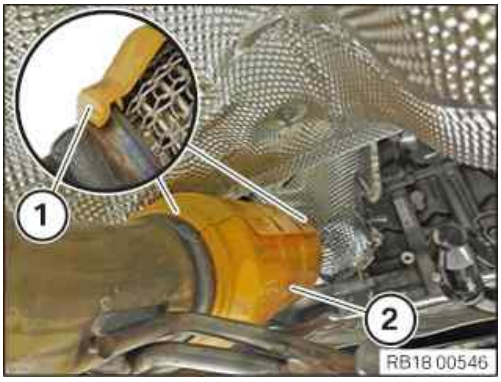


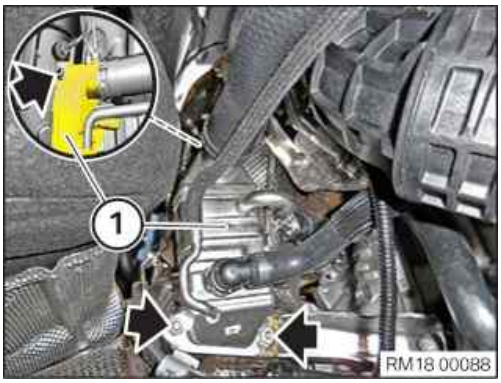
- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



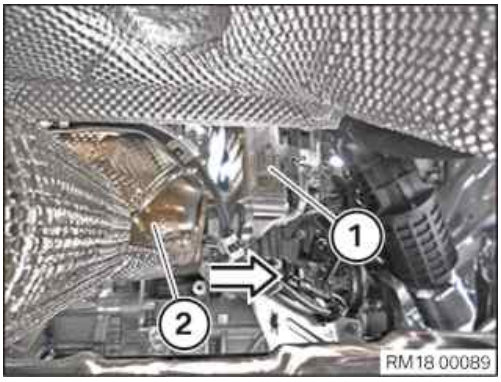
- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Detach nuts (arrows) from low pressure exhaust-gas recirculation cooler (1).



- Feed out low pressure exhaust-gas recirculation cooler (1) from diesel particulate filter (2) in direction of arrow and set aside.

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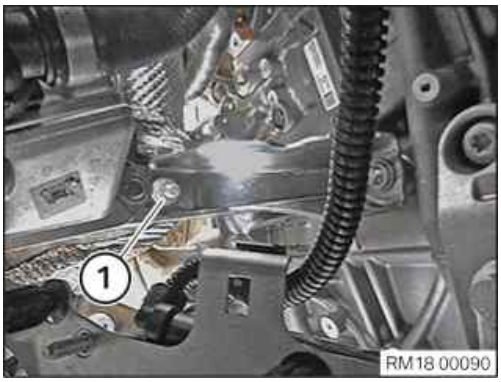
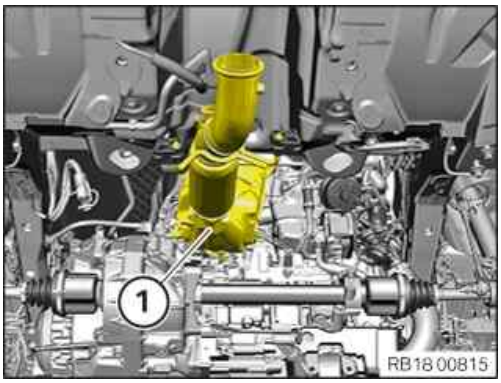


- Unfasten nut (1).



- Feed out diesel particulate filter (1) toward the bottom and remove.

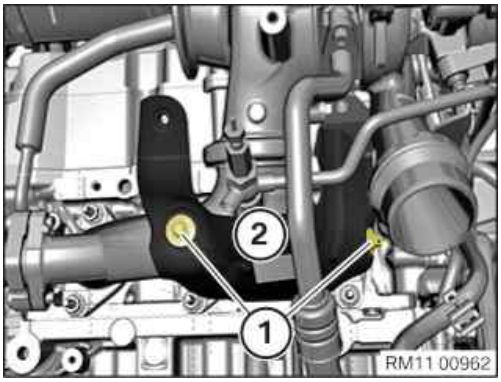
56 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

57 – Removing heat shield from rear exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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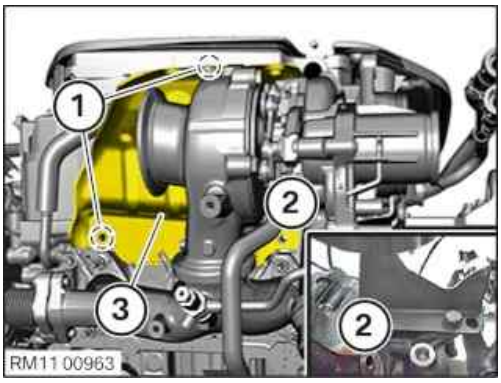
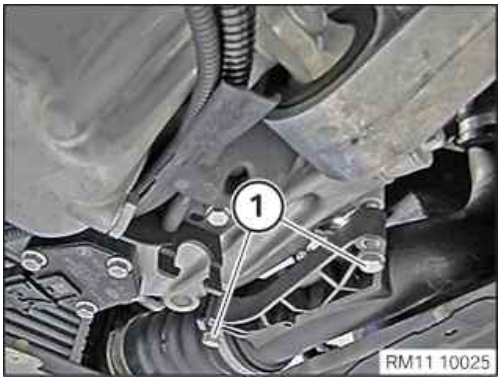


- Loosen screws (1).
- Loosen screw (2).

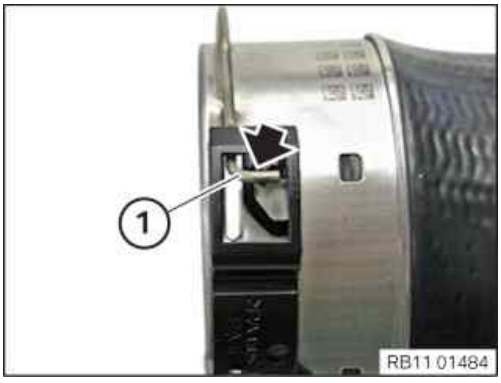
  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

58 – Remove right charge-air line

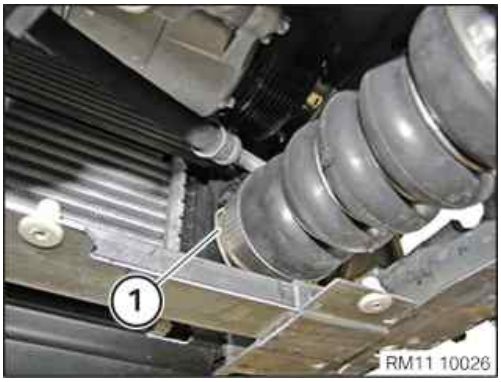


- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.



- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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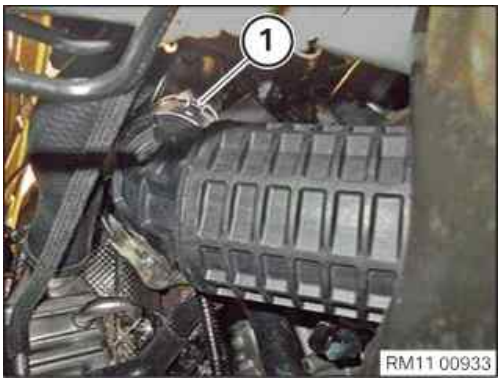

- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

59 – Remove exhaust turbocharger

- Release screw (1) from beneath with a long extension.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).
- Disconnect the oil return line (2) toward the bottom and set it aside.

- Release banjo bolt (1) of oil feed line from exhaust turbocharger and place to one side.

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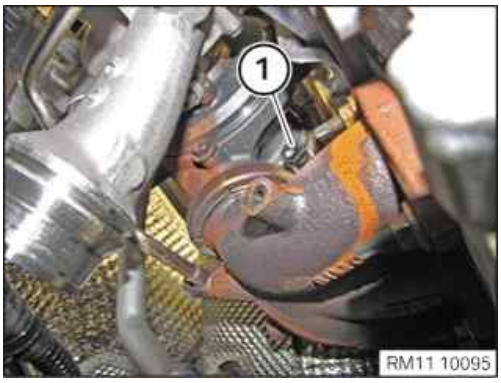


- Release screw (1) and remove V-clip.
- Pull exhaust turbocharger up and remove.
- Remove seal between exhaust turbocharger and exhaust manifold.

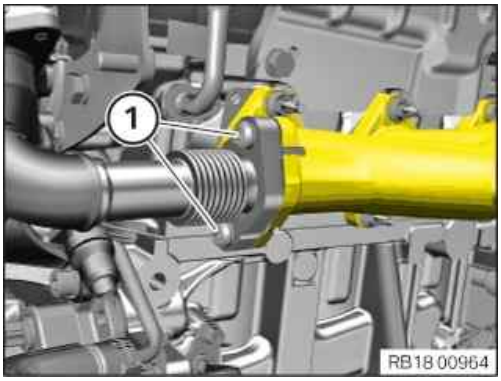
60 – Remove exhaust manifold

WARNING

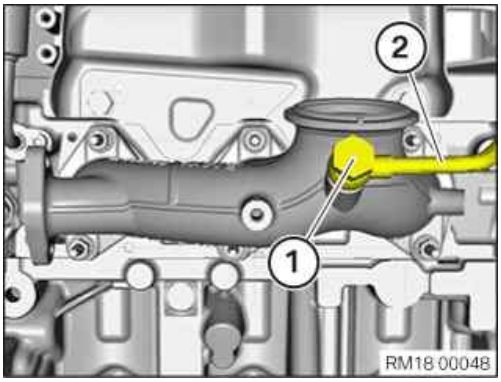
Hot surfaces.

Risk of burning!

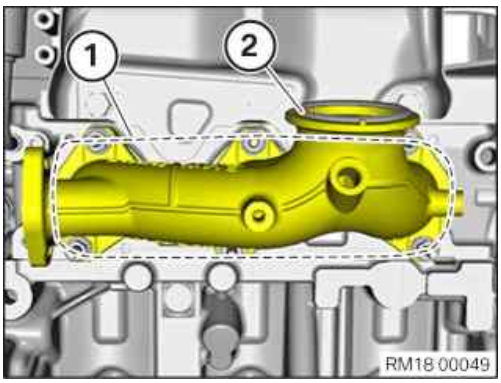
- Perform all work only on components that have cooled down.



- Loosen screws (1).



- Unscrew the banjo bolt (1).
- Feed out exhaust gas pressure pipe (2) and place to one side.



- Evenly release nuts along the dashed line (1) from outer to inner side.
- Feed out exhaust manifold (2) and remove.

61 – Removing the acoustic cover for the engine at the front

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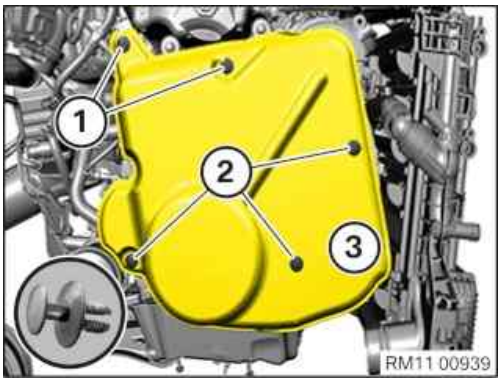


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

62 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

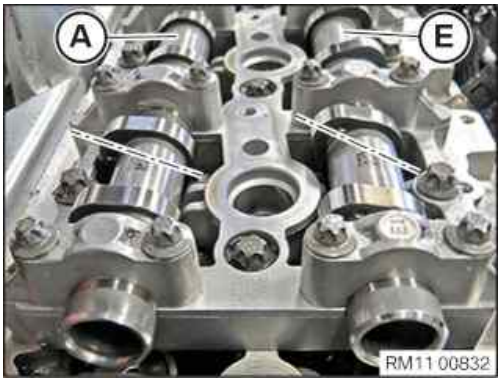
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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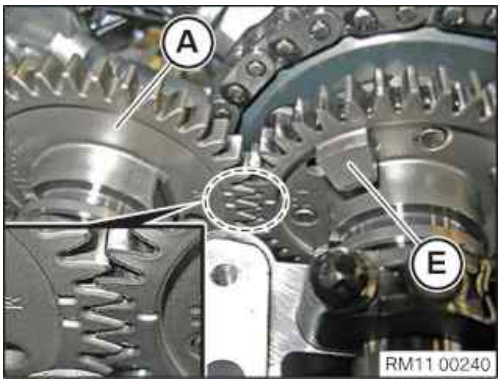
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

63 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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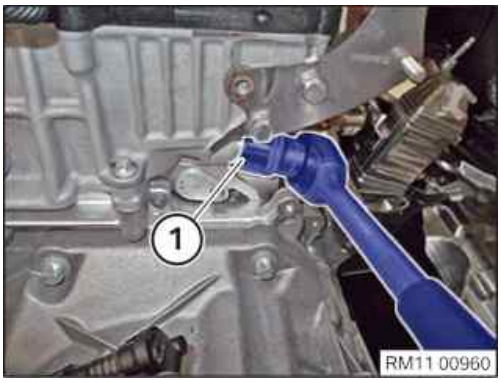
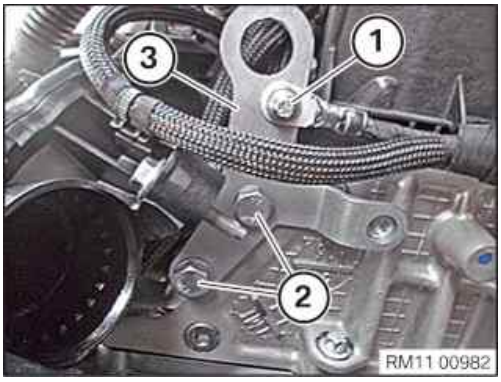


TECHNICAL INFORMATION

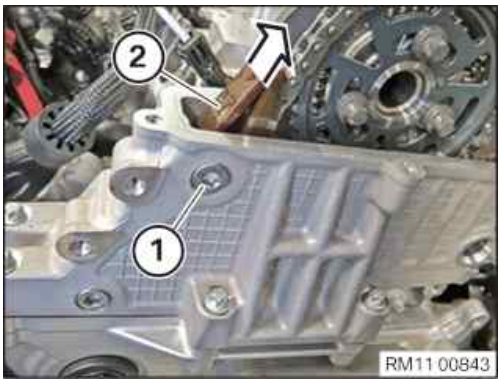
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

64 – Remove the timing chain guide rail

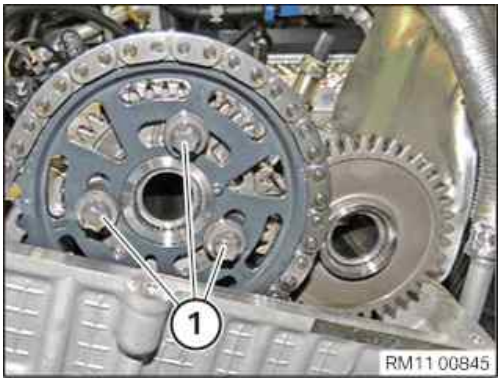


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

65 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

66 – Removing the camshaft support

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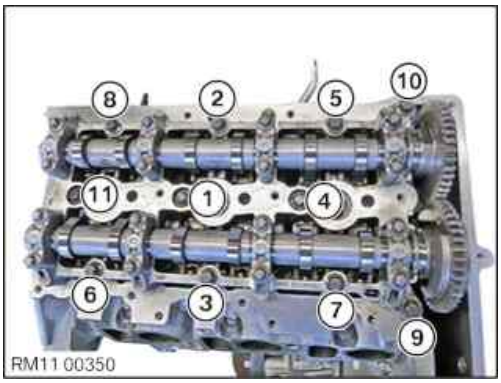
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

MAIN WORK

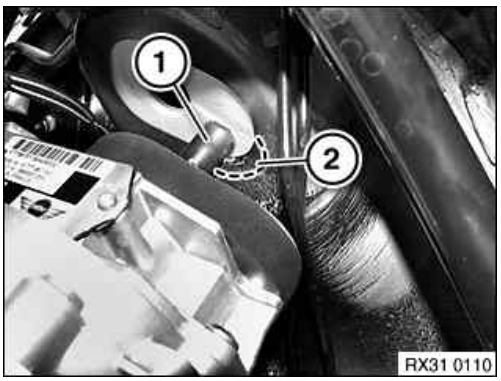
67 – Remove cylinder head.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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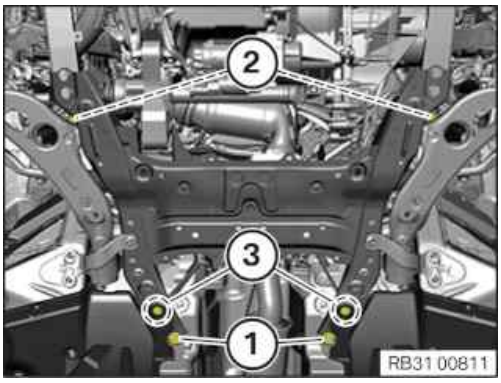


- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

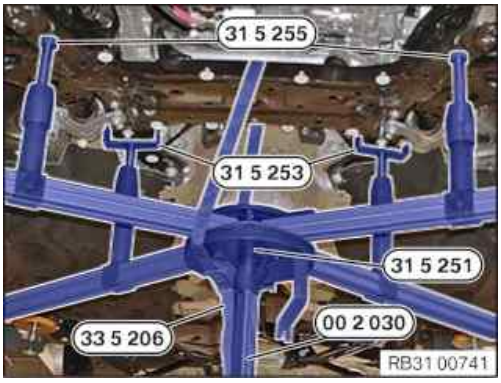
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

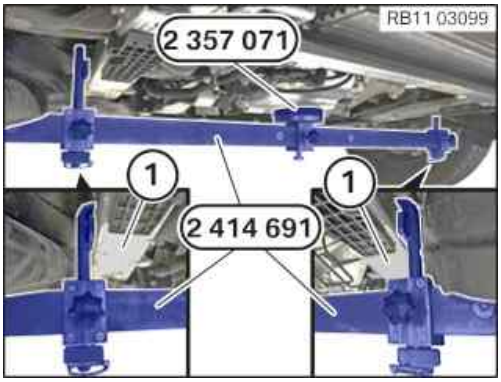
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and set it aside.



- Prepare special tool **2 414 691** together with the special tool **2 357 071**.
- Attach special tool **2 414 691** to front axle support and correctly align the special tool **2 357 071** under the oil sump and tighten.
- Turn special tool **2 414 691** at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools**2 414 691** and **2 357 071**.

- Remove all glow elements with special tool **0 491 068 (11 6 050)** or a standard tool.

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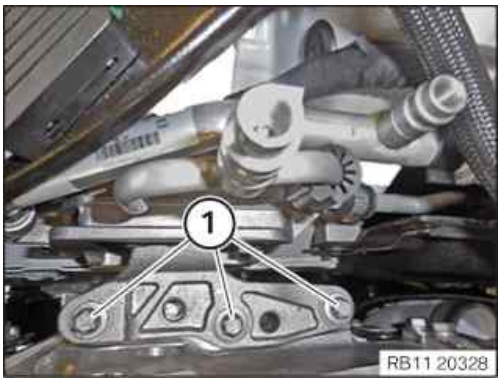
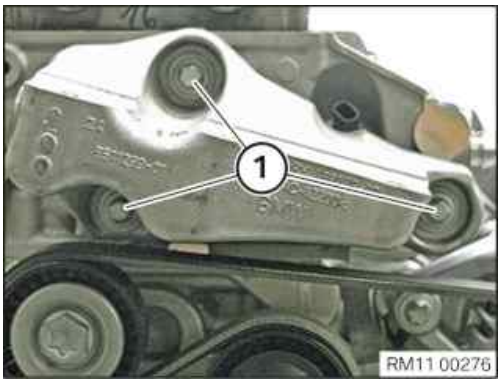


- Loosen screws (1).

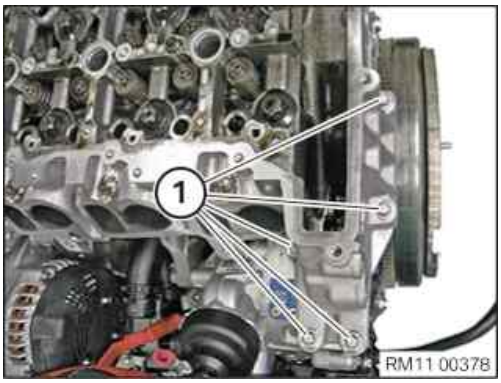


- Loosen screws (1).

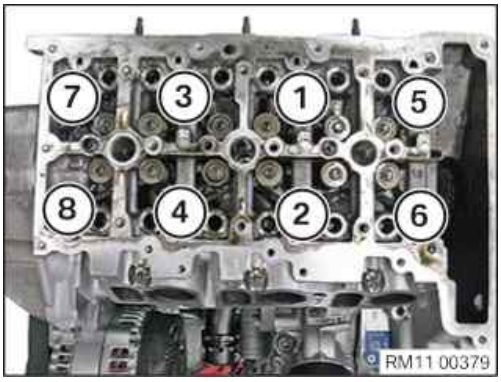
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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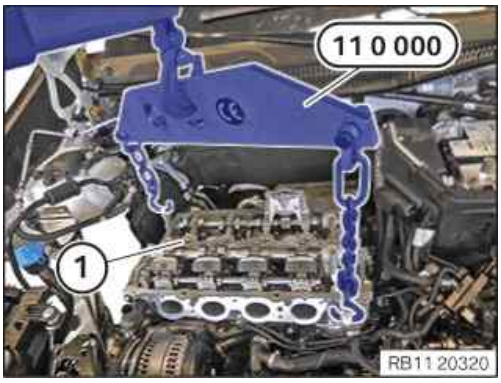


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

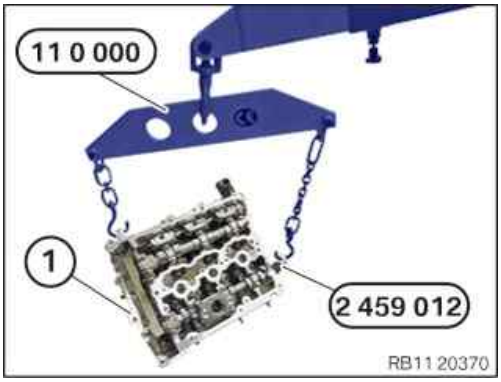
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.



- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

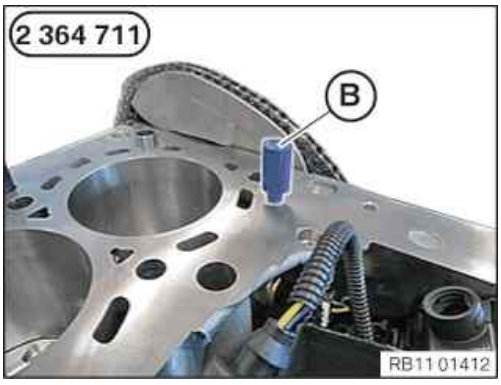
68 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

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RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

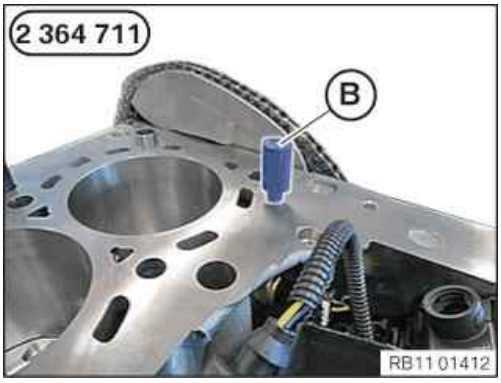
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

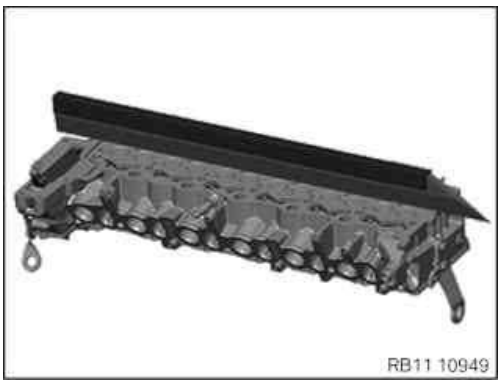
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

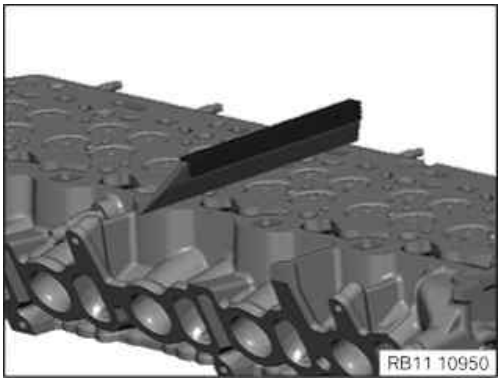
69 – Check the flatness of the cylinder head



- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm



- Check the flatness of the cylinder head crosswise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

70 – Checking the valve underprotrusion

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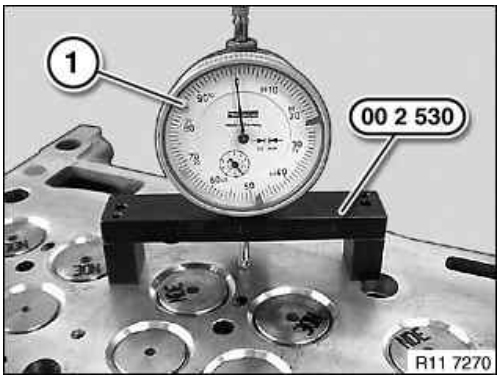
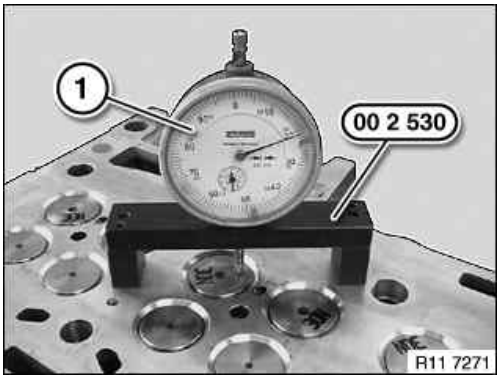


- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

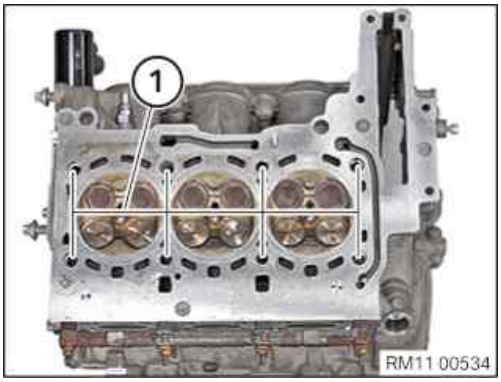
Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

71 – Renewing the cylinder head gasket



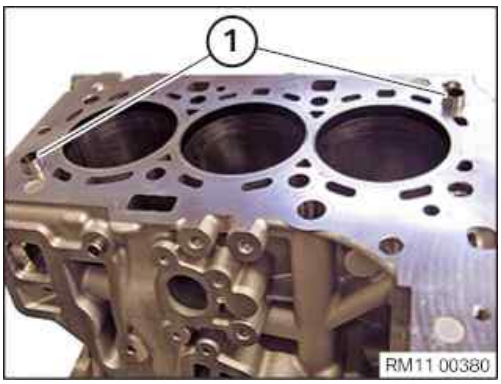
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).



- Check the fitting sleeves (1) for secure fit and damage.

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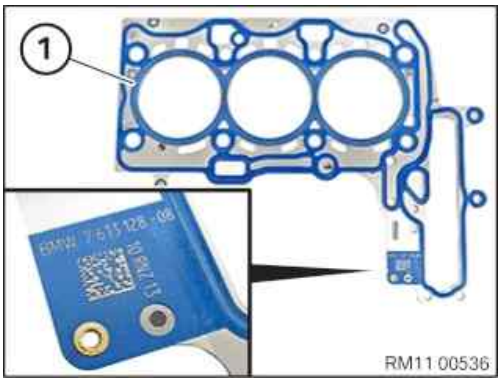
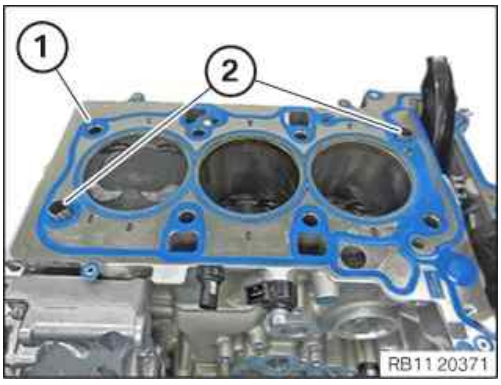


- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

72 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

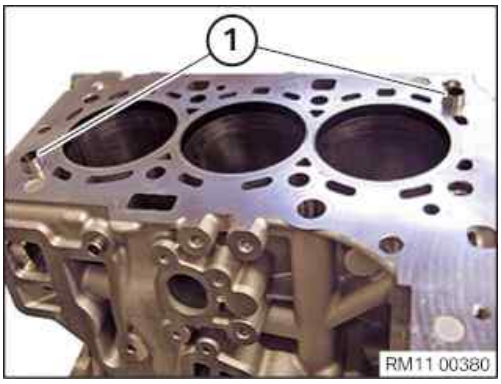
Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.

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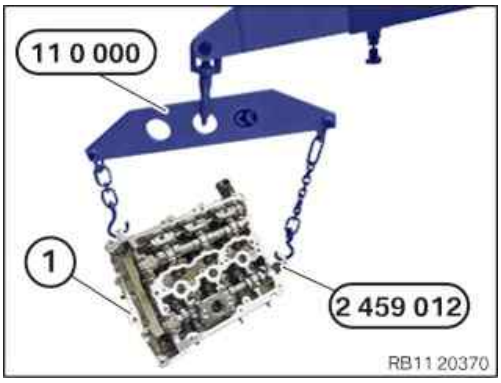
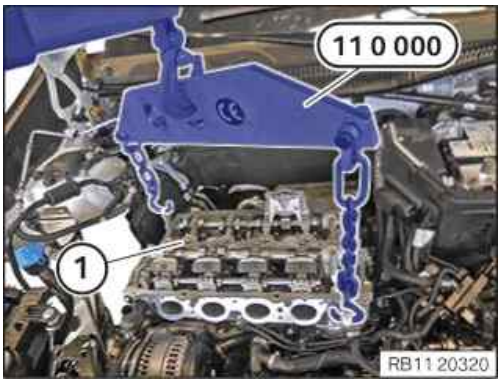


- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



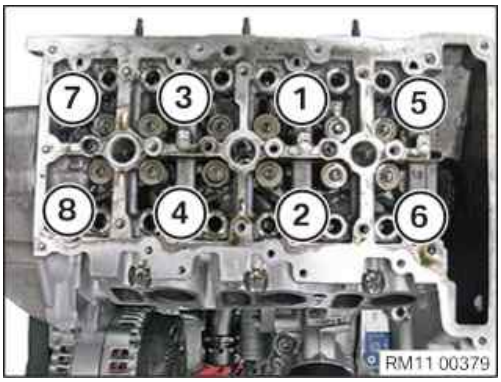
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Fit new cylinder head bolts.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

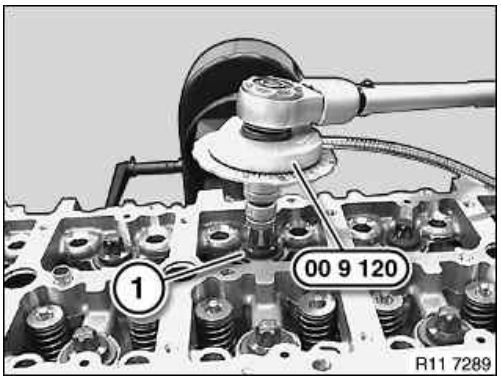
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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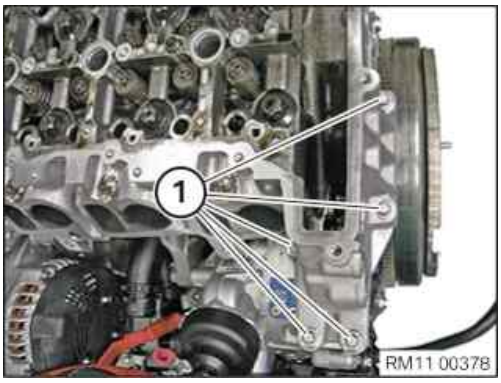
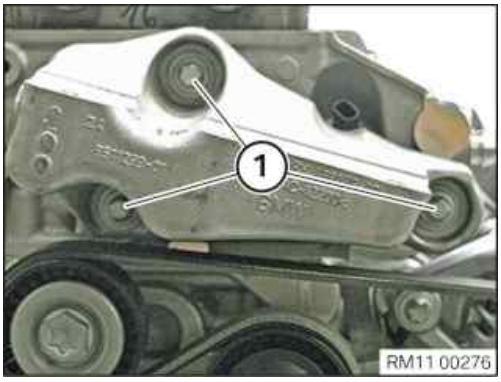


- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

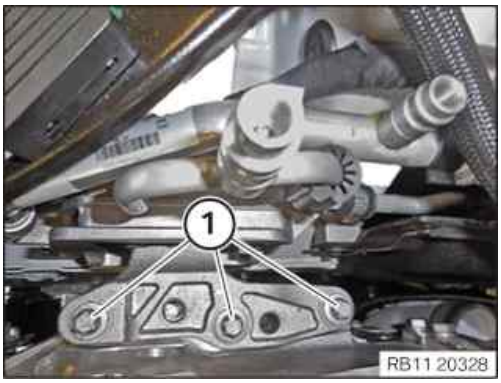
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.



- Tighten the screws (1).

Engine support to cylinder head

M10X45		Tightening torque	41 Nm



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

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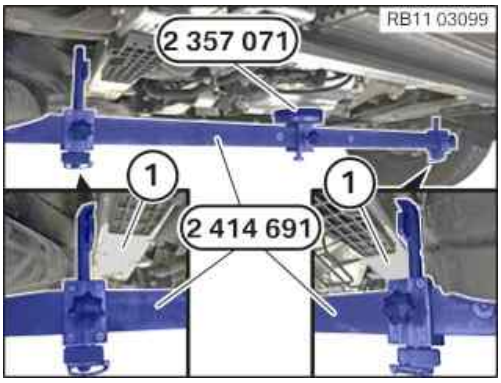
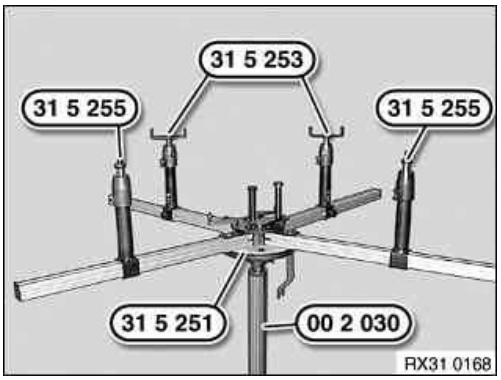
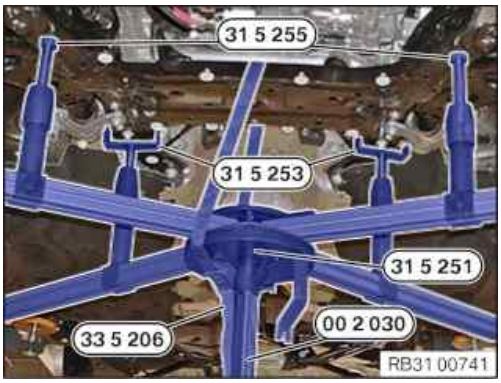


- Disassemble special tool **2 414 691** using special tool **2 357 071**.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

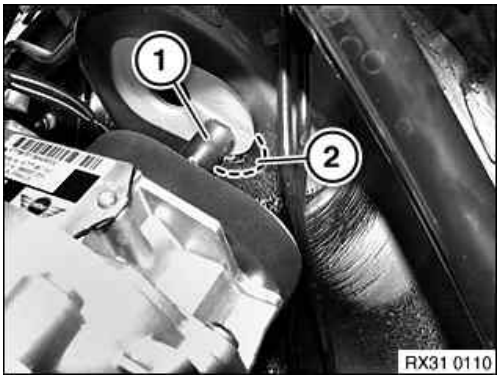
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

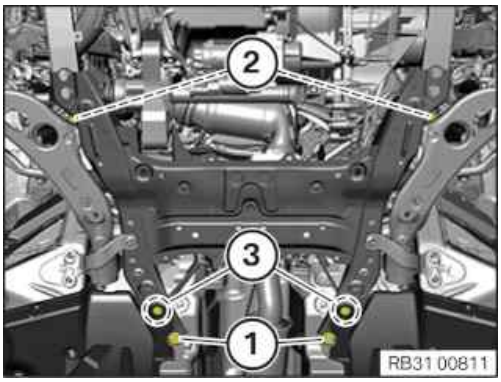


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

POSTPROCESSES

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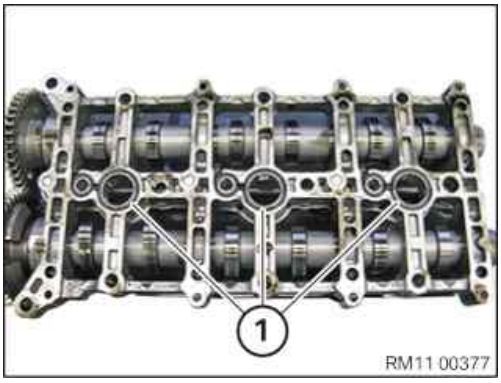
73 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

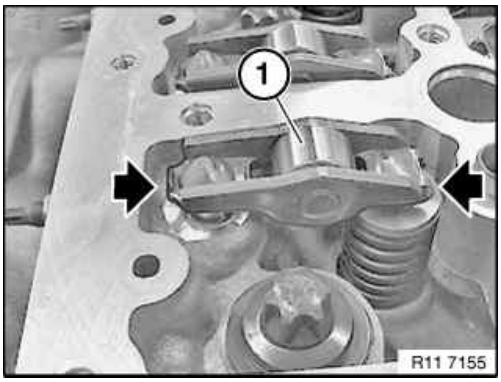
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

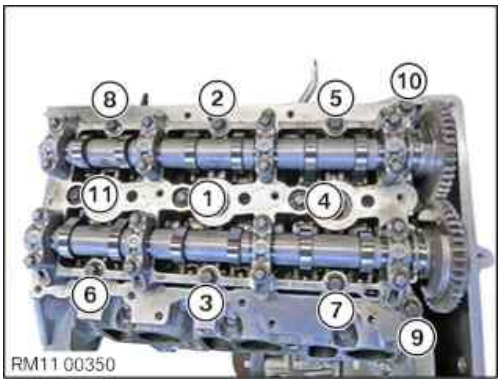


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.

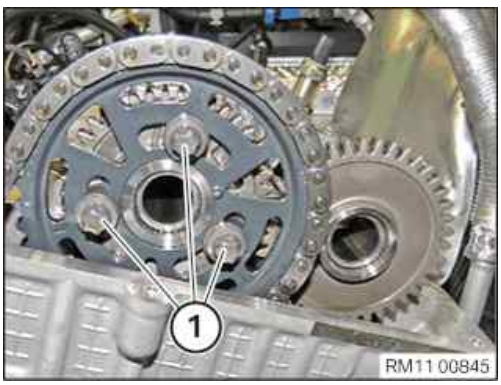


- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

74 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

75 – Install the timing chain guide rail

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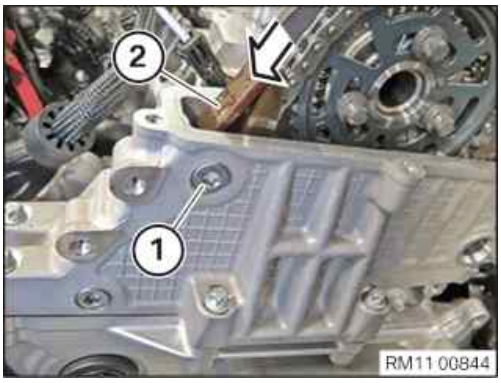


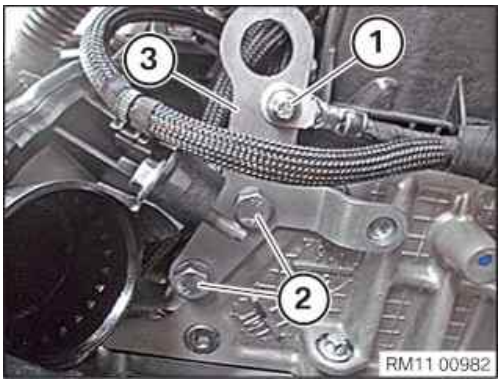
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

76 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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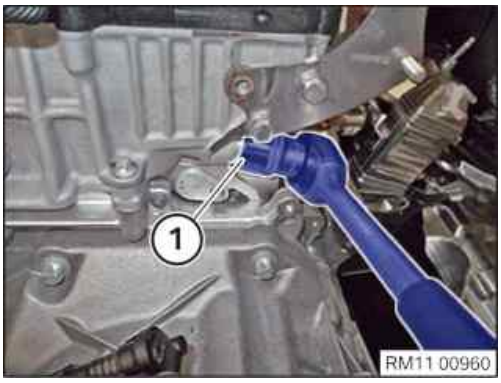
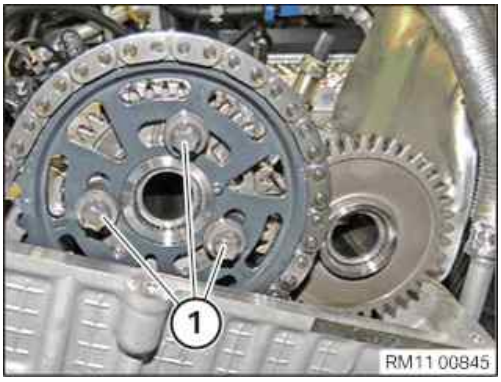


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

77 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

78 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

79 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

80 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

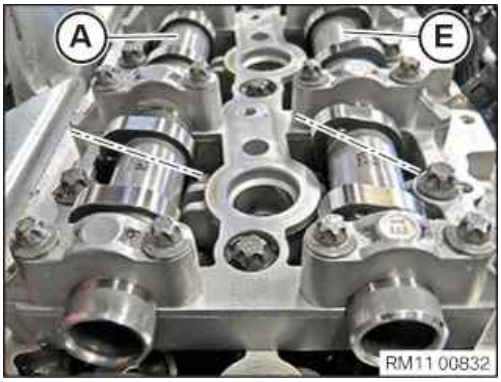
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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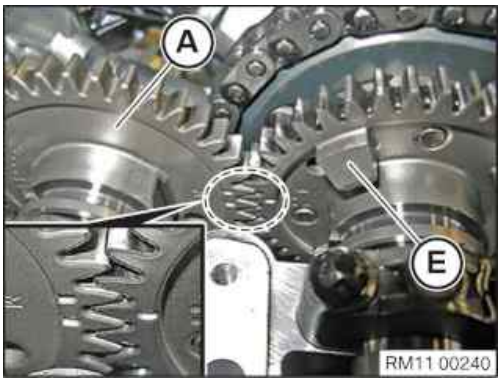


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

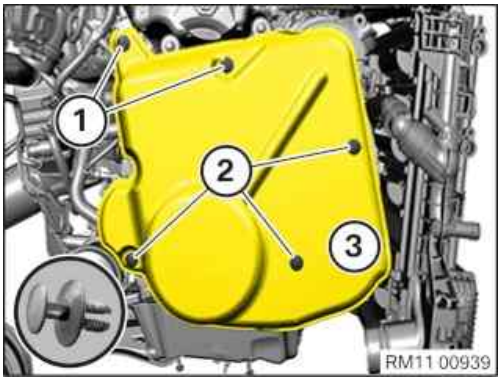
TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

81 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

82 – Installing exhaust manifold

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

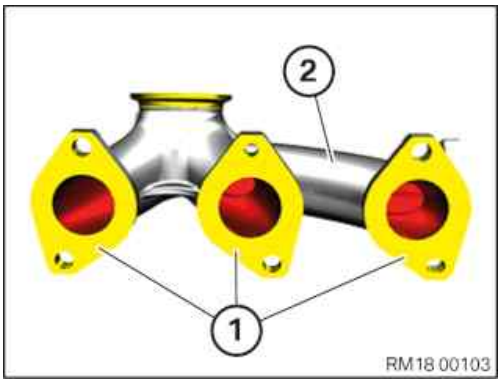
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

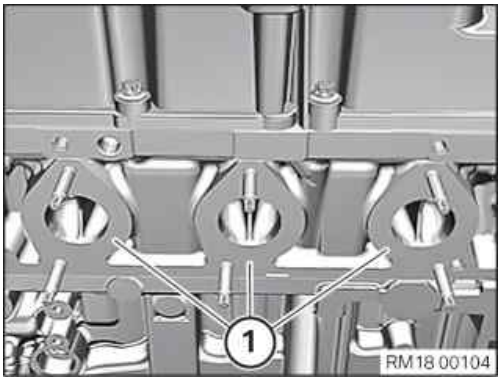
- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

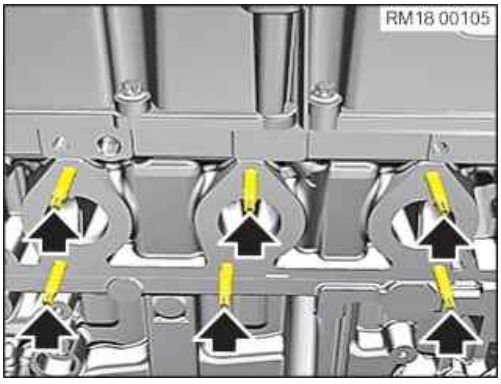
The sealing surfaces must be free from oils, grease and cleaning agents.



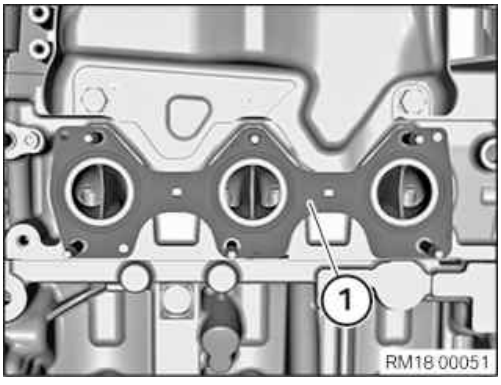
- Clean the connection points (1) on the exhaust manifold (2) with the special tool **0 495 102 (11 4 470)**.



- Clean the connection points (1) on the cylinder head with the special tool **0 495 102 (11 4 470)**.



- Check the stud bolts (arrows) on the cylinder head for **correct** fit.



TECHNICAL INFORMATION

The **coated side of the** seal must be mounted facing towards the exhaust manifold.

- Renew the gasket (1).

  Parts: Gasket

- Insert and install the gasket (1).

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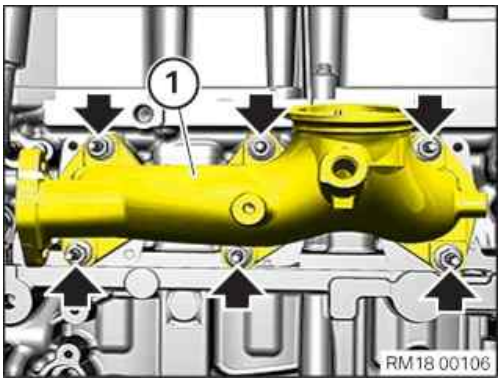
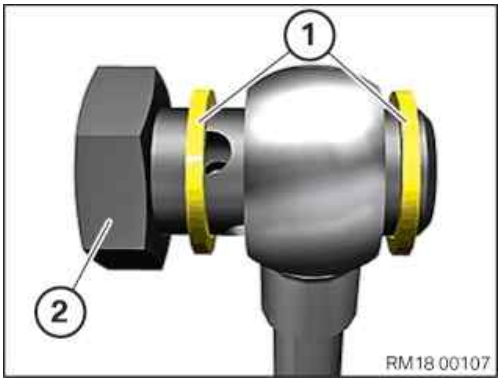


- Insert and install the exhaust manifold (1).
- Renew the nuts (arrows).

  Parts: Nuts
- Hand-tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.
- Tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.

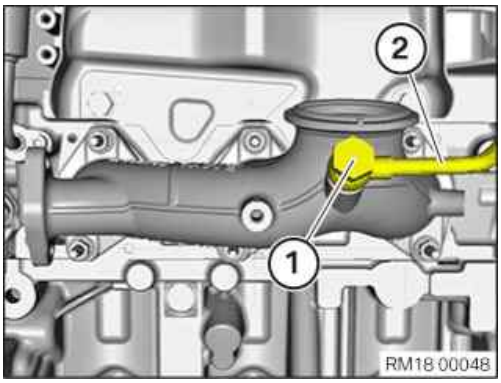
Exhaust manifold to cylinder head

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm



- Renew the sealing rings (1) from the banjo bolt (2).

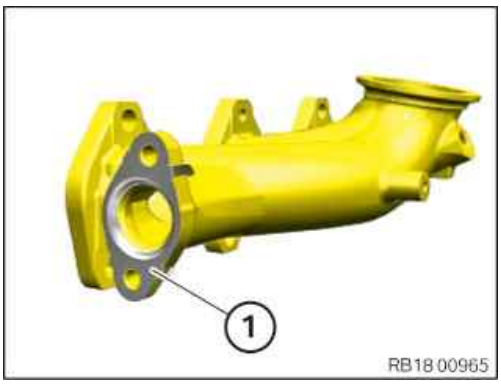
  Parts: Sealing ring



- Insert and install the exhaust gas pressure pipe (2).
- Tighten the banjo bolt (1).

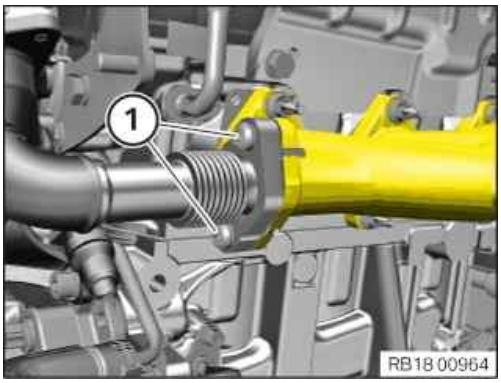
Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt		Renew sealing rings.	30 Nm



- Renew seal (1) between exhaust-gas recirculation cooler and exhaust manifold.

  Parts: Gasket



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

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- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

84 – Installing exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the exhaust turbocharger

Inadequate initial filling of exhaust turbocharger leads to dry running.

- Make sure the initial filling is correct when replacing exhaust turbocharger.
- Fill the exhaust turbocharger with the suitable additive (see electronic Parts Catalogue).

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.
For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

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TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

TECHNICAL INFORMATION

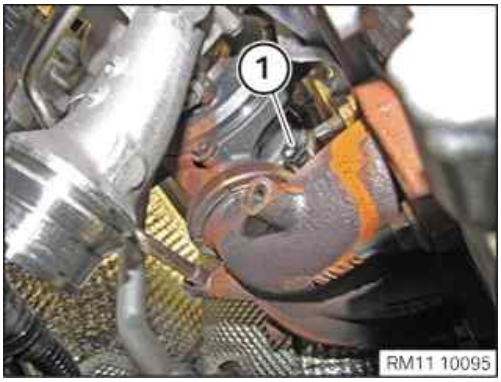
For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger



- Renew gasket.

  Parts: Gasket
- Position seal on exhaust manifold.
- Guide the exhaust turbocharger in from the top and position it.
- **Ensure that gasket is correctly seated.**
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Renew sealing rings.

  Parts: Sealing ring
- Position oil feed line with banjo bolt (1) and sealing rings and tighten hand-tight.

  There are 2 sealing rings fitted on the banjo bolt (1).
- Align oil feed line and tighten banjo bolt (1).

  The oil feed line must not sit on the exhaust turbocharger.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

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- Renew gasket.

  Parts: Gasket
- Position oil return line (2) with **seal** on exhaust turbocharger.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Feed in and tighten screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

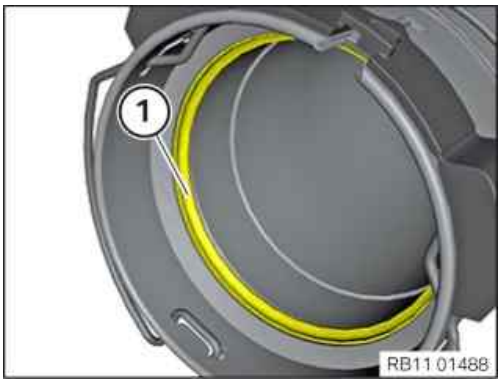
85 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

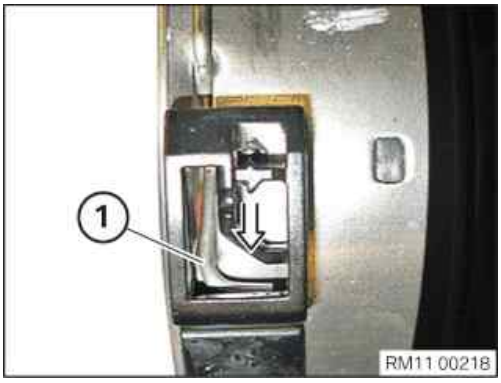
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

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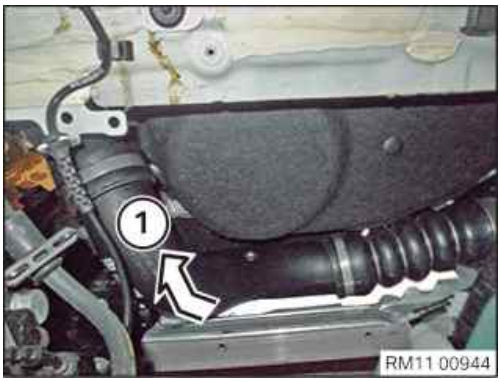
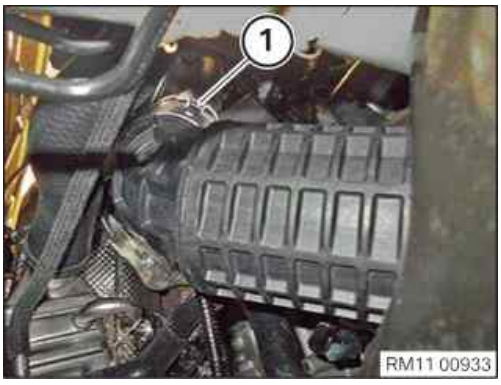
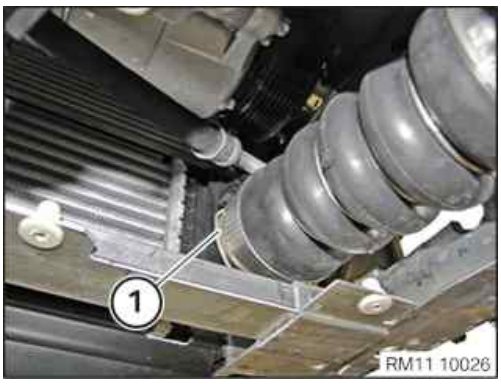


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



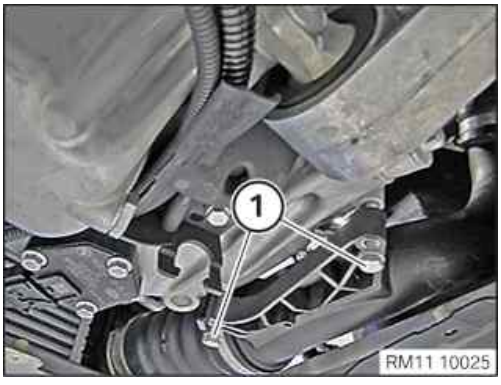
- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm



- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

86 – Installing heat shield on exhaust turbocharger at the rear

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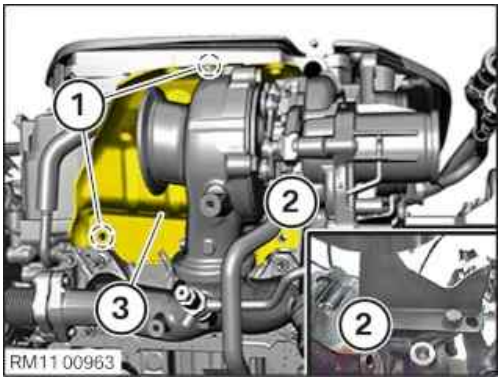
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

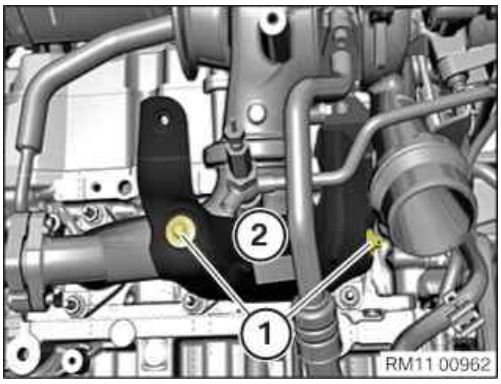
87 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

88 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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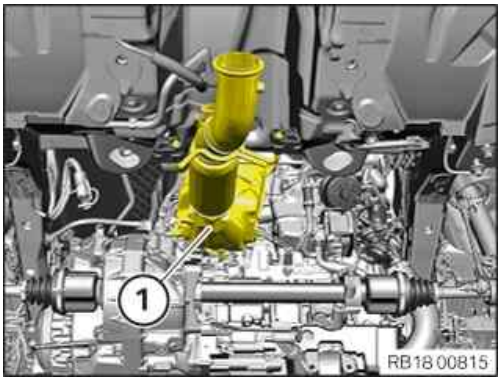
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

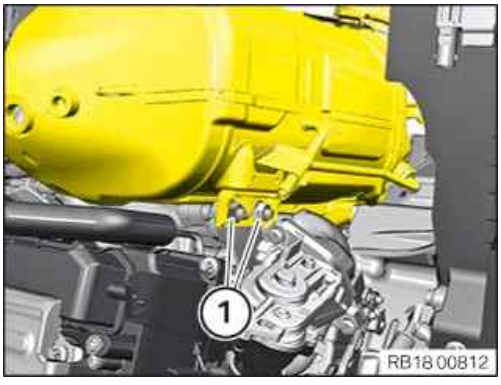
  Parts: Gasket

- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.

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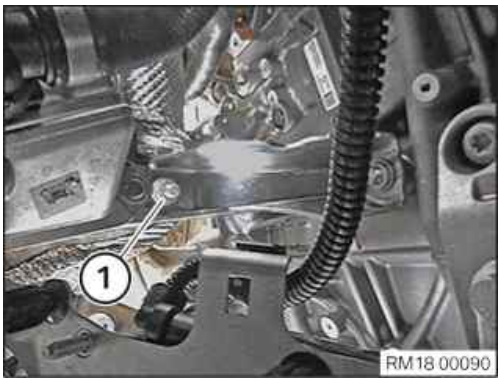


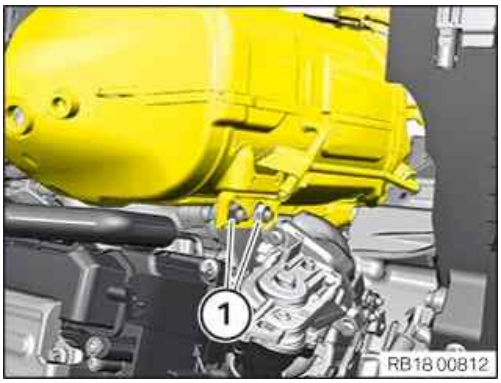
- Tighten the nut (1) hand-tight.

- Remove fitting aid (1) for the flexible tube.

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

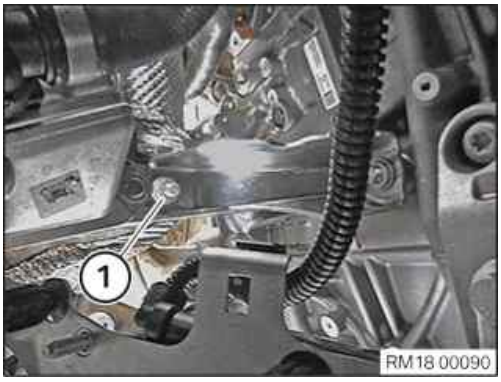
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten nut (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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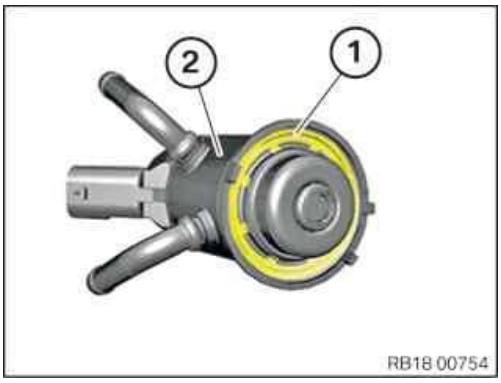
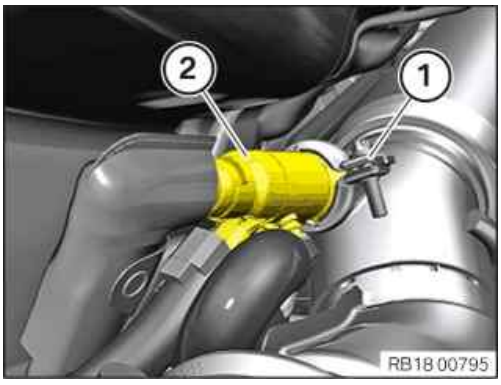


- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

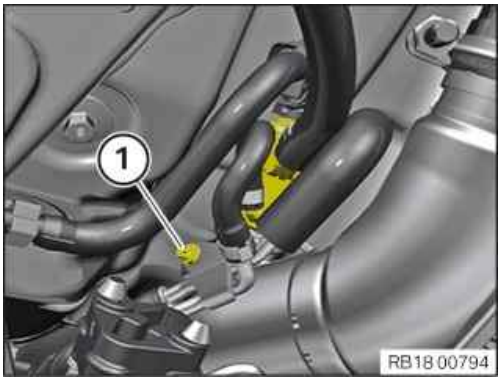


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

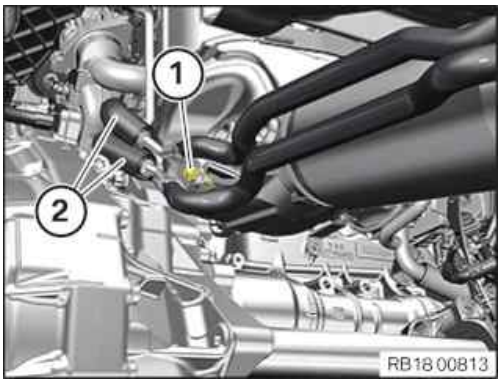
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

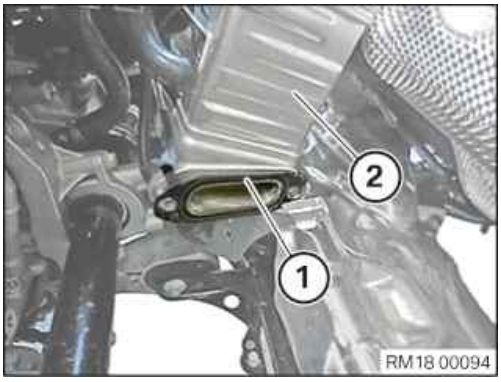
Torx bolt BM6x16		Tightening torque	8 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm



- Replace seal (1) of the low pressure exhaust-gas recirculation cooler (2).

  Parts: Gasket

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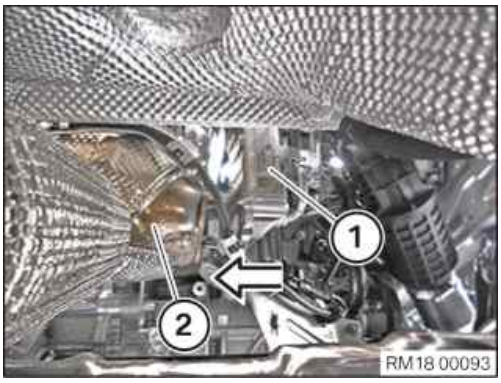
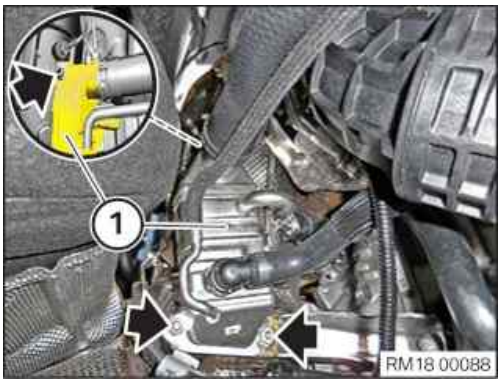


- Feed in and install the low pressure exhaust-gas recirculation cooler (1) in at the diesel particulate filter (2) in the direction of arrow.



- Tighten nuts (arrows) of the low pressure exhaust-gas recirculation coolers (1).

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

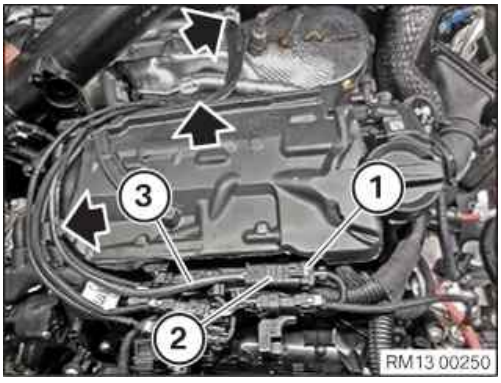
Flange nutM8		Tightening torque	19 Nm

89 – Install the control sensor

- Feed in front oxygen sensor (1) and install.
- Tighten the front oxygen sensor (1) with the special tool **0 491 075 (11 7 030)**.

Control sensor

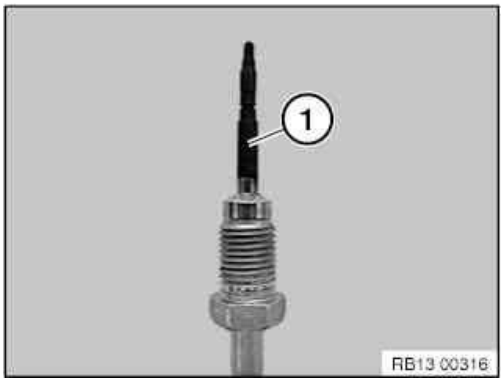
Control sensor		Tightening torque	50 Nm



- Feed in and install cable (3) from the oxygen control sensor into the clamps (arrows).
- Secure connector (2) on holder.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

90 – Install the exhaust-gas temperature sensor on the diesel particulate filter



RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.
- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.

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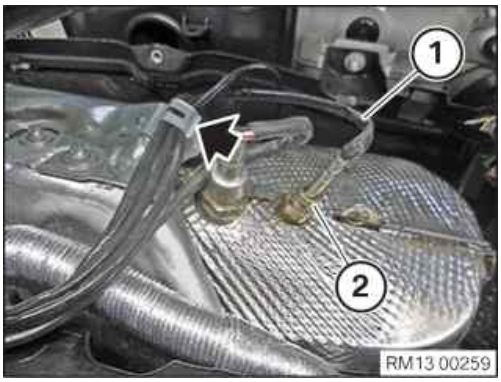


- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

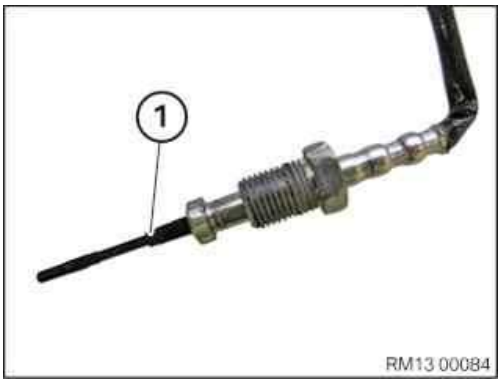
91 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

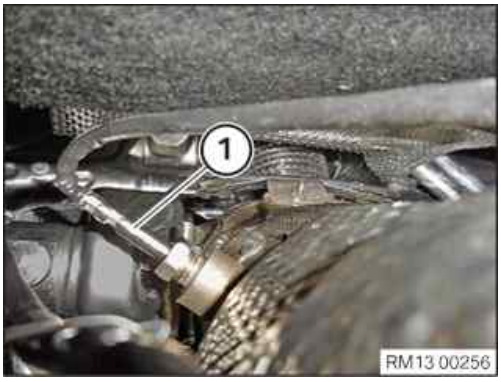
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.



- Feed in and install the exhaust temperature sensor (1).

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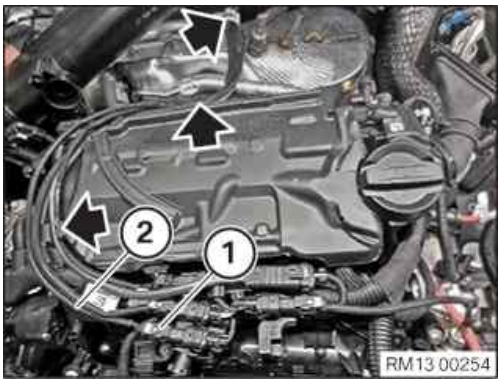
- Tighten the exhaust temperature sensor (1) with conventional tools (2).

Exhaust temperature sensor to diesel particulate filter

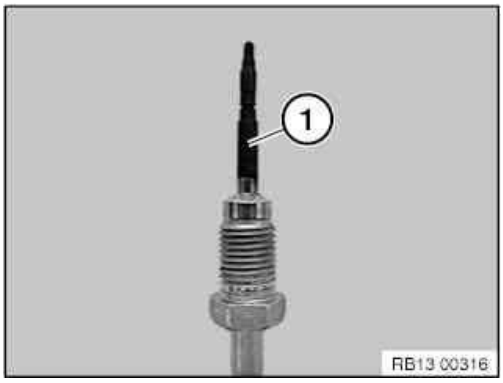
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

92 – Installing exhaust temperature sensor on catalytic converter

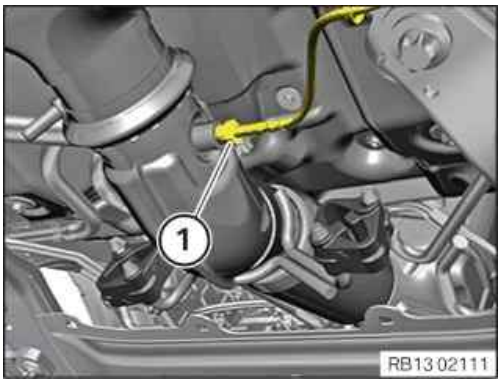


RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.
- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Secure the cable clips (1).

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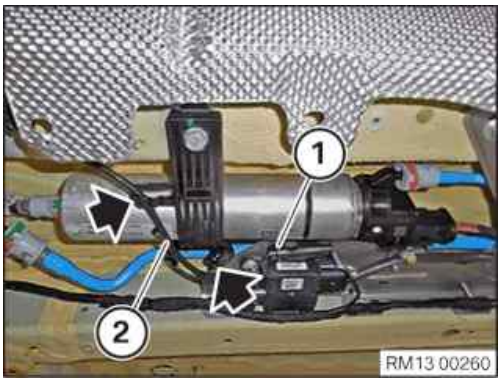
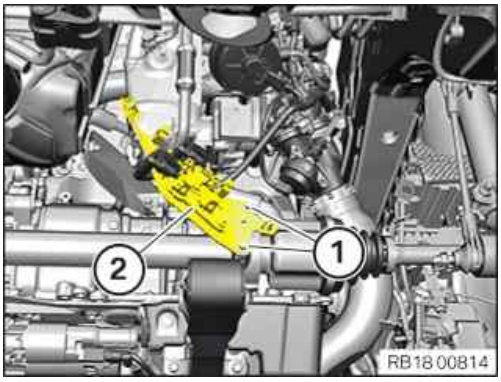


- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

93 – Install holder for oxygen sensor

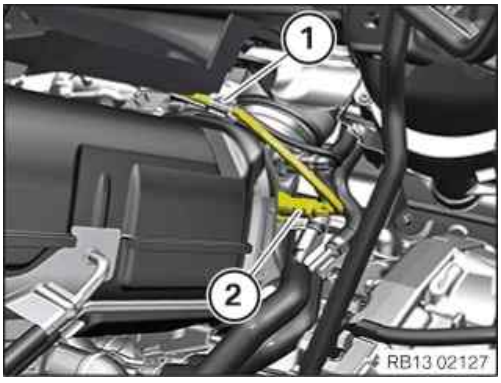


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

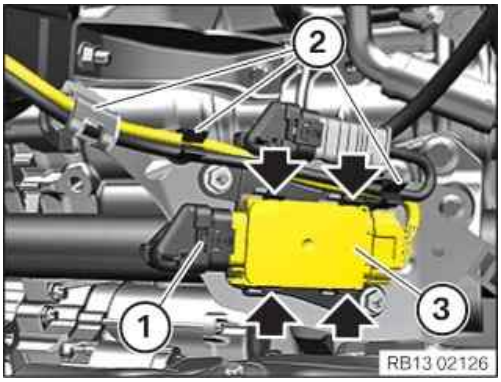
94 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

95 – Install the monitoring sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

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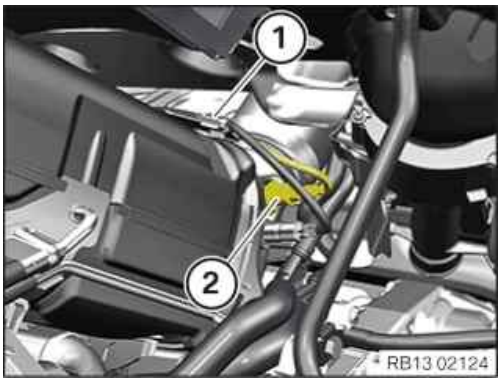
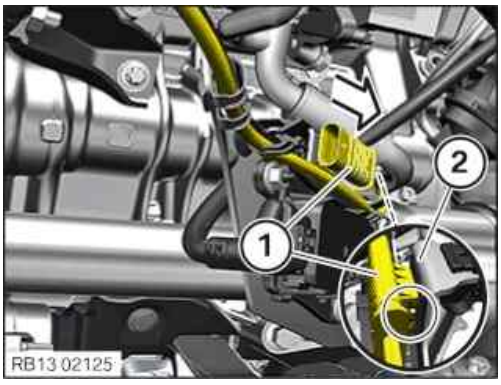


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

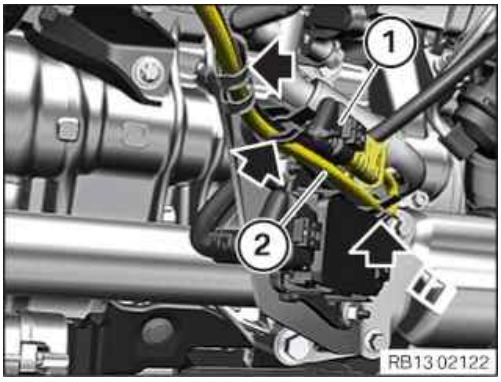
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

96 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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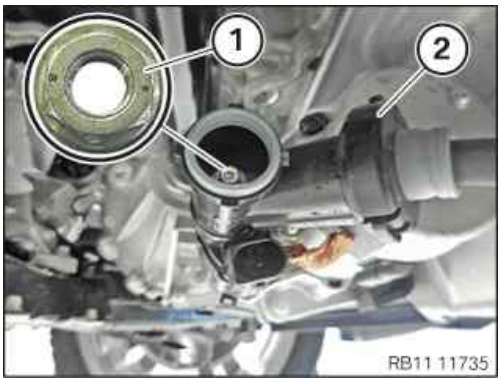


- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

97 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

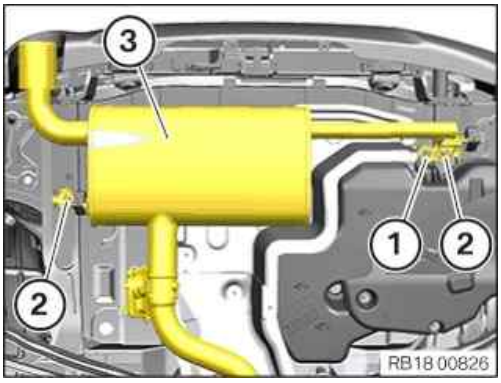
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert and install the exhaust system (3) with the help of another person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

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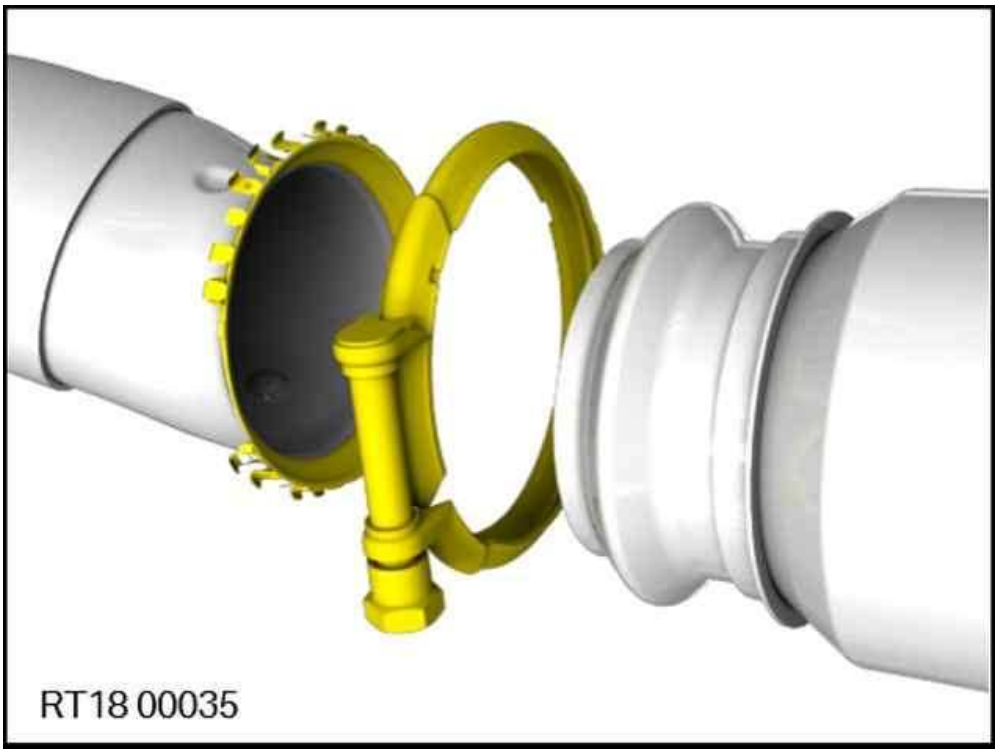
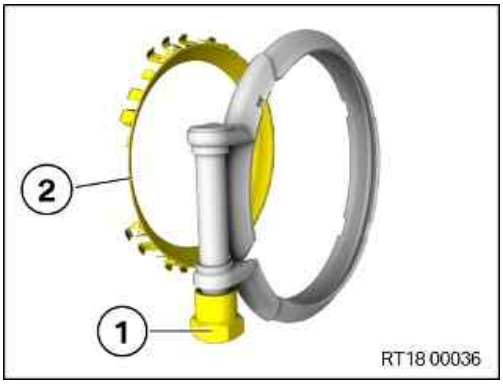
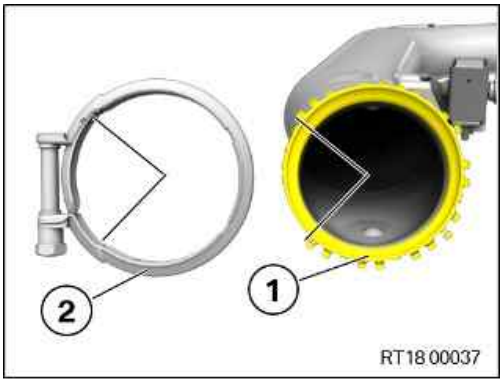
▶ **Install the V-clip**

V-band clamp



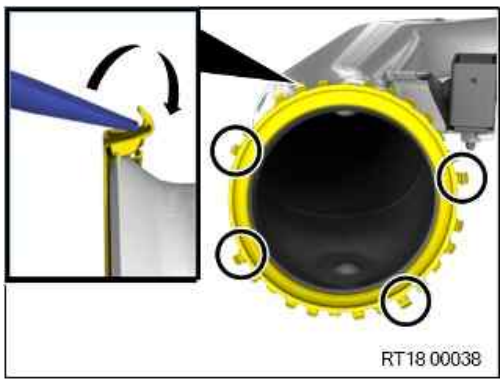


- Unscrew the nut (1) and remove the sealing ring (2).



- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

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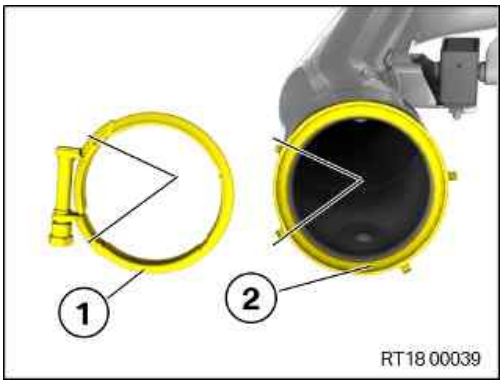
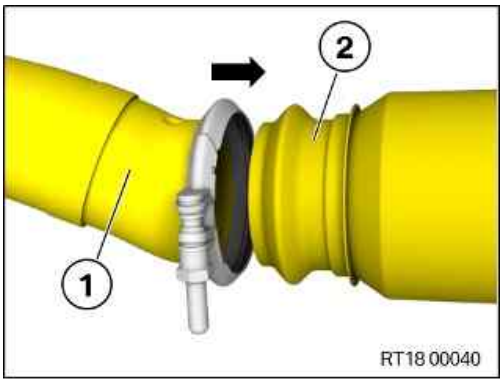
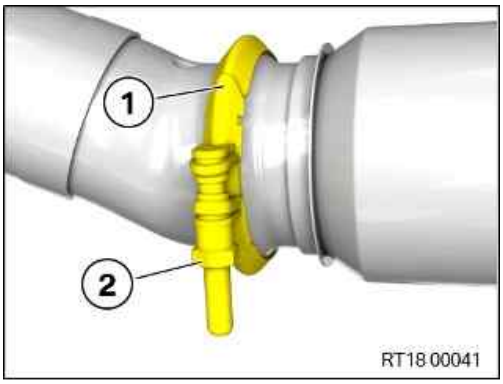


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



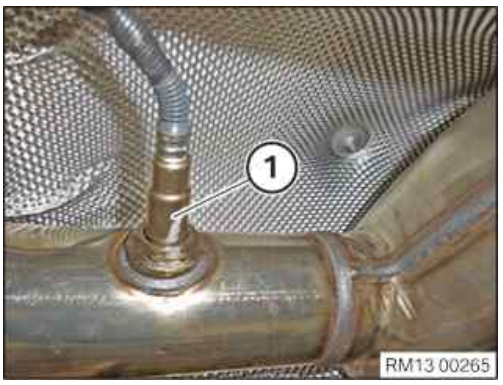
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Guide in, position and tighten the diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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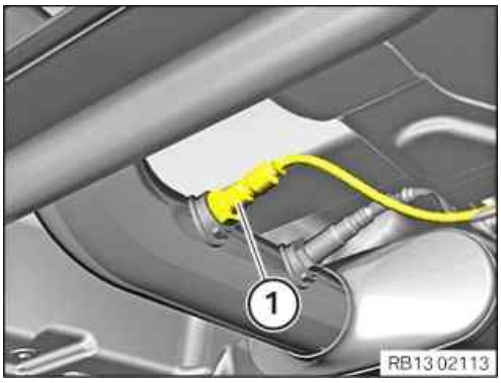
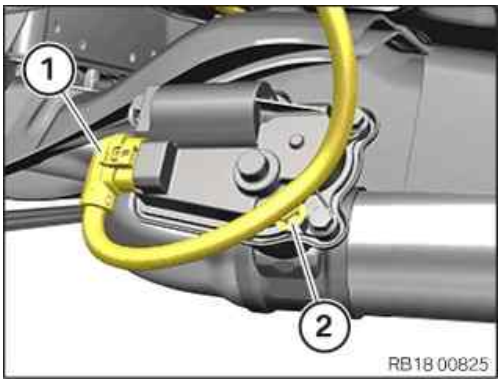


- Guide in, position and tighten the nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

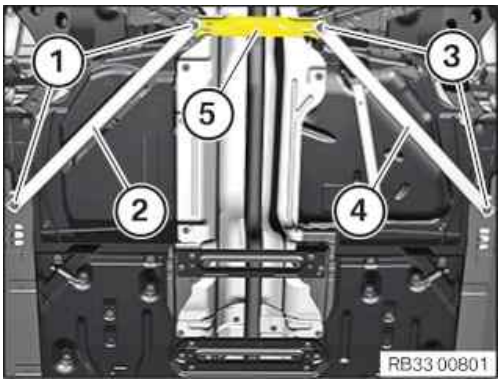
Sensor		Tightening torque	50 Nm



- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

98 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

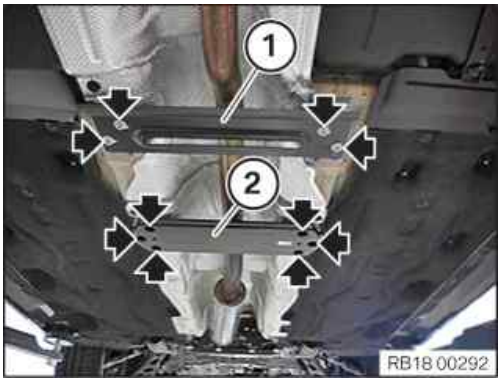
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

99 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

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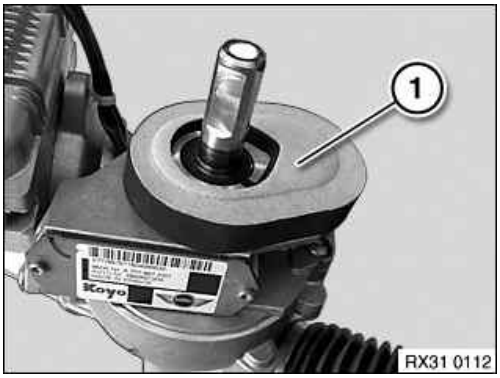
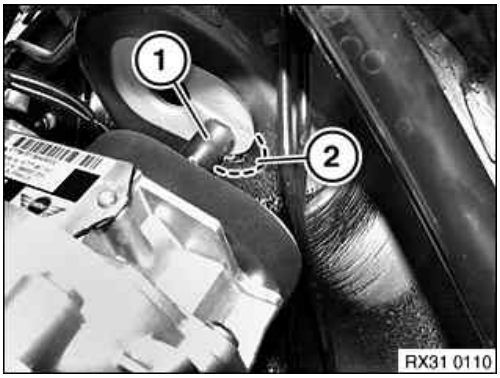
100 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

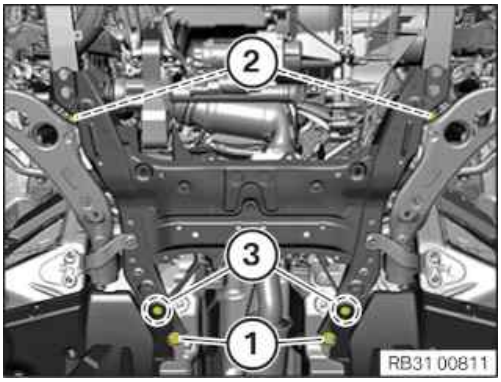


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

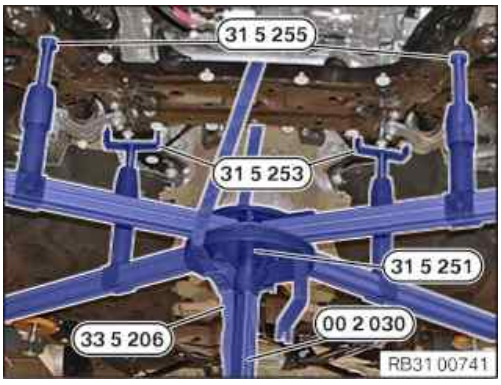
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.

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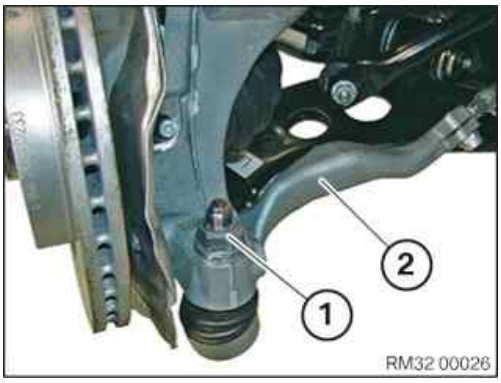


NOTICE

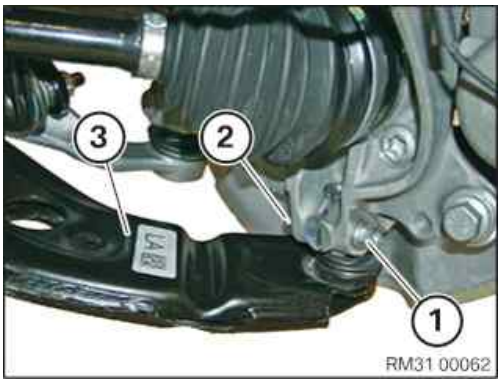
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

101 – Install the mounted parts on the front axle support

NOTICE

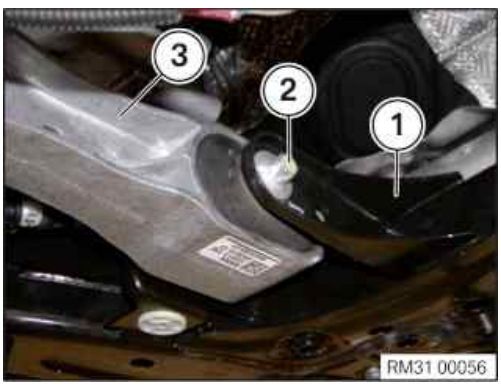
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

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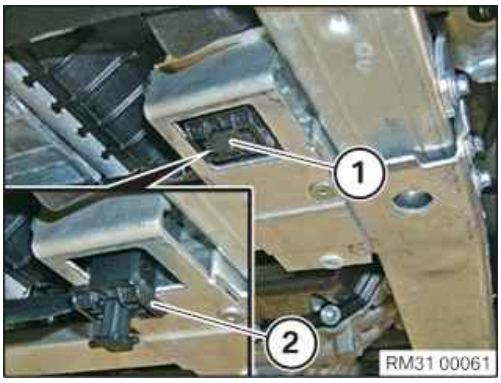
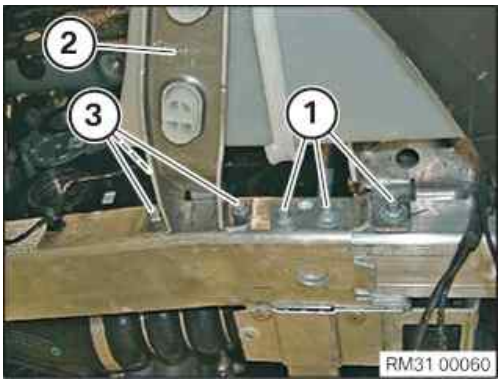


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

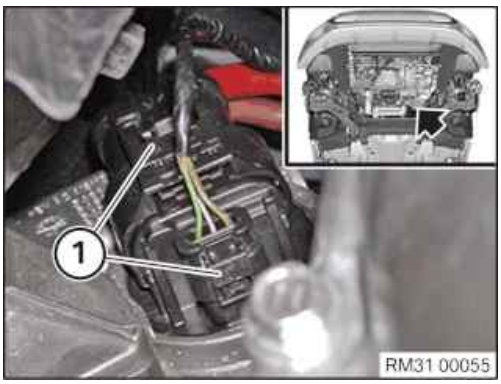
Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

102 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.

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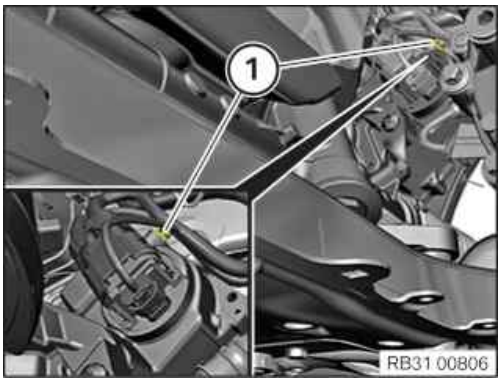
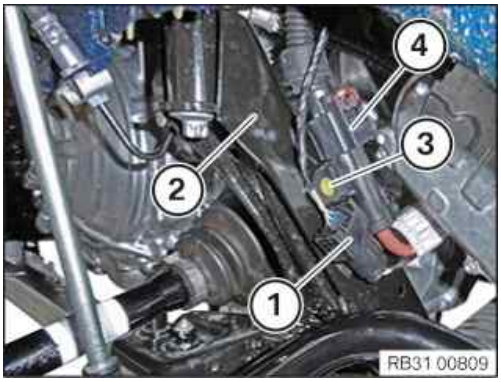


- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

103 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

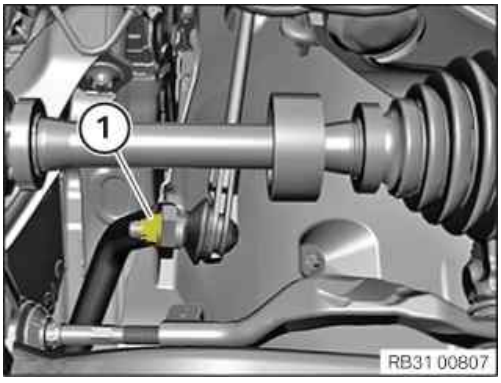
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

104 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

105 – With right installation: Securing the cable for the ride height sensor

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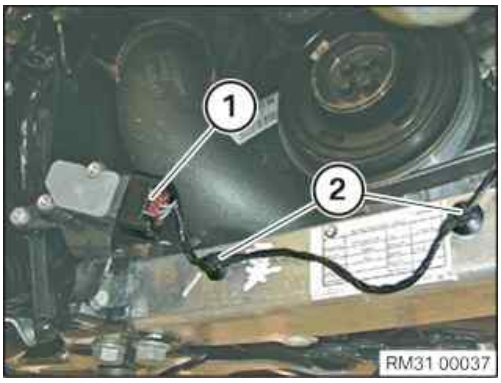


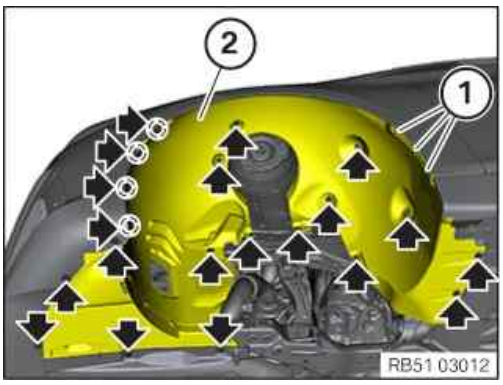
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

106 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▶ Installing the front wheel arch cover



- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

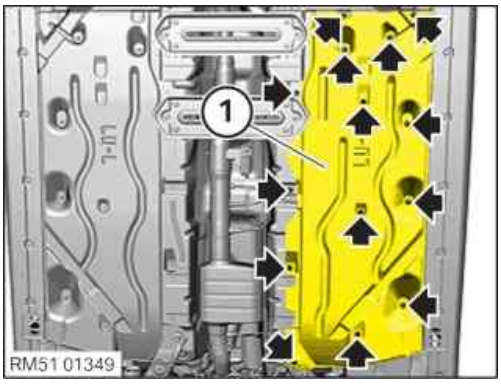
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

107 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

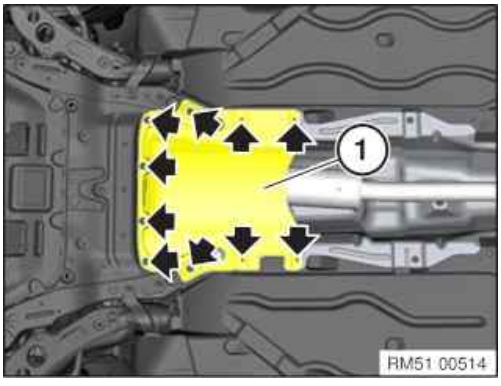
Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

108 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

109 – Mount the front left and right wheels

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▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

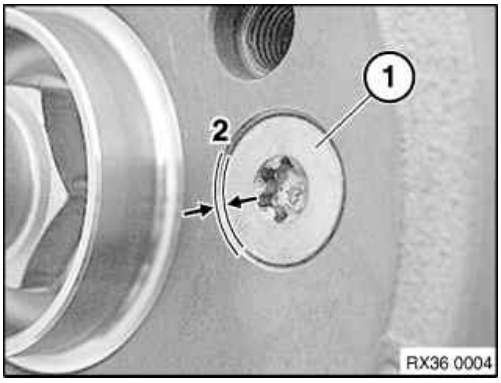
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

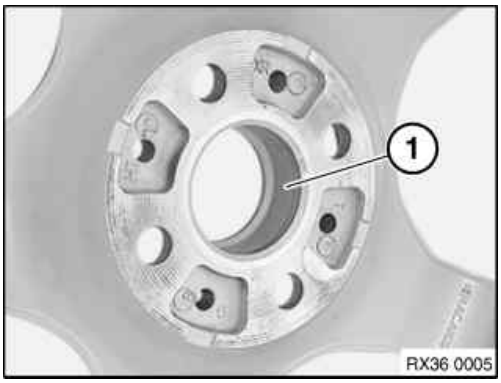
  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

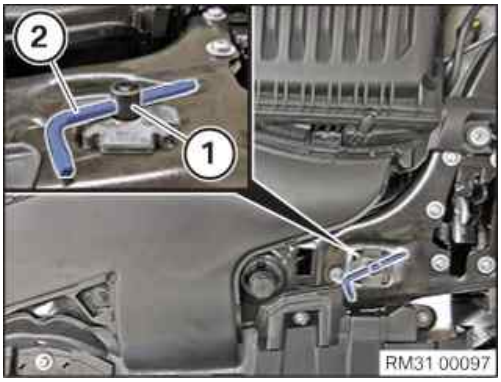
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

110 – Removing fastener for left and right radiator



NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

111 – Secure the steering shaft at the bottom on the steering gear

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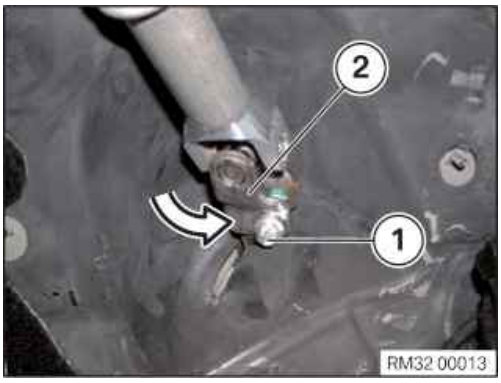
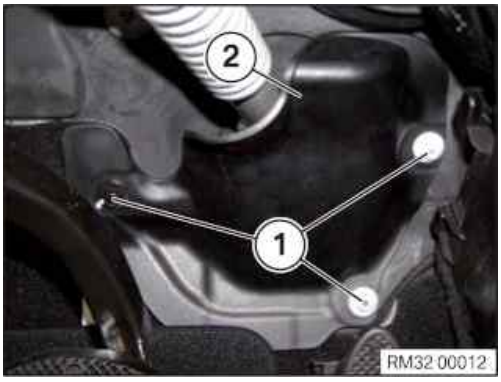


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

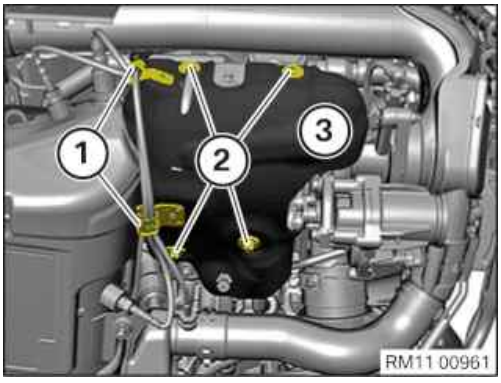
112 – Install the heat shield on the exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



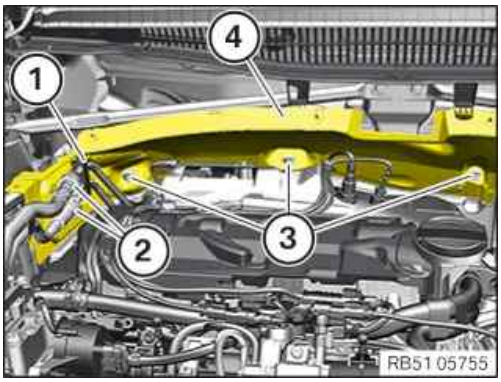
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

113 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

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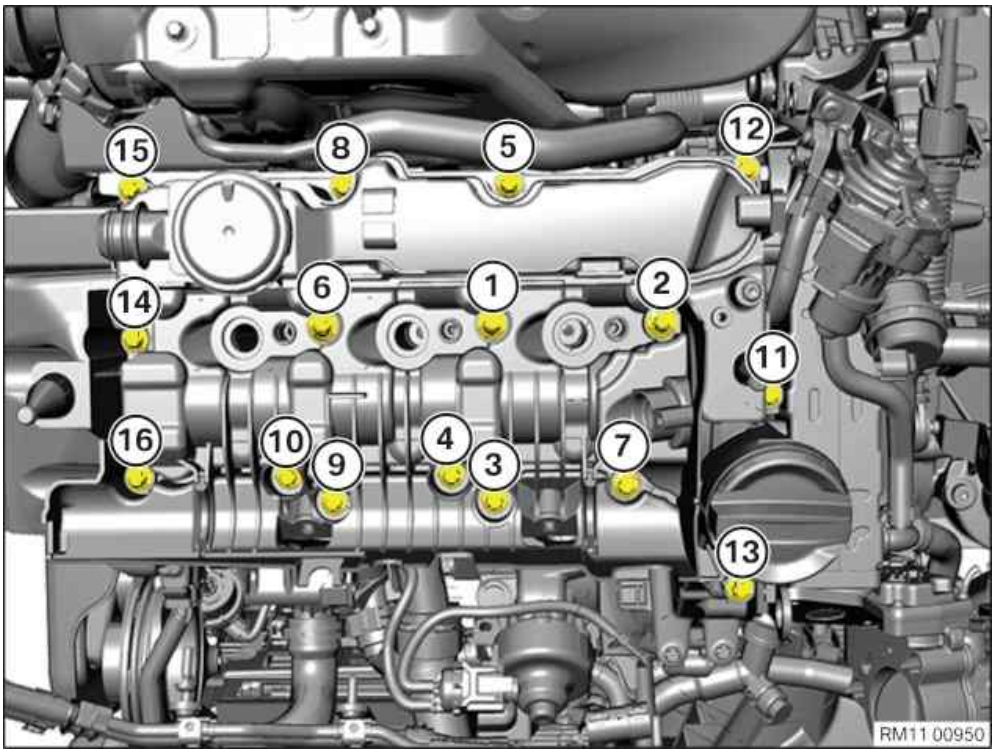
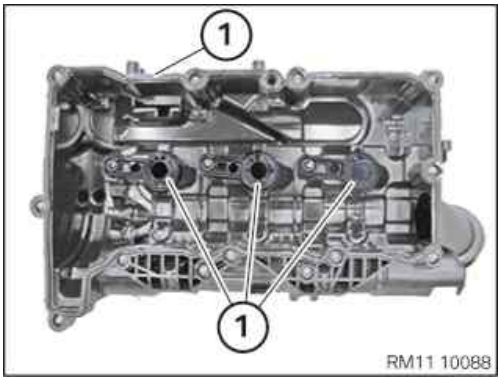
114 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover

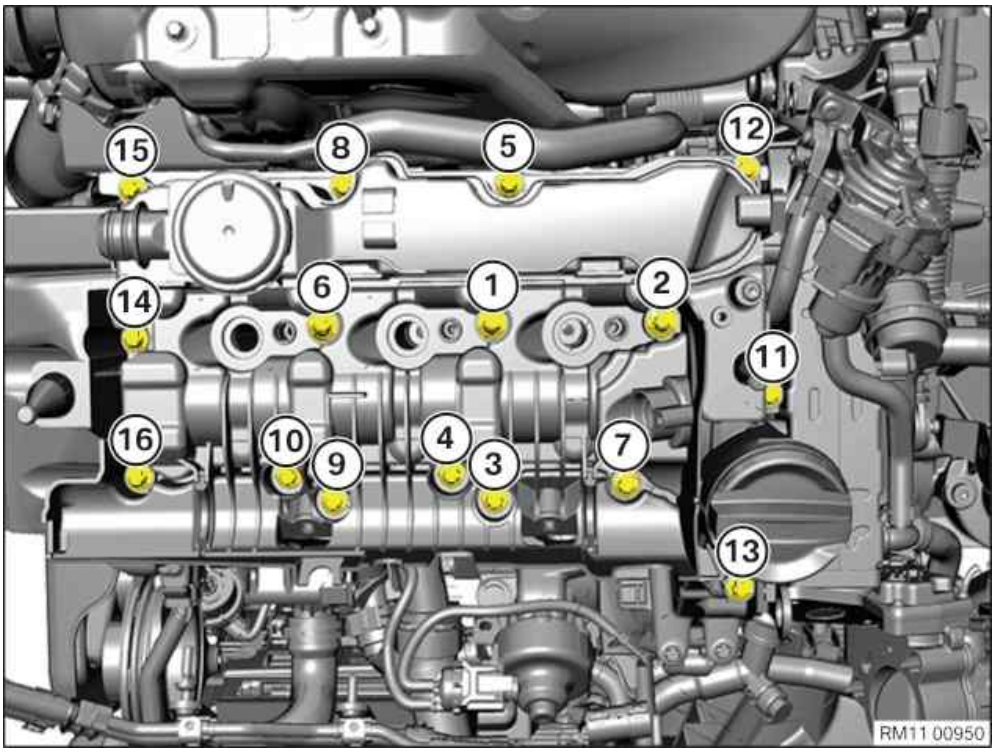


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm

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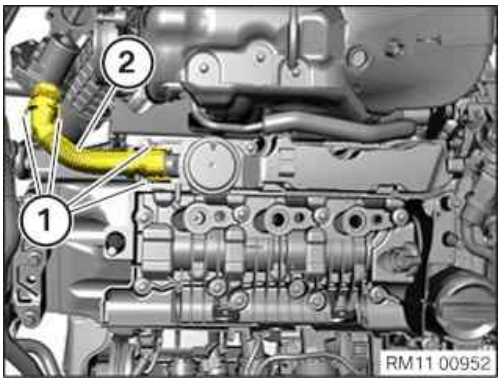
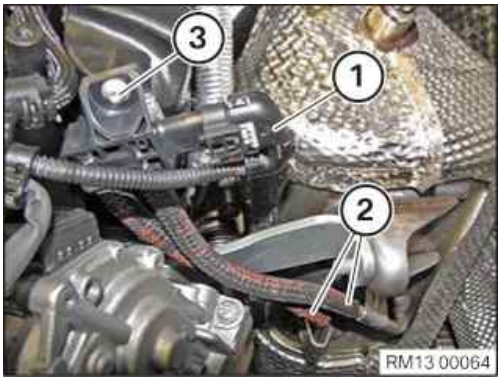


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

115 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

116 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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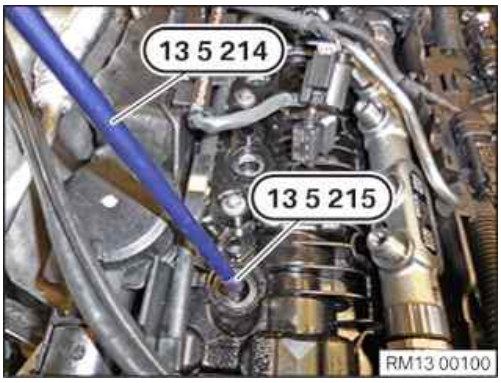
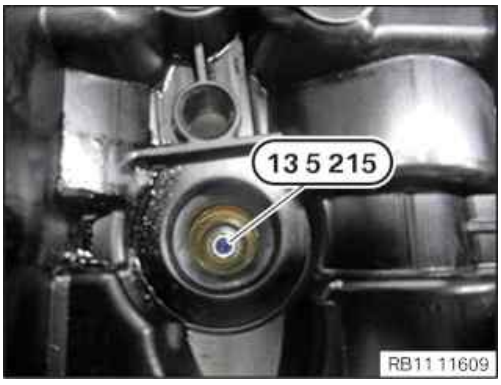


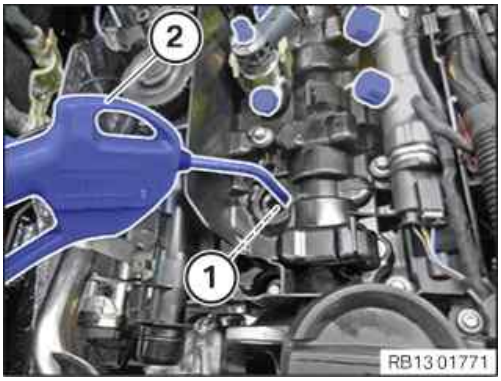
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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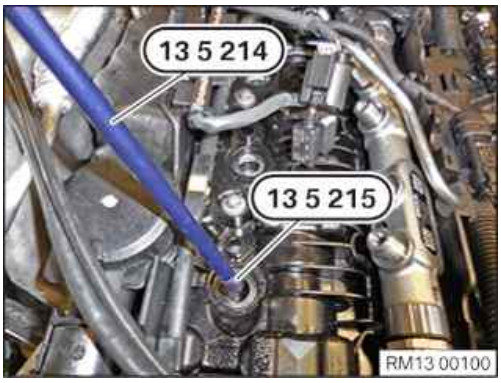


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

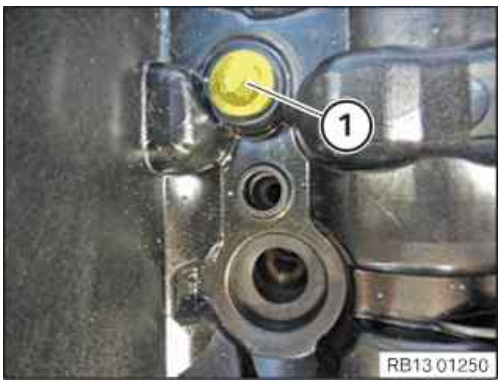
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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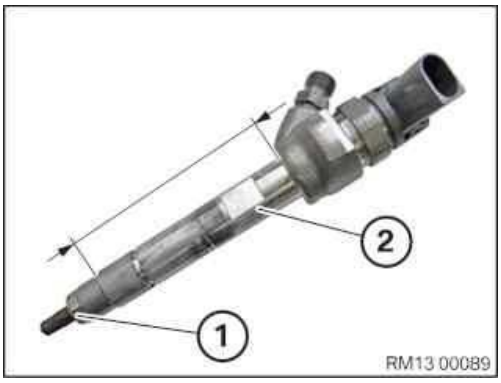


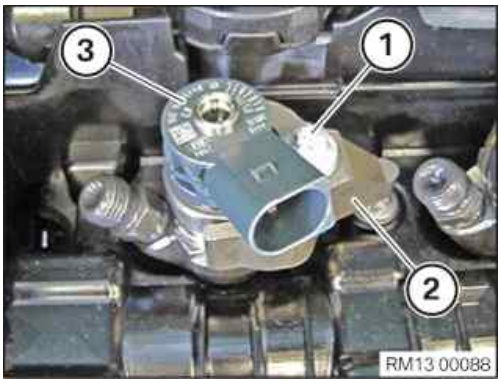
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

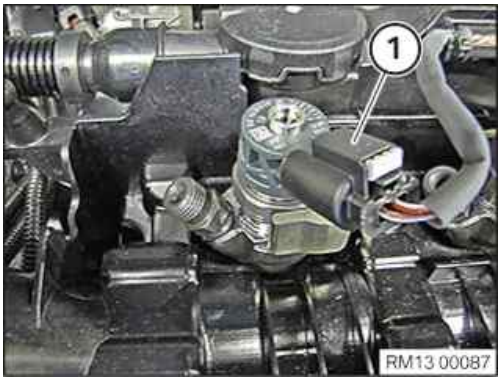
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

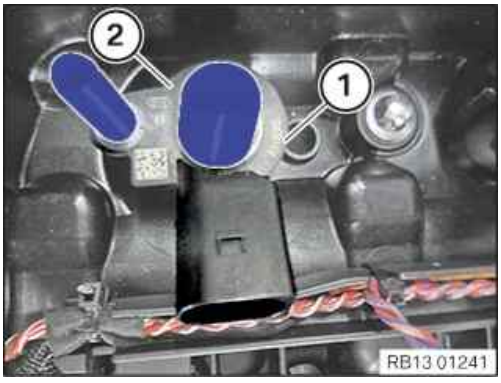
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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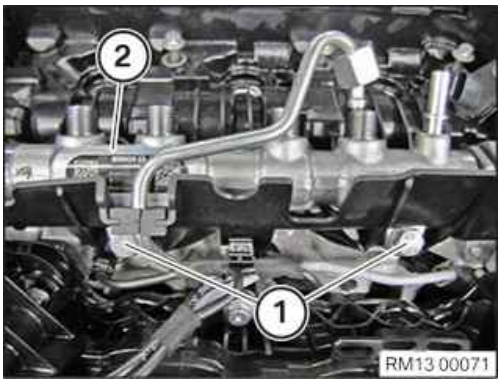
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

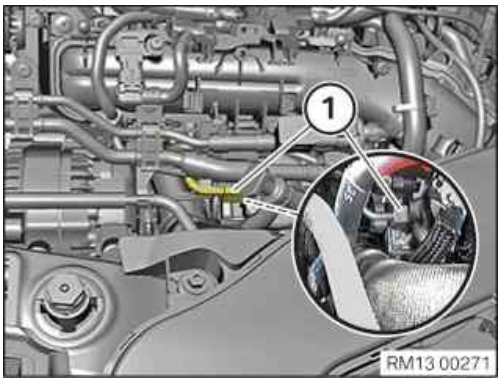
117 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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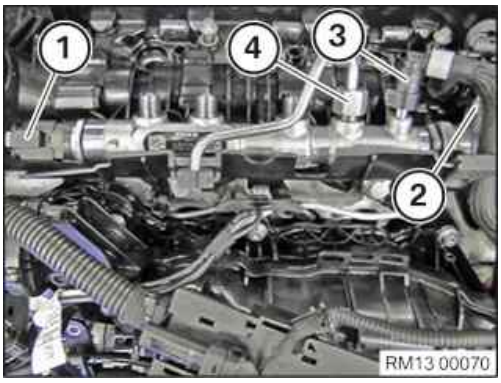

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

118 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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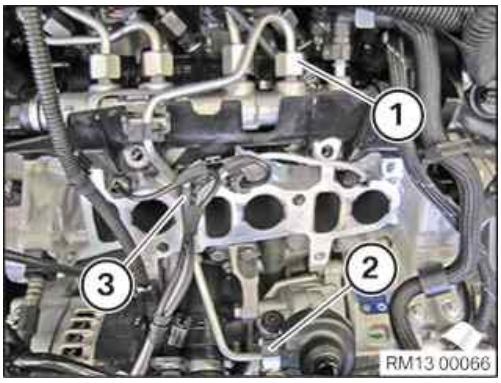

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

119 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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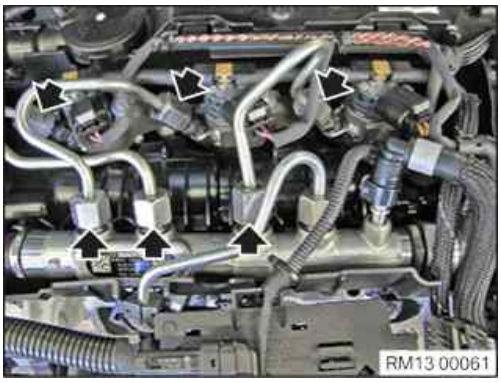

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

120 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

121 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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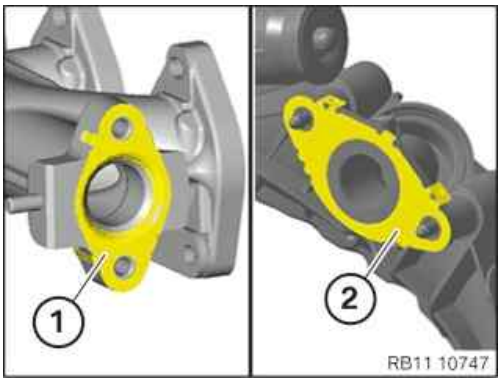
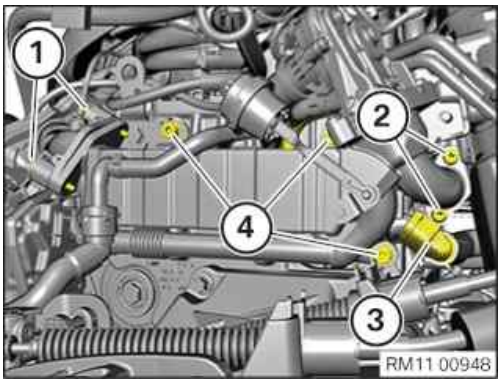


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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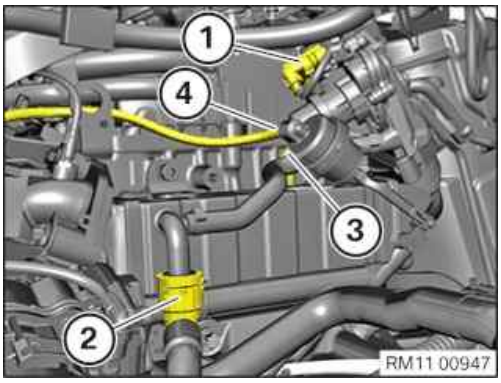


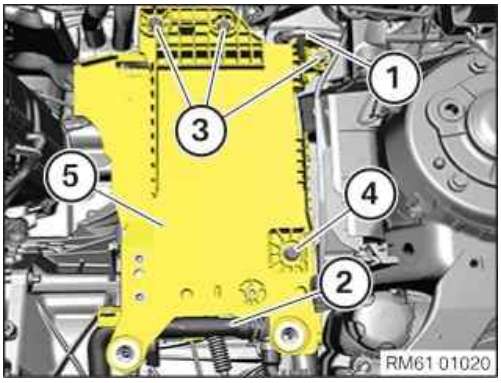
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

122 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

123 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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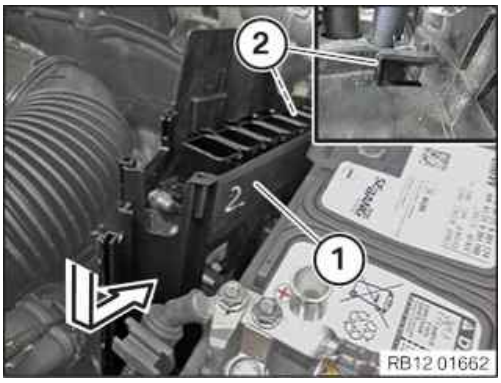
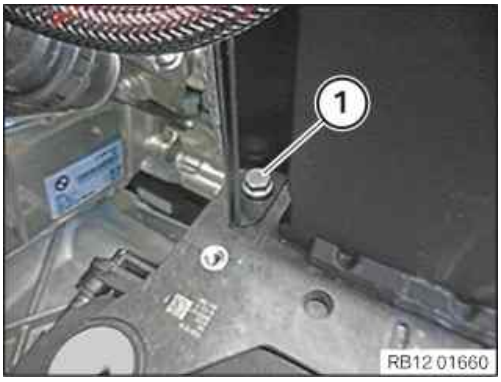


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

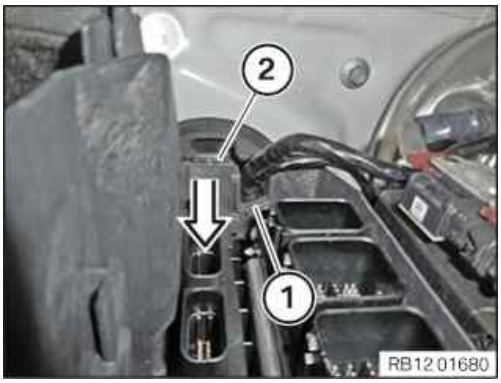
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



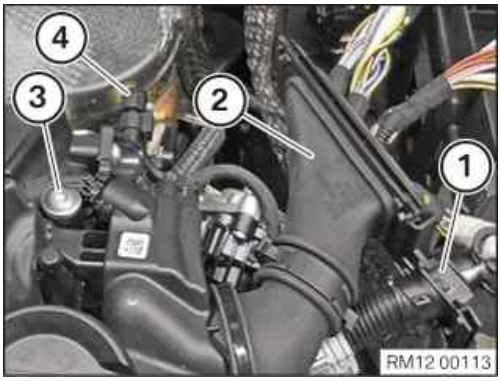
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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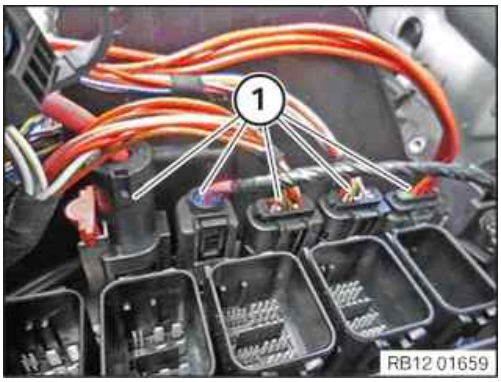
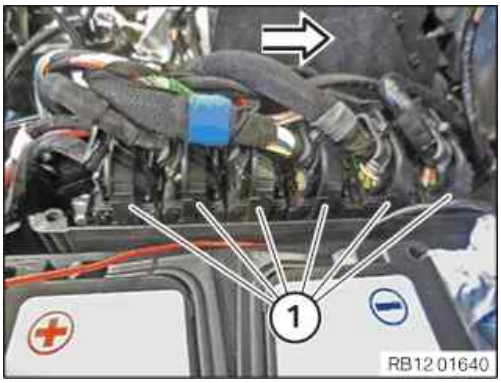
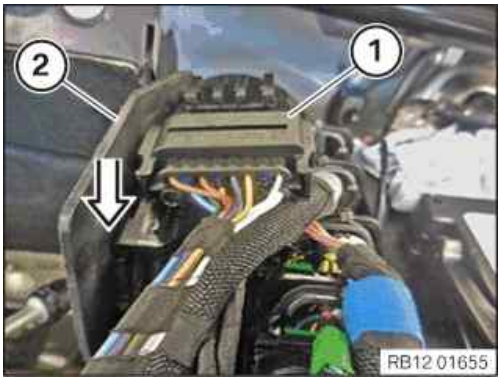


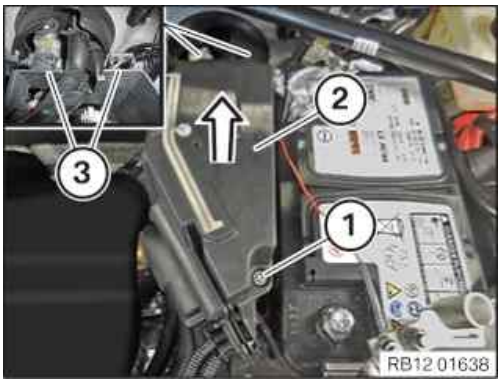
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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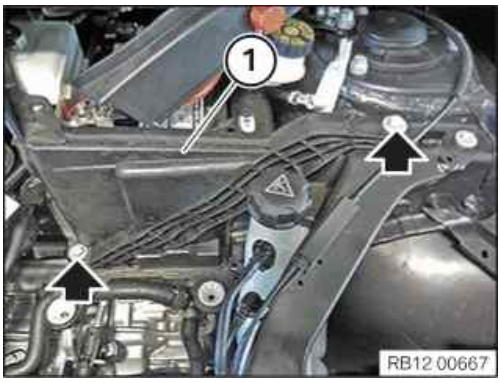


- Feed in and install tension strut (1).
- Tighten screws (arrows).

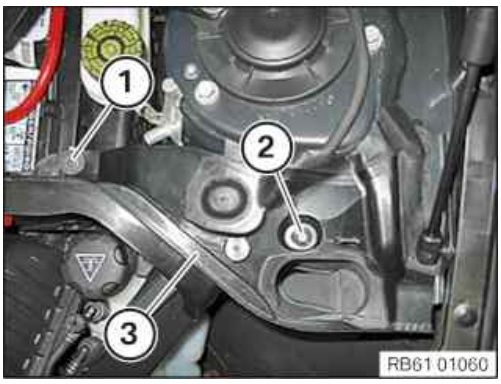
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

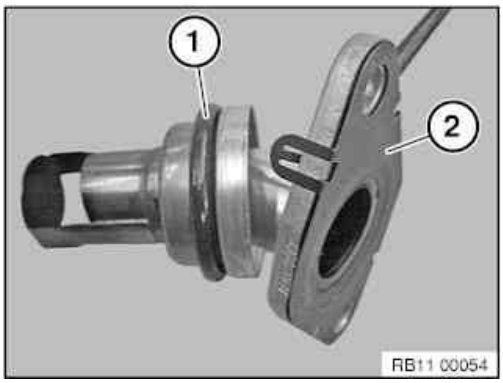


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

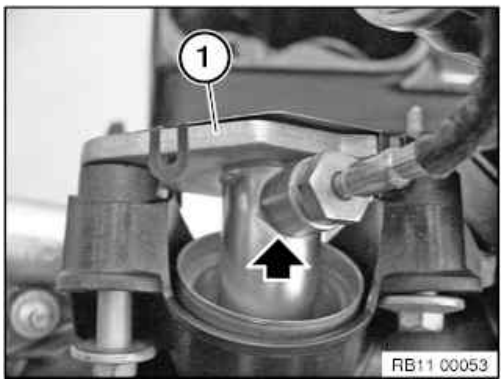
124 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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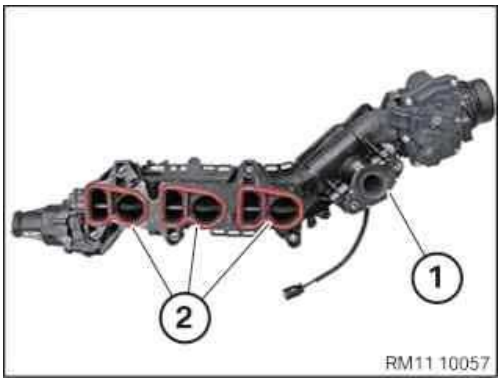
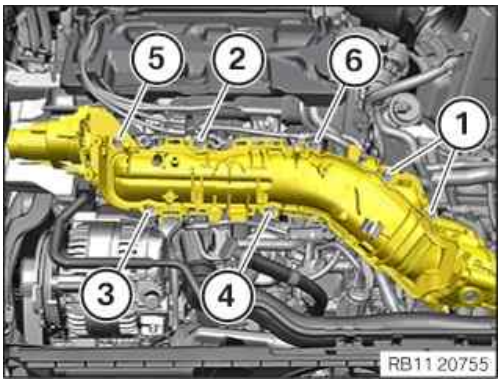


- Renew gaskets (2).

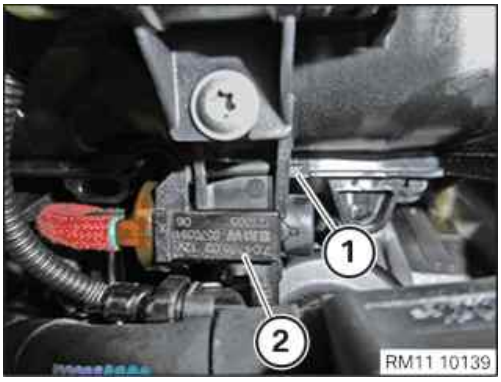
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



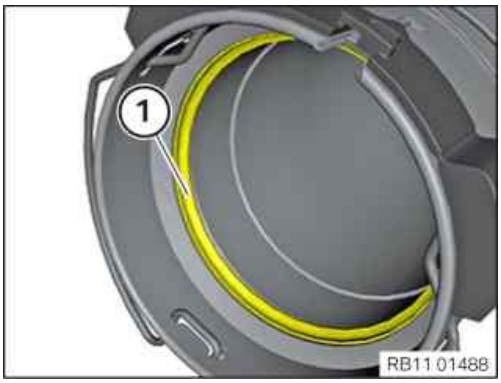
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

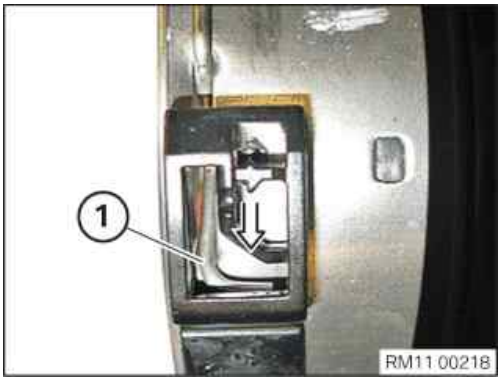


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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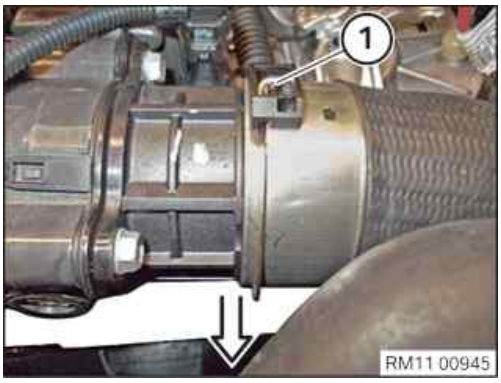
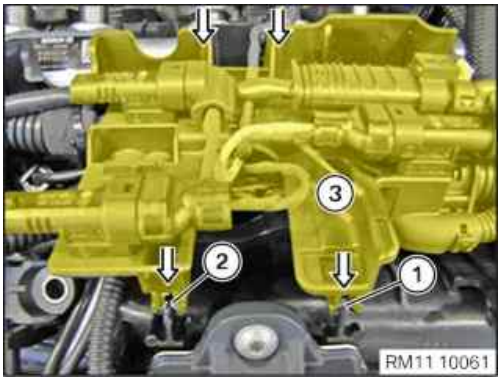


- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

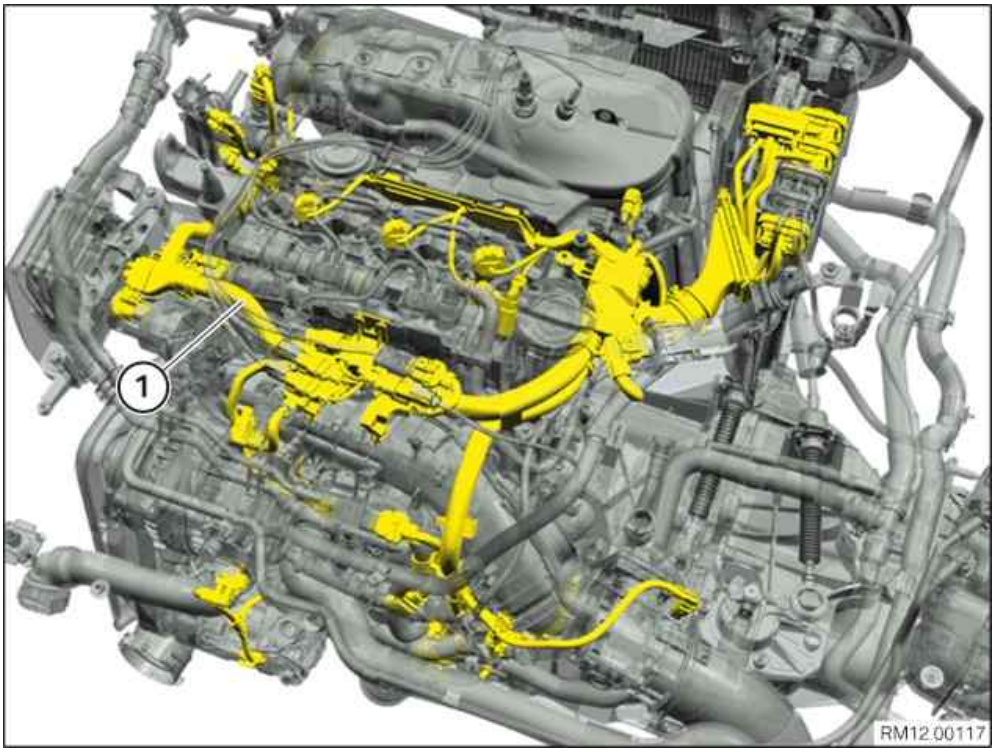
125 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

126 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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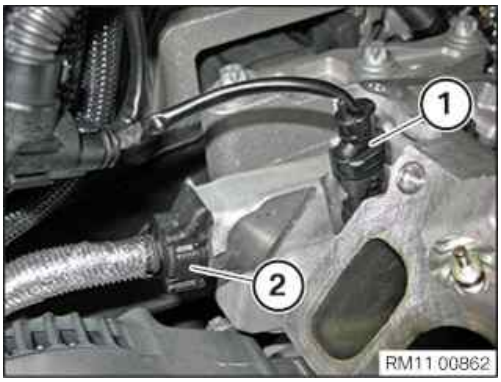
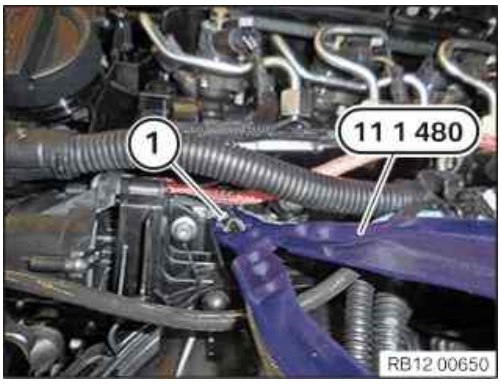
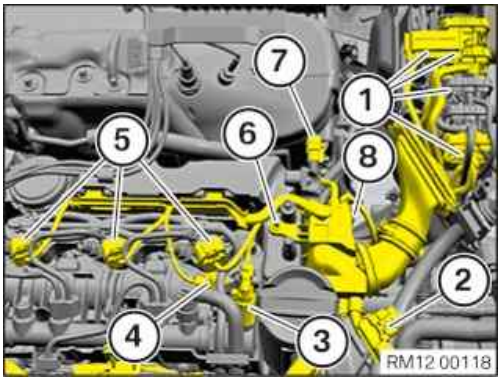


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

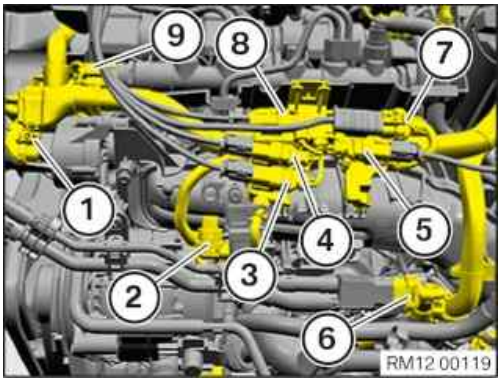


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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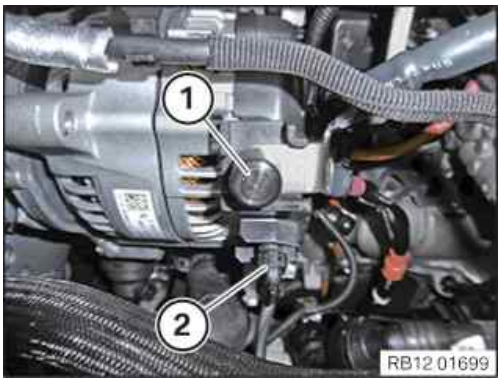
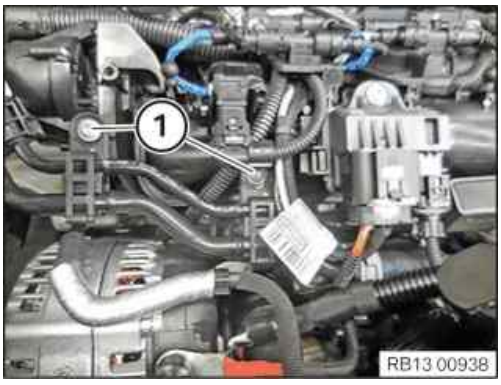


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

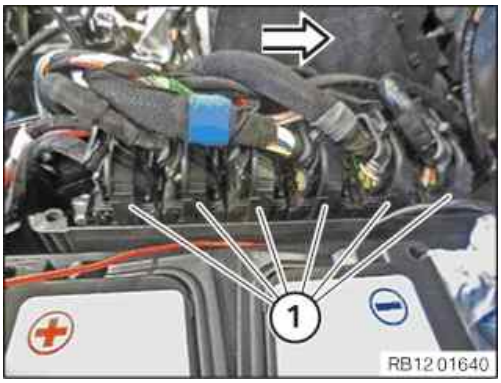


- Position fuel lines.
- Tighten the screws (1).

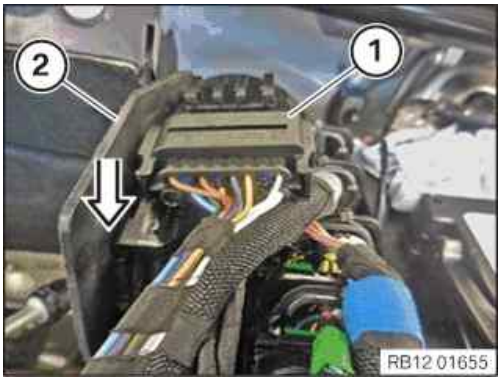
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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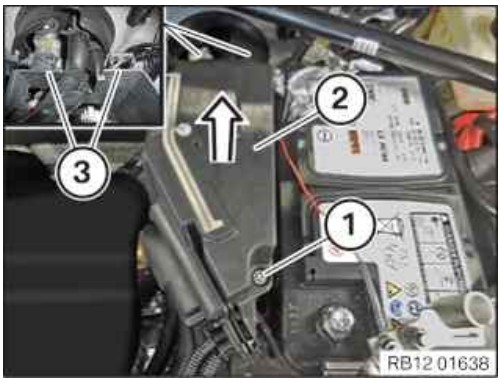
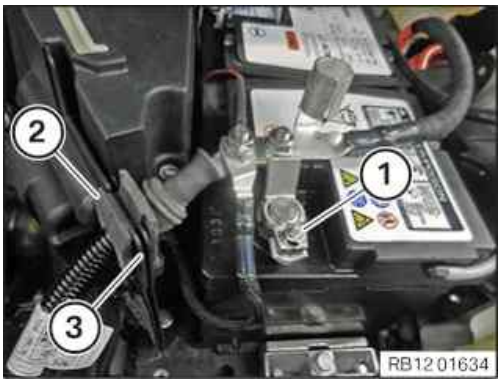


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

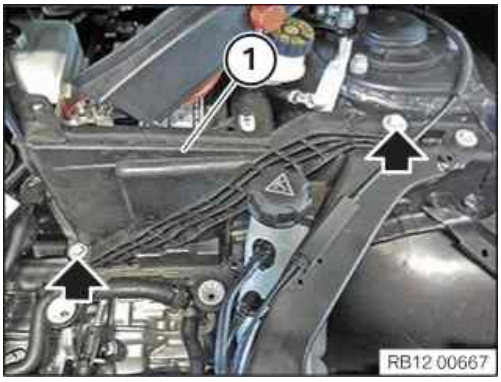
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

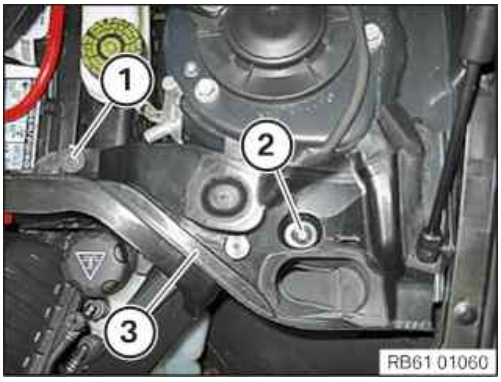
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm

127 – Installing clean air pipe

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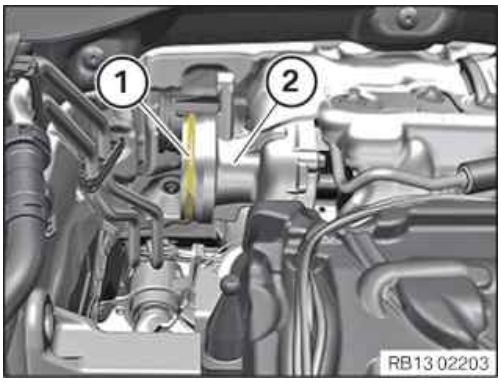
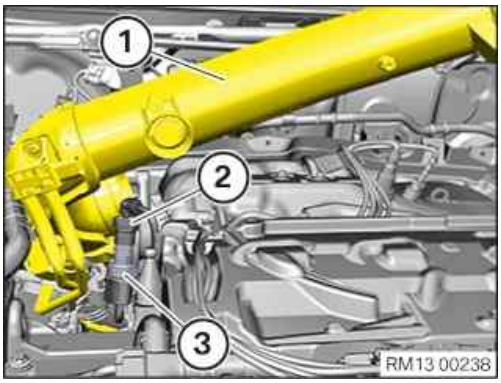


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



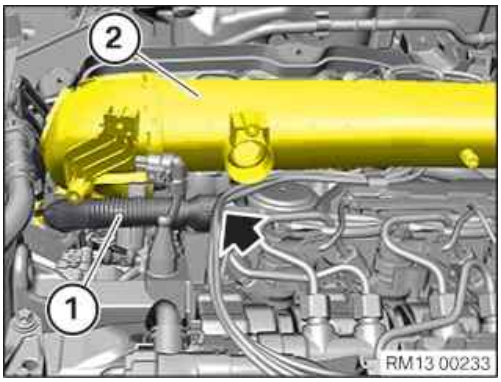
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

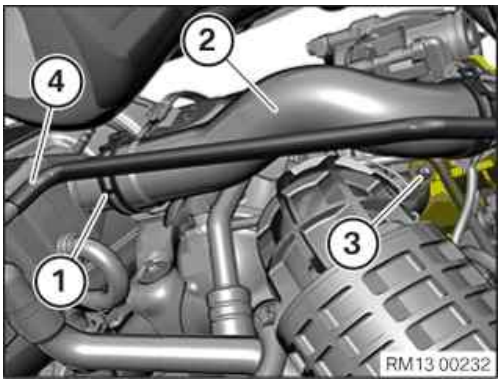
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

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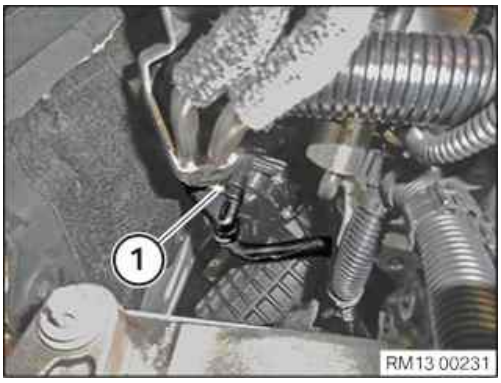
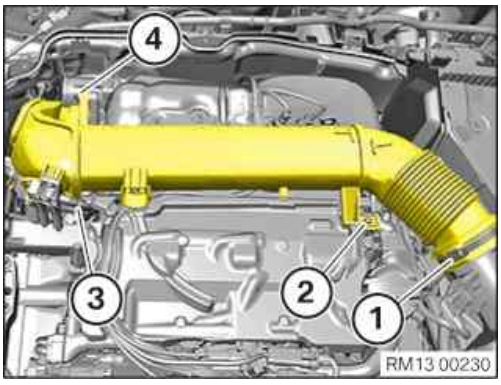


- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

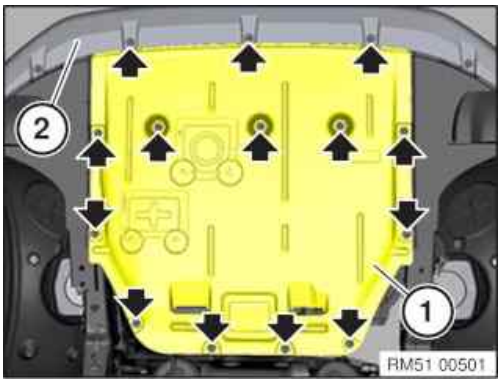
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

128 – Installing the front underbody protection

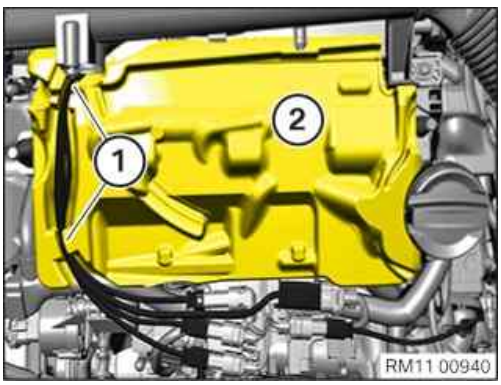


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

129 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

130 – Install resonator

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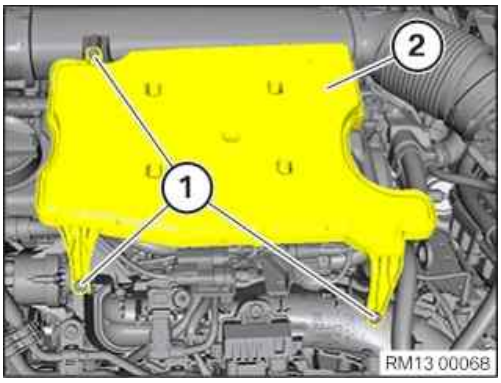

- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

131 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

132 – Install the rear cowl panel cover

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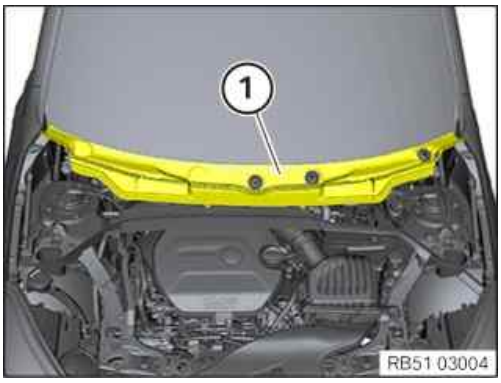
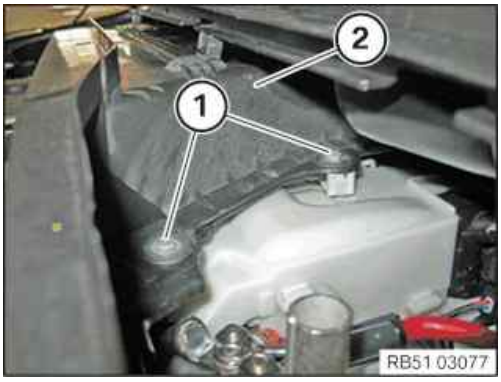


- Feed in and engage the rear cowl panel cover (1).

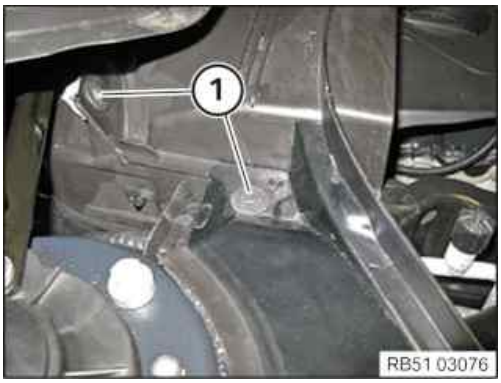
133 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

134 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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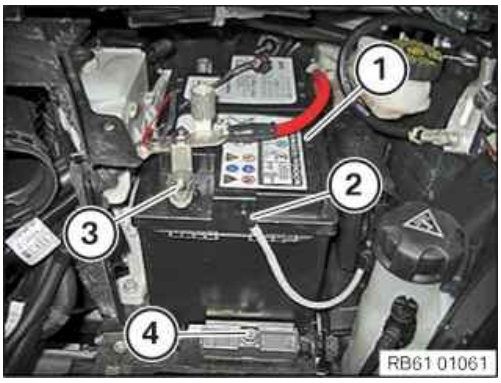


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

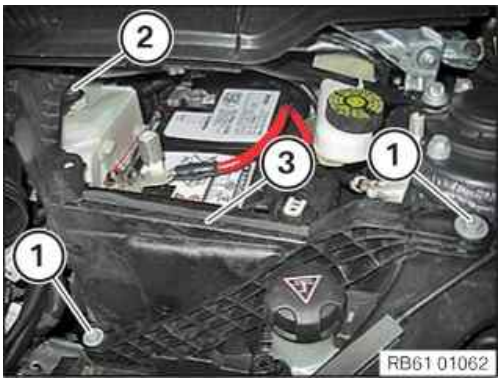
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

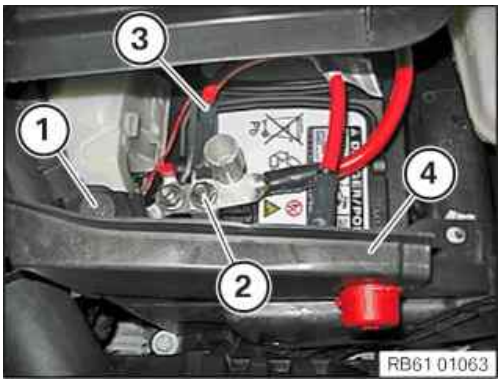
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

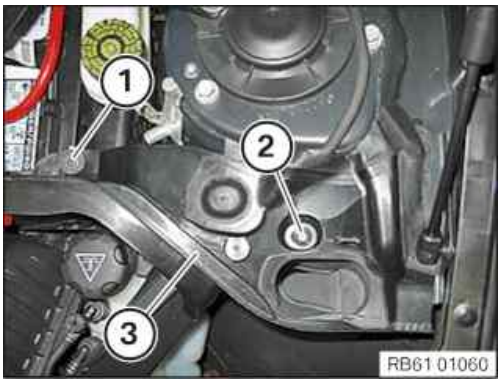
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

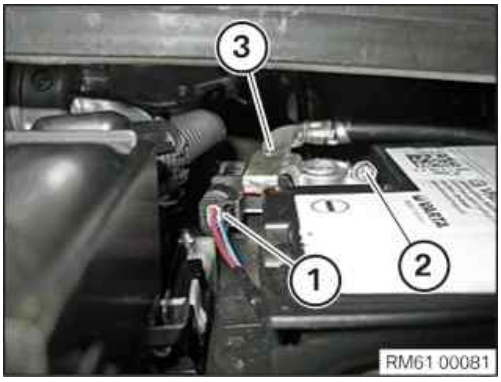
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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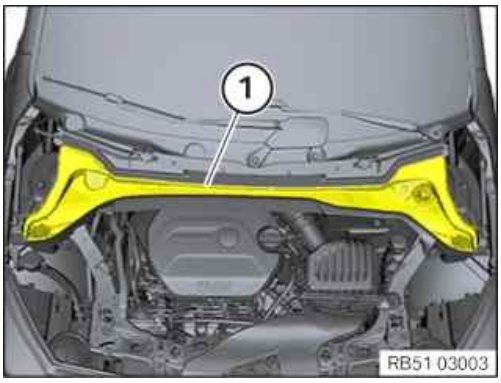
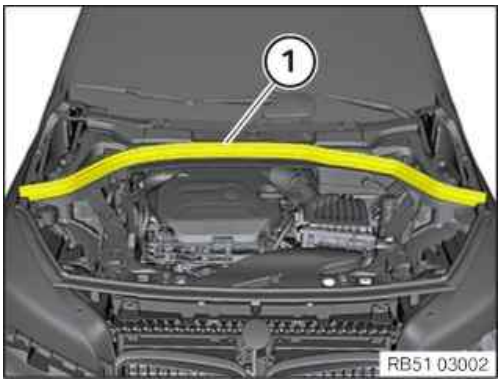


- Feed in the cowl panel cover (1).



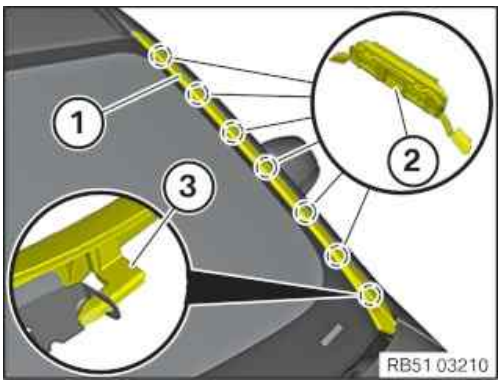
- Press the gasket (1) in a downwards direction.

135 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

136 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

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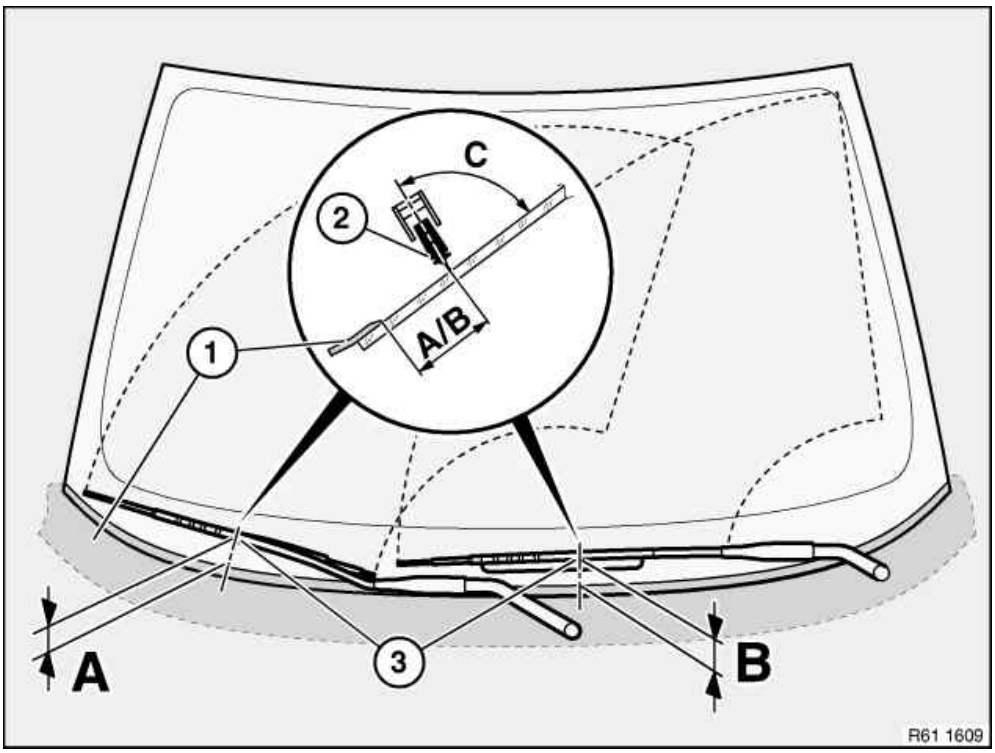
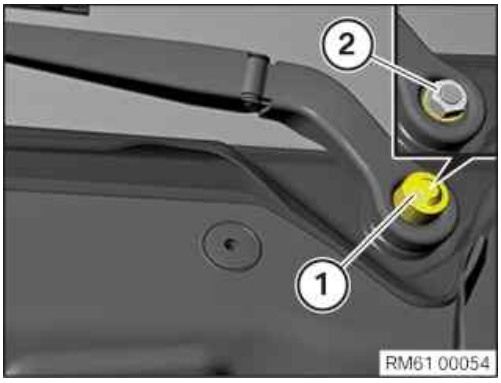
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

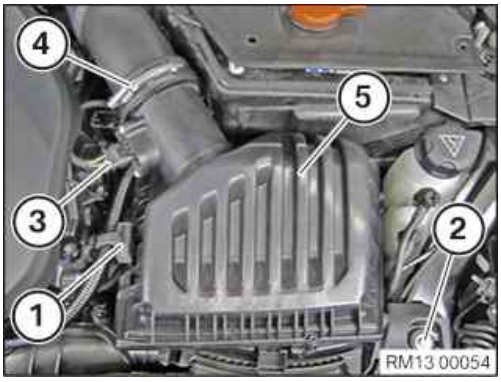
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

137 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

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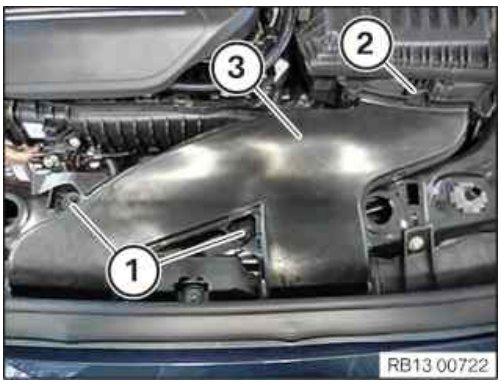
138 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

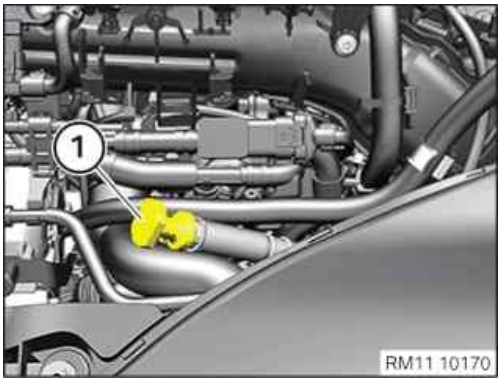
139 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

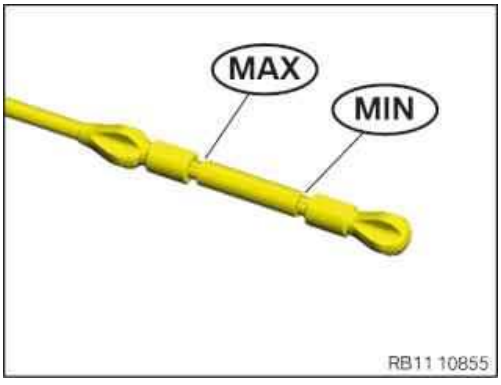


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

140 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Bracing strut to top cross connection — Used in step 32

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 32

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 32

M6x20		Tightening torque	12 Nm

Rear end of front axle support to body — Used in step 67 100

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 67 100

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 67 100 108

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 67

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase — Used in step 72

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 72

M8x40		Tightening torque	19 Nm

Engine support to cylinder head — Used in step 72

M10X45		Tightening torque	41 Nm

Right engine mount to cylinder head — Used in step 72

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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Glow elements to cylinder head

Used in step 72

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 73

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 75

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 75

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 75

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 76

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 77

M7x17.			17 Nm

Exhaust manifold to cylinder head

Used in step 82

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 82

Hollow bolt		Renew sealing rings.	30 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 82 121

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust turbocharger to exhaust manifold

Used in step 84

V-band clamp		Tightening torque	19 Nm

Oil feed line to exhaust turbocharger

Used in step 84

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Oil return line to turbocharger

Used in step 84

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 84

M8x16		Tightening torque	22 Nm

Charge air line to crankcase

Used in step 85

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 85

M6		Tightening torque	8 Nm

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Heat shield for exhaust turbocharger

Used in step 86 87 112

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head

Used in step 86

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 88

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 88

M8 hexagon nut		Tightening torque	19 Nm

SCR metering module V-clip to exhaust system

Used in step 88

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 88

Torx bolt BM6x16		Tightening torque	8 Nm

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Used in step 88

Flange nutM8		Tightening torque	19 Nm

Control sensor

Used in step 89

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 90 91

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 92

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 93

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 94

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 95

Sensor		Tightening torque	50 Nm

Starter motor to transmission

Used in step 96

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 96

M8		Tightening torque	13,5 Nm

Exhaust system to body

Used in step 97

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 97

Hexagon screw M8x30		Tightening torque	19 Nm

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V-clip to catalytic converter

Used in step 97

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 97

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 97

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 98

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

Front connection carrier to body

Used in step 99

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 99

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing

Used in step 100

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 100

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 101

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support

Used in step 101

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 101

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 101

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 102

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 104

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 106

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 106

Plastic nut		Tightening torque	3 Nm

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Underbody panelling, side

Used in step 107

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 107

Plastic nut		Tightening torque	2,6 Nm

Brake disc to front wheel hub

Used in step 109

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

Used in step 109

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 109

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 111

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 111

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 113

Oval-head screw		Tightening torque	5 Nm

Cylinder head cover to cylinder head

Used in step 114

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 115

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 115 127

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 116

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 116

Screw		Jointing torque Angle of rotation	8 Nm 120 °

Rail on cylinder head cover

Used in step 117

Torx screw M8x25		Tightening torque	19 Nm

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High pressure line between high pressure pump and rail

Used in step 117 118

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 119

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 121

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 121

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 121

M8x20		Tightening torque	19 Nm

Battery holder to engine support

Used in step 122

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 123

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 123 126

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 123 126

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 123 126

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 123 126

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 123 126

		Tightening torque	3 Nm

Battery cover

Used in step 123 126 134

Screw			2,8 Nm

Intake plenum to cylinder head

Used in step 124

M6		Tightening torque	11 Nm

Positive battery cable to alternator

Used in step 126

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 126

TS6x20		Tightening torque	5 Nm

Exhaust gas pressure sensor

Used in step 127

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

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Clean air pipe to exhaust turbocharger — Used in step 127

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 127

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 127 137

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 128

			3 Nm

Resonator to manifold and clean air pipe — Used in step 130

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 133

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 134

M8 screw		19 Nm

Positive battery terminal — Used in step 134

NutM6		5 Nm

Trailing link — Used in step 134

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 134

Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 134

NutM6		5 Nm

Windscreen wiper arm — Used in step 136

Combination hexagon nut		Tightening torque	35 Nm

Intake silencer housing to lock bridge — Used in step 137

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 138

M6		Tightening torque	8 Nm

Overview of Special Tools

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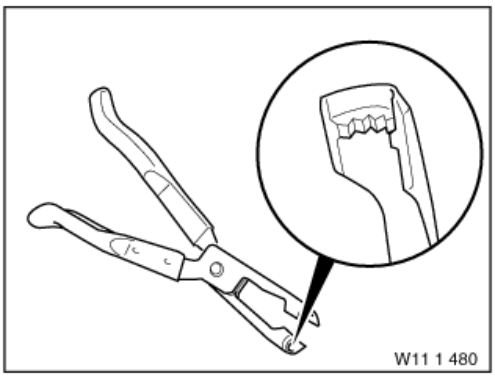
0 490 796 (11 1 480) Pliers



Common	Used in step 20
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common	Used in step 24 25 26 117 118 119
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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2 413 106 Fastener

Common Used in step 24 25 118 119

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller

Used in step 27

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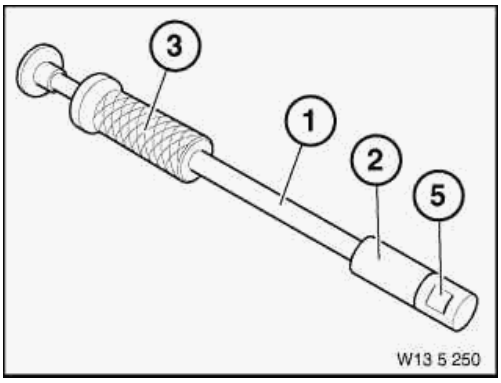

Common

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common

Used in step 27

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common

Used in step 27

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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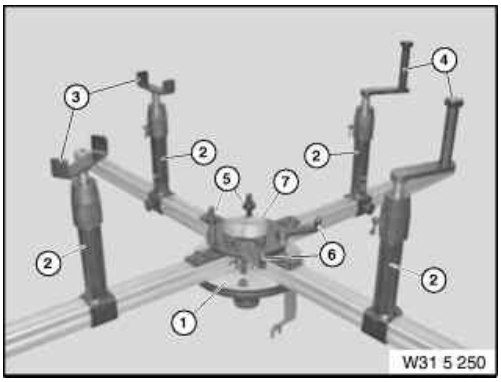
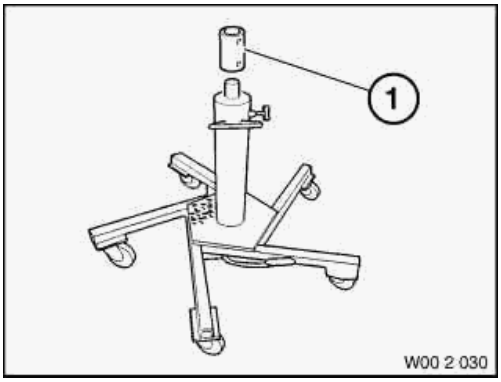
0 495 817 (31 5 251) Basic body



Common Used in step 43 67 72 100

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



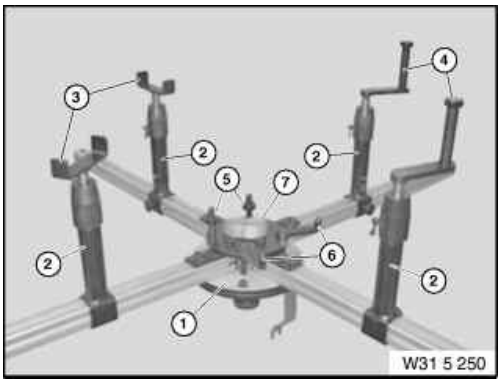
Common Used in step 43 67 72 100

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 821 (31 5 255) Adapter



Common Used in step 43 72

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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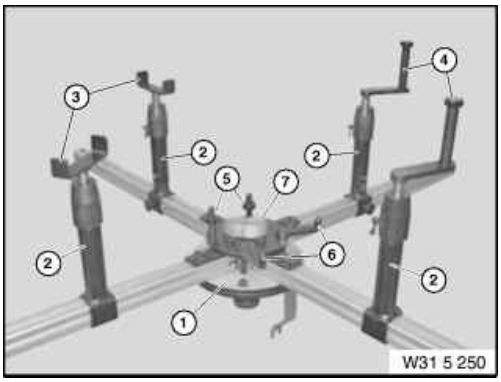
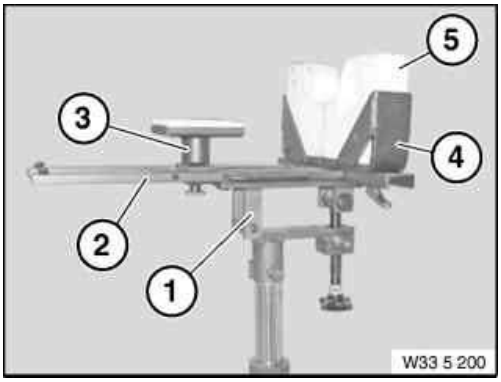
0 495 819 (31 5 253) Adapter



Common	Used in step 43 72
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt



Common	Used in step 43 67 72 100
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

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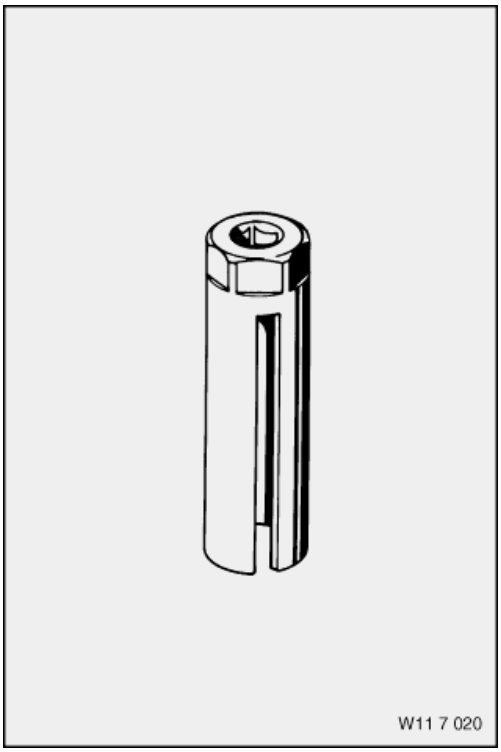
0 491 074 (11 7 020) Socket wrench insert



Common

Used in step 48 49 95

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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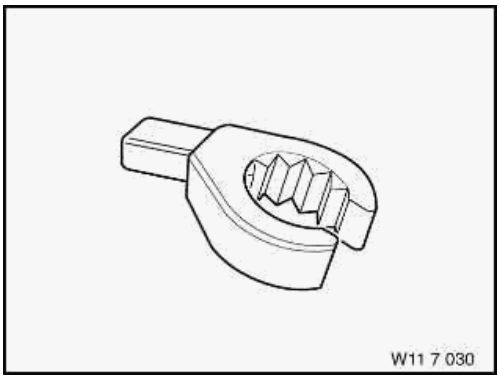
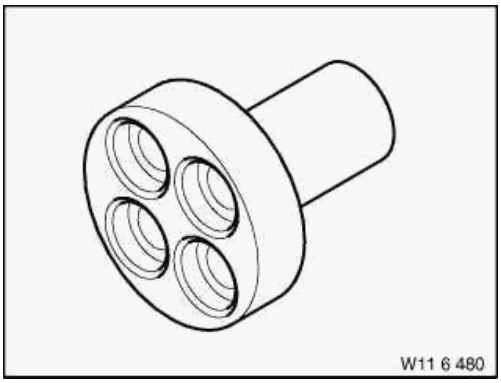
0 491 075 (11 7 030) Socket wrench insert



Common	Used in step 54 89
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

0 493 380 (11 6 480) Connector



Common	Used in step 62 80
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 62 79 80
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge

Common	Used in step 62 78 80
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 414 691 Support

Common	Used in step 67 72
Usage	To support the engine when the engine support is removed.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	2357071
SI-Number	01 12 16 (406)

2 357 071 Panel

Common	Used in step 67 72
Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

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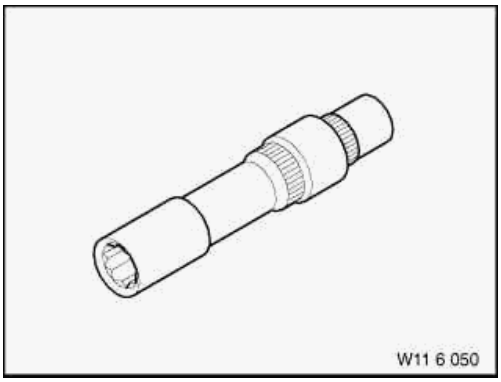
0 491 068 (11 6 050) Socket wrench insert



Common	Used in step 67 72
Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 459 012 Holder

Common	Used in step 67 72
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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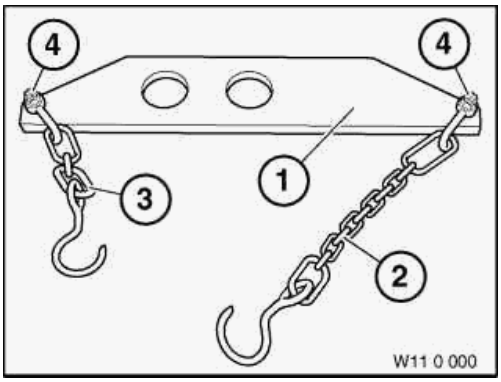
0 490 561 (11 0 000) Lifting gear



Common

Used in step 67 72

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 67

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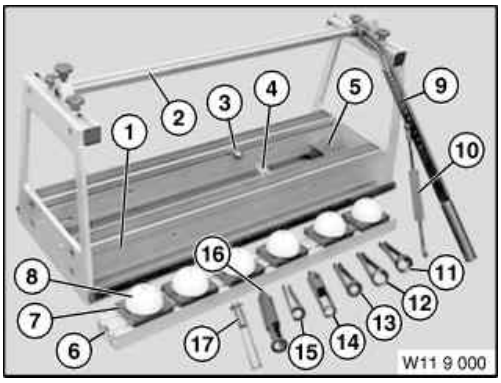

Common

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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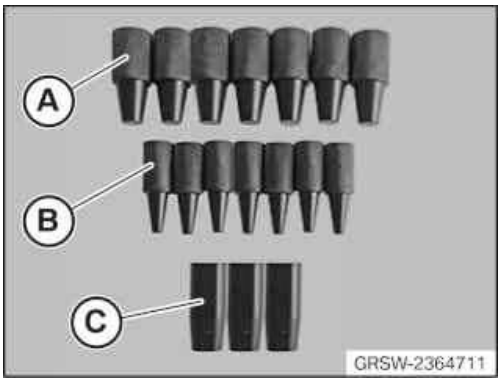
2 364 711 Plug



Common Used in step 68

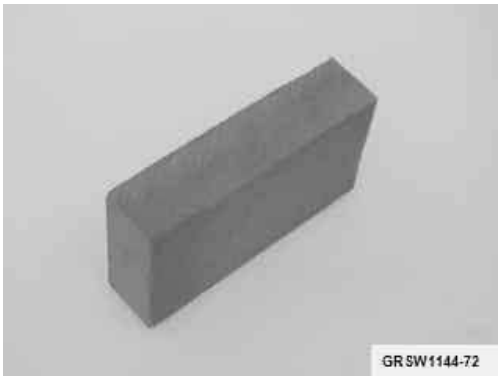
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common Used in step 68

Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

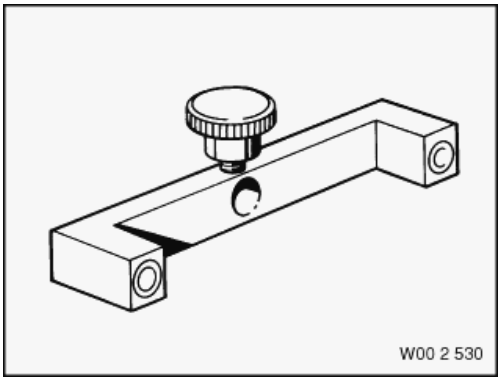
0 495 104 (11 4 472) Extractor



Common Used in step 68

Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 490 185 (00 2 530) Bridge



Common Used in step 70

Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

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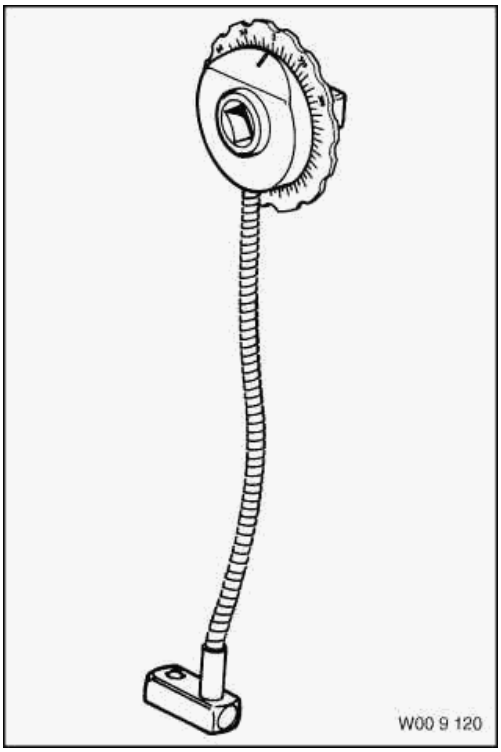
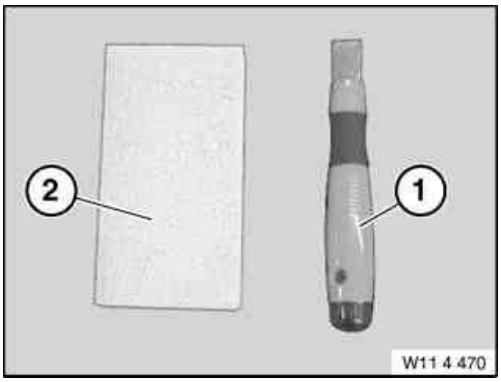
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 72

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 495 102 (11 4 470) Tool



Common Used in step 82

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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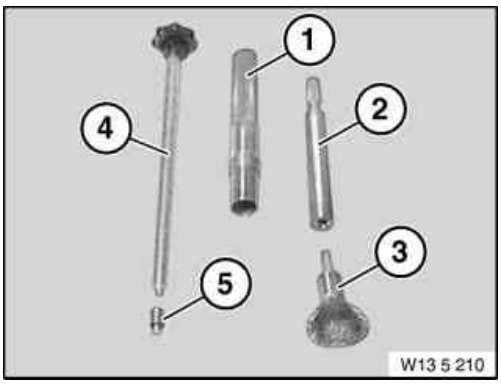
2 344 011 Tool

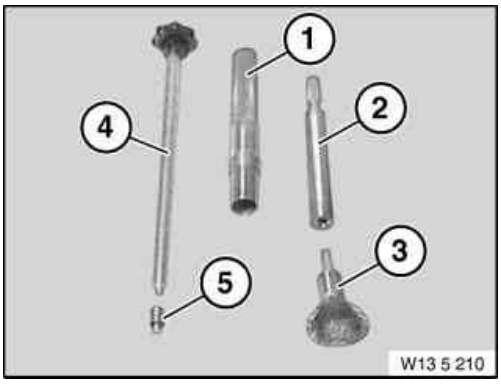
Common	Used in step 109
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common	Used in step 116
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 116
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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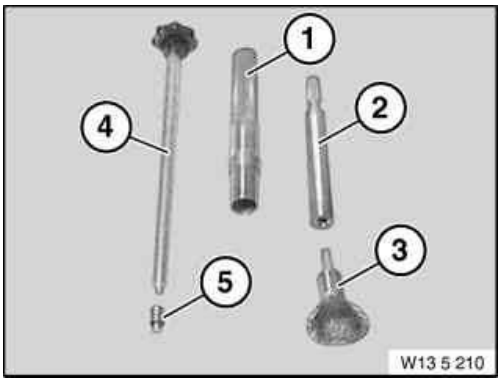
0 493 758 (13 5 210) Tool



Common

Used in step 116

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

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0 495 221 (36 1 323) Wheel stud

Common	Used in step 34
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 34
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 34
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud

Common	Used in step 34
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 34
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 34
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud

Common	Used in step 34
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 34
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Cylinder head flatness	Used in step 69
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

Valve underprotrusion	Used in step 70
	0,8 (0,7 - 0,9) mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 121
EGR controller	19 121
Troubleshooting on the exhaust turbocharger	84

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 134
61 12 ... Notes on intelligent battery sensor (IBS)	1 134
61 00 ... Notes for disconnecting and connecting battery	1 134

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Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	16 27 28 48 49 51 52 53 54
11 65 020 Turbocharger damage due to blocked oil supply lines	84
11 65 ... Test steps in the event of turbocharger damage	84
17 00 008 Draining and topping up coolant for high-temperature circuit	140
17 00 008 Draining and topping up coolant for high-temperature circuit	140
17 00 008 Draining and topping up coolant for high-temperature circuit	140
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	140
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	140
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	140

Operating materials	Used in step
2.0 Grease for wheel centring	109

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	76
Exhaust-gas recirculation cooler seal on exhaust manifold	121
Exhaust-gas recirculation cooler seal on intake plenum	121

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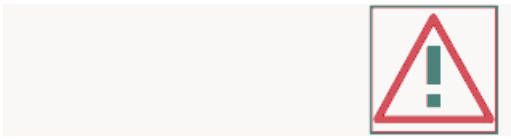
11 12 100 Removing and installing cylinder head (B37C)

Special tools required:

- 2 414 691
- 2 357 071
- 11 4 470
- 11 4 471
- 11 4 472
- 2 364 711
- 00 2 530
- 00 9 120



Attention!

There must be no coolant, water or engine oil in any of the threaded holes in the engine block.

Fit new cylinder head bolts.

Do not wash off bolt coating.

Jointing torque and angle of rotation must be observed without fail (**risk of damage!**).

Necessary preliminary tasks:

- Remove front right wheel arch cover.
- Remove exhaust turbocharger.
- Remove oil feed line.
- Remove diesel particulate filter.
- Remove exhaust-gas recirculation cooler
- Remove cylinder head cover.
- Remove all valve clearance compensating elements.

Removal:

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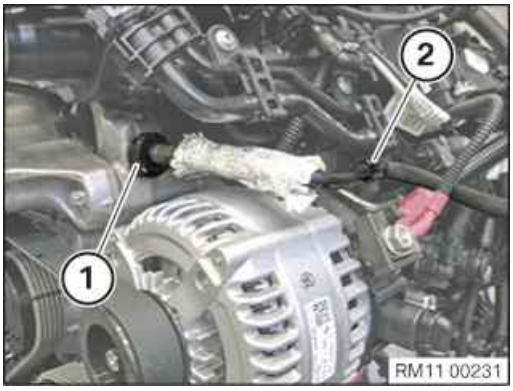
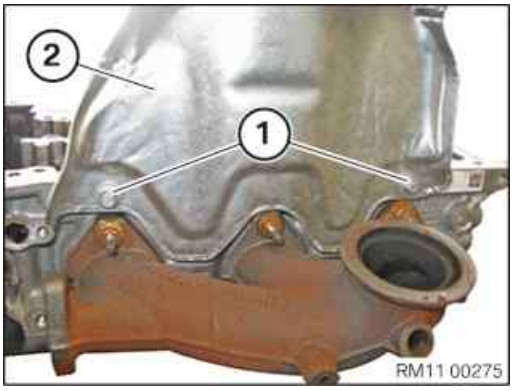


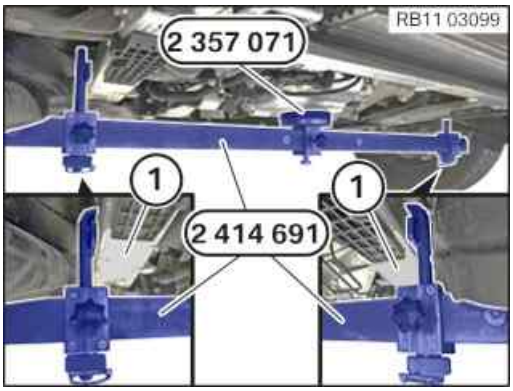
Unlock coolant line (1) and pull off.

Unclip coolant line (1) from holder (2).



Release screws (1).

Remove heat shield (2).

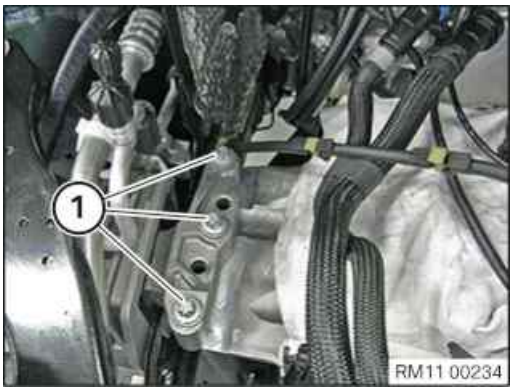


Prepare special tool 2 414 691 together with the special tool 2 357 071 .

Attach the special tool 2 414 691 on the front axle support and correctly align and tighten the special tool 2 357 071 under the oil sump.

Turn the special tool 2 414 691 on the adjusting screws evenly in an upward direction, until the special tool 2 357 071 touches the oil sump.

Tighten all the adjusting screws of special tools 2 414 691 and 2 357 071 .



Release screw connection (1) of right engine support.

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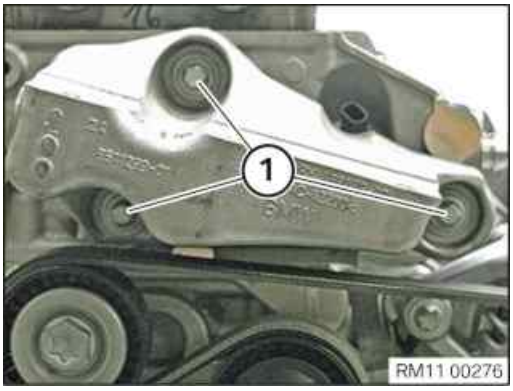
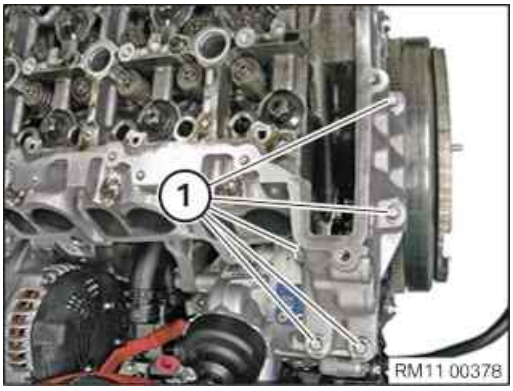
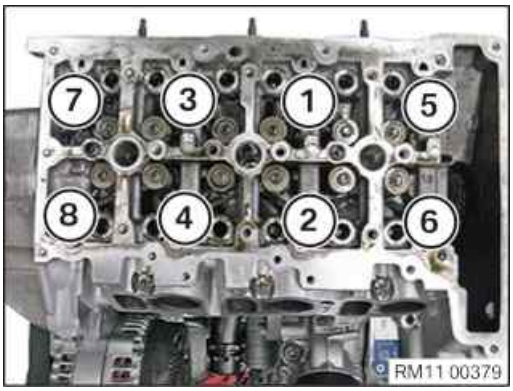


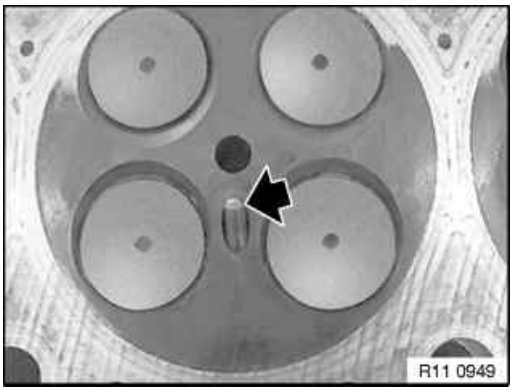
Release screws (1). Remove holder from cylinder head.*Note:* Shown with engine mount removed for purposes of clarity.



Release screws (1).



Slacken cylinder head bolts in sequence 8 to 1.



Attention!

Glow elements protrude at the sealing surface and may be damaged when put down.

Remove cylinder head.

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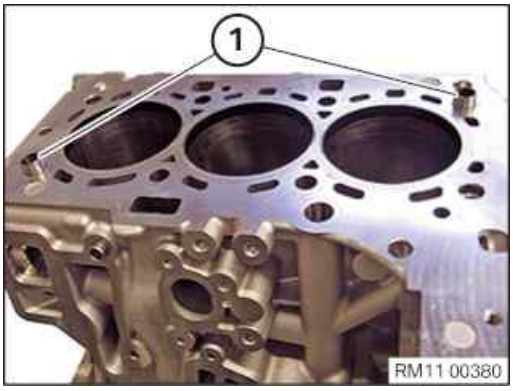


Check fitting sleeves (1) for damage and correct installation position.

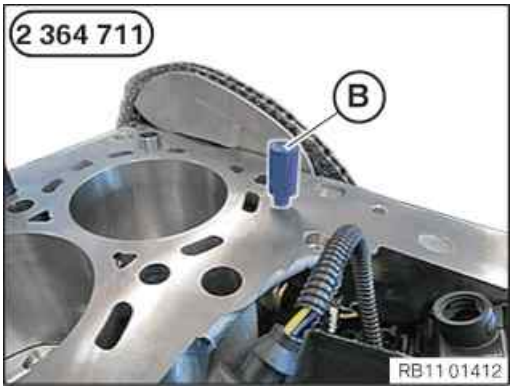
Clean sealing surfaces on the cylinder head and crankcase using special tool 11 4 470 .

Attention!

Do not use any metal-cutting tools (e.g.emery cloth) to clean sealing surfaces!

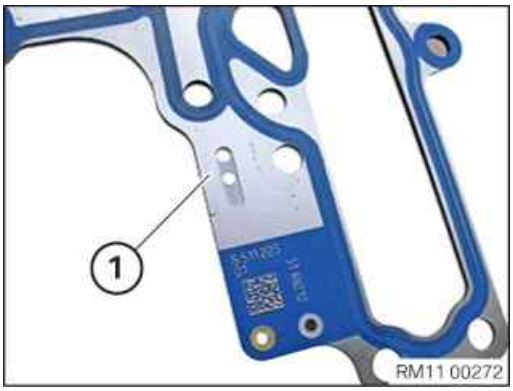
Installation:

Note:
The oil ducts must be sealed before cleaning the sealing surfaces using special tools 11 4 471 and 11 4 472 .



Close oil duct at front using special tool **(B)** from tool set 2 364 711 .**Attention!**

Do not use any metal-cutting tools (e.g. emery cloth).



Installation note:
Without work on the engine block which alters the piston protrusion, use a new cylinder head gasket with the same gasket thickness (number of holes).

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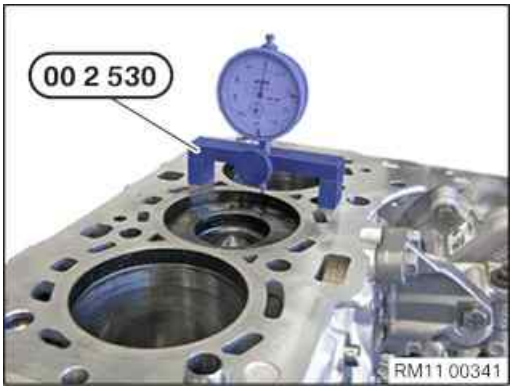
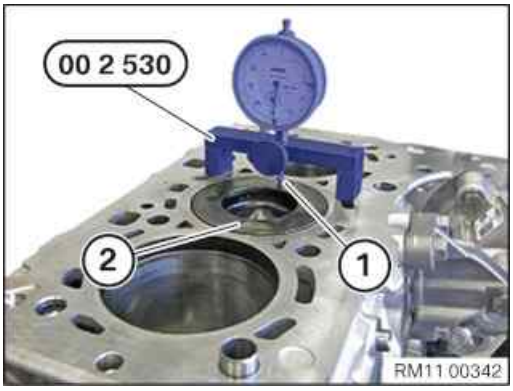


If work was carried out on the crankshaft drive or piston, the gasket thickness must be redetermined.

Measuring the piston protrusion:

Place dial gauge on the cleaned cylinder sealing surface using special tool 00 2 530 . Set dial gauge to zero under preload.

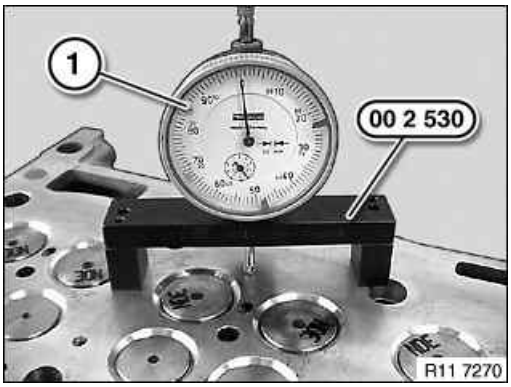


Clean piston at measuring points (1 and 2).

Place dial gauge on the measuring points (1 and 2) on the cleaned piston. Determine highest point by turning crankshaft.

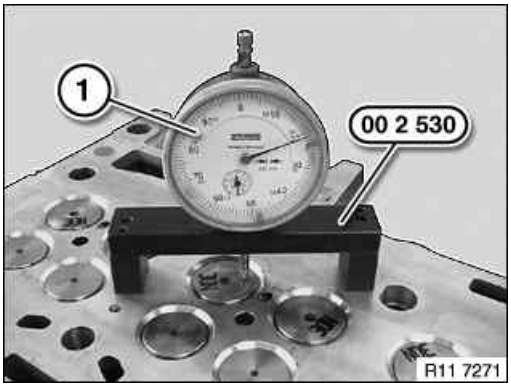
Measure and note down piston protrusion at measuring points (1 and 2) on all 3 pistons.

Installation note:
Determine thickness of cylinder head gasket.



Position special tool 00 2 530 with dial gauge (1) on cylinder head.

Set dial gauge (1) to zero.



Position special tool 00 2 530 with dial gauge (1) on valve.

Determine valve underprotrusion.

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Attention!

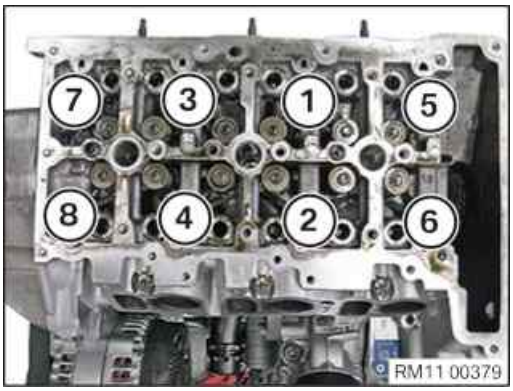
There must be no coolant, water and engine oil in any of the threaded holes in the engine block.

Fit new cylinder head bolts.

Do not wash off bolt coating.

Lightly oil screw head support.

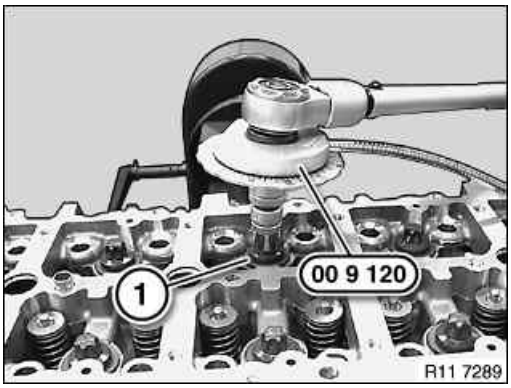
Jointing torque and angle of rotation must be observed without fail (**risk of damage!**).



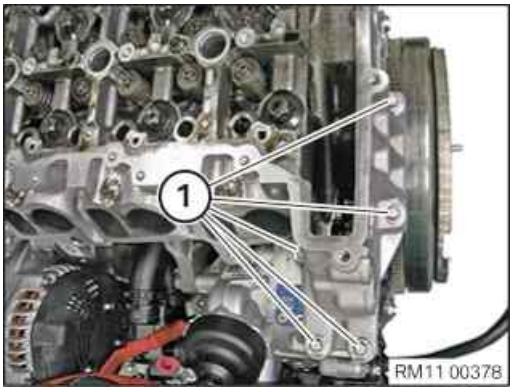
Position the new cylinder head gasket with the previously determined gasket thickness.

Fit cylinder head and secure with new bolts, tightening in the sequence 1 to 8.

Tightening torque: 11 12 1AZ.



Secure cylinder head bolts (1) with special tool 00 9 120 .



Install and tighten down screws (1).

Tightening torque: 11 12 2AZ.

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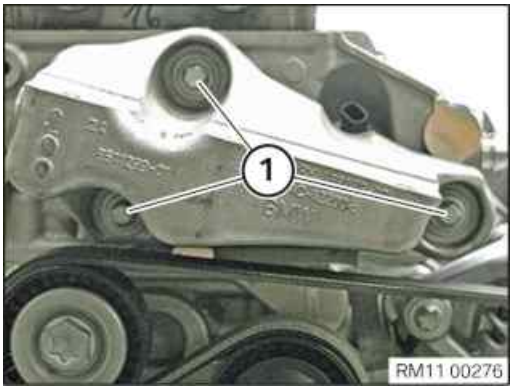
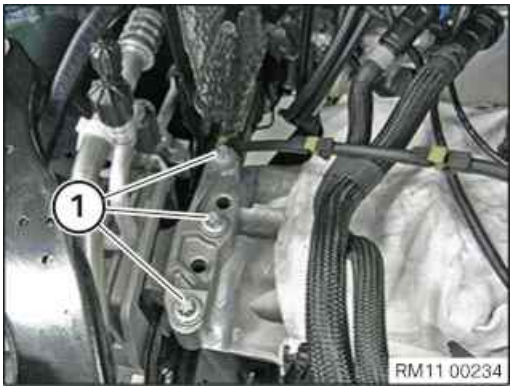


Fit holder to cylinder head. Tighten down screws (1).

Tightening torque: 22 11 3AZ.

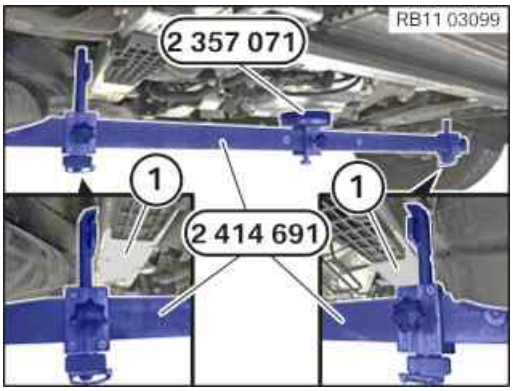
Note:
Shown with engine mount removed for purposes of clarity.



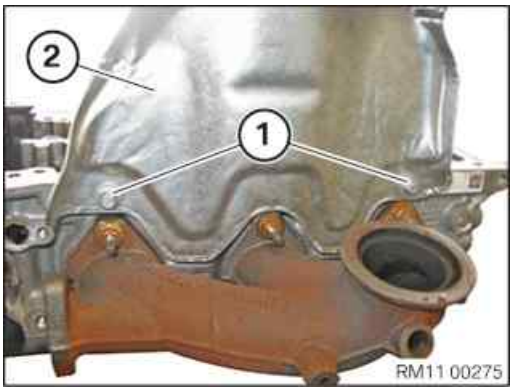
Parts: Renew screws (1).

Screw engine mount to engine mounting bracket (1).

Tightening torque: 22 11 1AZ.



Disassemble the special tool 2 414 691 .



Mount heat shield (2).

Tighten down screws (1).

Tightening torque: 11 65 5AZ.

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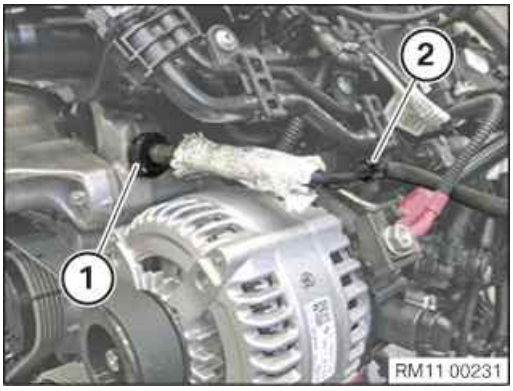

Connect coolant line (1) and clip in (2).

Required follow-up work:

- Install all valve clearance compensating elements.
- Install cylinder head cover.
- Install exhaust-gas recirculation cooler.
- Install diesel particulate filter.
- Install oil feed line.
- Install exhaust turbocharger.
- Install front right wheel arch cover.

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11 12 000 Removing and installing/sealing cylinder head cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

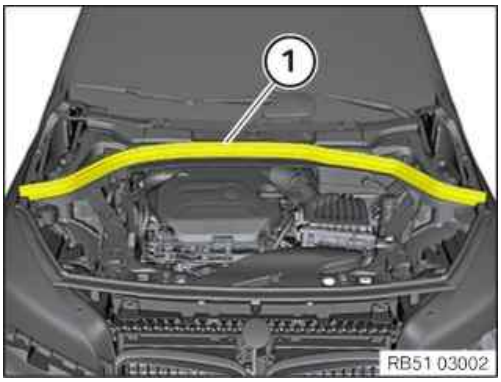
1 – Disconnecting all battery earth leads

- See additional information.

2 – Remove the seal for the rear bonnet

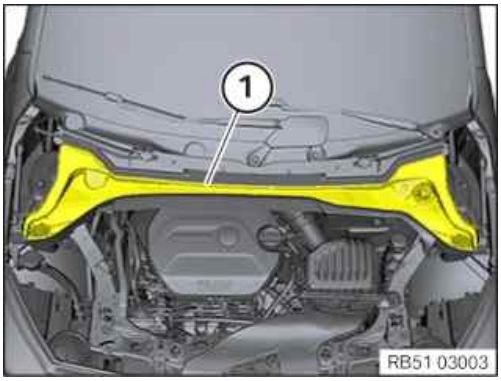
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

4 – Remove left and right wiper arm

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NOTICE

Description is for left component only. Procedure on the right side is identical.

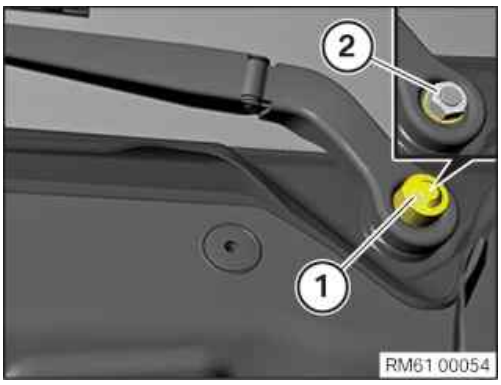
▶ **Remove the wiper arm**

RISK OF DAMAGE

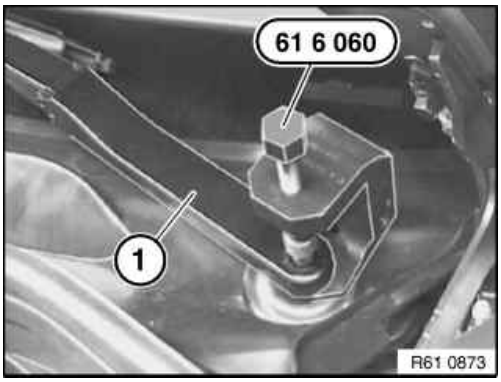
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

5 – Remove the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**

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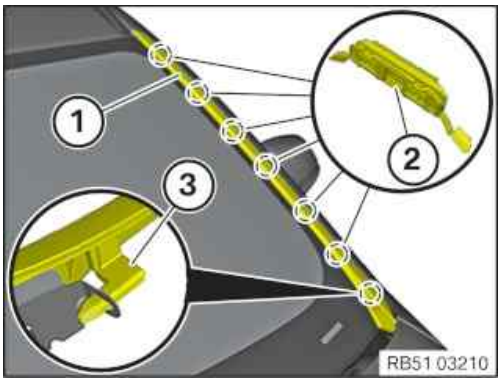
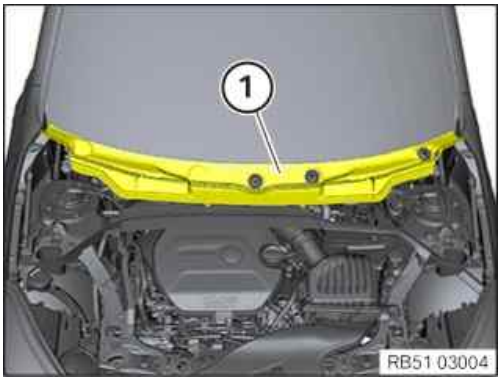


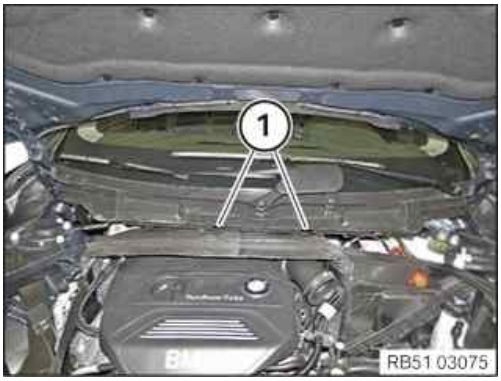
- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

6 – Remove the rear cowl panel cover

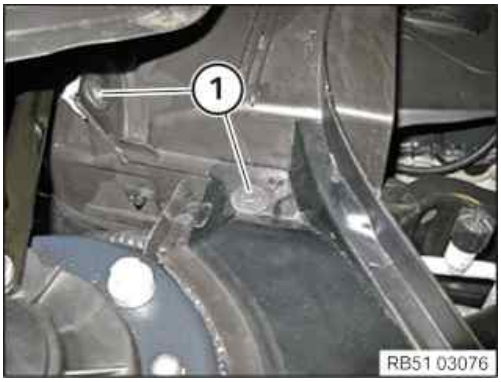


- Disengage and guide out the rear cowl panel cover (1) towards the top.

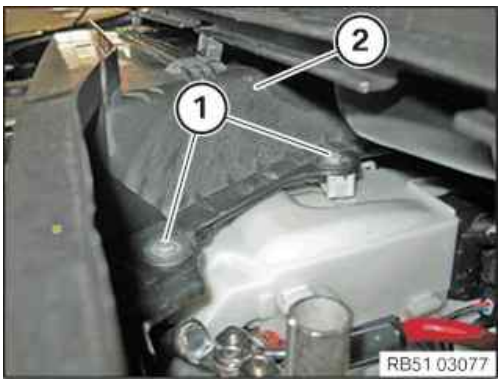
7 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

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8 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

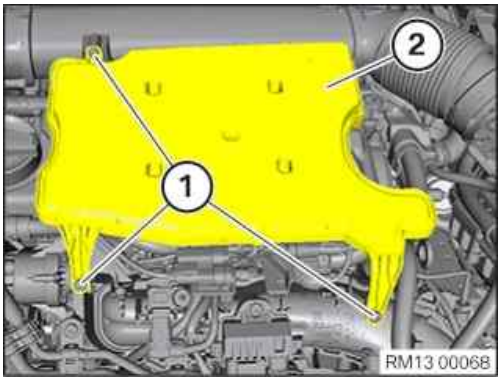
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

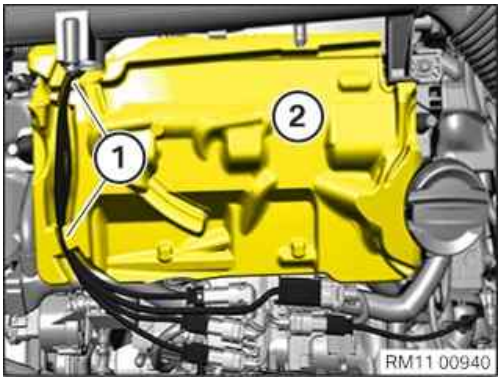
- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

10 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

11 – Remove the intake neck for intake silencer housing

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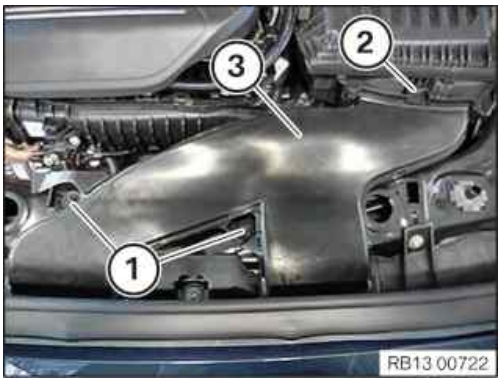
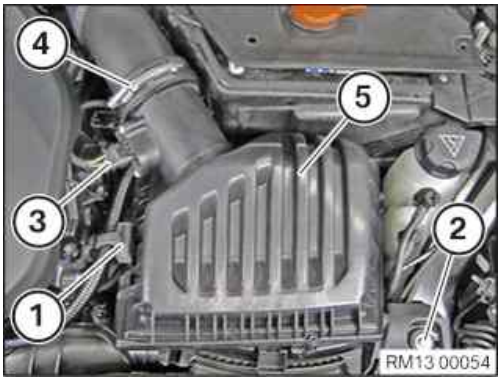


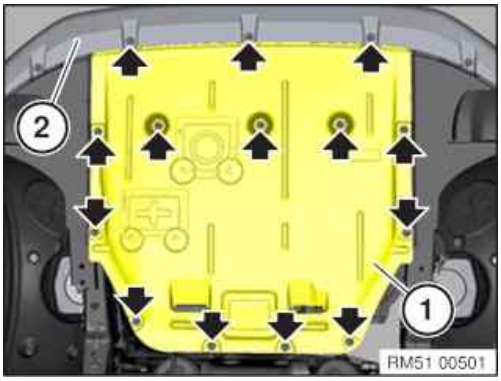
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

12 – Removing intake silencer housing



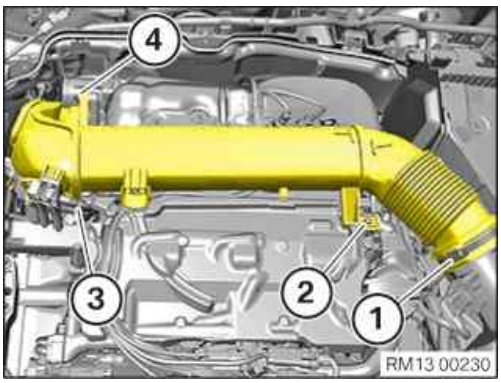
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

13 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

14 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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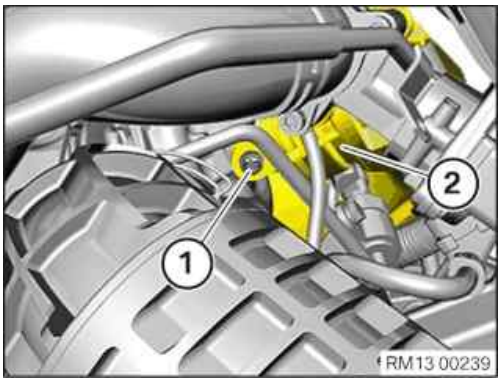
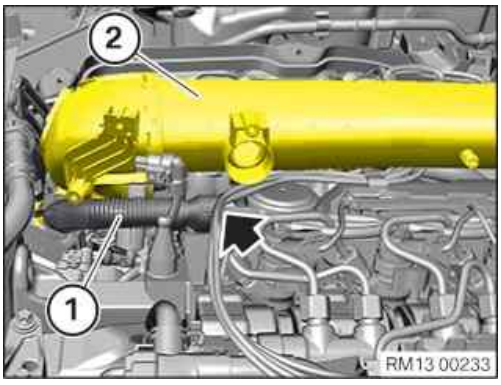


- Unscrew the screw (1) from the clean air pipe (2).

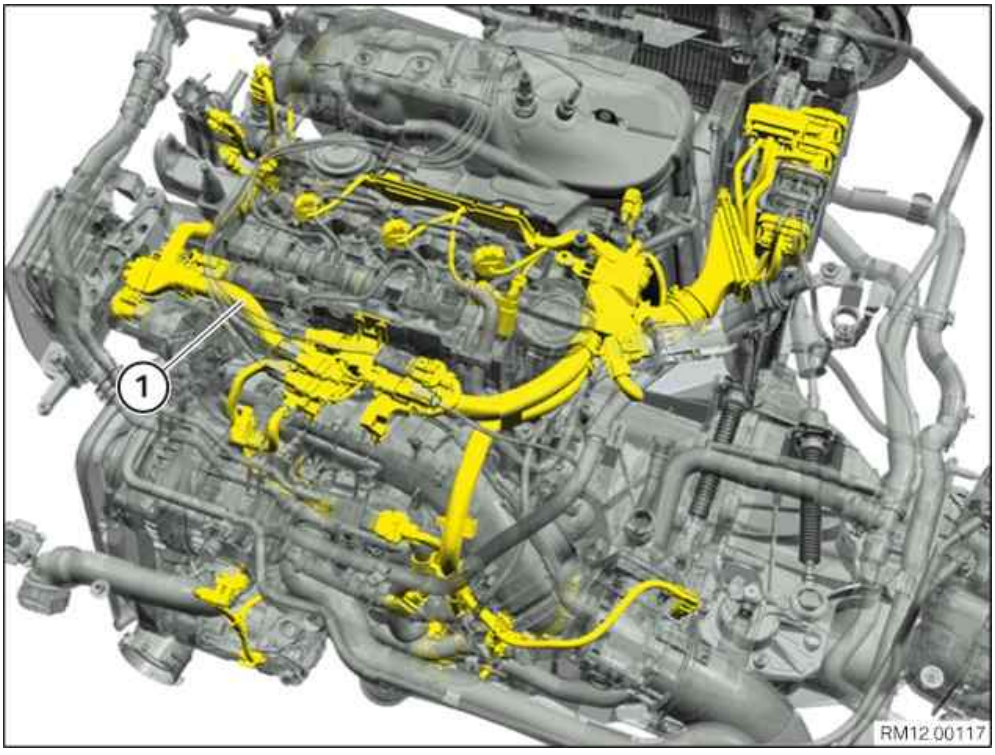


- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

15 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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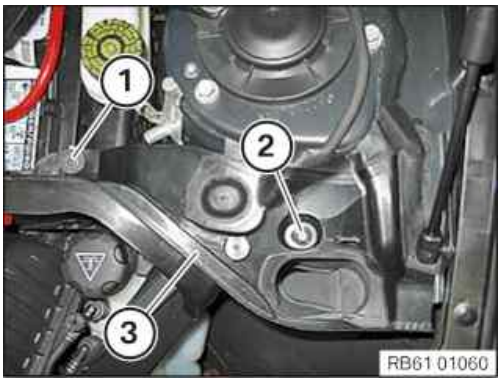
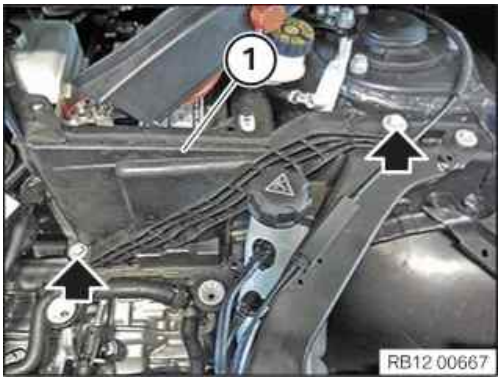
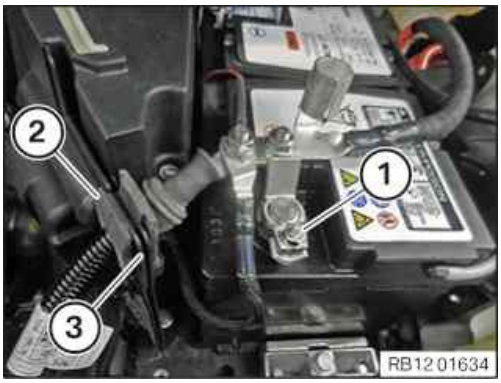


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

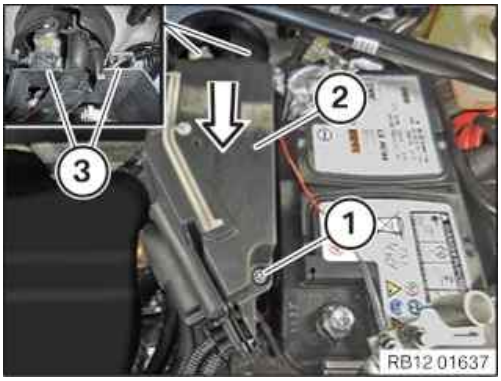
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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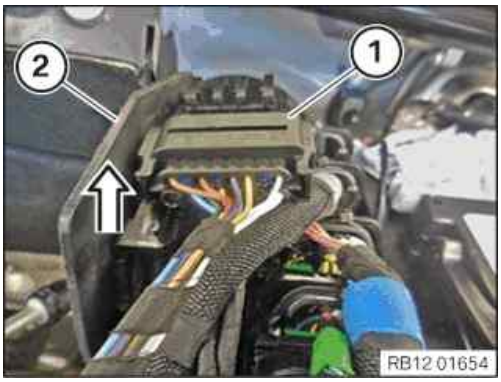
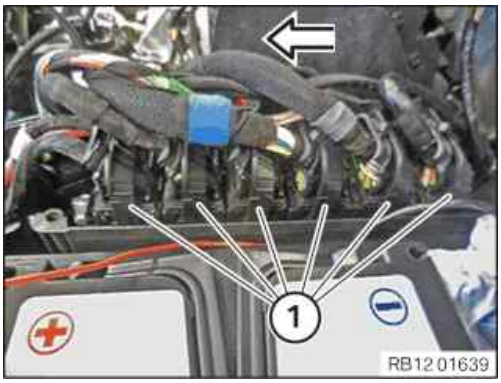
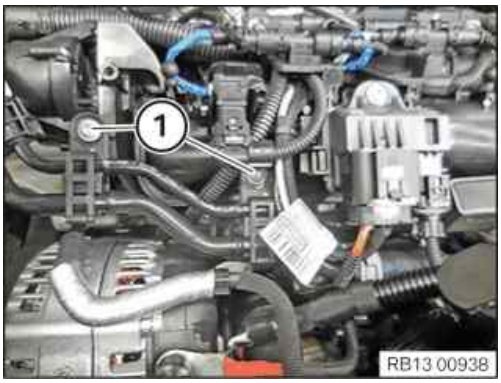


- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).

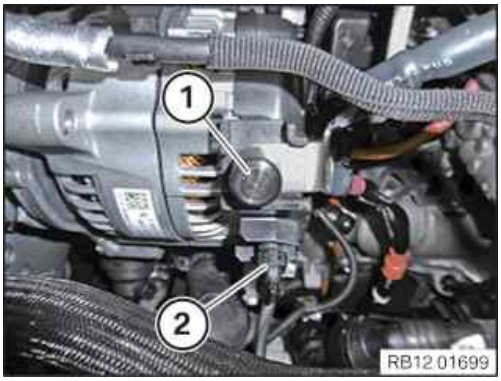


- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).



- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

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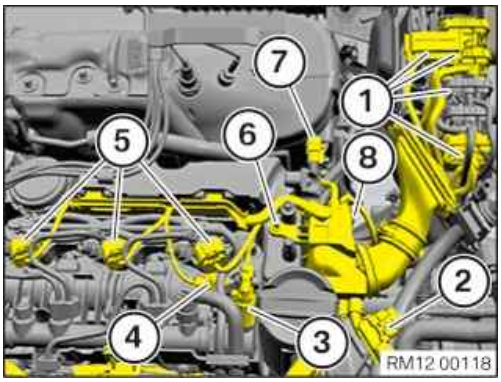
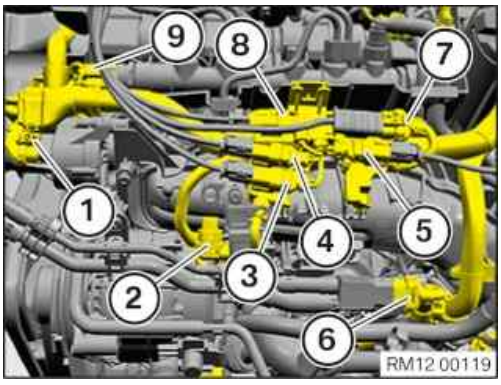
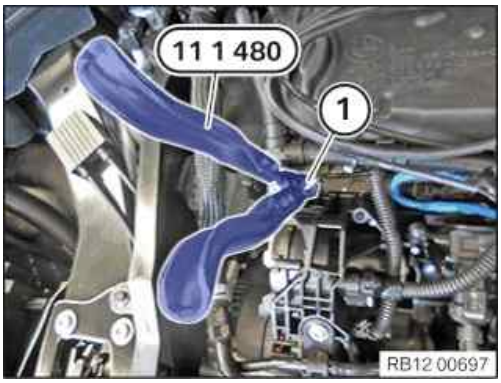


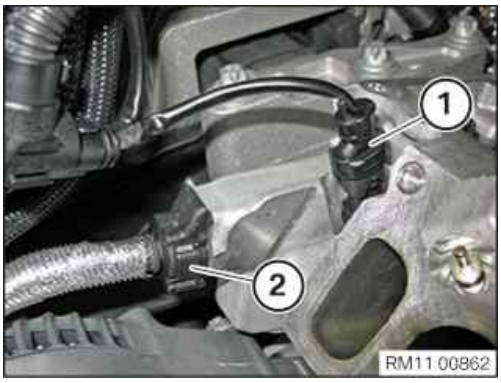
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.

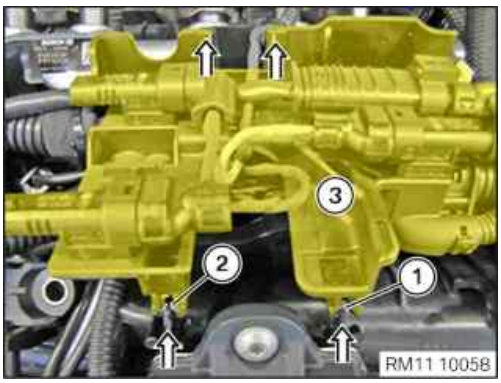


- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

16 – Removing the cable clips from the intake plenum



- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

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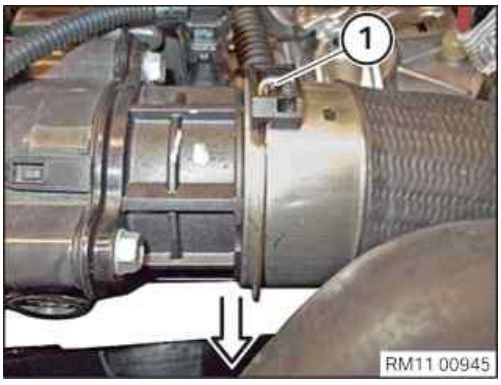
17 – Removing the intake plenum

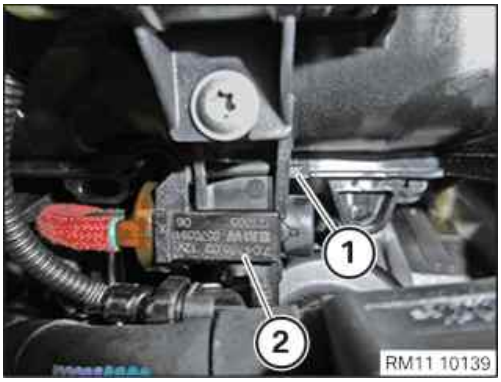
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

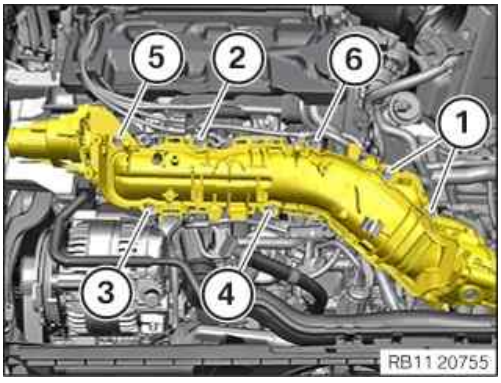
- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.

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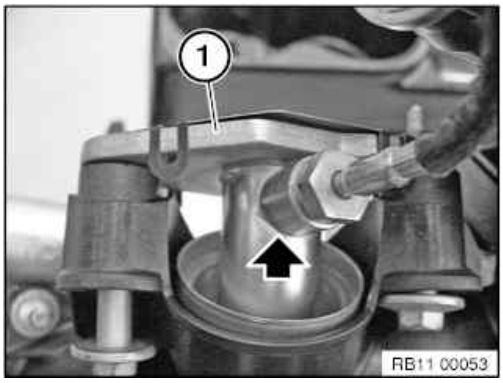

- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

18 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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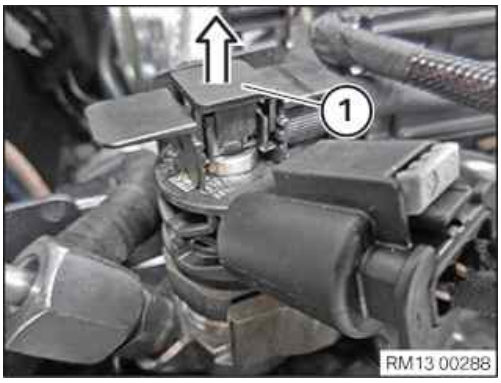

- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

19 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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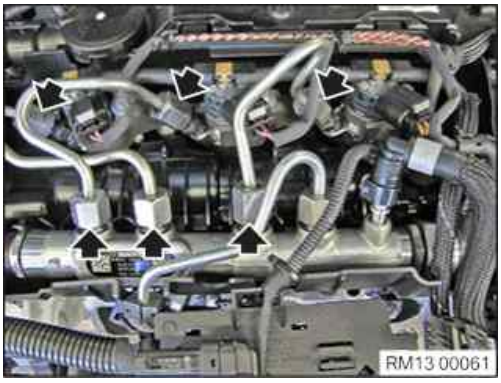
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

20 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

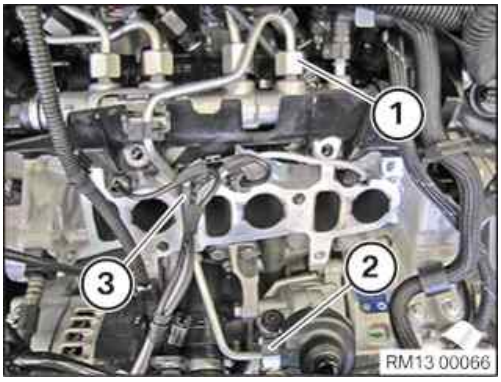
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

21 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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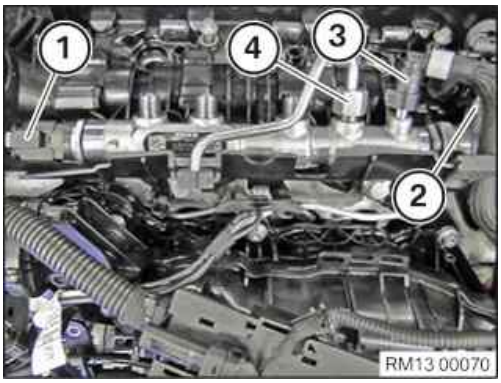
TECHNICAL INFORMATION

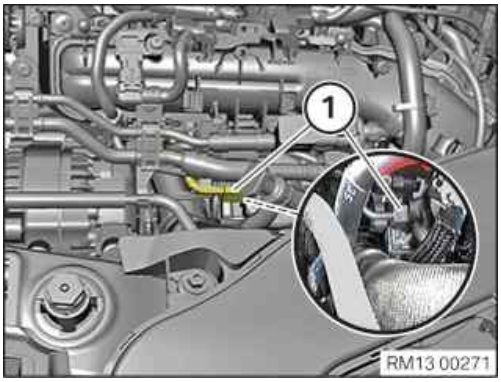
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

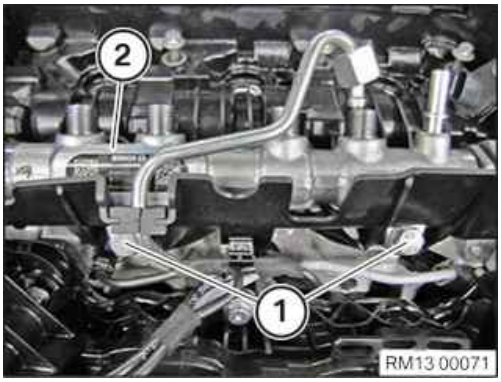
Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.



- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

22 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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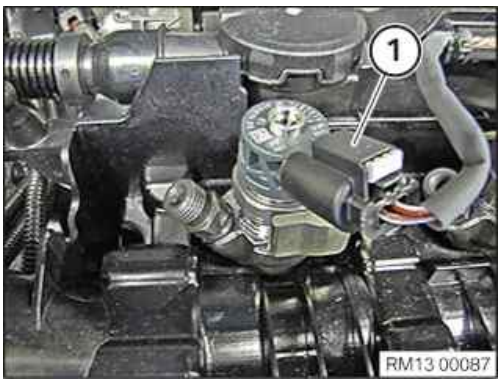
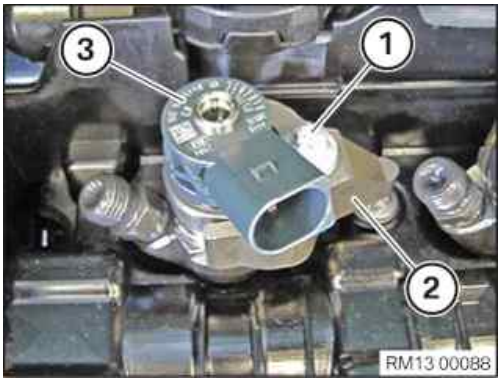
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

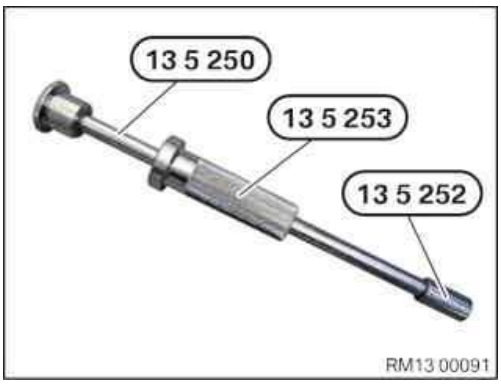
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

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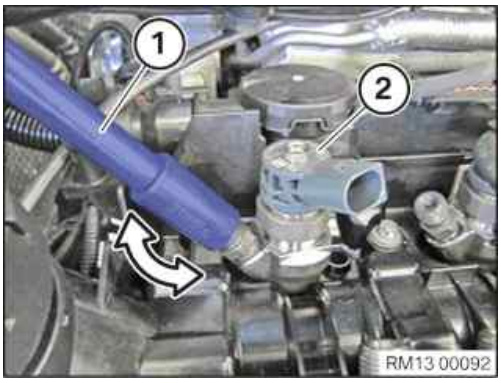


- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

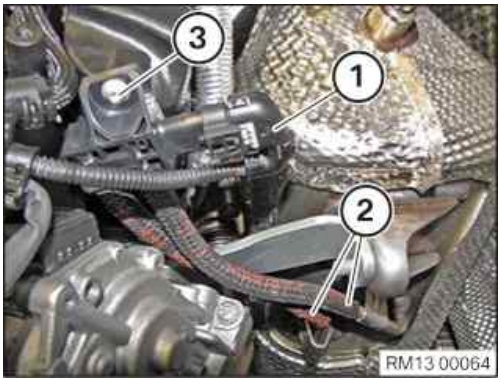
23 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

MAIN WORK

24 – Removing the cylinder head cover

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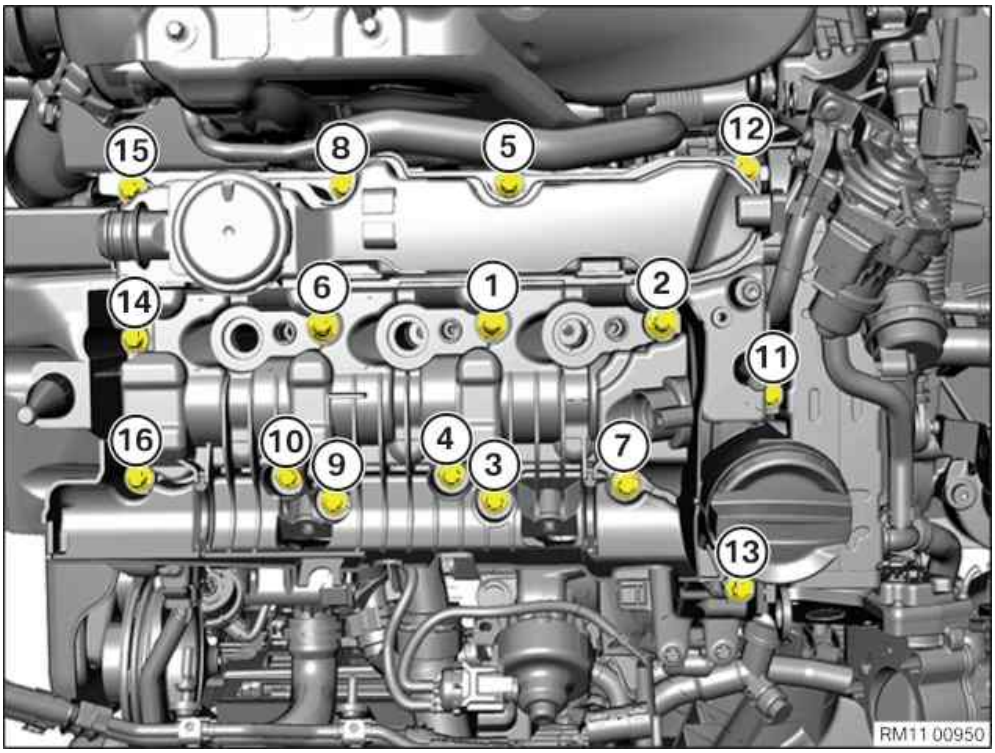
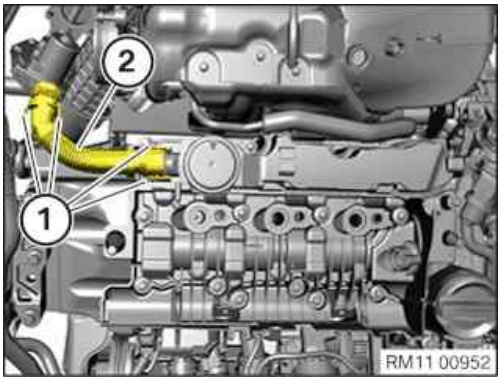
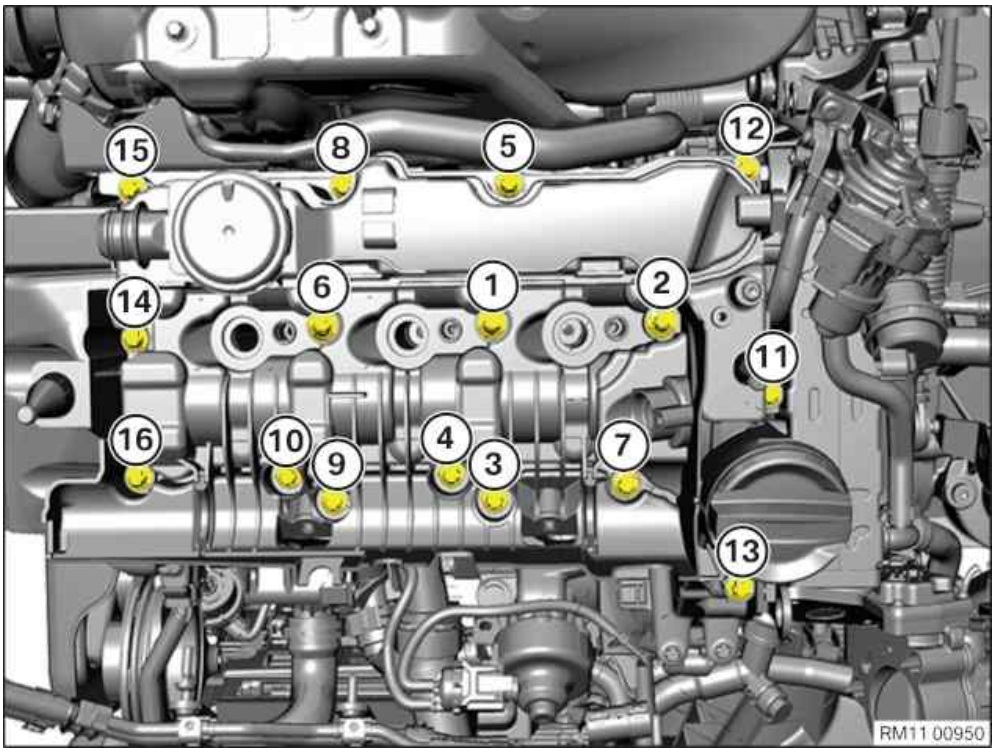
Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

25 – Installing cylinder head cover

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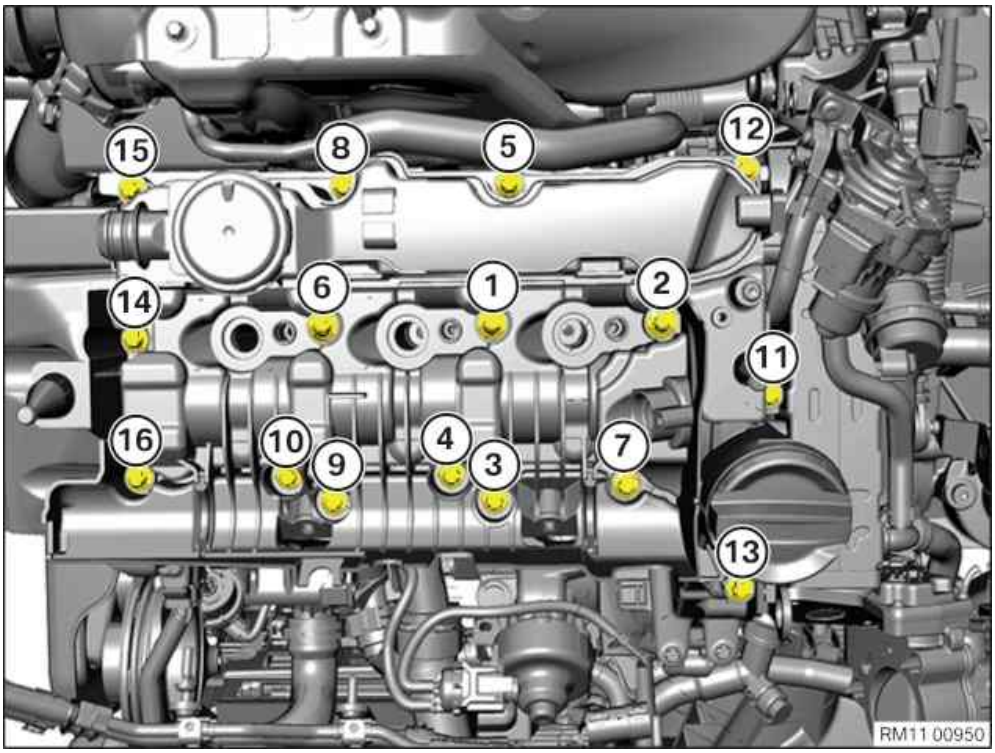
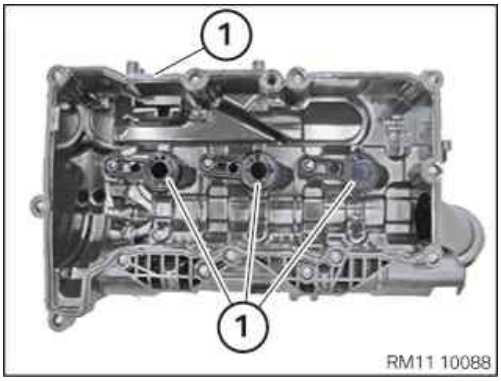
Overview: Screw connection of the cylinder head cover

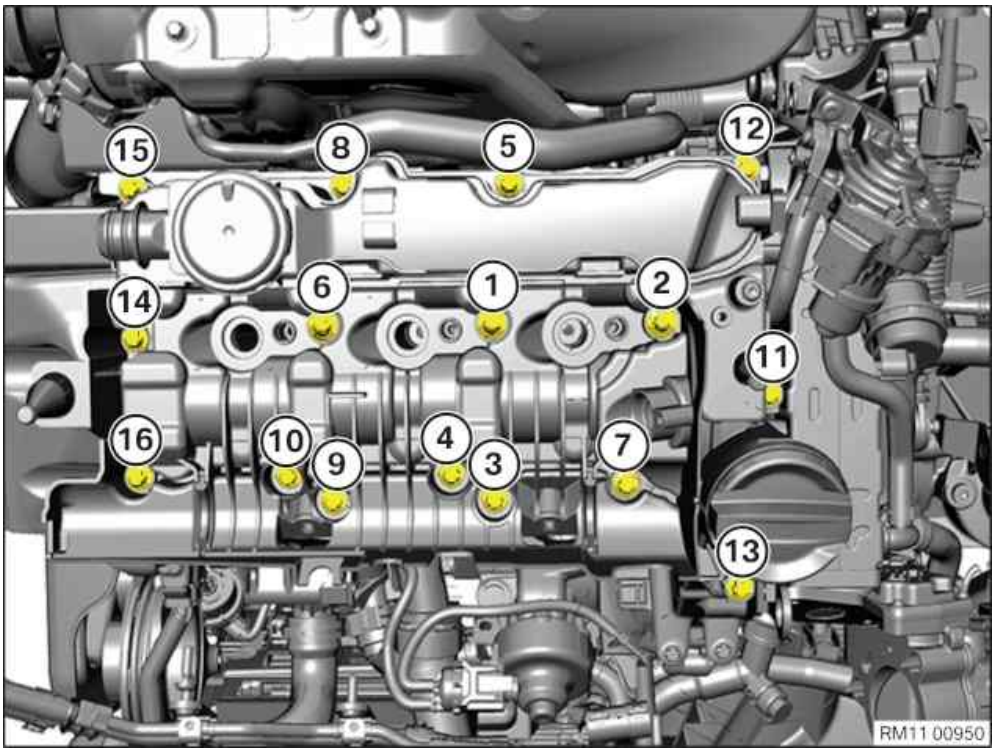


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm

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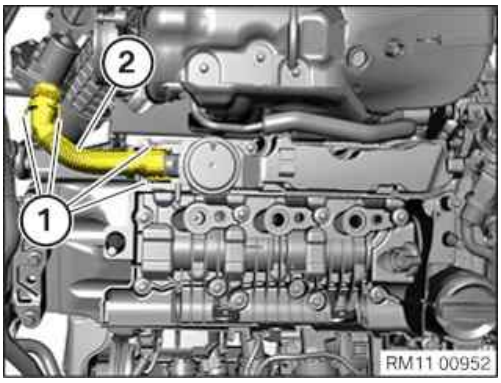
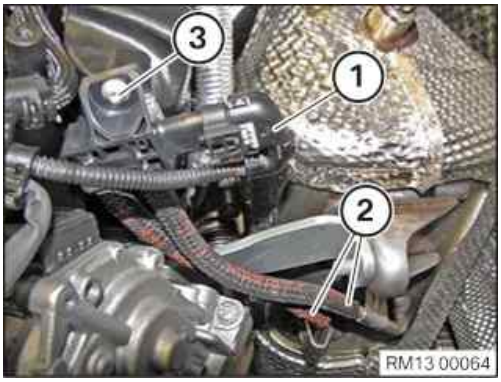


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

POSTPROCESSES

26 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

27 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

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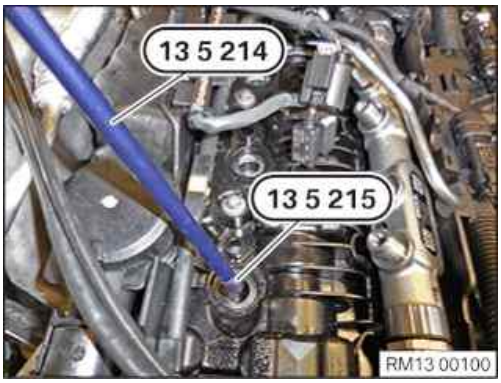
RISK OF DAMAGE

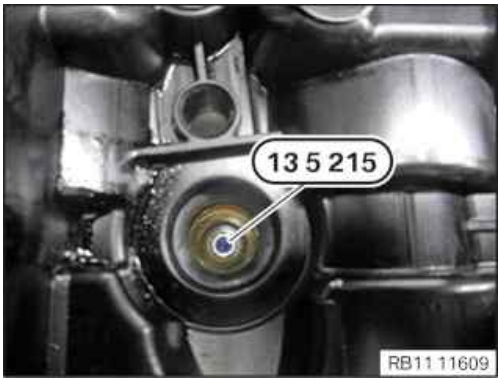
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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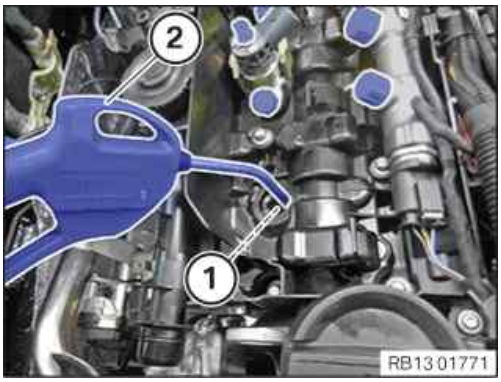
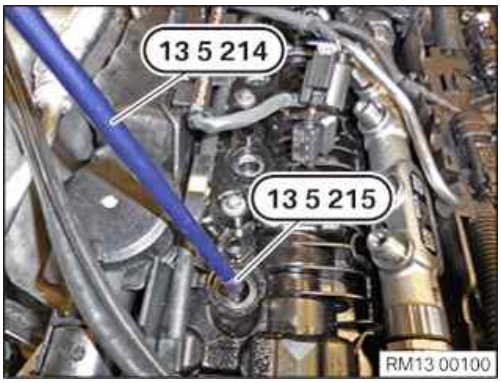


- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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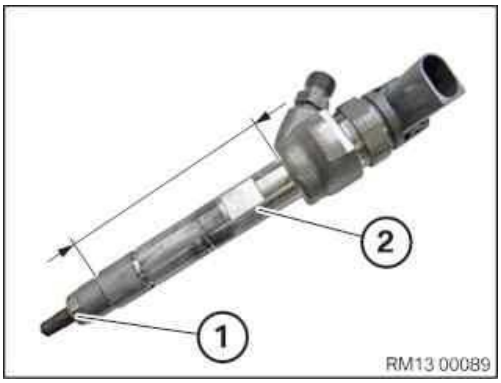
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

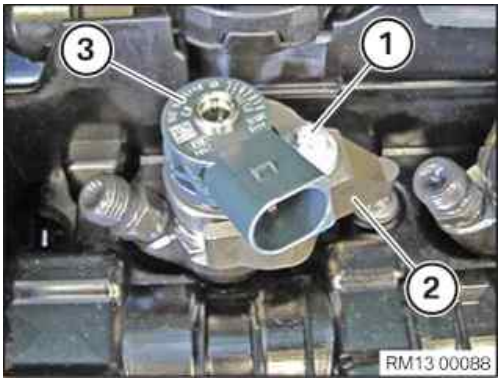


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

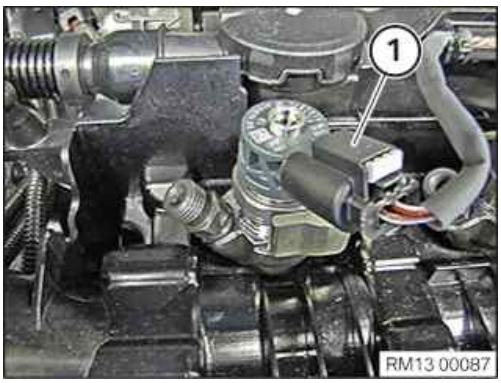
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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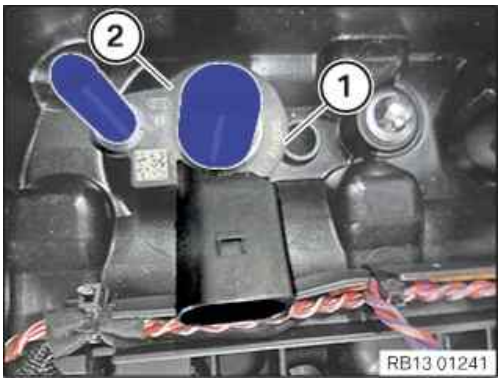
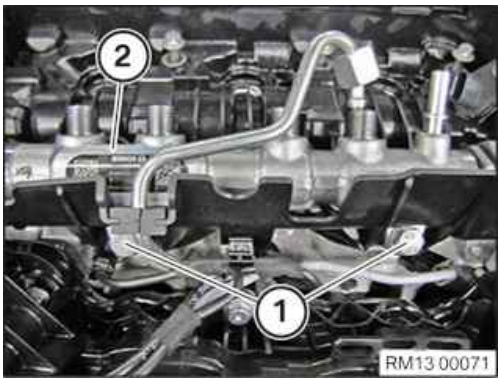


- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

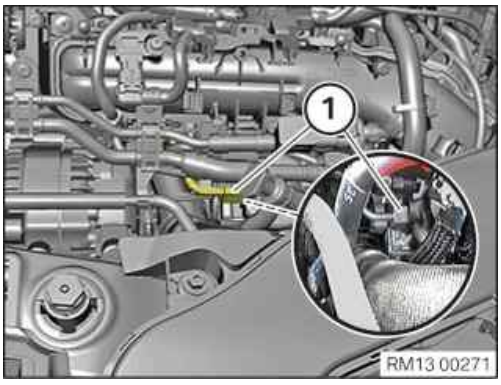
28 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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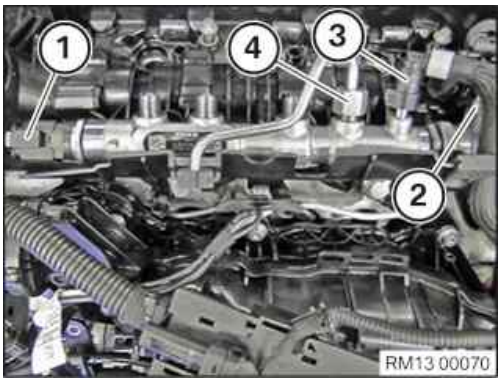

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

29 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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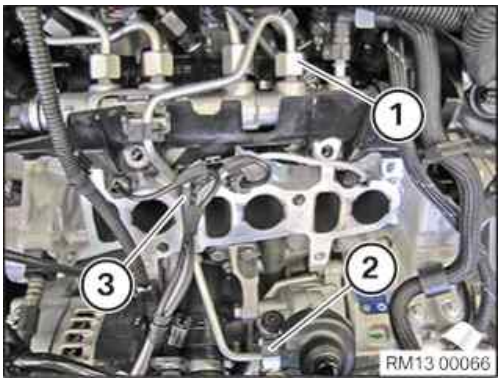

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

30 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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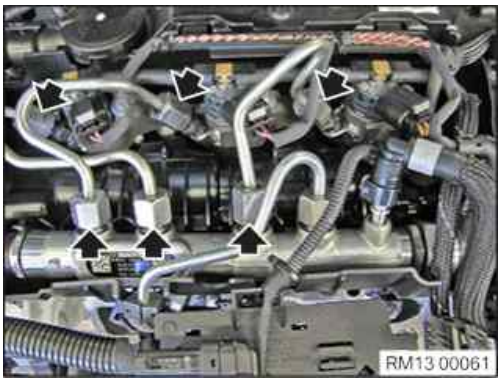


- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

31 – Connect the leakage oil line on the injector

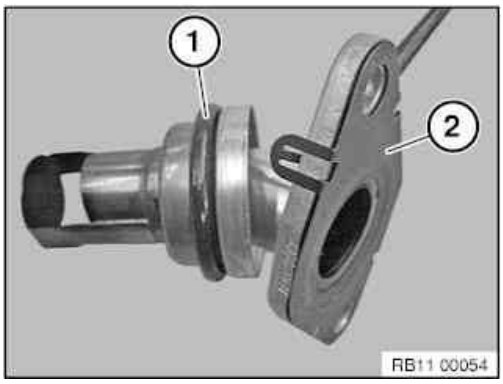
- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

32 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

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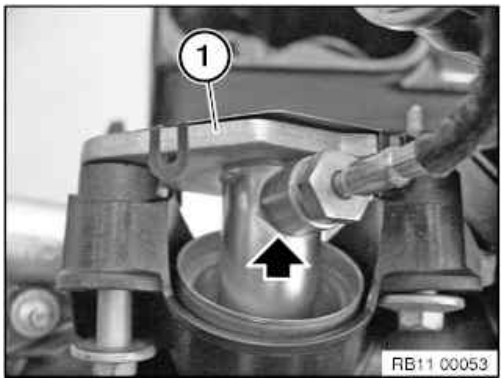
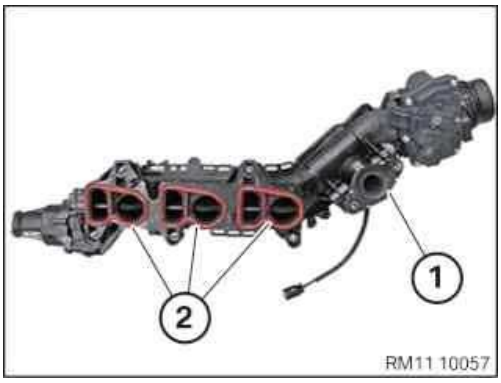
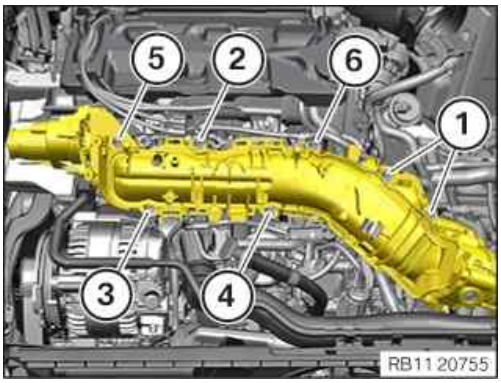


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

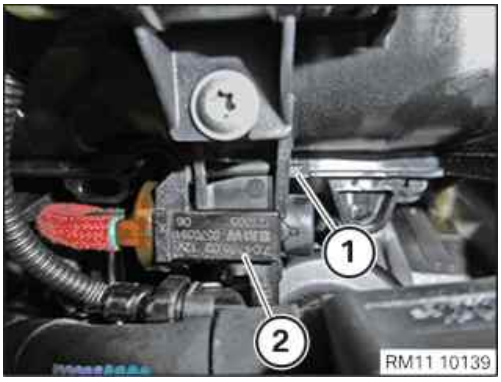
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



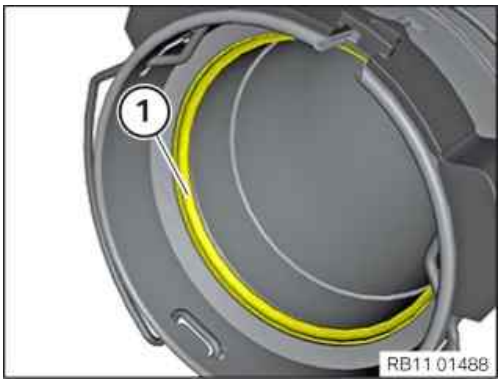
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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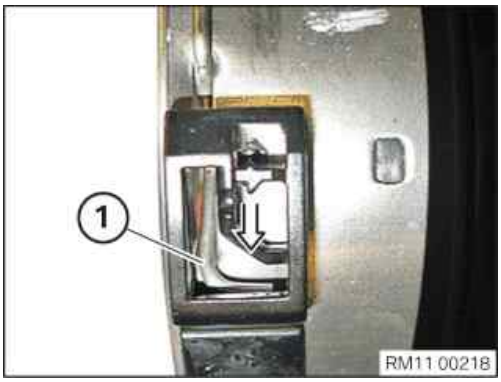
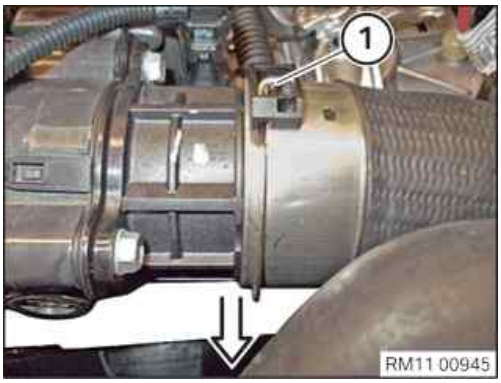
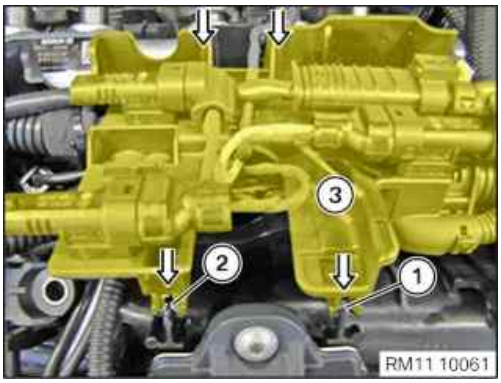


- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

33 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

34 – Fastening the wiring harness section for the intake plenum

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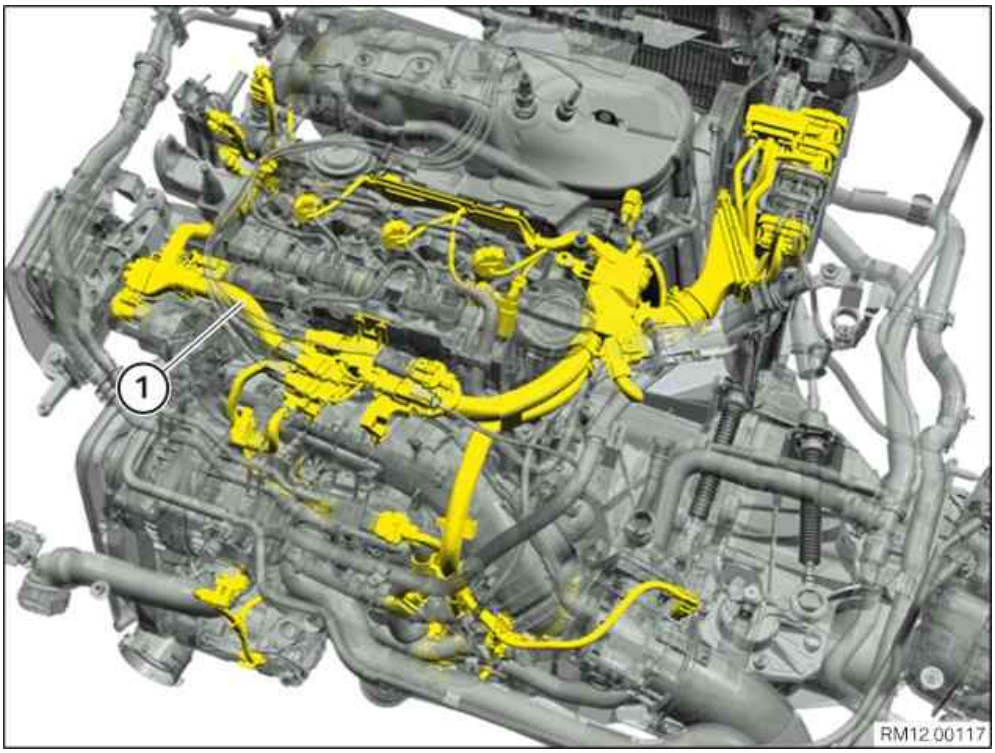
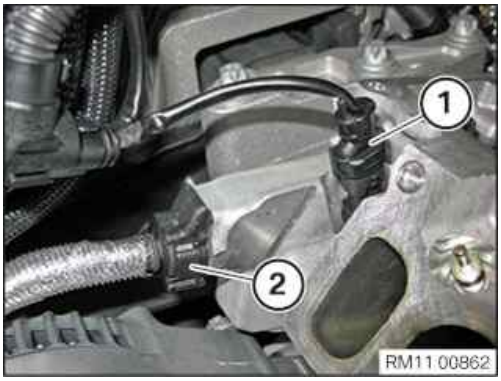
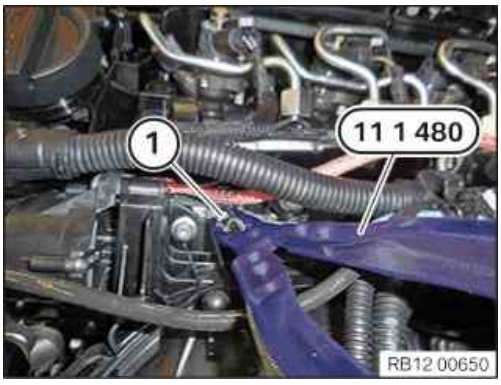
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

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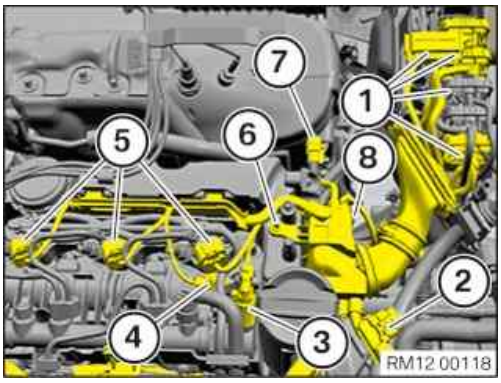
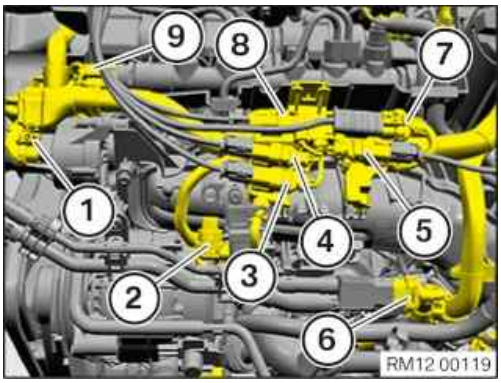


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

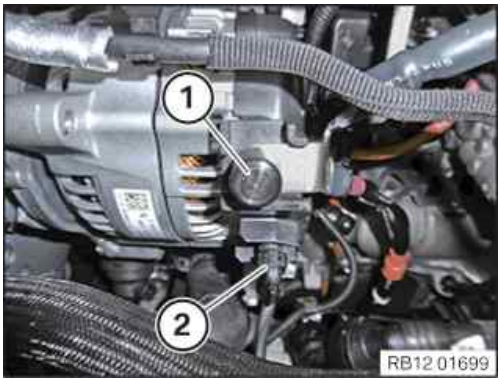
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

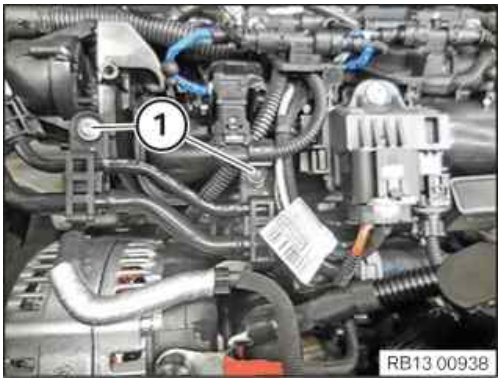


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm



- Position fuel lines.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

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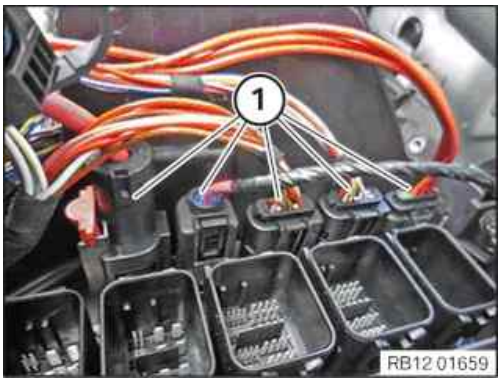
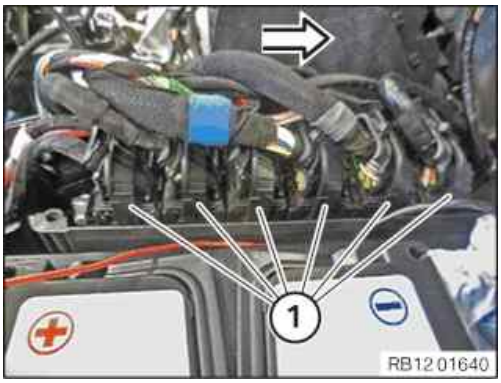
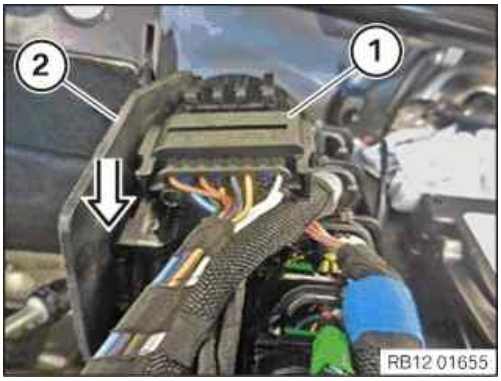


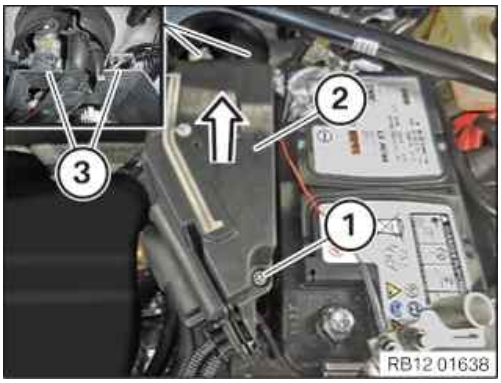
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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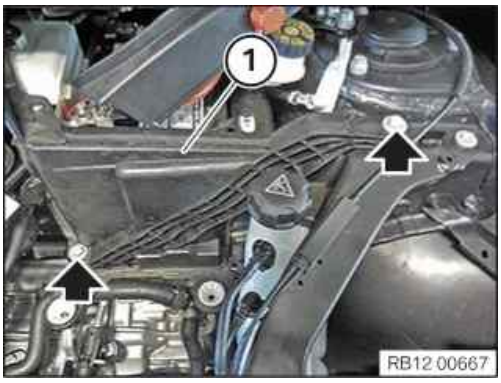


- Feed in and install tension strut (1).
- Tighten screws (arrows).

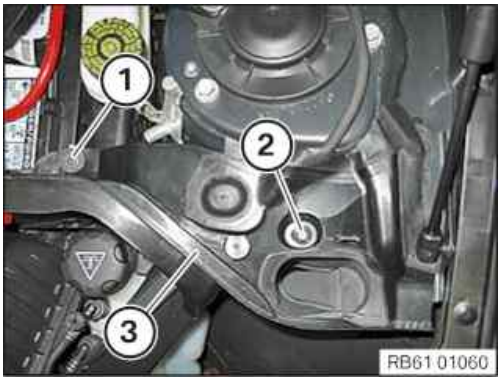
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

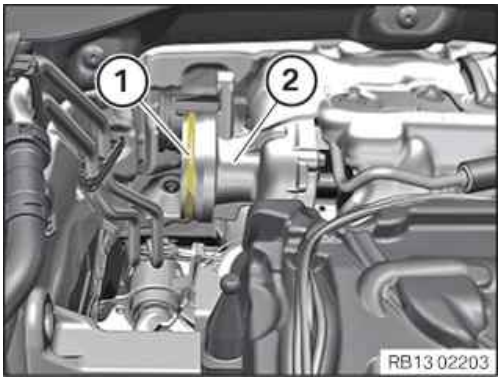


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

35 – Partially securing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.

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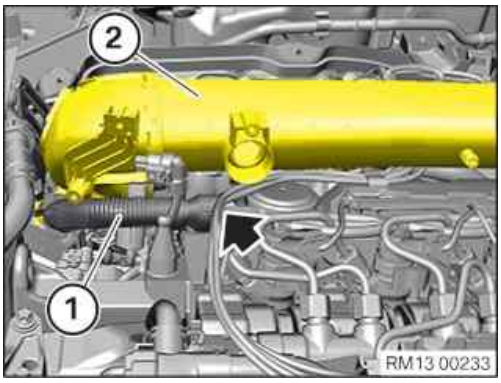
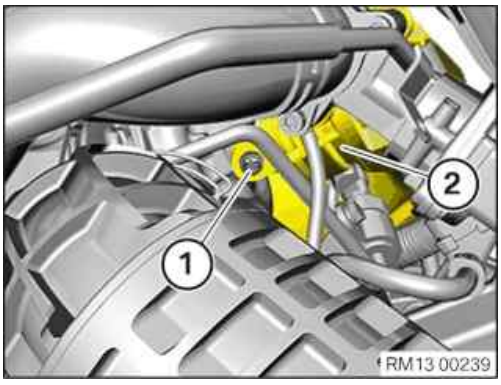


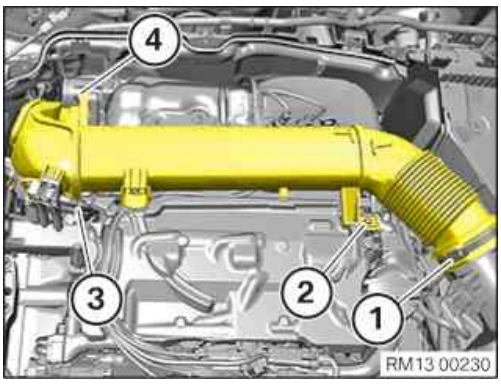
- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

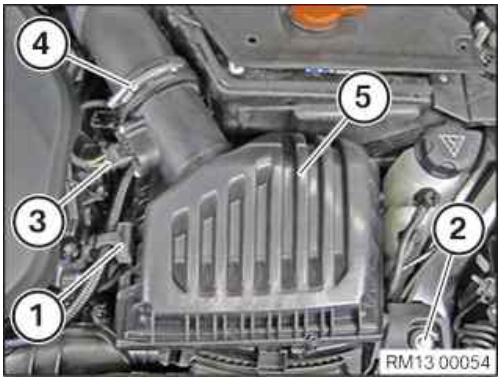
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

36 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

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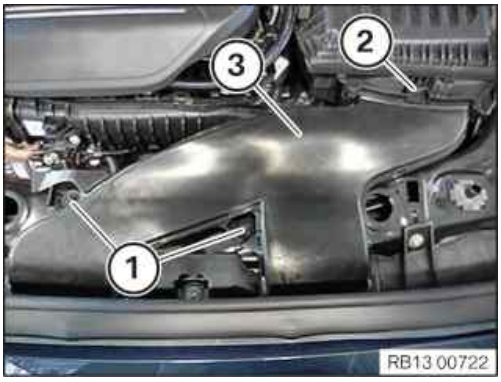
37 – Install the intake neck for the intake filter housing



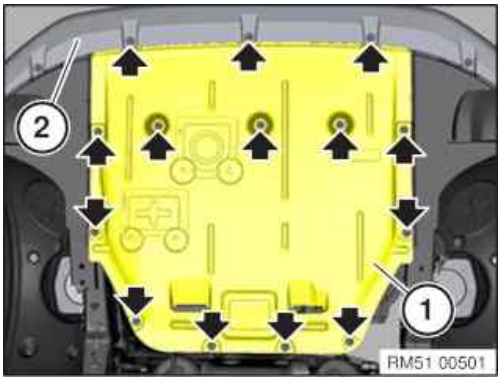
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

38 – Installing the front underbody protection

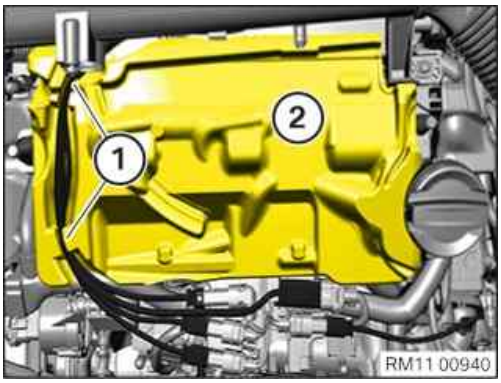


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

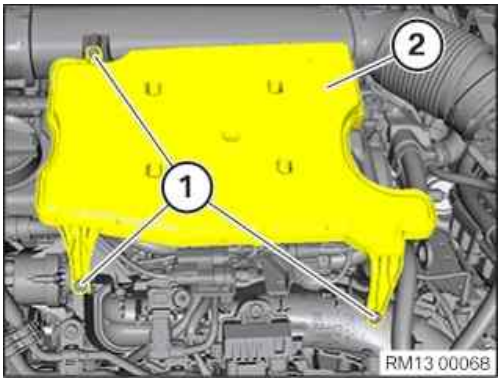
			3 Nm

39 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

40 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

41 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

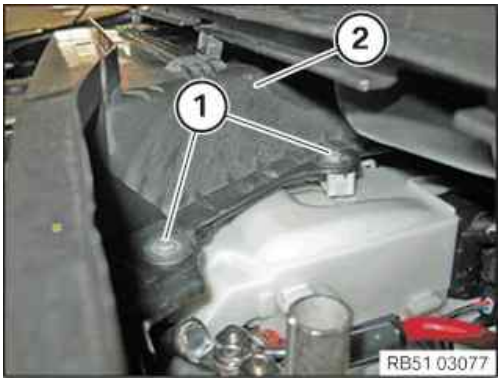
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

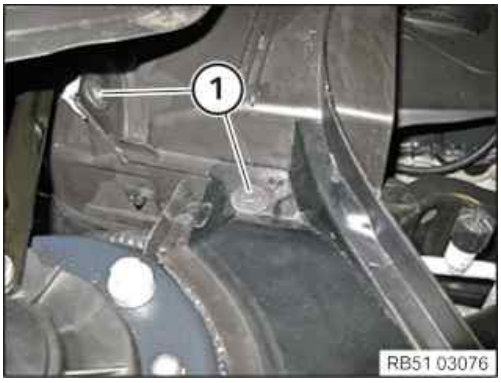
42 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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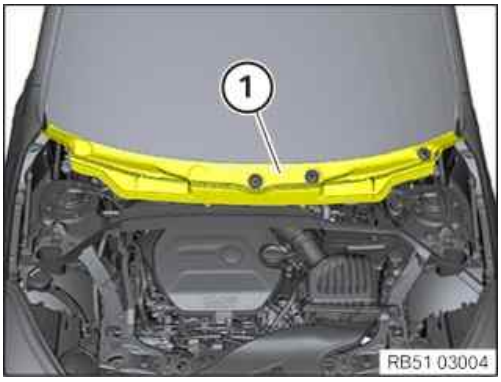
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

43 – Install the rear cowl panel cover



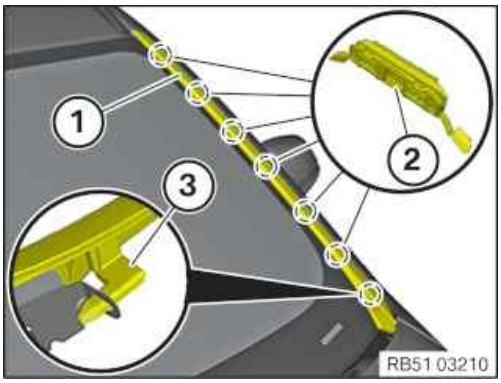
- Feed in and engage the rear cowl panel cover (1).

44 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

45 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the wiper arm**

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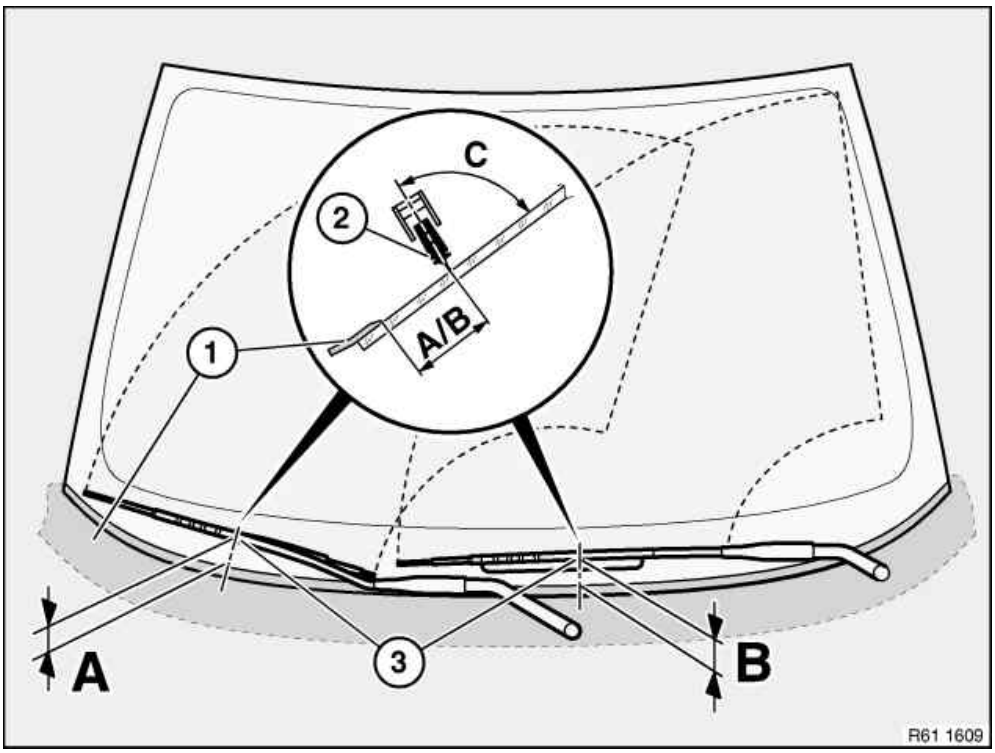
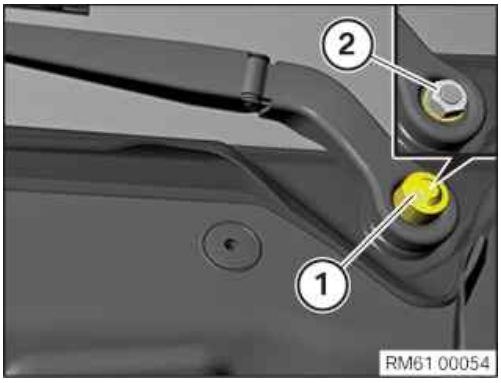
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

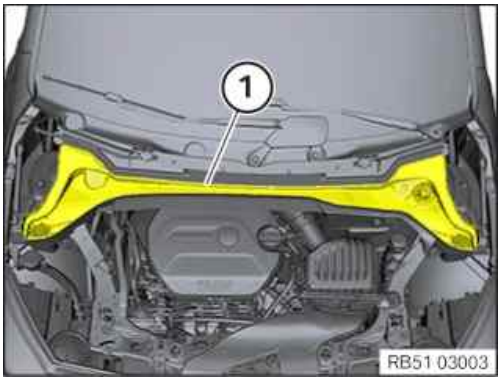
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

46 – Installing front cowl panel cover



- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

47 – Install the seal for the bonnet

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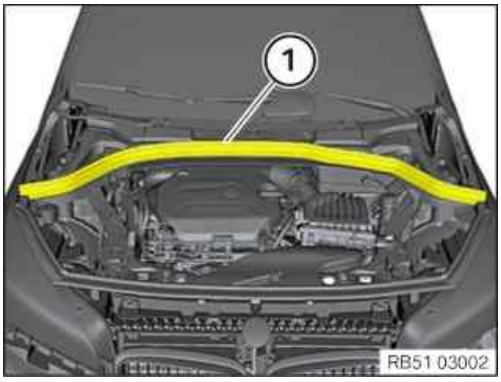
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

48 – Disconnecting all battery earth leads

- See additional information.

Additional Information

Overview of Tightening Torques

Cylinder head cover to cylinder head — Used in step 25

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder — Used in step 26

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 26

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover — Used in step 27

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover — Used in step 27

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover — Used in step 28

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail — Used in step 28 29

High-pressure pipe		Tightening torque	28 Nm

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High pressure lines between injector and rail

Used in step 30

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 32

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover

Used in step 34

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 34

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 34

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 34

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 34

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 34

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 34

		Tightening torque	3 Nm

Battery cover

Used in step 34

Screw			2,8 Nm

Clean air pipe to exhaust turbocharger

Used in step 35

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover

Used in step 35

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 35 36

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge

Used in step 36

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 37

M6		Tightening torque	8 Nm

Underbody protection front

Used in step 38

			3 Nm

Resonator to manifold and clean air pipe

Used in step 40

Screw TS6	Renew screw.	Tightening torque	5 Nm

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Bulkhead cover, top — Used in step 42

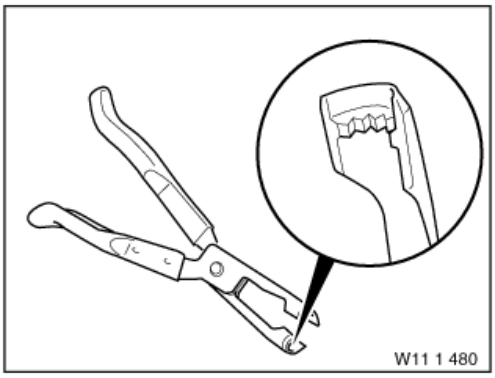
Screw		Tightening torque	3 Nm

Windscreen wiper arm — Used in step 45

Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 15

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common — Used in step 19 20 21 28 29 30

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

2 413 106 Fastener

Common — Used in step 19 20 29 30

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

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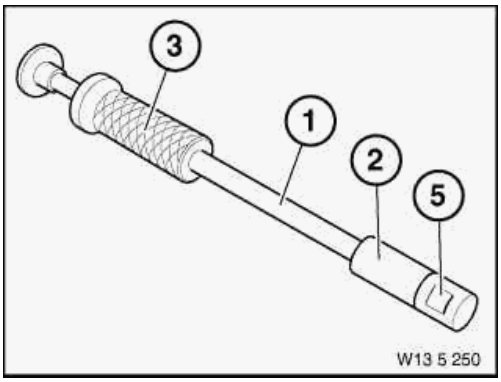
0 493 321 (13 5 250) Puller



Common

Used in step 22

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common

Used in step 22

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common

Used in step 22

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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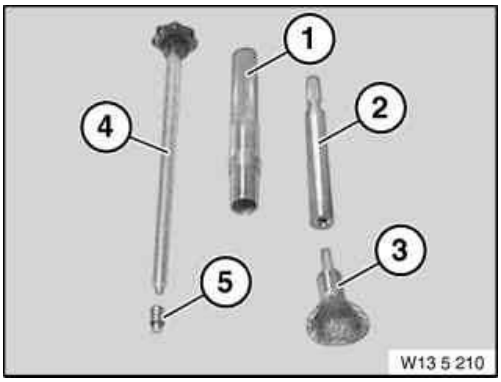
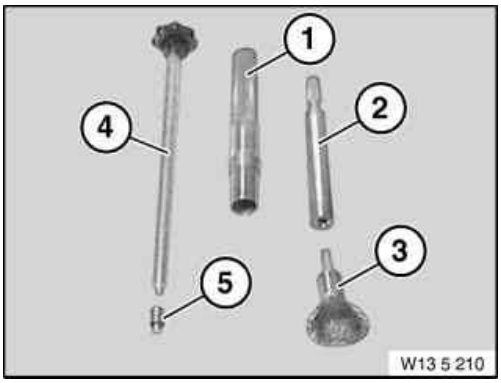
0 493 763 (13 5 215) Plug



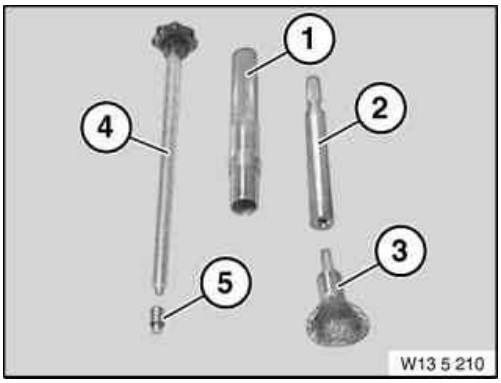
Common		Used in step 27
Usage	(Seal plug)	
Included in the tool or work	0 493 758	
Storage location		
Replaced by		
In connection with		
SI-Number		

0 493 762 (13 5 214) Rod



Common		Used in step 27
Usage	(Mounting rod) For the seal plug	
Included in the tool or work	0 493 758	
Storage location		
Replaced by		
In connection with		
SI-Number		

0 493 758 (13 5 210) Tool



Common		Used in step 27
Usage	(Cleaning set) For injector channels	
Included in the tool or work		
Storage location	B4	
Replaced by		
In connection with		
SI-Number	01 05 00 (574)	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Overview Technical Data

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Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 48
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 48
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 20 900 Disconnecting and connecting battery earth lead	1 48
61 35 ... Notes on ESD protection (Electro Static Discharge)	22 23

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11 12 000 Removing and installing/sealing cylinder head cover (B37C)

Important!

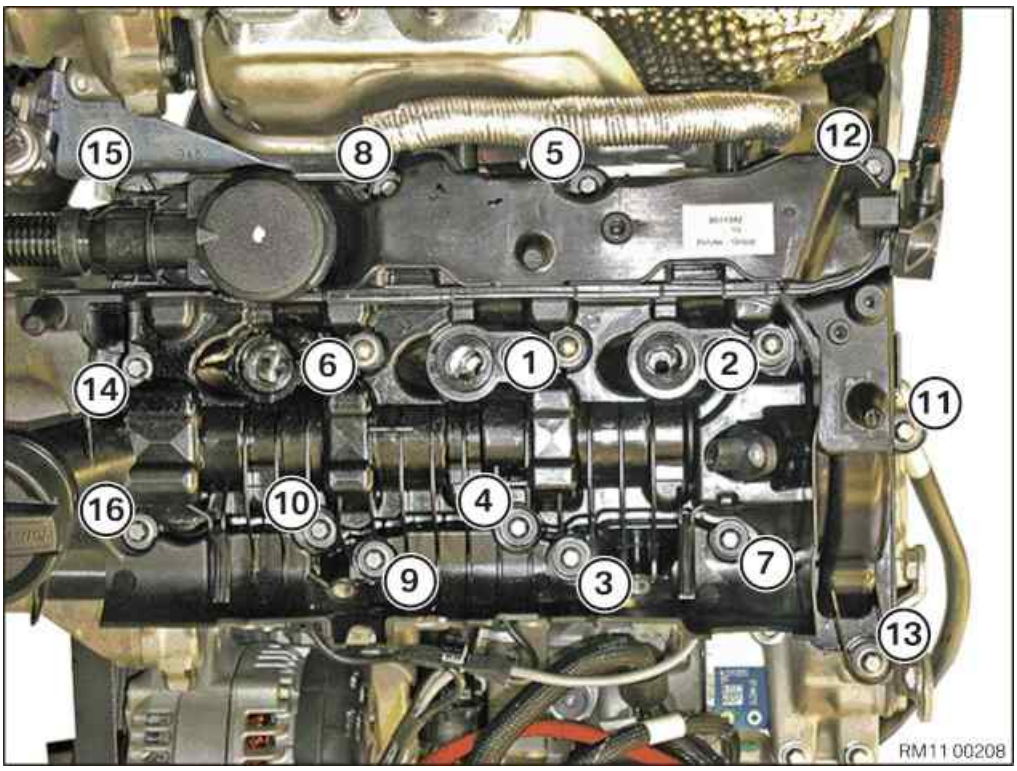
When carrying out repair work on the oil, coolant or fuel circuit, the alternator must be protected against dirt contamination.

Cover alternator with suitable materials.

Necessary preliminary tasks:

- Remove intake silencer housing.
- Remove intake plenum.
- Remove injectors.
- Remove pressure accumulator.
- Undo engine wiring harness in the area of the cylinder head cover.

Removal:



Release bolts in sequence **16 to 1**.

Remove cylinder head cover by lifting it out.

Preparation for installation:

Replace seals.

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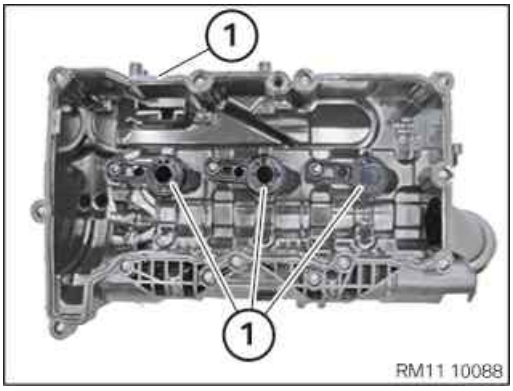
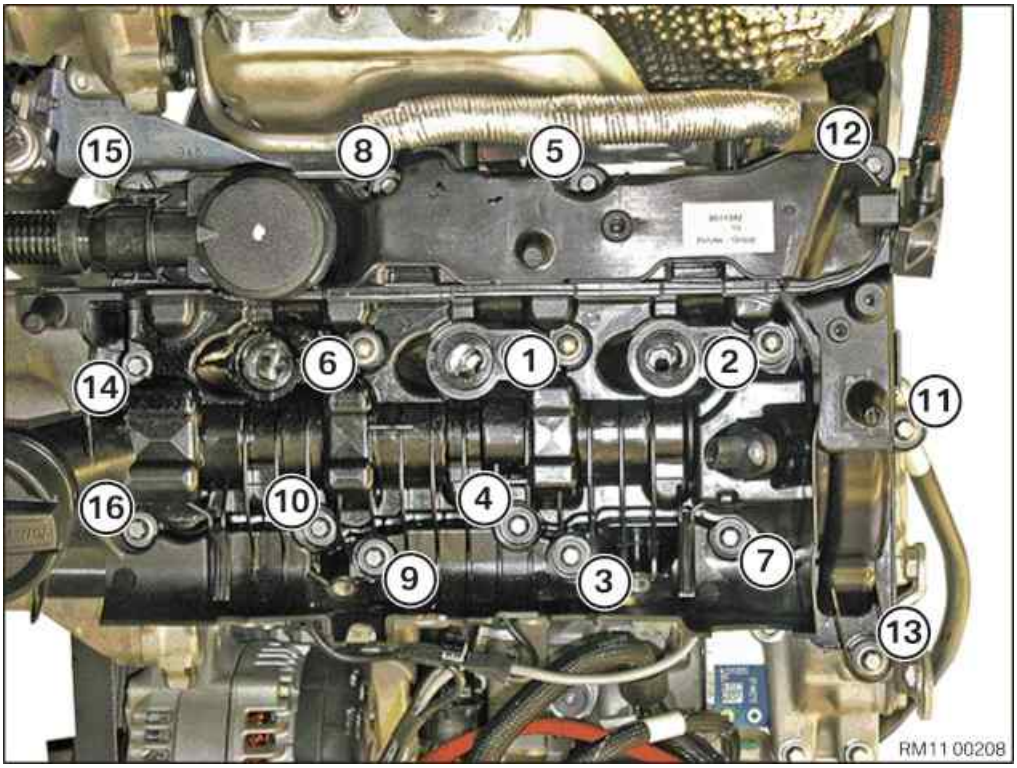


Parts: Replace profile seals (1).

Installation:



Position cylinder head cover.

Tighten down bolts in sequence **1 to 16**.

Tightening torque 11 12 3AZ.

Required follow-up work:

- Install pressure accumulator.
- Install injectors.
- Install intake plenum.
- Route and connect engine wiring harness in area of cylinder head cover.
- Install intake silencer housing.

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11 12 161 replace cylinder head

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Maintain conditions of absolute cleanliness.

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1 – Remove vehicle battery

WARNING

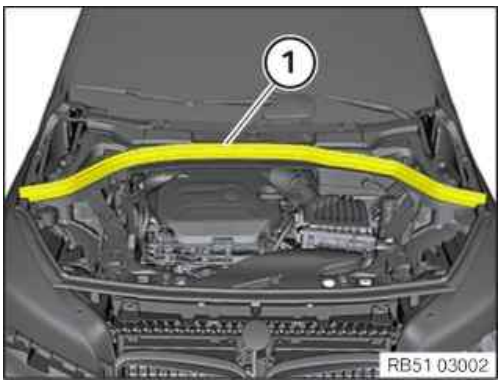
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

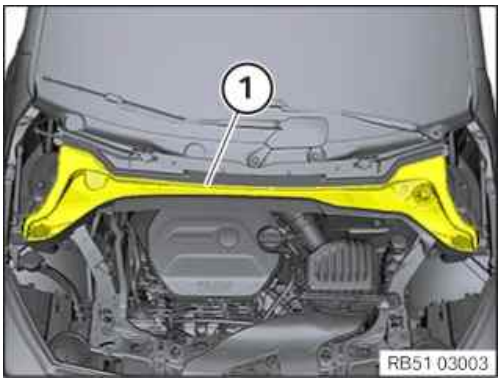
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

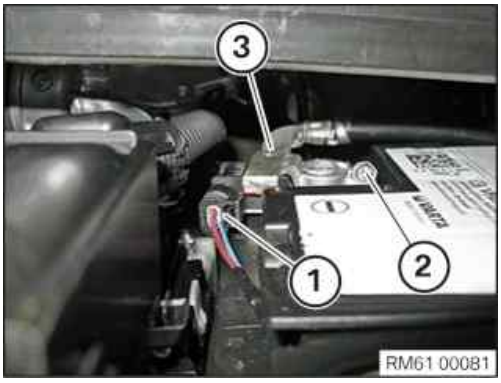
For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).

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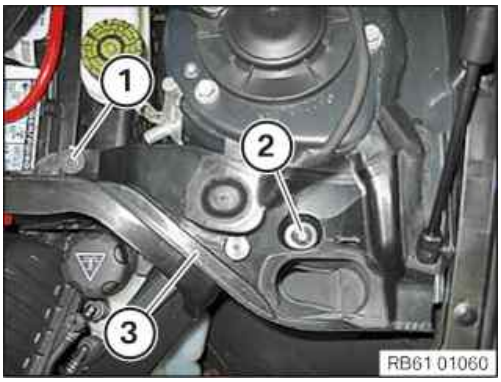
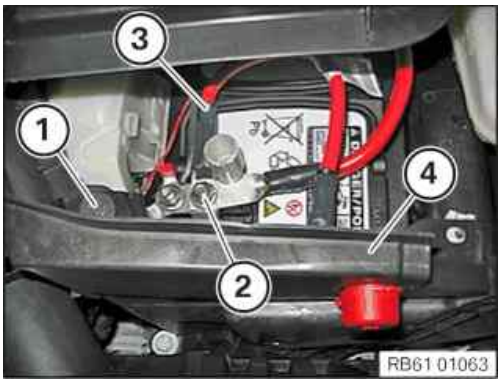
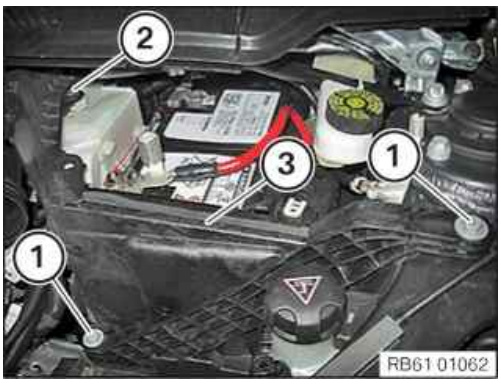


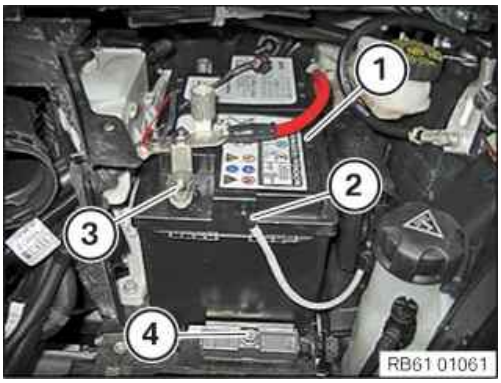
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Removing the upper bulkhead cover

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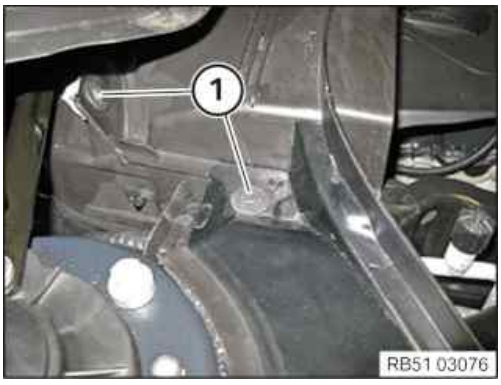
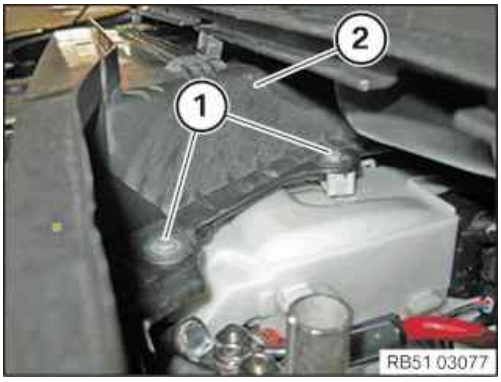
- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

3 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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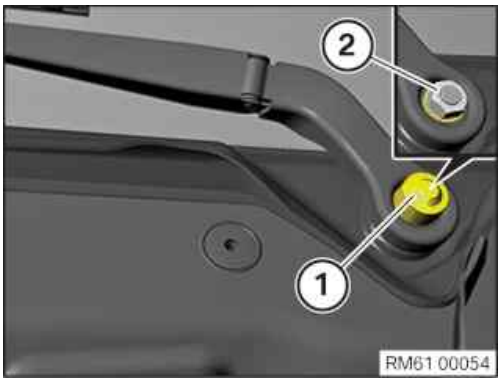
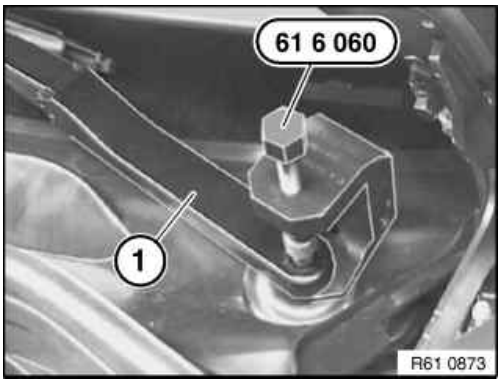


- Remove the protective cap (1).
- Loosen nut (2).



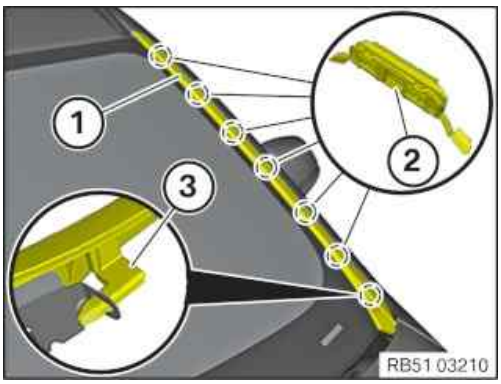
- Pull off the wiper arm (1) using special tool .

4 – Remove the gutter strip on the windscreen on the left and right

NOTICE

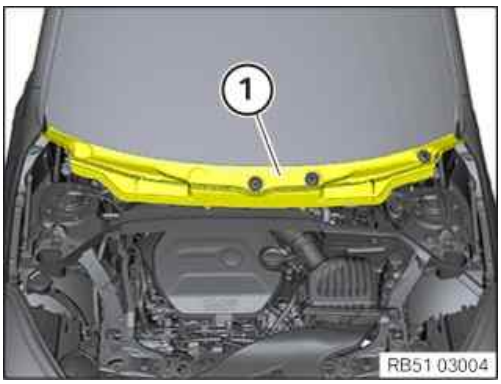
Description is for left component only. Procedure on the right side is identical.

▶ Remove the gutter strip on the windscreen



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

5 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

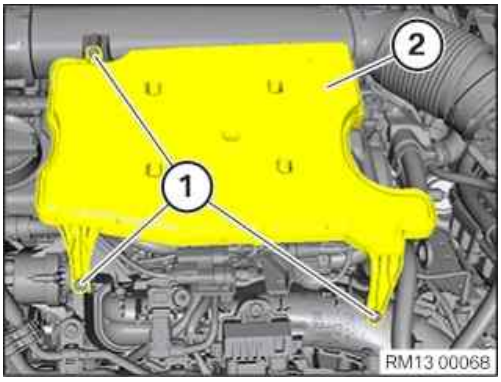
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

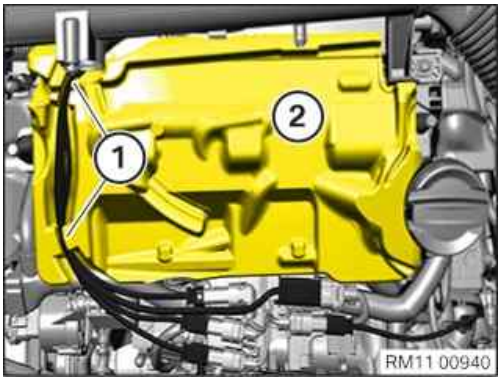
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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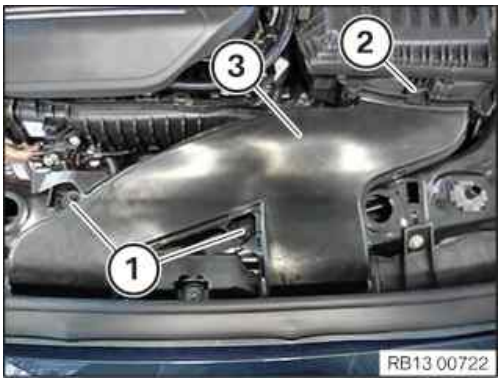
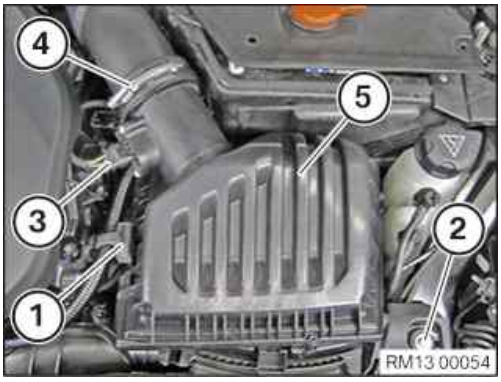


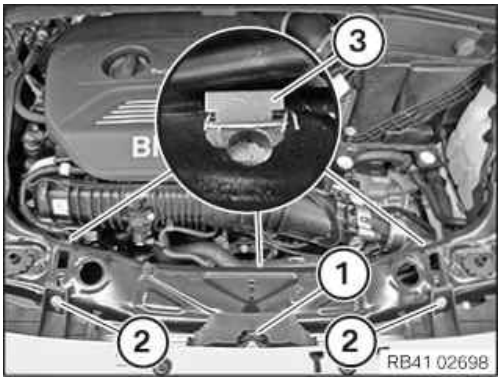
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

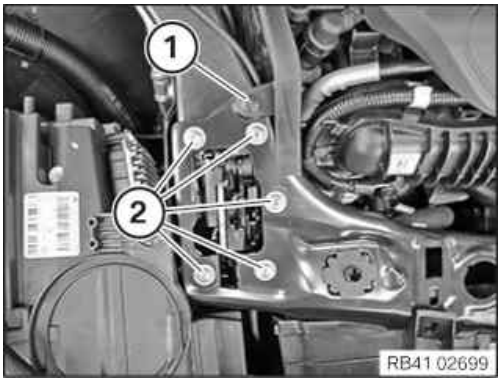


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

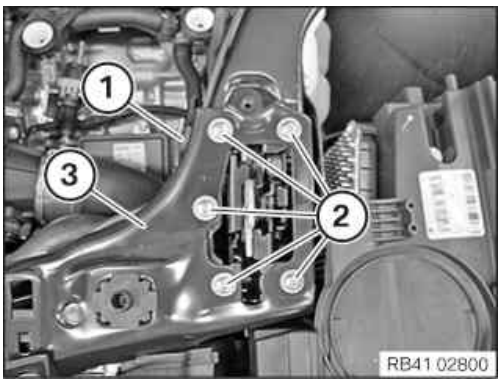
11 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

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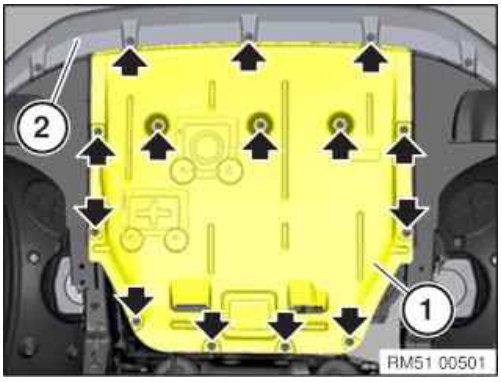
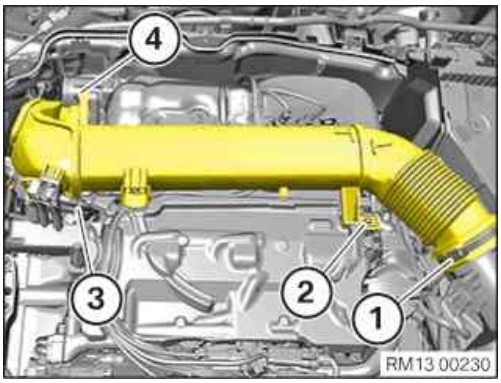
12 – Removing the front underbody protection

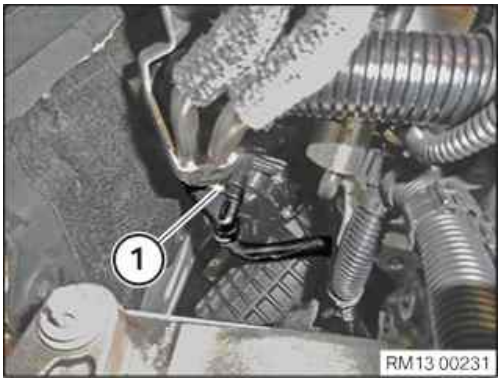


- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

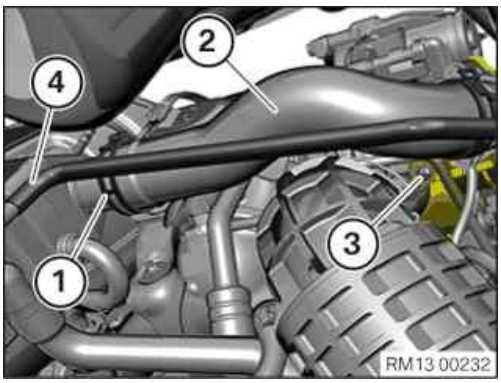
13 – Removing clean air pipe



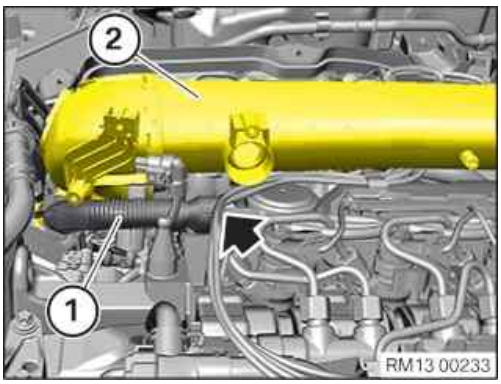
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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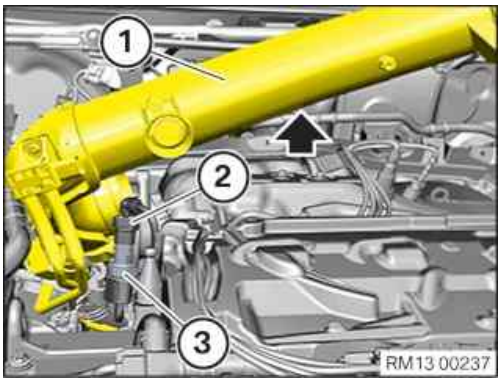

- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

14 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

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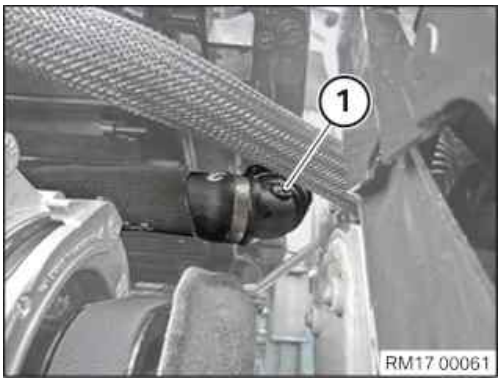
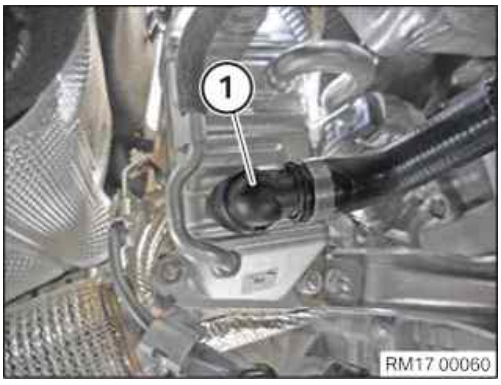


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

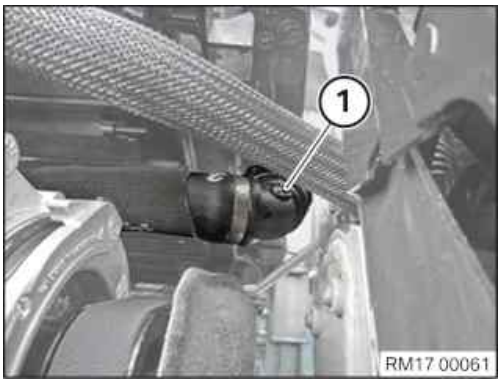


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

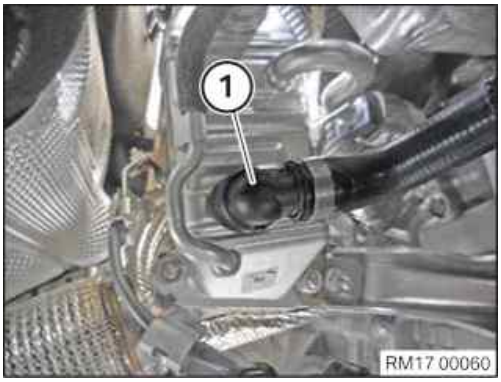
15 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

16 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

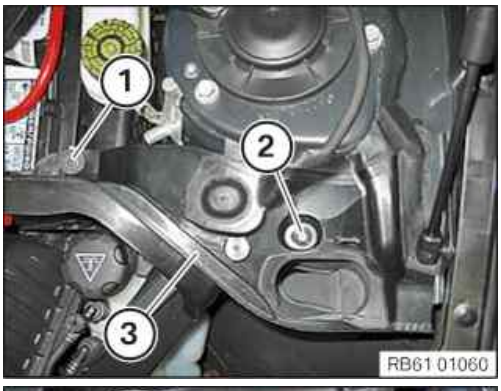
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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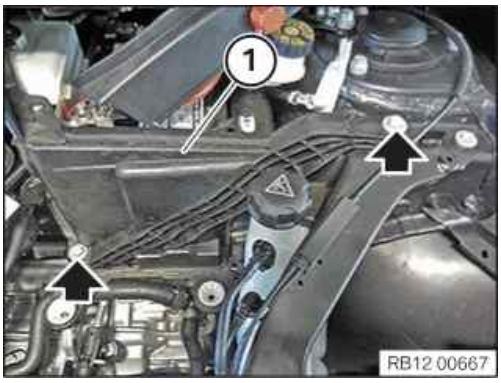
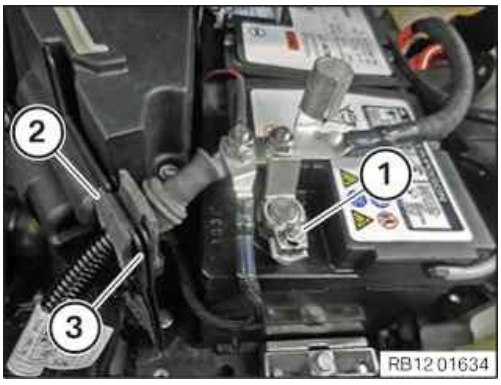
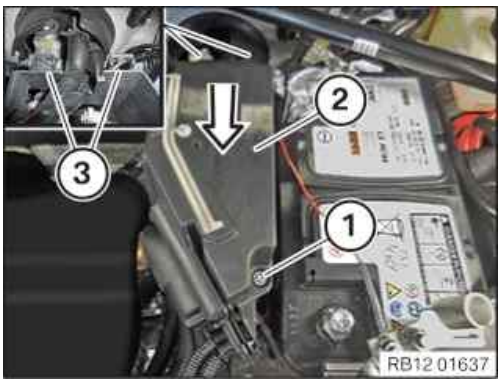


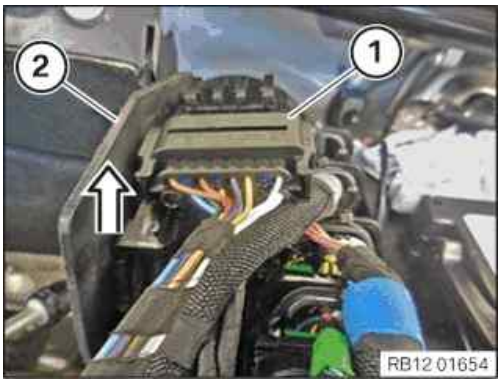
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



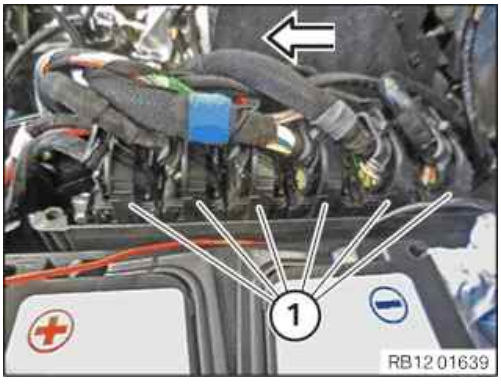
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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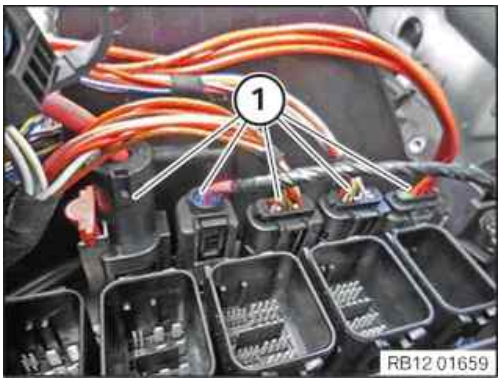
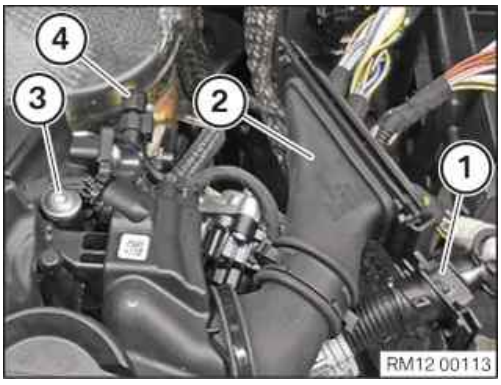
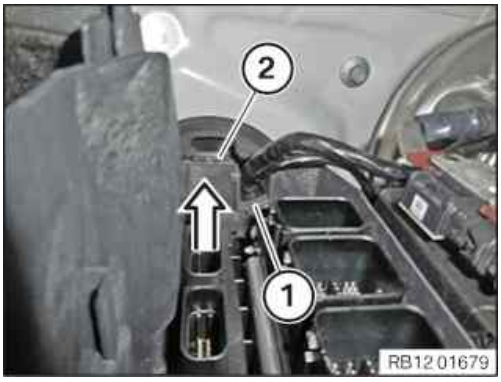


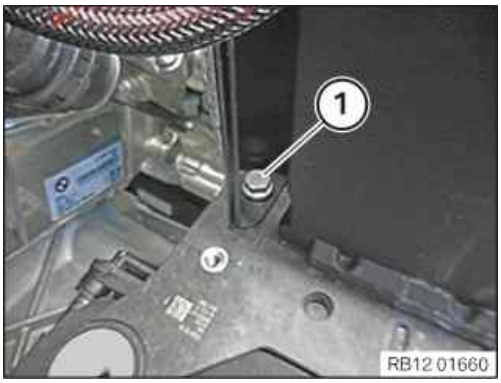
- Unlock and loosen connector (1).



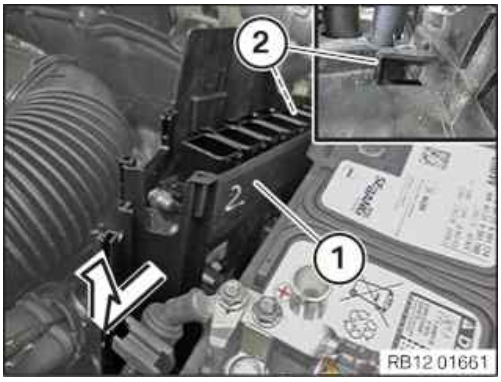
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

17 – Remove battery holder

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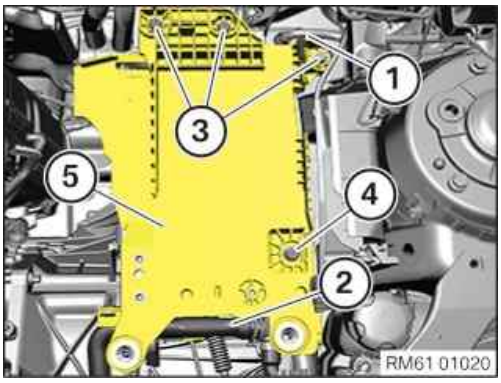
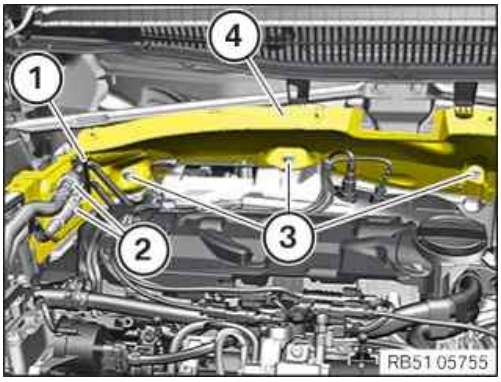


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

18 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

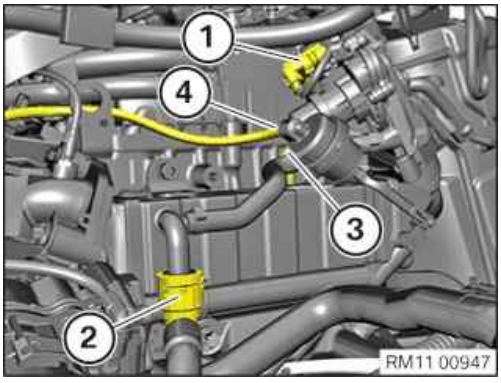
19 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

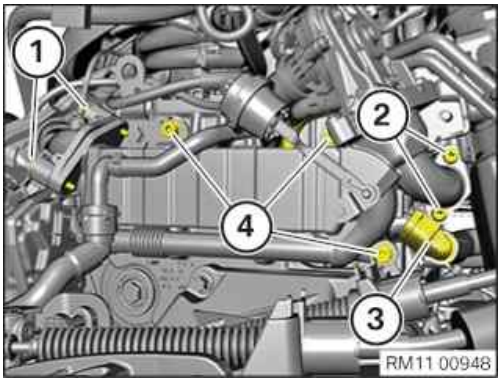
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

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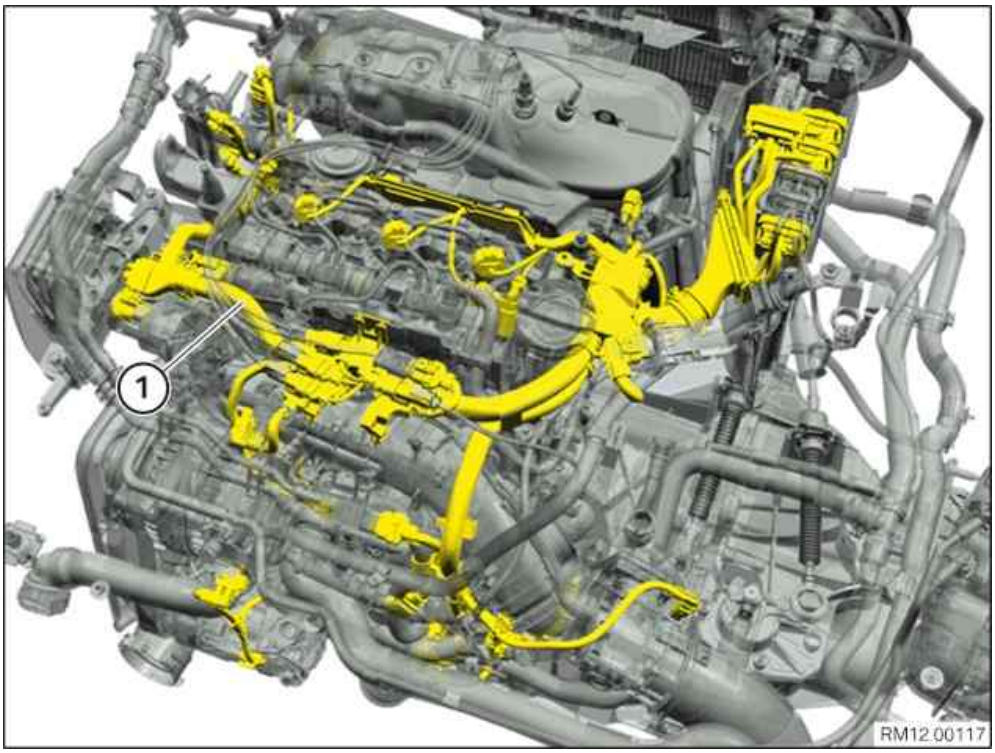
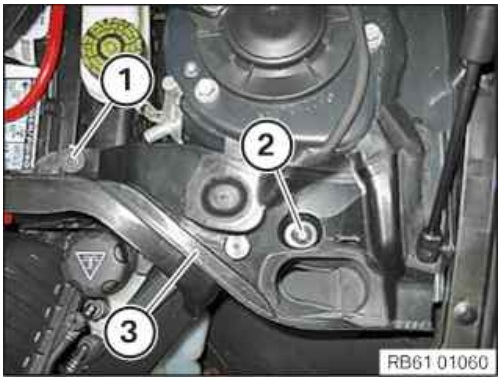
20 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine

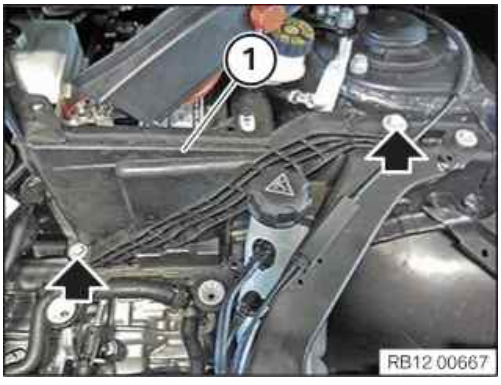


1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.

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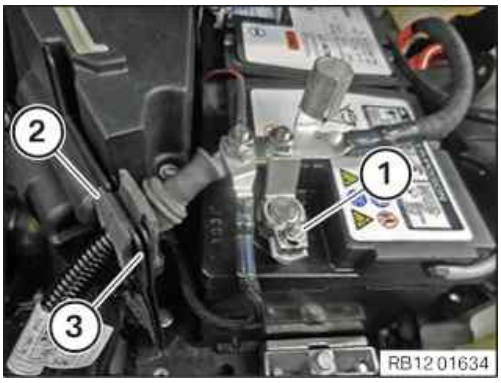
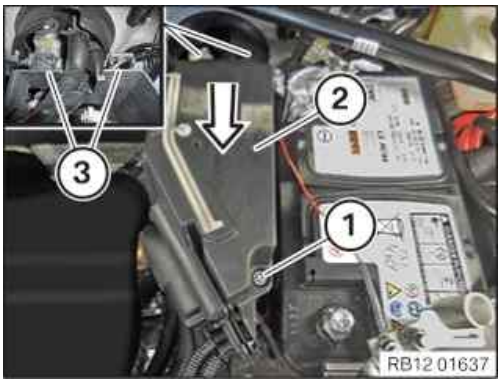
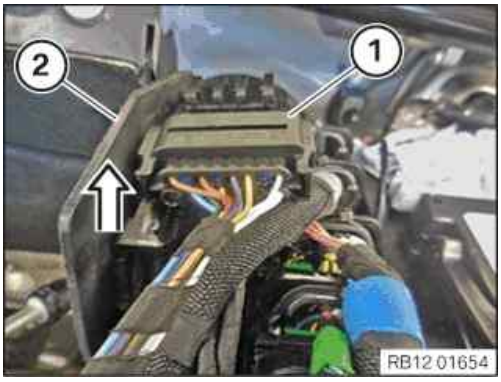


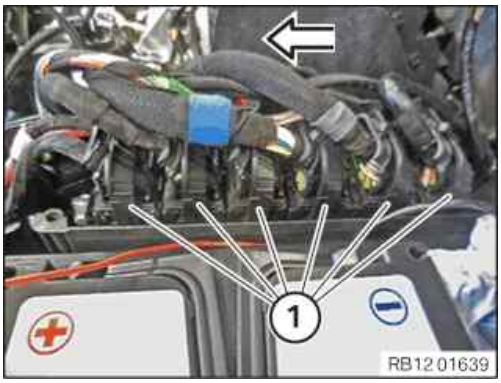
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).

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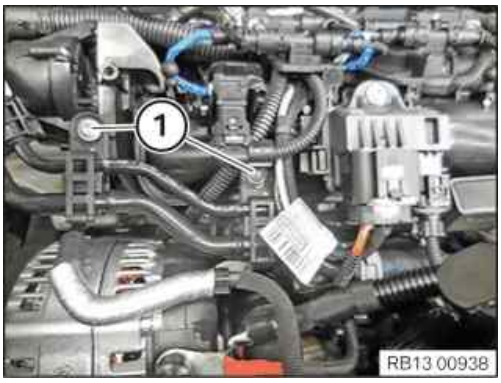
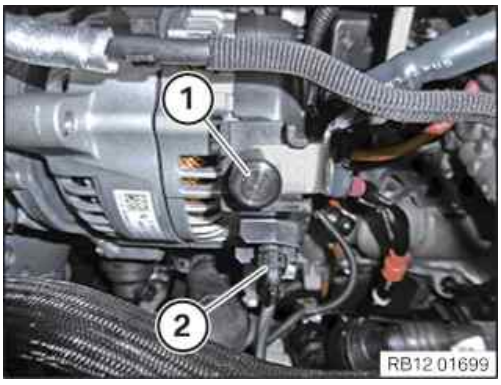
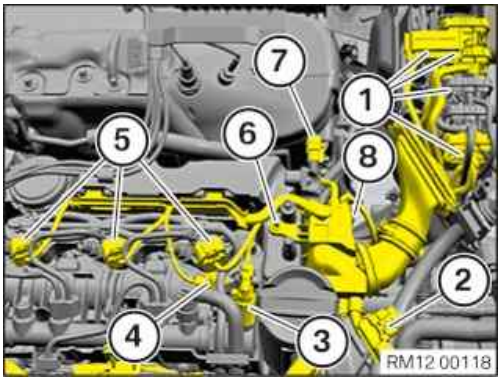


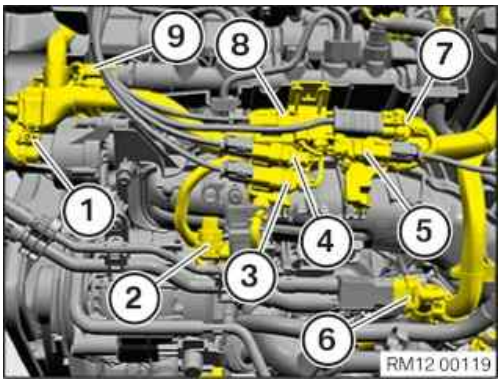
- Loosen screws (1).



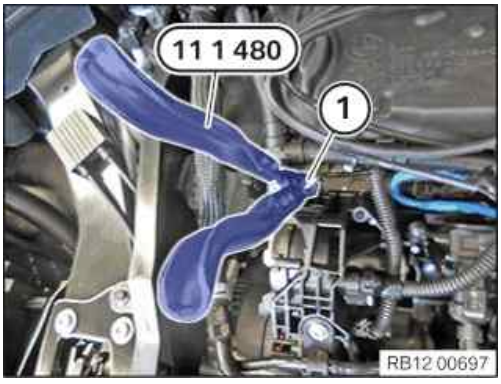
- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.



- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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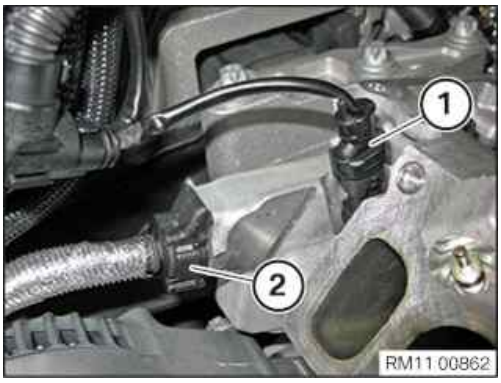
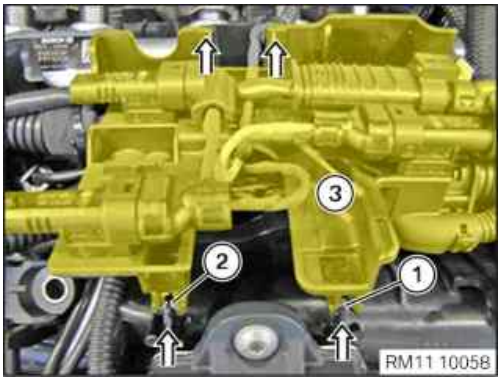


- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

21 – Removing the cable clips from the intake plenum



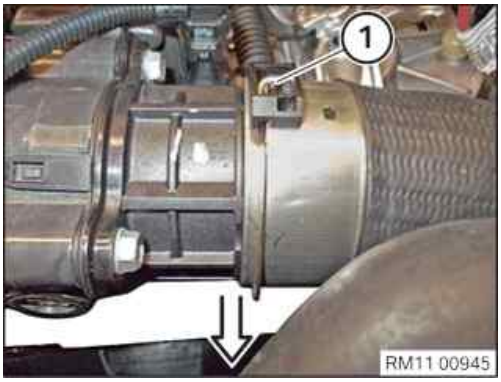
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

22 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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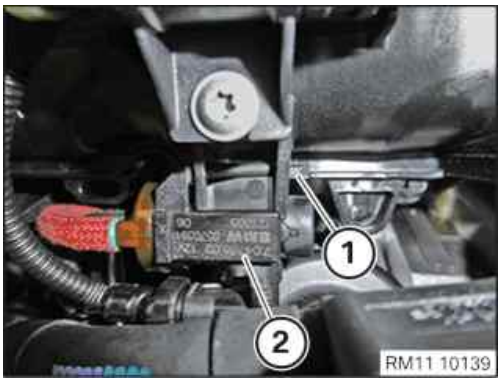
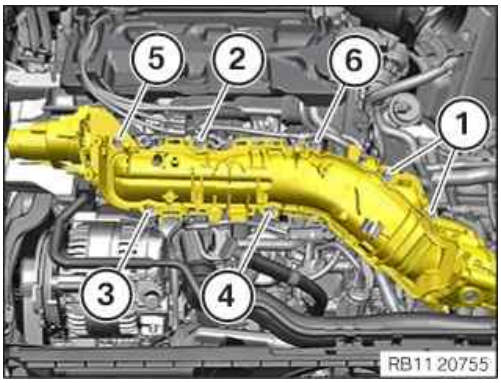
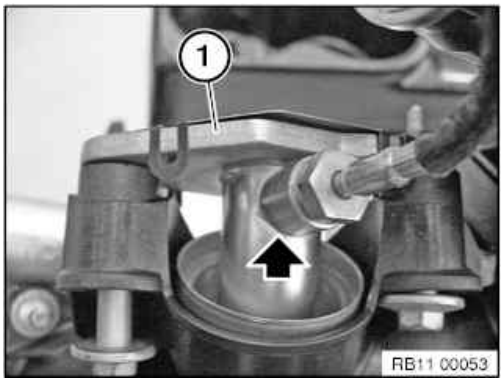


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

23 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

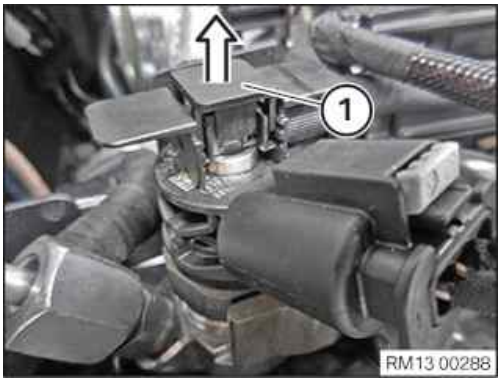
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

24 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

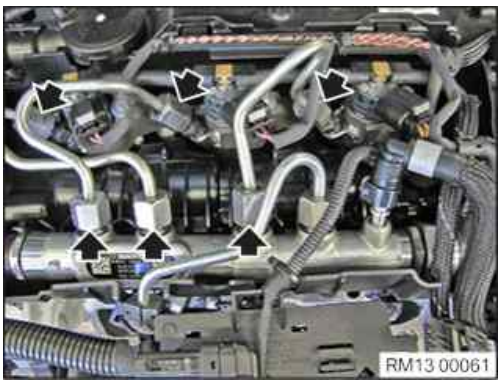
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

25 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

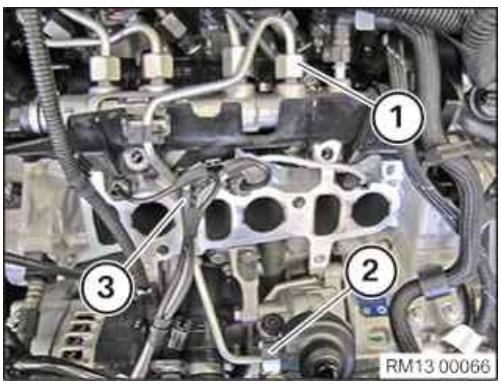
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

26 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

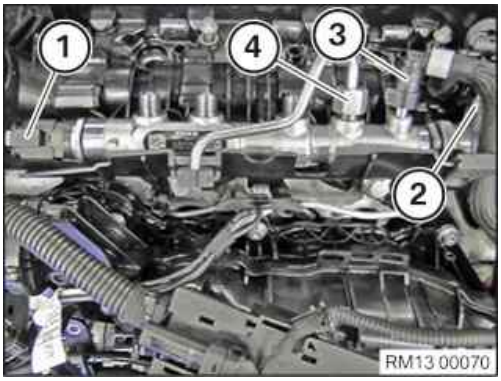
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

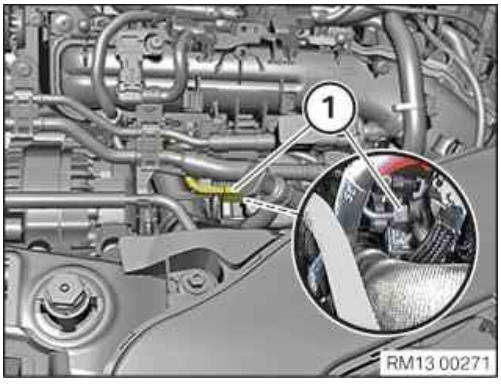
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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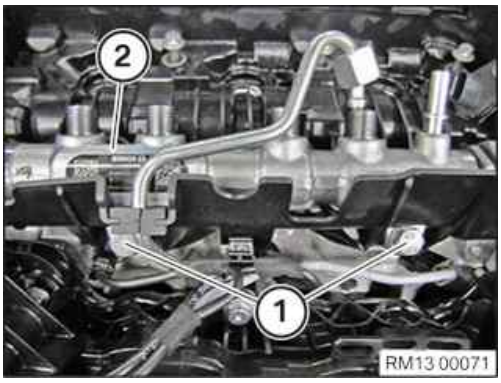

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

27 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

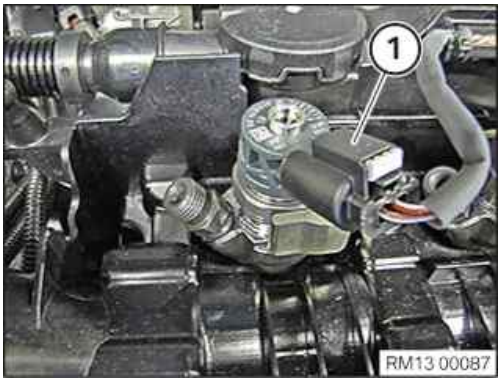
Electrostatic discharge.

Damage to or destruction of electrical components.

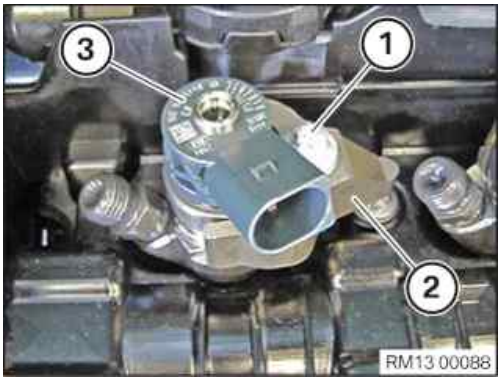
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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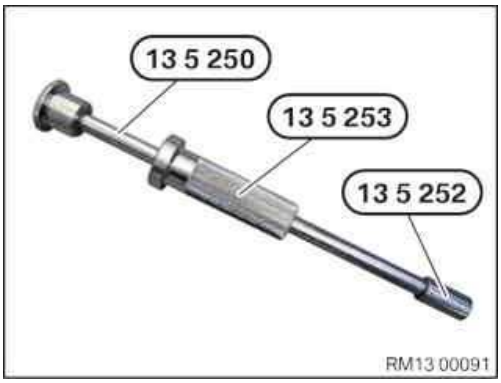
RISK OF DAMAGE

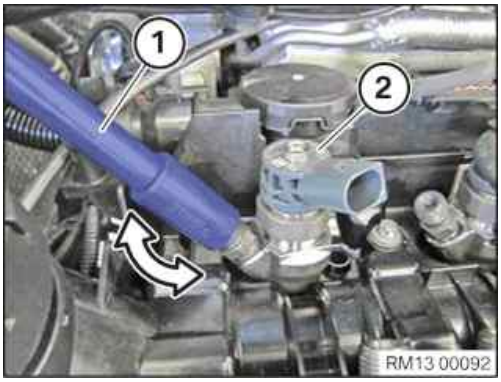
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

28 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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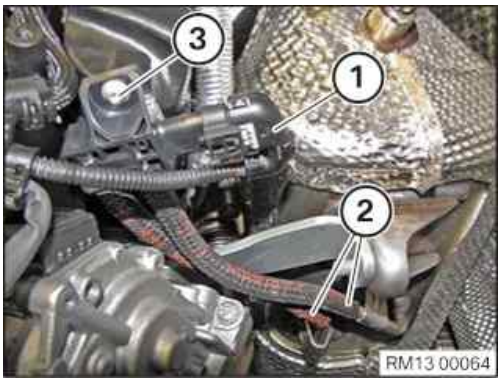
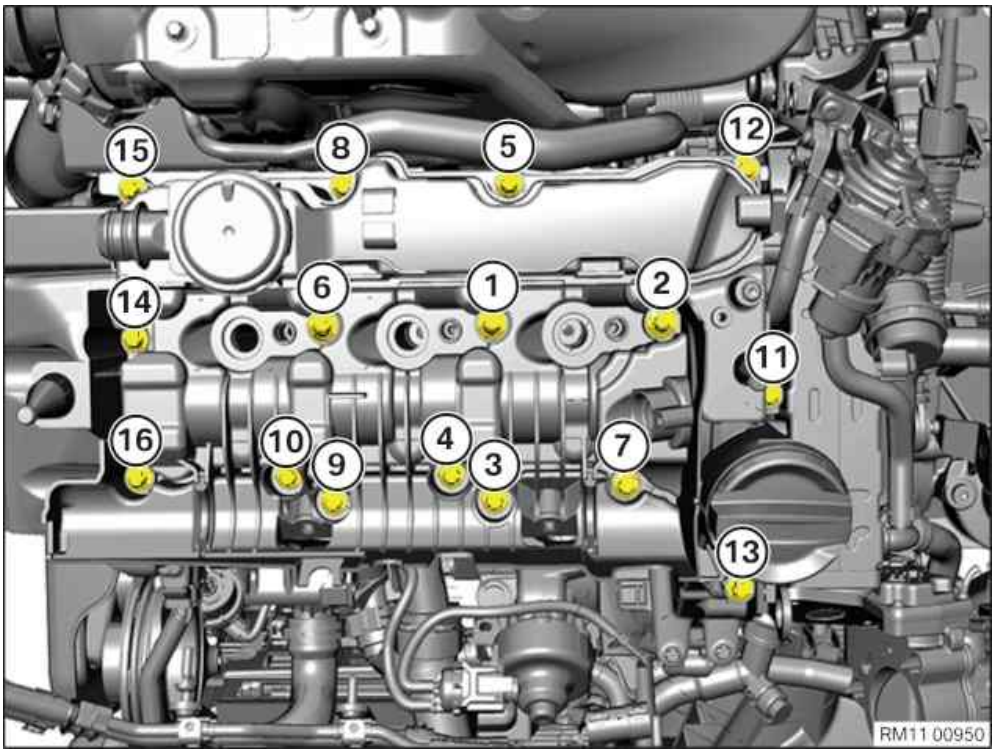


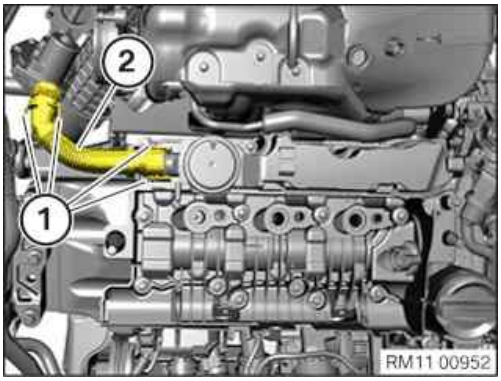
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

29 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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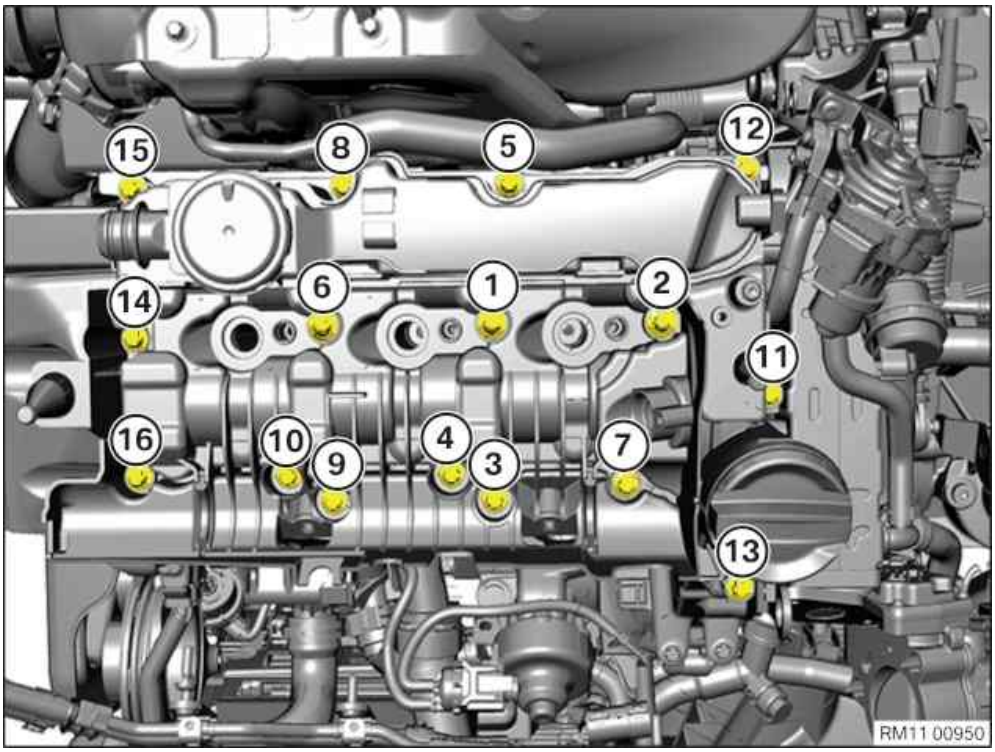


- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

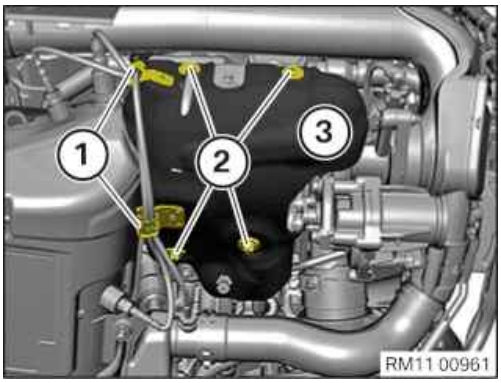
30 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

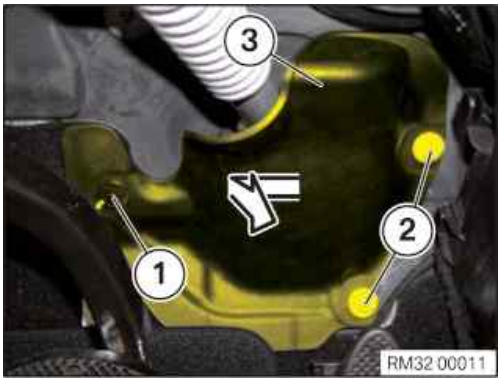
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).

31 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!

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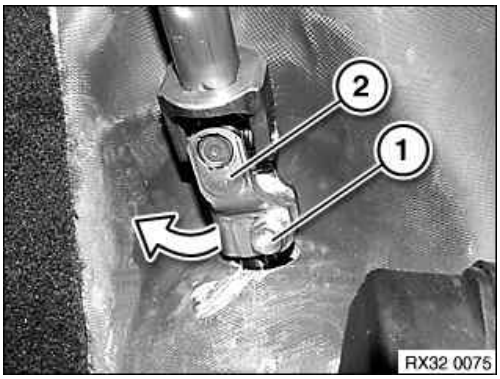
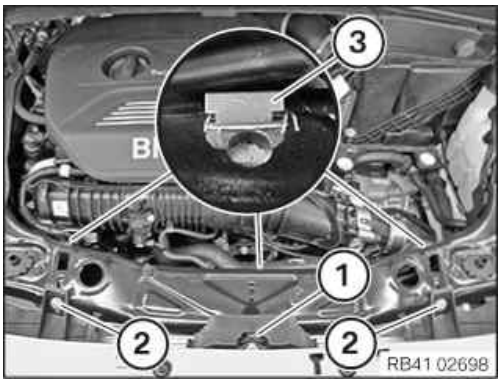


- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

32 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

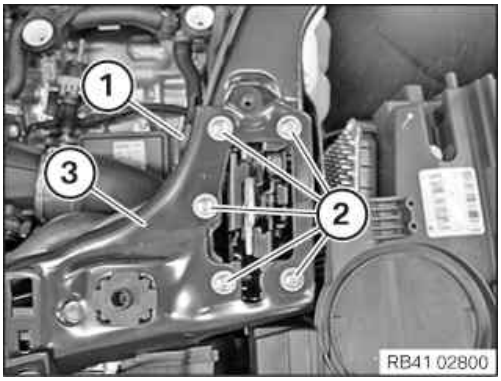
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

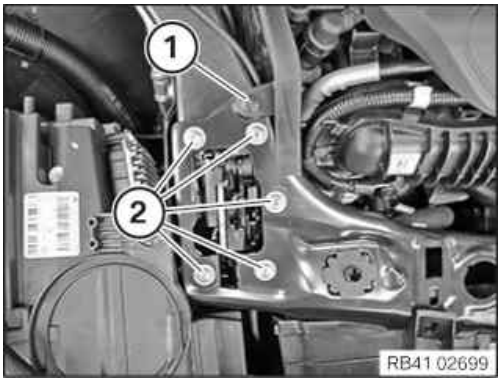


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

33 – Securing radiator on left and right

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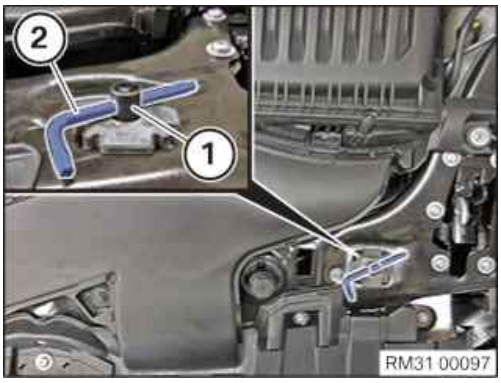


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

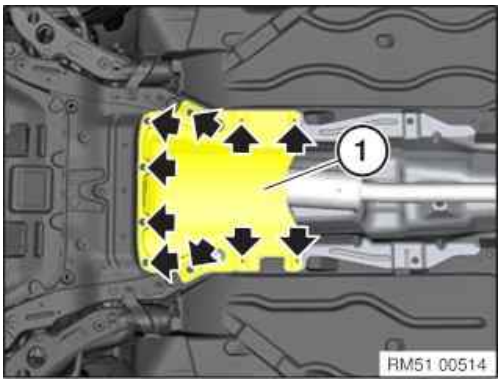
34 – Remove the front left and right wheel

▶ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

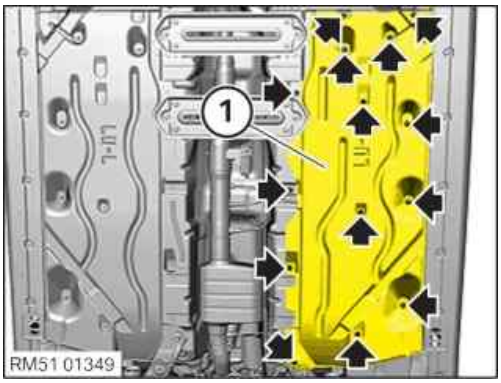
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

35 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

36 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

37 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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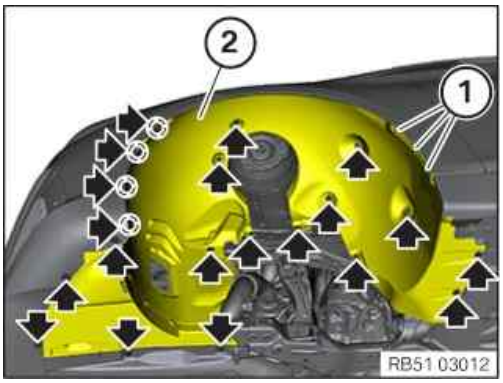
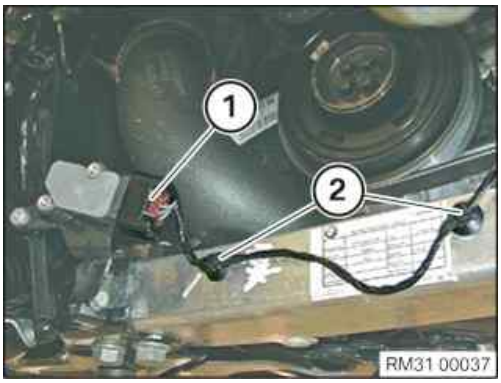
▶ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

38 – With right installation: Detaching ride height sensor cable



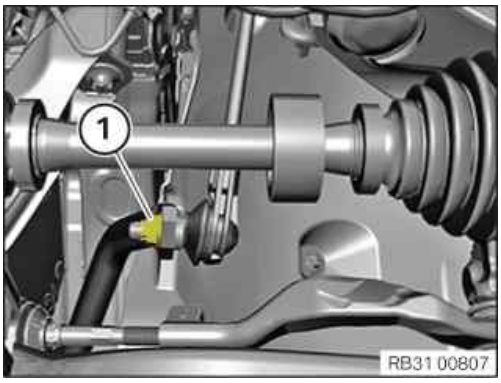
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

39 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

40 – Detaching rubber mount from front axle support

- Spray rubber mount (1) with lubricant and release from holder on front axle support.

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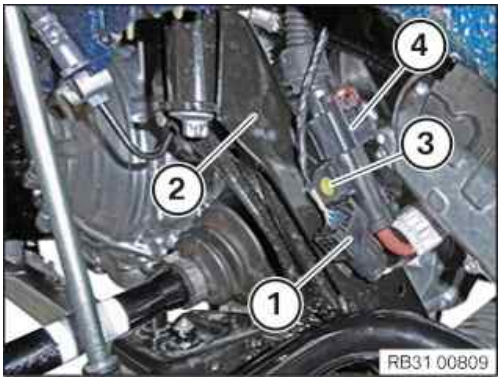
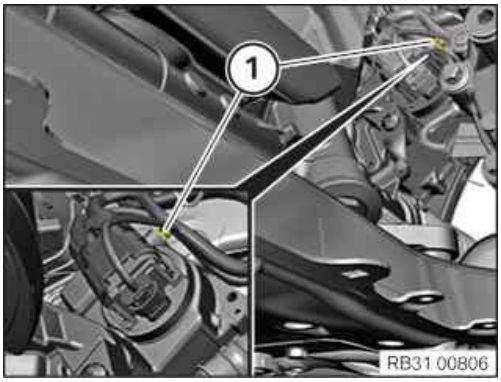
41 – Disconnecting plug connections from steering gear

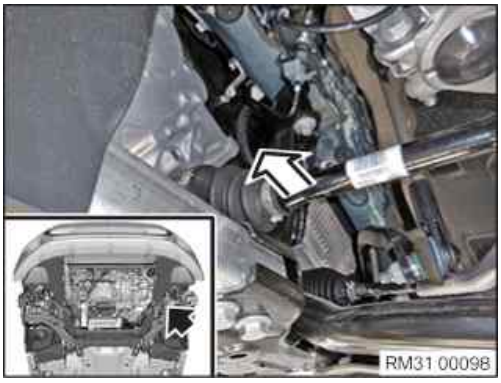
▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

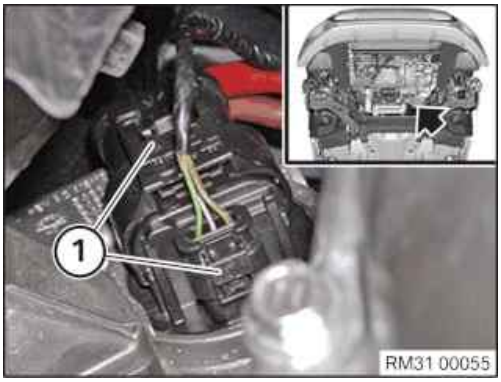


- Disconnect wiring harness (1) from steering gear.



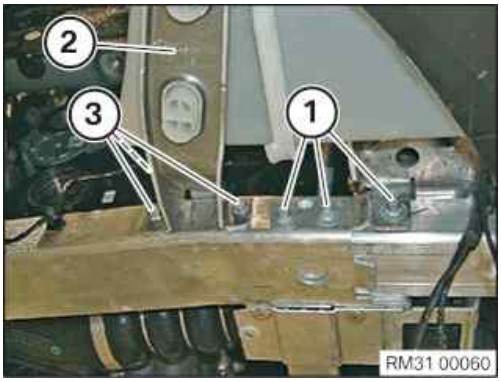
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

42 – Releasing the mounted part from the front axle support



- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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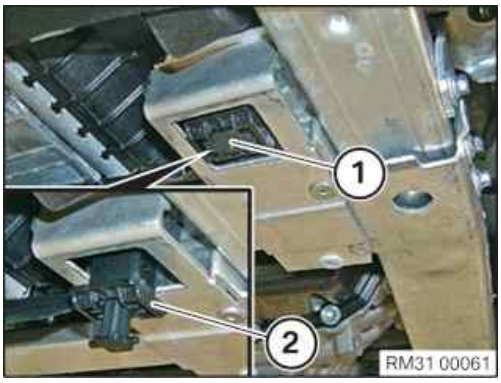
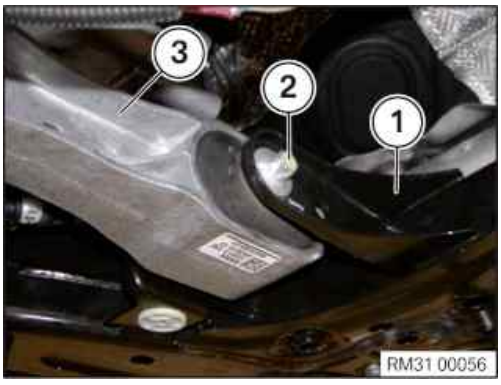


NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



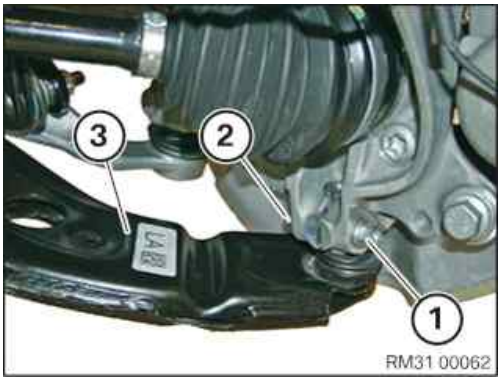
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

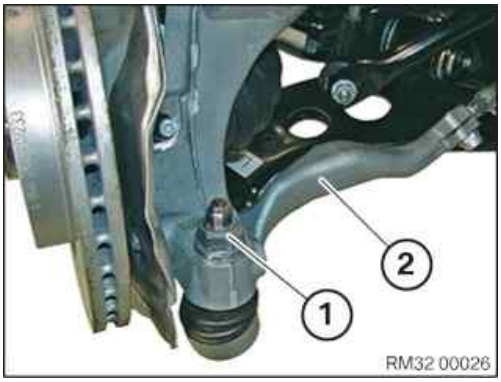
43 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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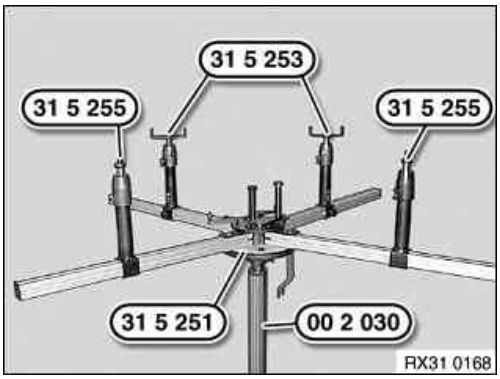
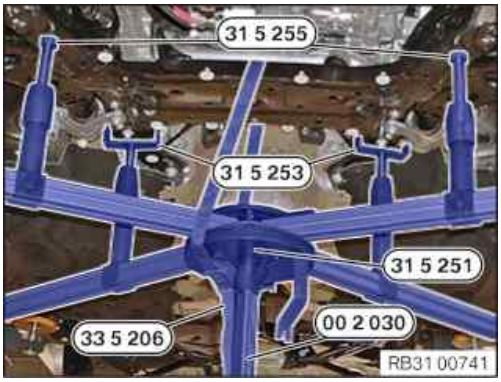


- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

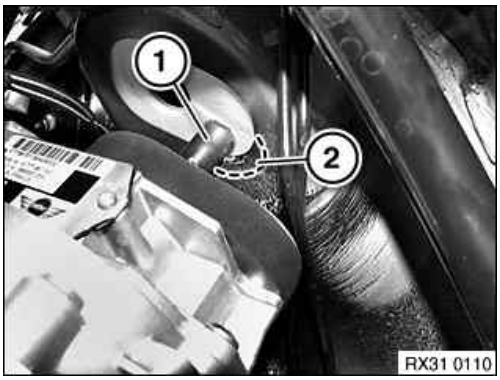
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

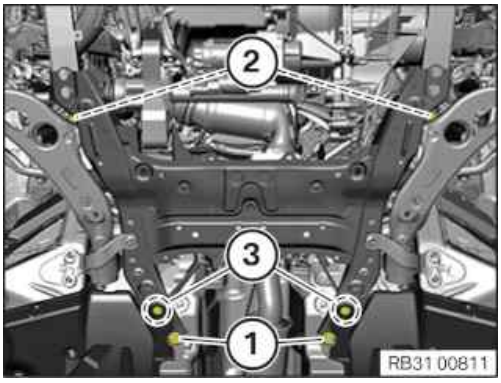


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.

For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

44 – Removing the connecting support from the tunnel in front and back

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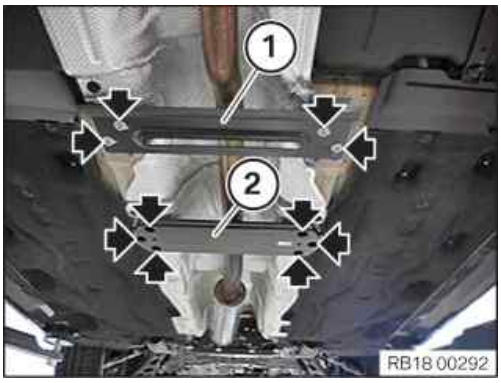
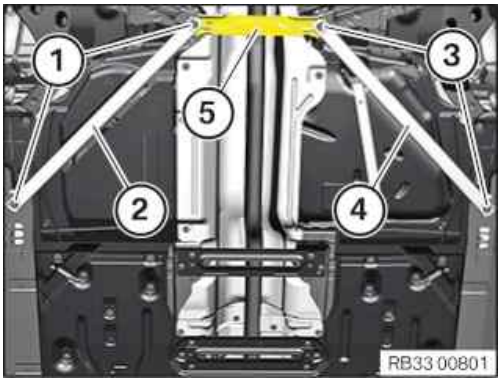


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

45 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

46 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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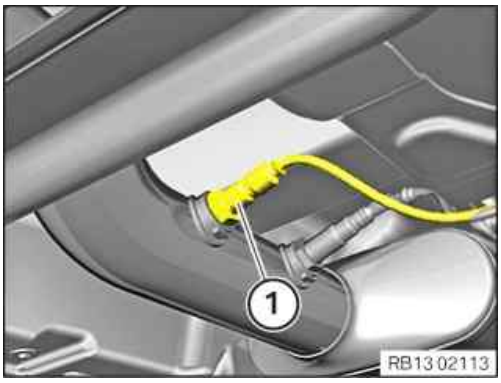
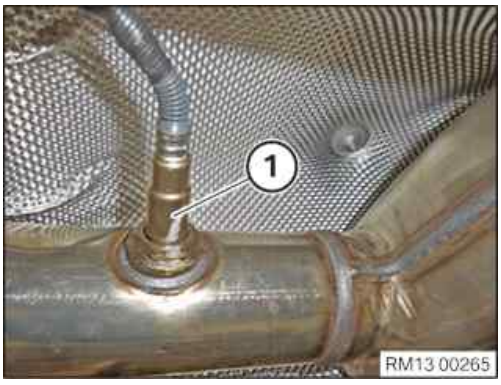
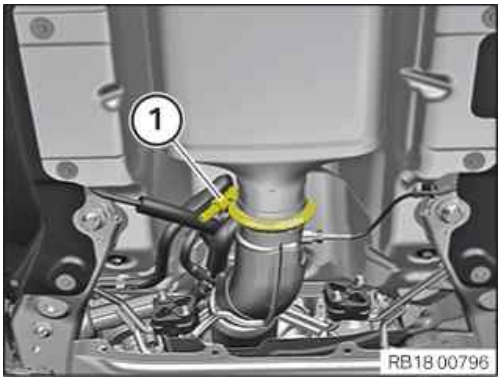


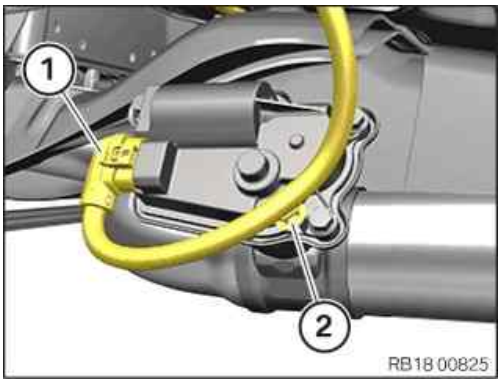
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



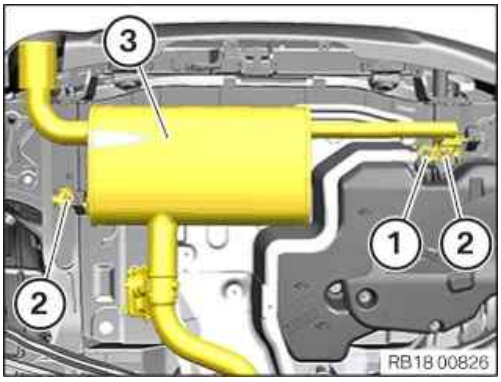
- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Unlock and disconnect connector (1).
- Loosen clamp (2).



- Loosen screw (1).
- Loosen nuts (2).
- Lower the exhaust system (3) with an auxiliary person, guide out and remove.

47 – Removing starter motor

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

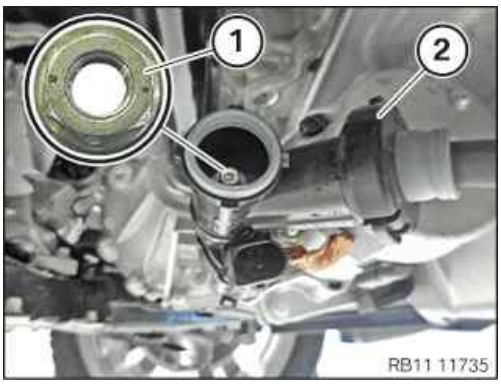
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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- Loosen screws (1).
- Feed out starter motor and remove.

48 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

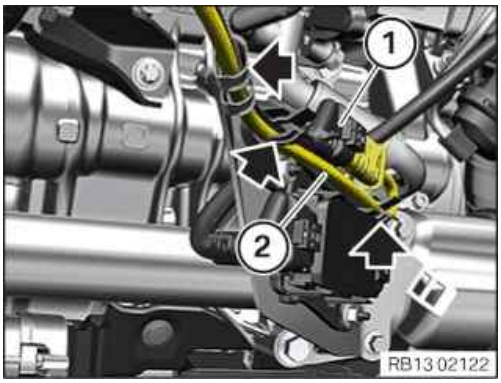
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

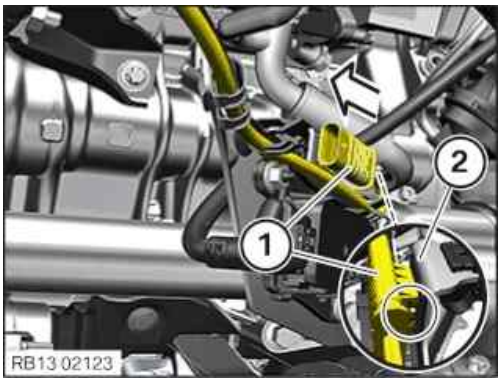
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.

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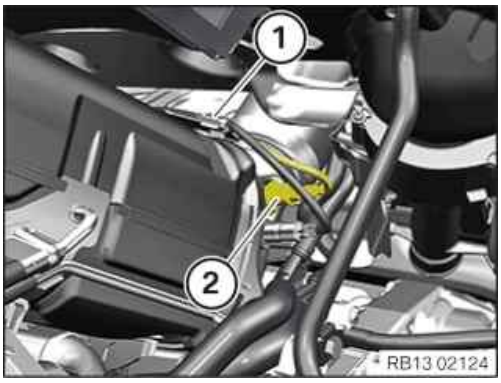


- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

49 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

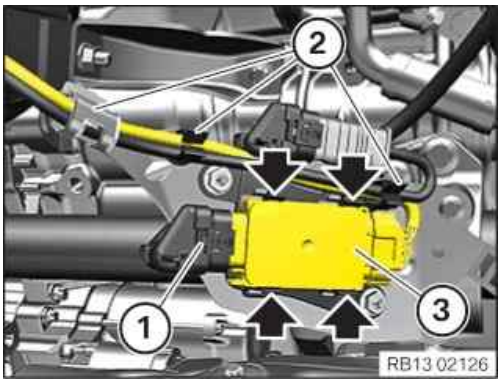
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

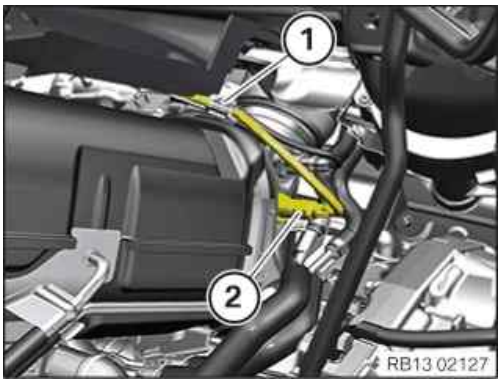
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

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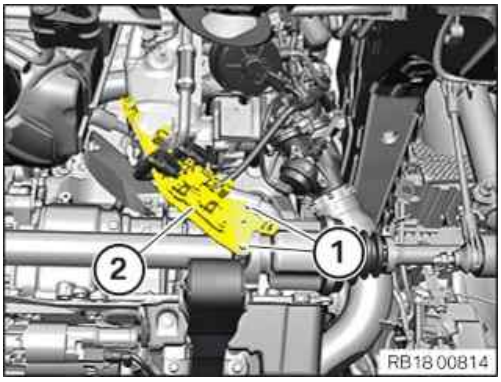
50 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

51 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

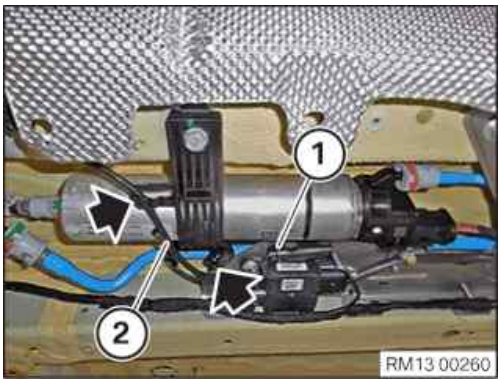
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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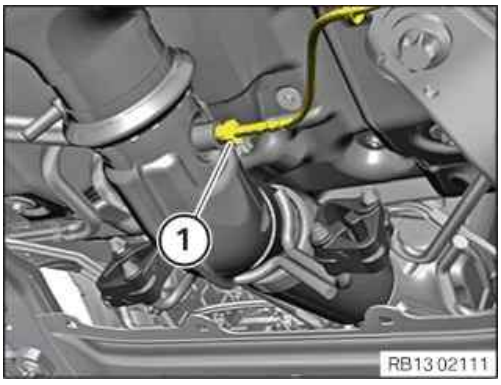
- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

52 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

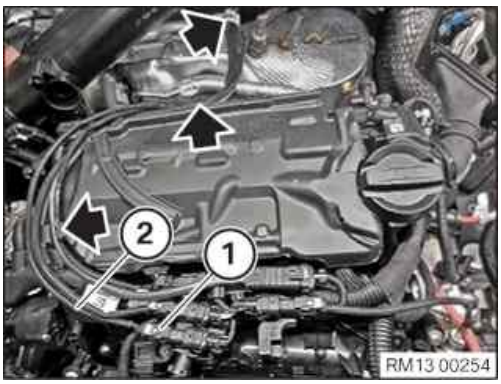
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Feed the cable (2) from the temperature sensor out of the clamps (arrows) and remove it.

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- Release the exhaust temperature sensor (1) with conventional tools (2).

- Feed out and remove exhaust temperature sensor (1).

53 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and disconnect the plug connection (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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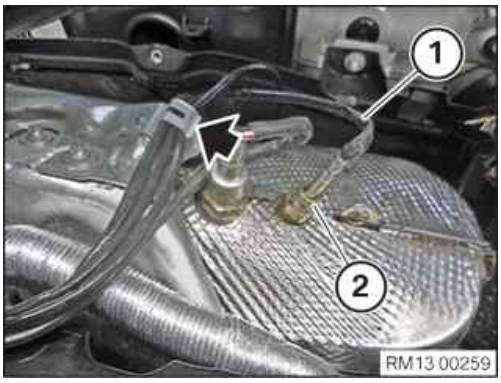


- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

54 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

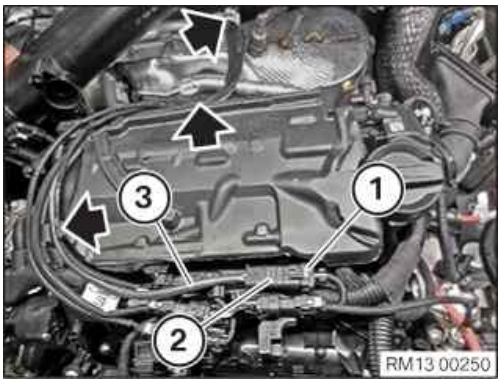
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

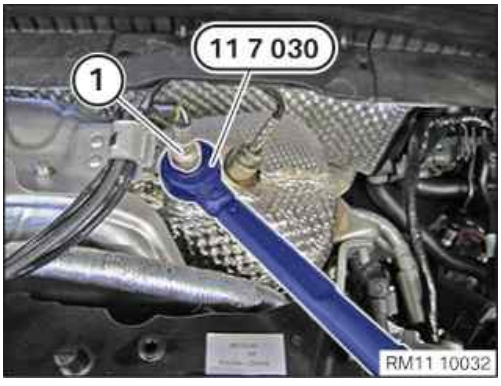
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Detach the connector (2) from the holder .
- Feed out and remove cable (3) out of the oxygen control sensor from the clamps (arrows).



- Release the front oxygen control sensor (1) using special tool **0 491 075 (11 7 030)** .
- Feed out and remove the control sensor (1).

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55 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

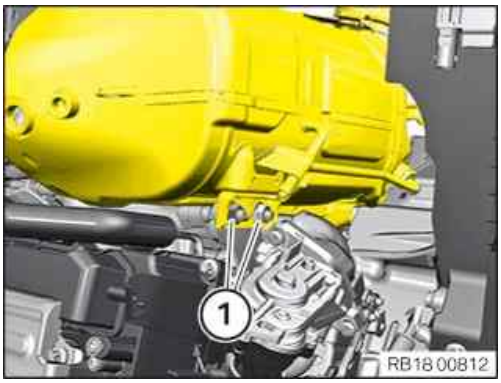
CAUTION

Heavy component.

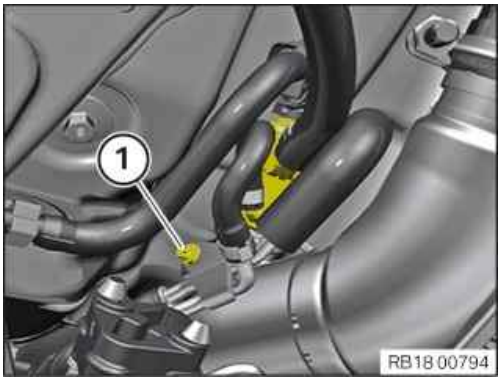
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen nuts (1).



- Loosen screw (1).

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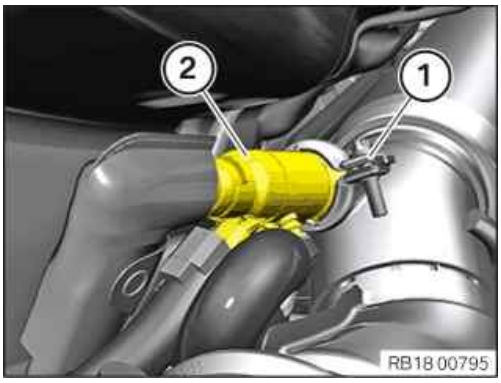
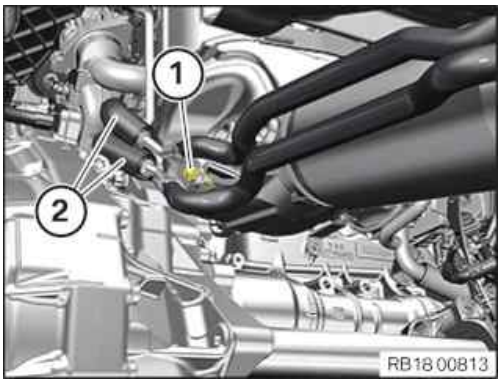
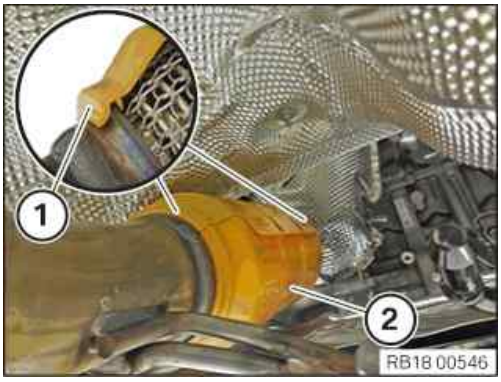


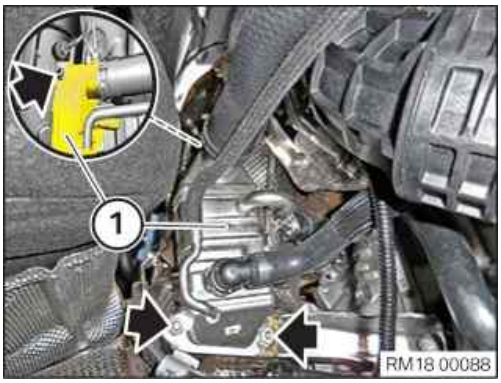
- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



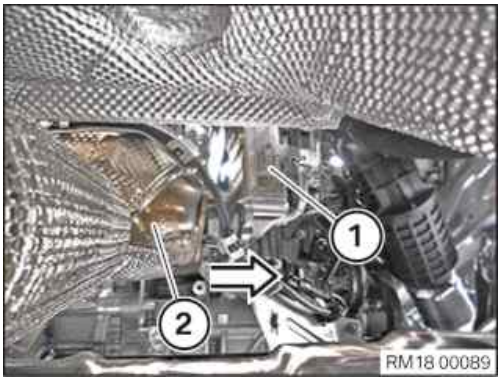
- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Detach nuts (arrows) from low pressure exhaust-gas recirculation cooler (1).



- Feed out low pressure exhaust-gas recirculation cooler (1) from diesel particulate filter (2) in direction of arrow and set aside.

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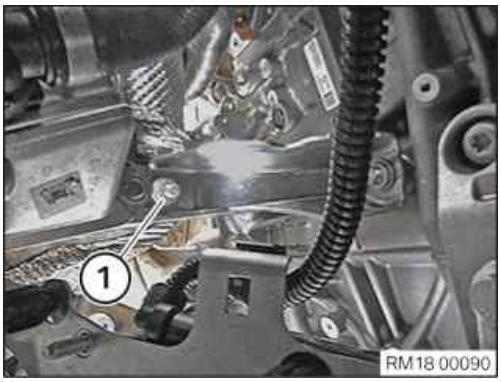
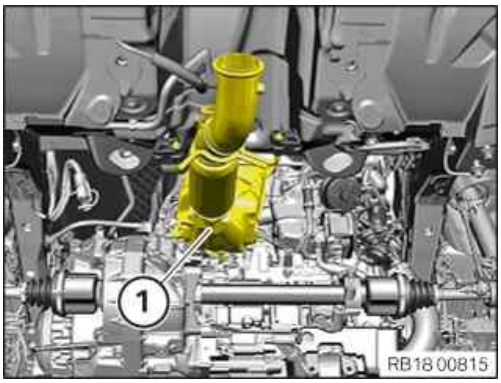


- Unfasten nut (1).



- Feed out diesel particulate filter (1) toward the bottom and remove.

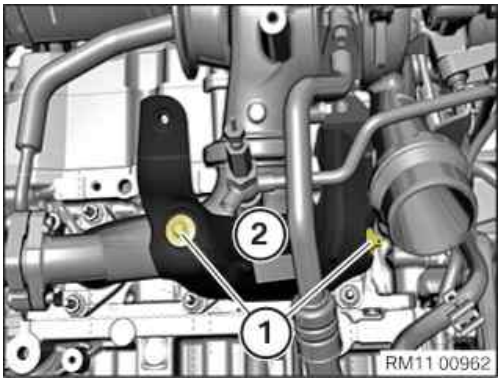
56 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

57 – Removing heat shield from rear exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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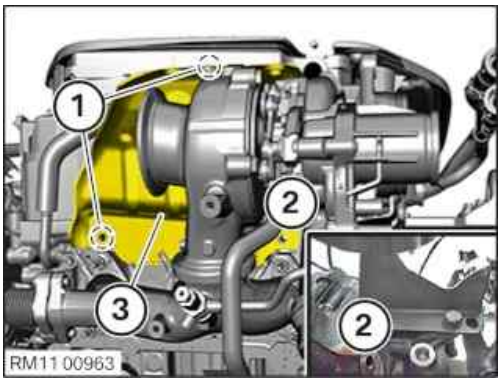
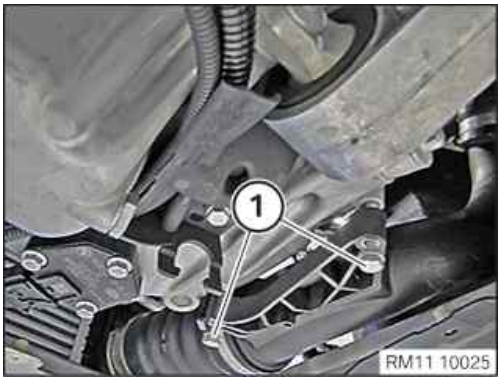


- Loosen screws (1).
- Loosen screw (2).

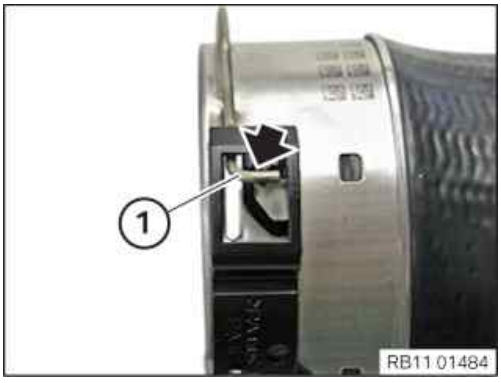
  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

58 – Remove right charge-air line

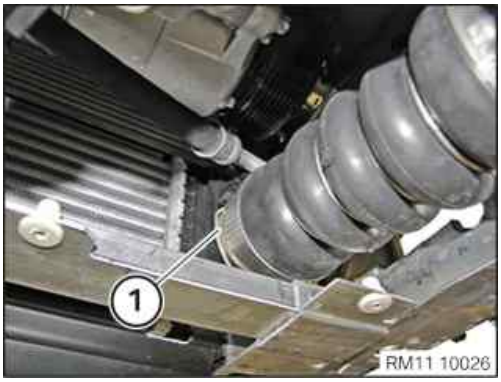


- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.



- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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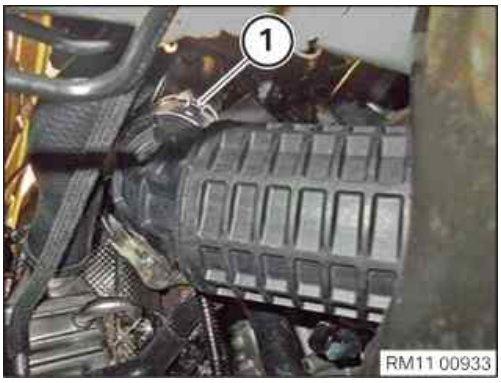

- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

59 – Remove exhaust turbocharger

- Release screw (1) from beneath with a long extension.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).
- Disconnect the oil return line (2) toward the bottom and set it aside.

- Release banjo bolt (1) of oil feed line from exhaust turbocharger and place to one side.

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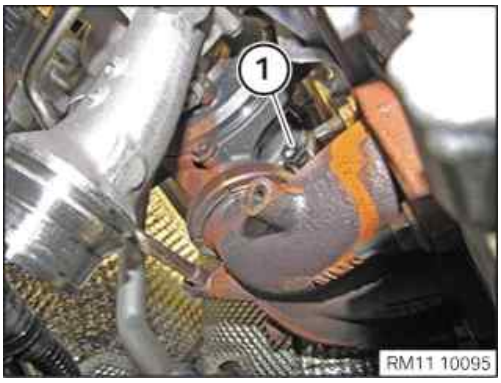


- Release screw (1) and remove V-clip.
- Pull exhaust turbocharger up and remove.
- Remove seal between exhaust turbocharger and exhaust manifold.

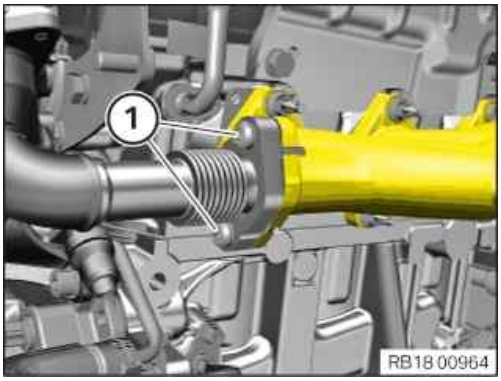
60 – Remove exhaust manifold

WARNING

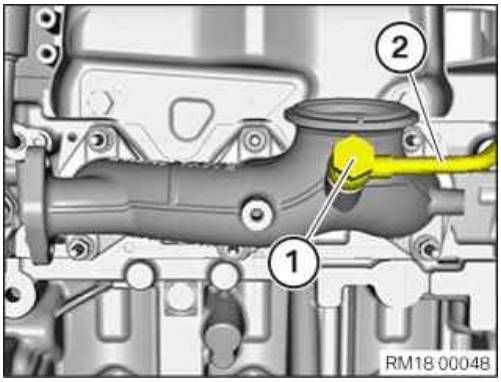
Hot surfaces.

Risk of burning!

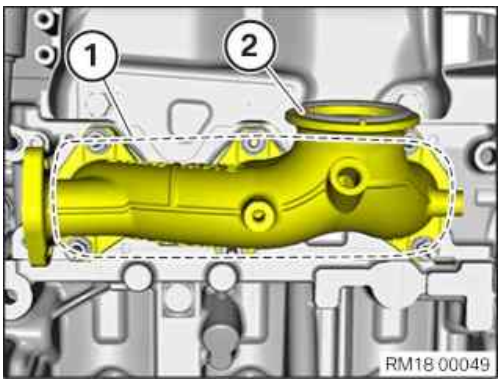
- Perform all work only on components that have cooled down.



- Loosen screws (1).



- Unscrew the banjo bolt (1).
- Feed out exhaust gas pressure pipe (2) and place to one side.



- Evenly release nuts along the dashed line (1) from outer to inner side.
- Feed out exhaust manifold (2) and remove.

61 – Removing the acoustic cover for the engine at the front

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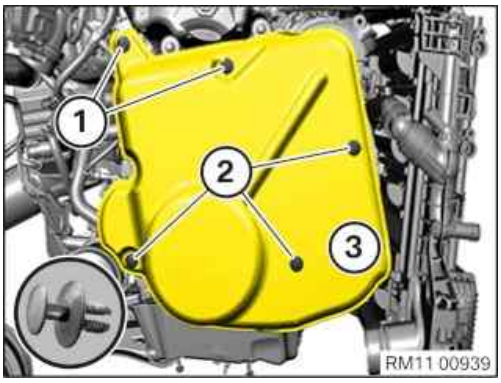


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

62 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

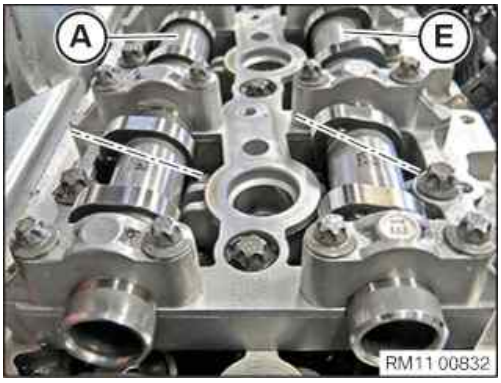
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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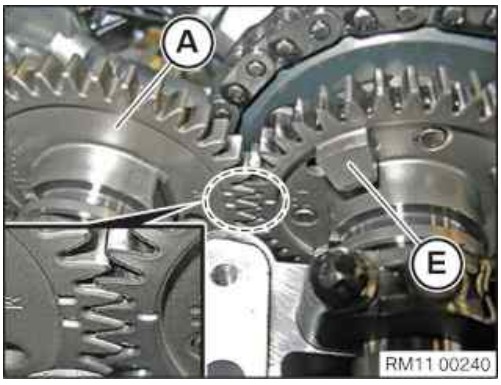
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

63 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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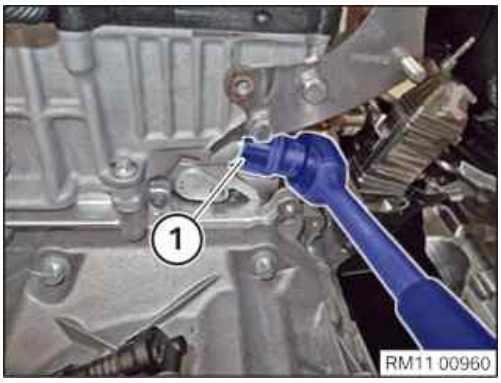
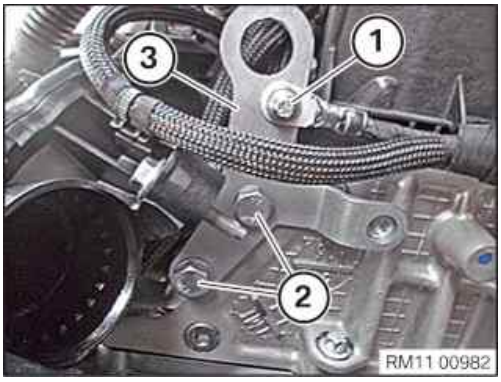


TECHNICAL INFORMATION

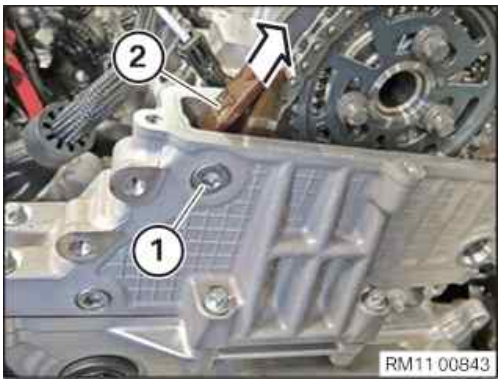
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

64 – Remove the timing chain guide rail

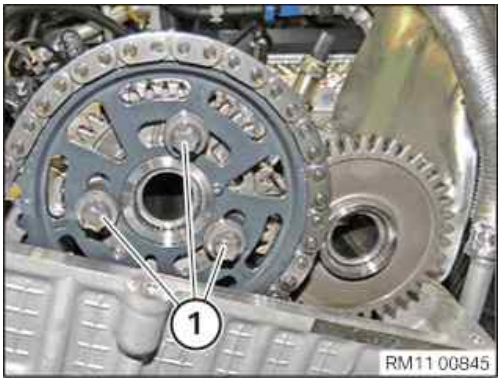


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

65 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

66 – Removing the camshaft support

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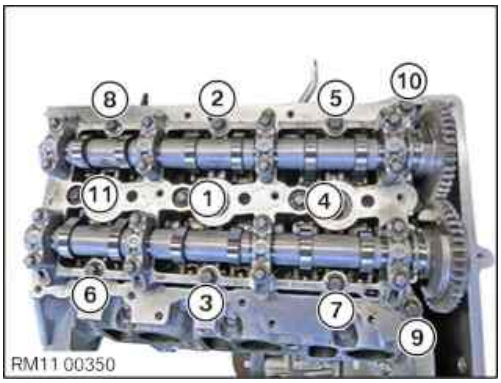
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

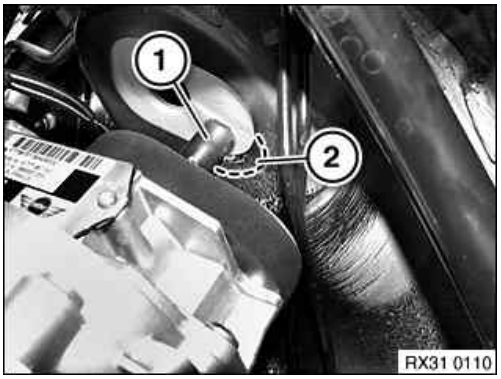
67 – Remove cylinder head.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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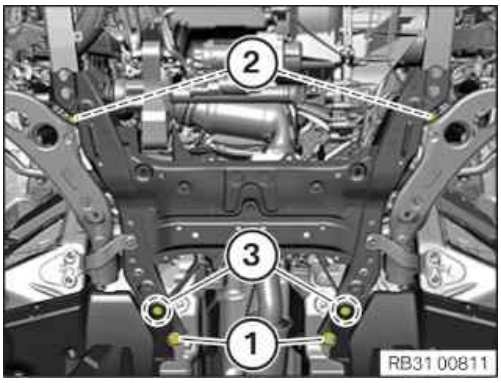


- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

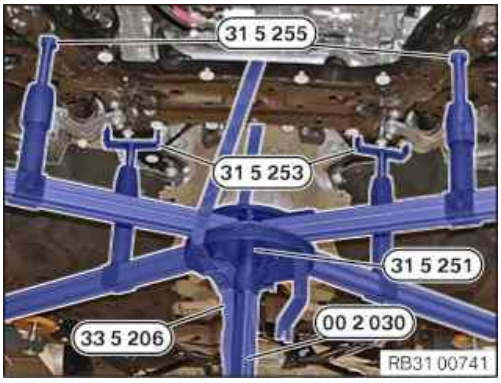
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

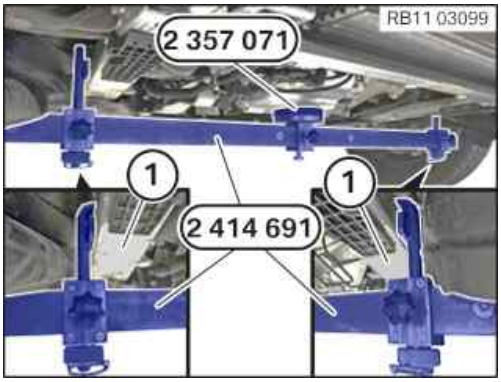
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and set it aside.



- Prepare special tool **2 414 691** together with the special tool **2 357 071**.
- Attach special tool **2 414 691** to front axle support and correctly align the special tool **2 357 071** under the oil sump and tighten.
- Turn special tool **2 414 691** at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools**2 414 691** and **2 357 071**.

- Remove all glow elements with special tool **0 491 068 (11 6 050)** or a standard tool.

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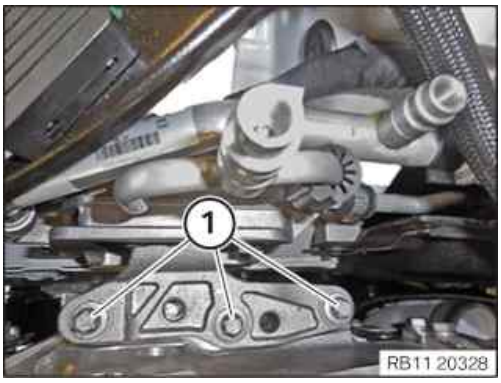
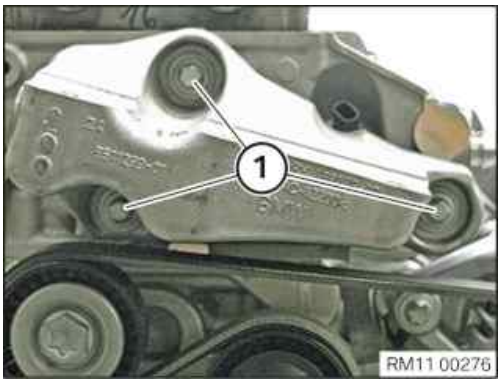


- Loosen screws (1).

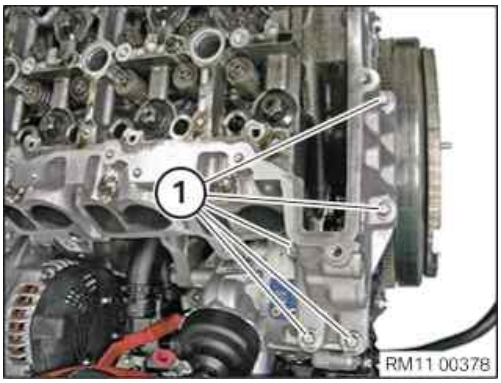


- Loosen screws (1).

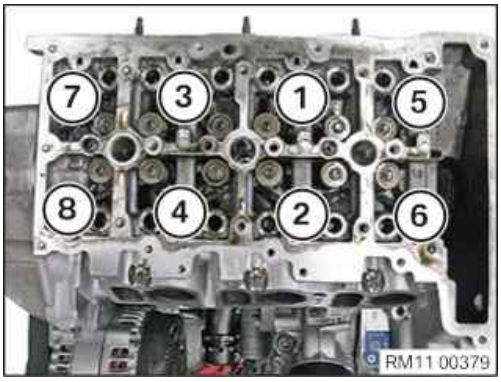
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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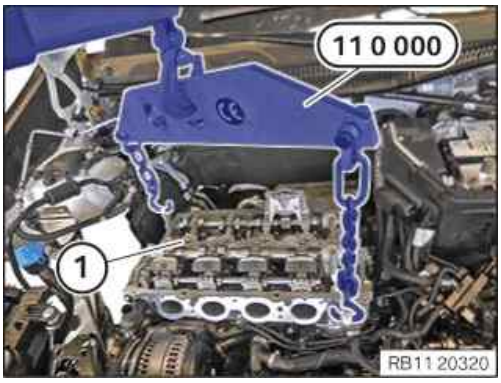


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

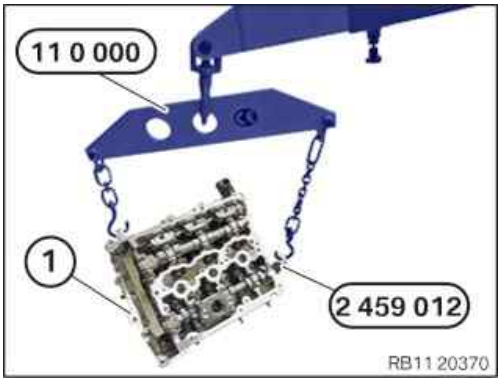
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.

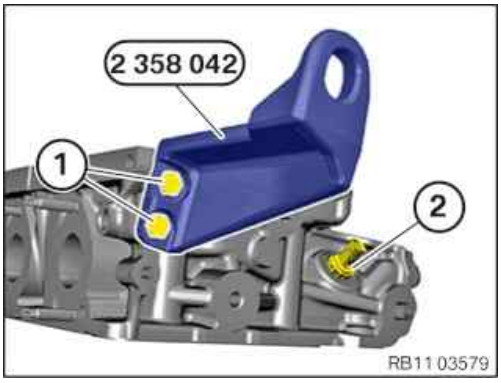


- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

MAIN WORK

68 – replace cylinder head

- Unscrew the preheating elements with special tool **0 491 068 (11 6 050)**.



- Loosen screws (1).
- Remove the special tool **2 358 042** from the cylinder head.
- Loosen the coolant temperature sensor (2).

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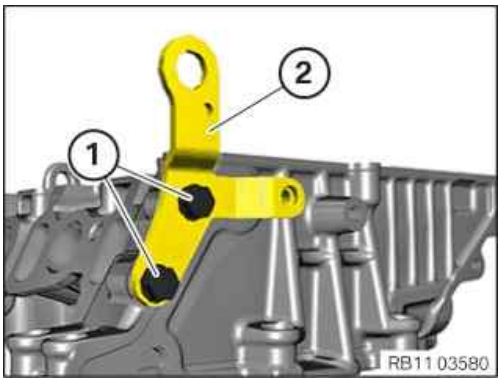


- Loosen screws (1).
- Remove mounting lug (2) from cylinder head.

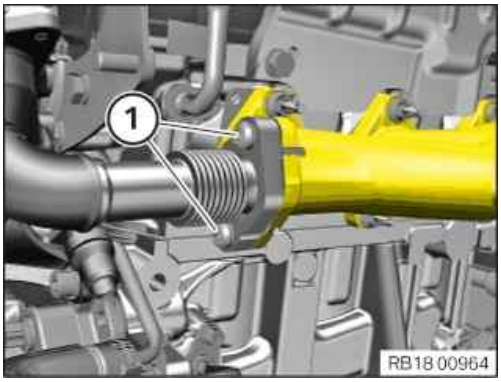
▶ **Remove exhaust manifold**

WARNING

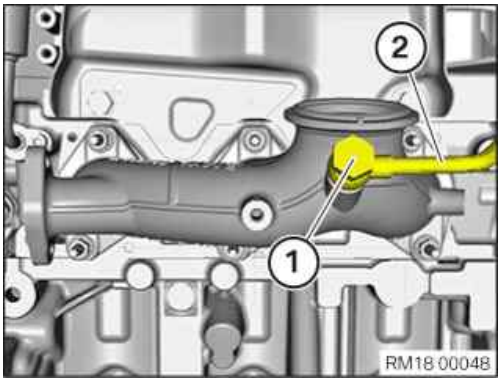
Hot surfaces.

Risk of burning!

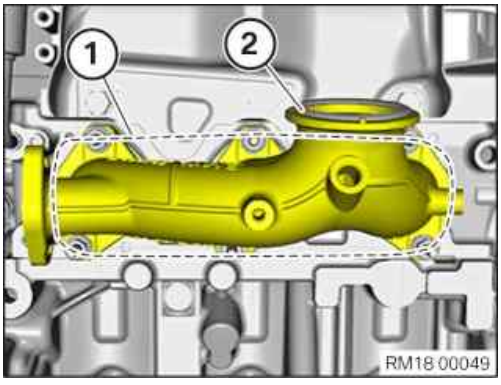
- Perform all work only on components that have cooled down.



- Loosen screws (1).



- Unscrew the banjo bolt (1).
- Feed out exhaust gas pressure pipe (2) and place to one side.



- Evenly release nuts along the dashed line (1) from outer to inner side.
- Feed out exhaust manifold (2) and remove.

▶ **Remove all valve springs**

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

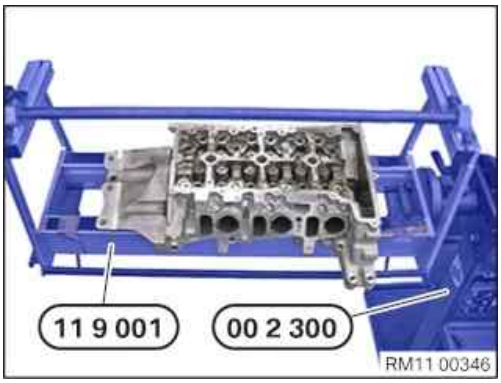
- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

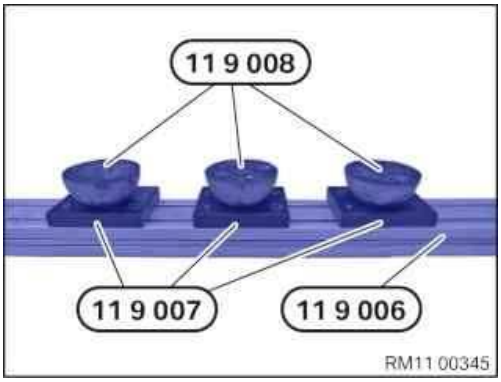
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

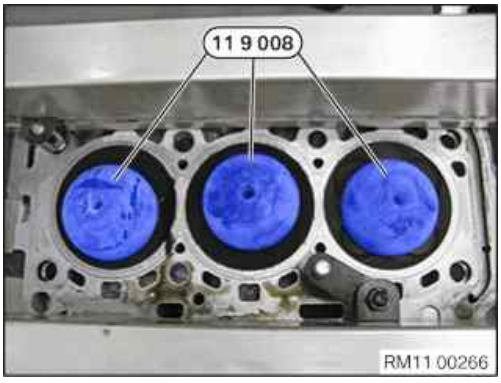
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Mount and bolt special tool **0 494 366 (11 9 001)** on special tool **0 495 187 (00 2 300)**.
- Mount and bolt the cylinder head to the special tool **0 494 366 (11 9 001)**.



- Prepare special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- Make sure that the special tools **0 494 373 (11 9 008)** are positioned as shown in the next operation.

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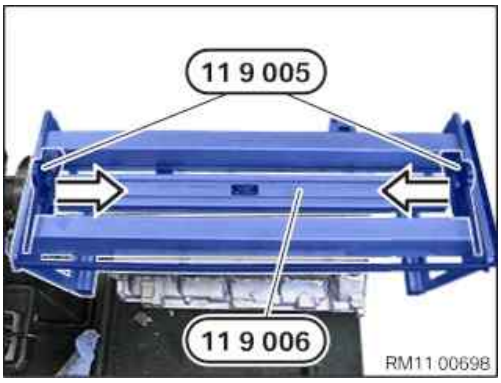
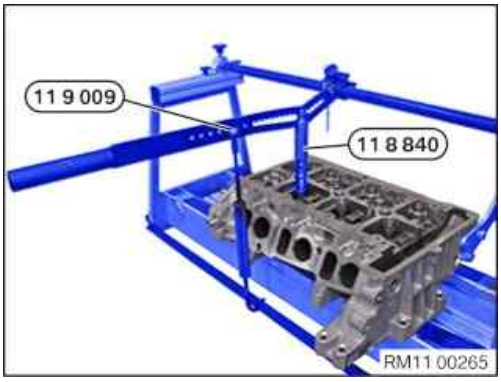


- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Slide the special tool **0 494 370 (11 9 005)** in the direction of the arrow.

- Lock special tool 1**0 494 370 (11 9 005)** in the direction of the arrow.
- Rotate the cylinder head with the special tool **0 494 362 (11 9 000)** by 180° into the installation position.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.

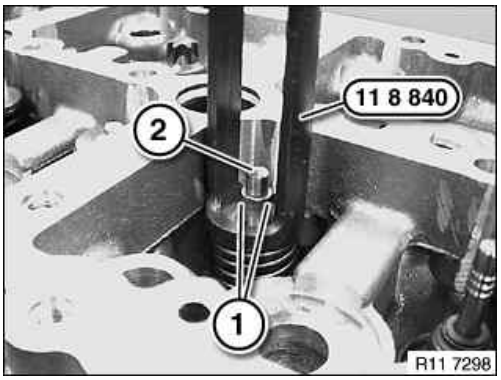
CAUTION

Component with preload.

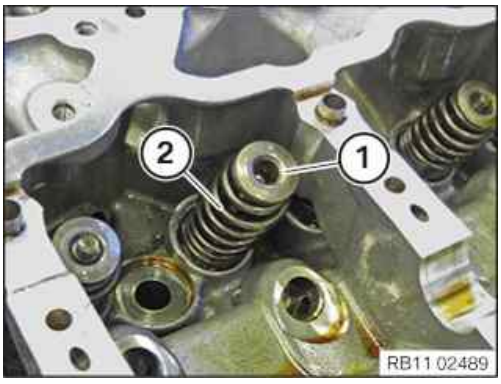
Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Remove the valve shims (1) with a magnet from the valve (2).
- Carefully relieve the valve spring.



- Set the spring cup (1) and the valve spring (2) down in the special tool **0 495 105 (11 4 480)** in order.

▸ **Remove valve stem seals**

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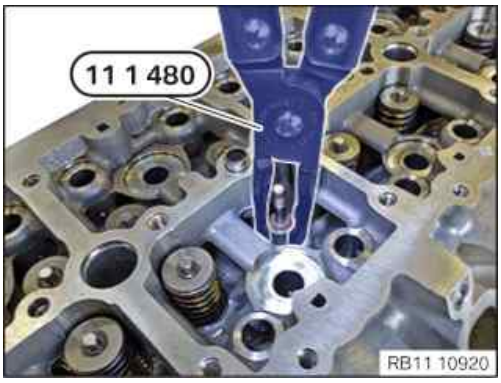
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.



- Disassemble the valve stem seal (1) using the special tool **0 490 796 (11 1 480)**.

▸ **Remove all valves**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Turn the cylinder head with the special tool **0 494 362 (11 9 000)**.
- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Remove special tool **0 494 371 (11 9 006)**.

- Remove special tool **0 494 373 (11 9 008)** if necessary.

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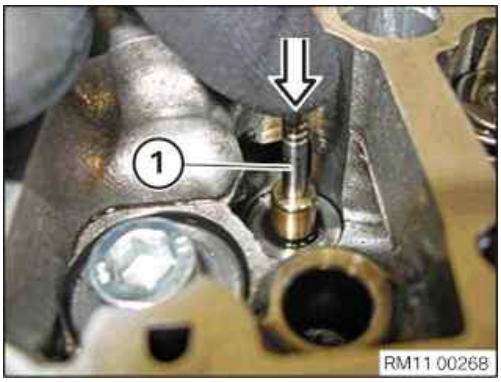
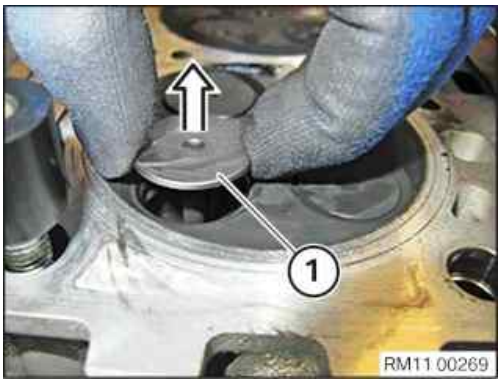
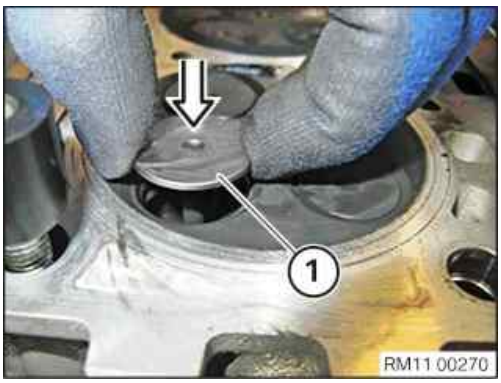


- Push the valve stem (1) into the cylinder head in the direction of the arrow.

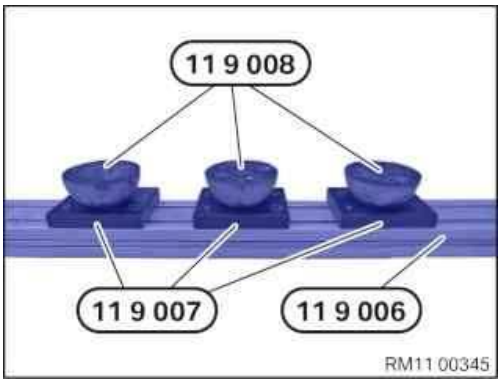


- Remove the valve (1) in the direction of arrow and store it properly in the special tool **0 495 105 (11 4 480)**.

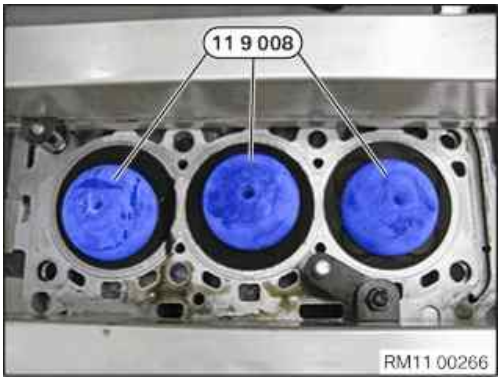


- Install valves (1) in the new cylinder head.

  Parts: Cylinder head
- Feed valves (1) in the direction of arrow and install.
- **Check the valves for tightness.**



- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- The special tools **0 494 373 (11 9 008)** must be set up accordingly in the next operation.

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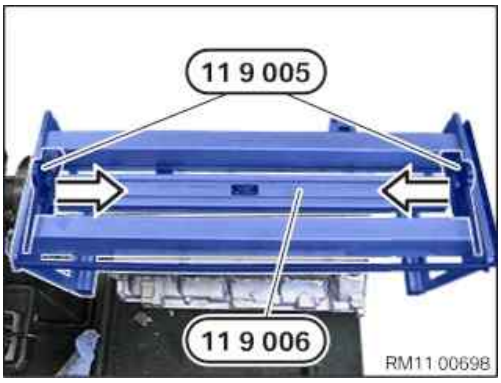


- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.

- Lock special tool **0 494 370 (11 9 005)** in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.

▶ **Installing valve stem seals**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

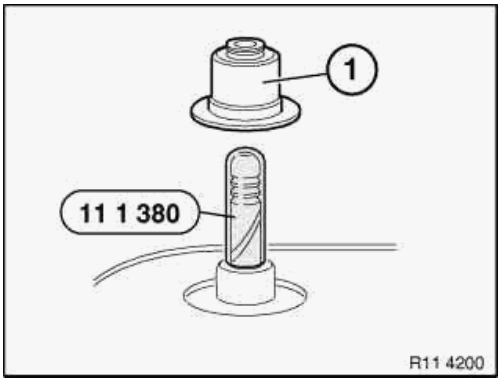
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the contact surfaces (1).



- Fit special tool **0 490 746 (11 1 380)**.
- Oil the valve stem seal (1) and install it.

  Parts: Valve stem seal

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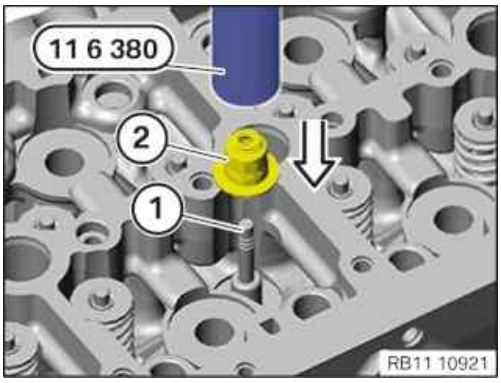
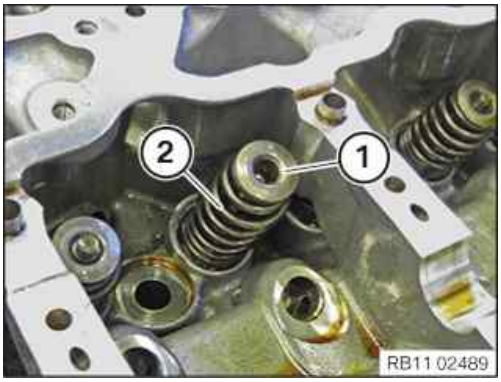
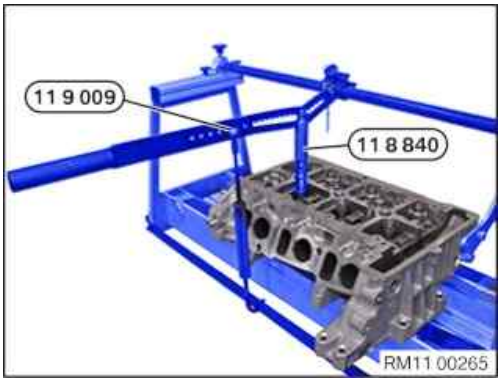


- Position the valve stem seals (2) on the valve (1).
- Use special tool **0 493 249 (11 6 380)** to press down the valve stem seal (2) until they are in contact with the cylinder head.

► **Install all valve springs**



- The mounting orientation of the valve springs (2) can be freely chosen.
- Install the valve spring (2) and spring cup (1).



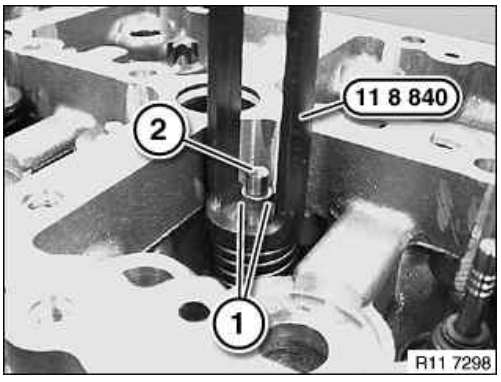
CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

- Align special tool in direction of valve axis.
- Select the corresponding groove using special tool **0 496 143 (11 8 840)**.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Install the valve shims (1) of the valve (2) with a magnet.
- Relieve load on valve spring.

- Unlock special tool **0 494 370 (11 9 005)** in the direction of arrow and remove.

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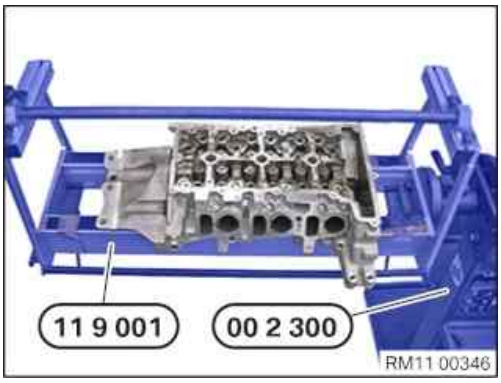
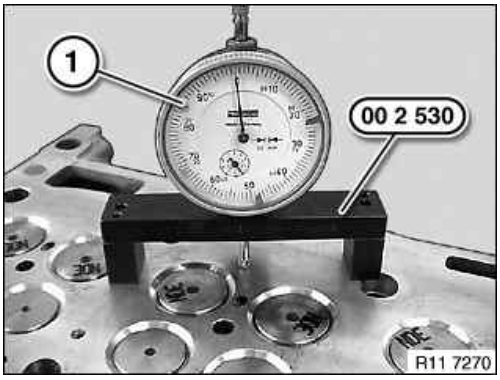


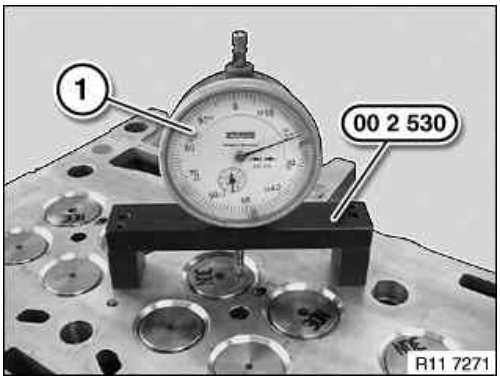
- Remove cylinder head from special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

▸ **Checking the valve underprotrusion**



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".

Check



- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

▸ **Installing exhaust manifold**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

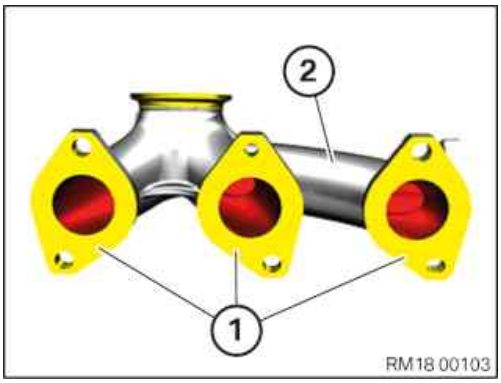
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

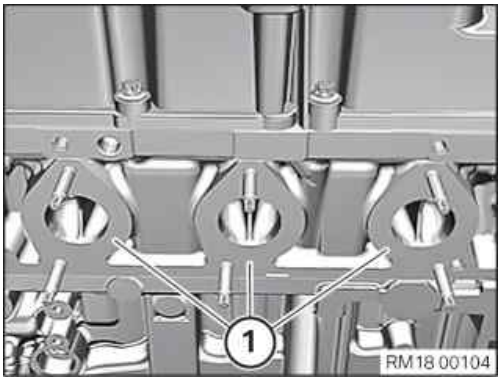
- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

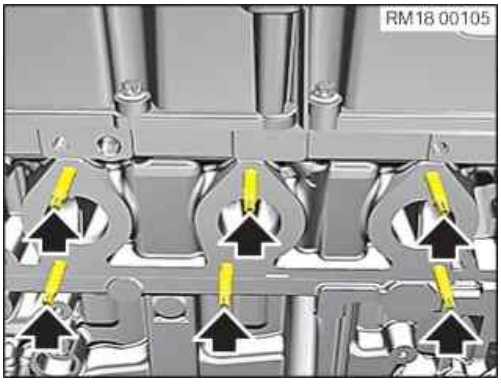
The sealing surfaces must be free from oils, grease and cleaning agents.



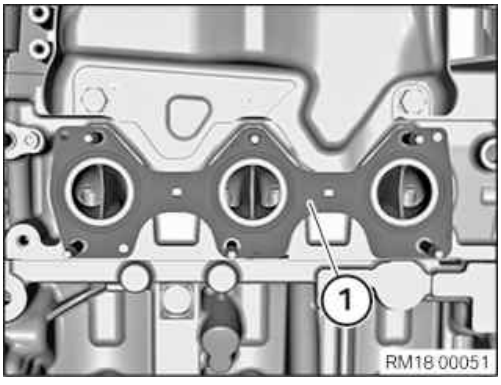
- Clean the connection points (1) on the exhaust manifold (2) with the special tool **0 495 102 (11 4 470)**.



- Clean the connection points (1) on the cylinder head with the special tool **0 495 102 (11 4 470)**.



- Check the stud bolts (arrows) on the cylinder head for **correct** fit.



TECHNICAL INFORMATION

The **coated side of the** seal must be mounted facing towards the exhaust manifold.

- Renew the gasket (1).

  Parts: Gasket

- Insert and install the gasket (1).

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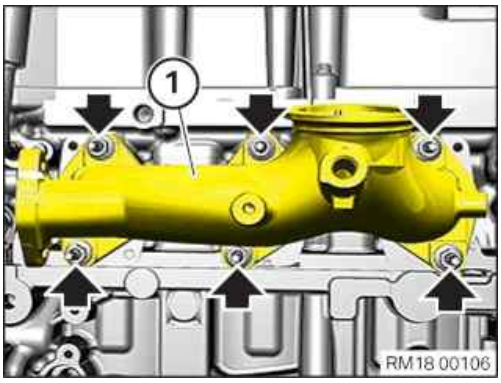
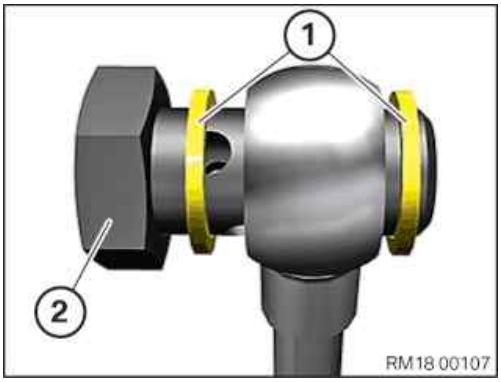


- Insert and install the exhaust manifold (1).
- Renew the nuts (arrows).

  Parts: Nuts
- Hand-tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.
- Tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.

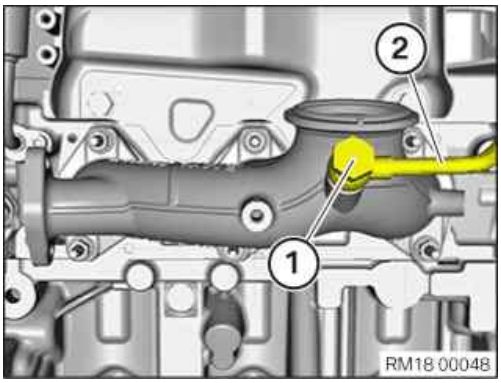
Exhaust manifold to cylinder head

M7	If necessary, renew loose stud bolts. Replace nuts.	Tightening torque Tightening torque	11 Nm 13 Nm



- Renew the sealing rings (1) from the banjo bolt (2).

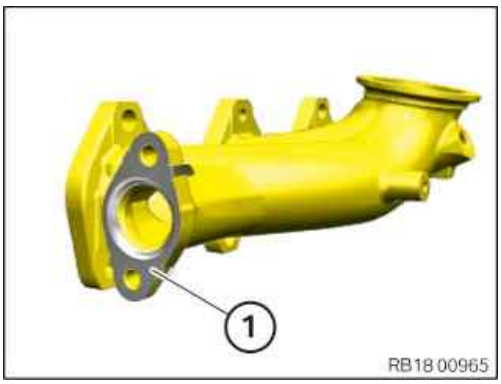
  Parts: Sealing ring



- Insert and install the exhaust gas pressure pipe (2).
- Tighten the banjo bolt (1).

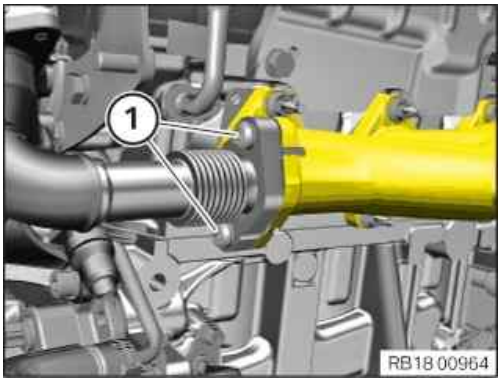
Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt		Renew sealing rings.	30 Nm



- Renew seal (1) between exhaust-gas recirculation cooler and exhaust manifold.

  Parts: Gasket



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

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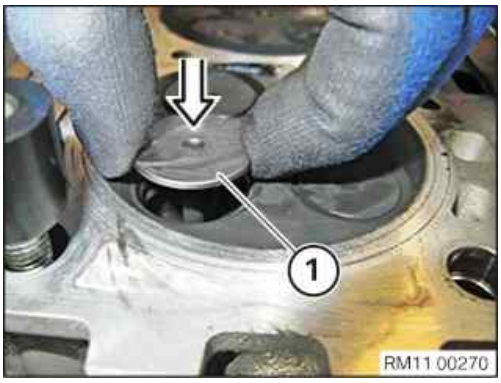
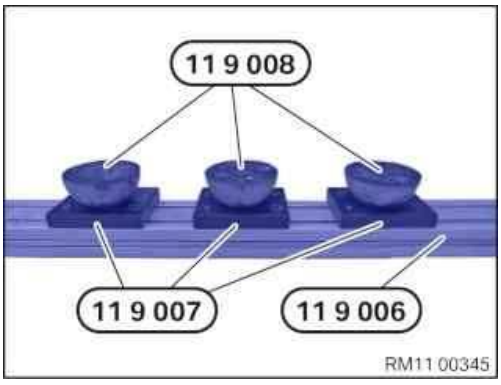
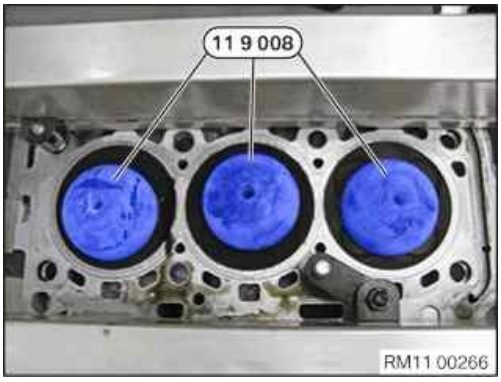


- Install valves (1) in the new cylinder head.

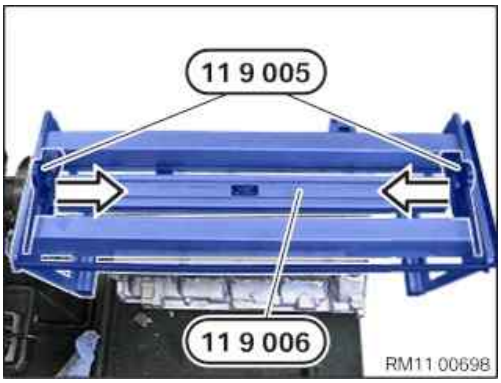
  Parts: Cylinder head
- Feed valves (1) in the direction of arrow and install.
- **Check the valves for tightness.**



- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- The special tools **0 494 373 (11 9 008)** must be set up accordingly in the next operation.



- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.

- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.

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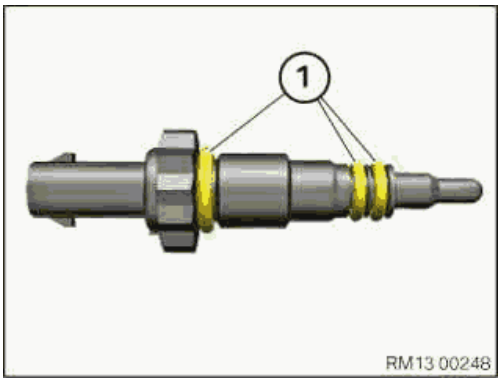
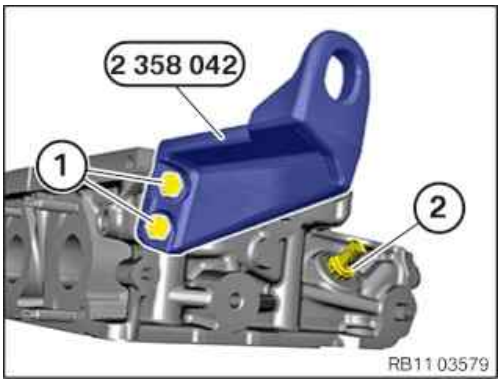


- When reusing coolant temperature sensor sealing rings (1), check for damage, renew if necessary.

  Parts: Sealing ring



- Attach the special tool **2 358 042** on the cylinder head.
- Tighten the screws (1).

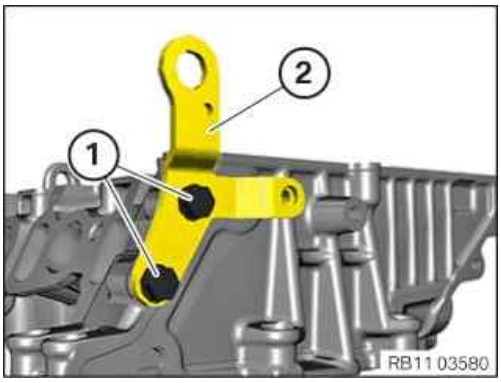
Special tool to cylinder head

M8		Tightening torque	21,5 Nm

- Tighten the coolant temperature sensor (2).

Coolant temperature sensor at cylinder head

Temperature sensor		Tightening torque	3,5 Nm



- Install mounting lug (2) on the rear cylinder head.
- Tighten the screws (1).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Screw in preheating elements using special tool **0 491 068 (11 6 050)** and tighten.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

POSTPROCESSES

69 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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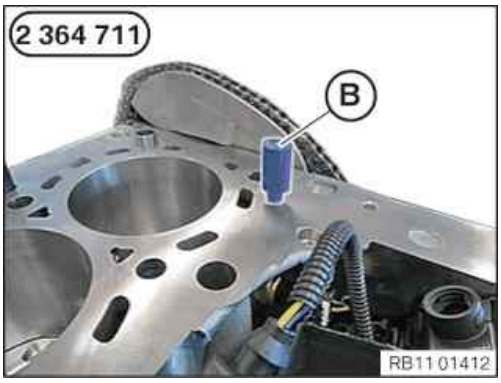


- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

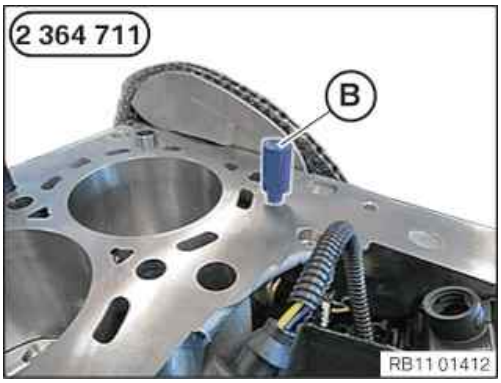
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

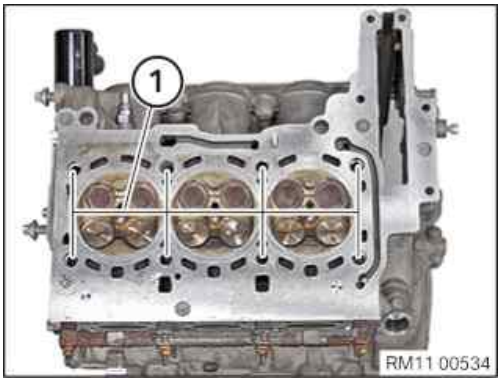
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

70 – Renewing the cylinder head gasket



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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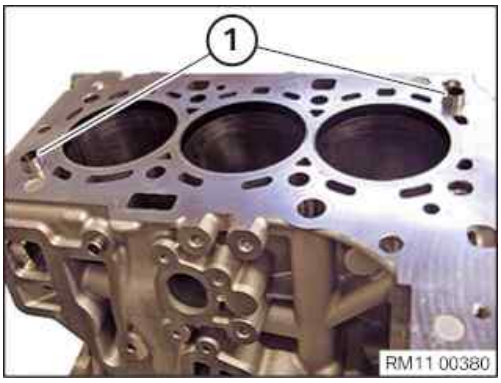
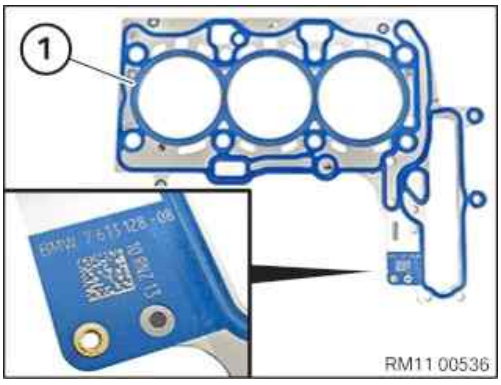
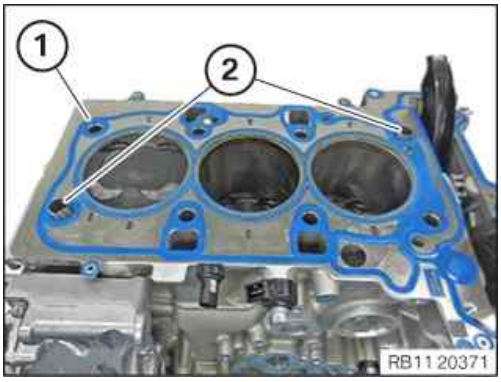


- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

71 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

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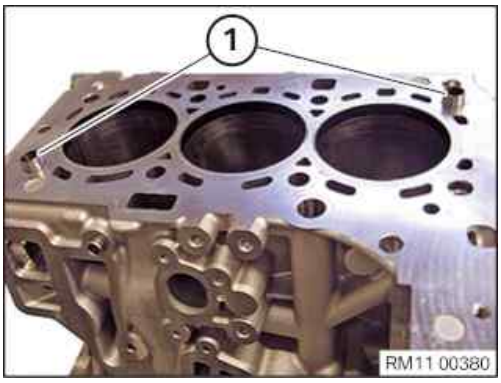
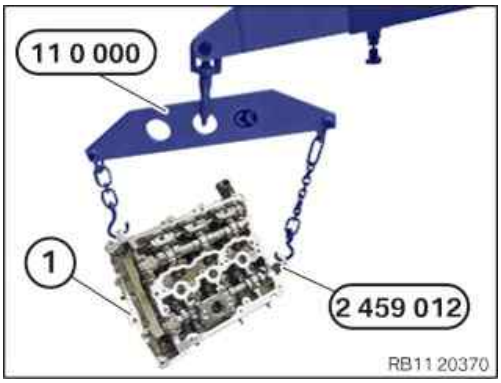


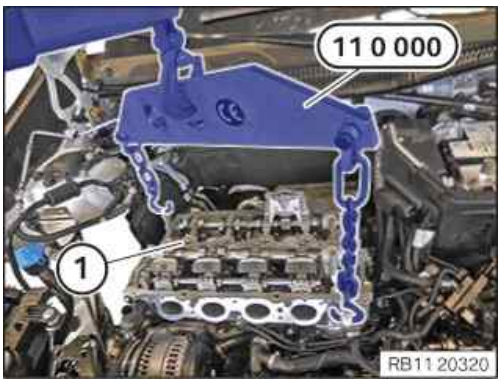
- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.

- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



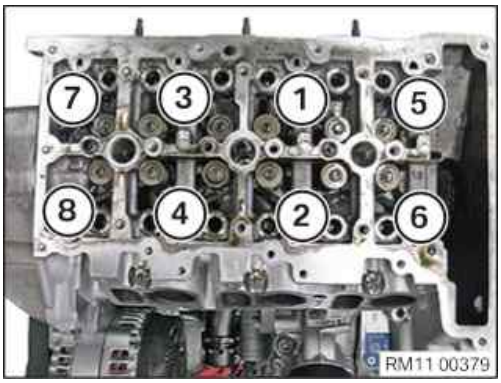
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Fit new cylinder head bolts.

  Parts: Cylinder head bolts

- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).

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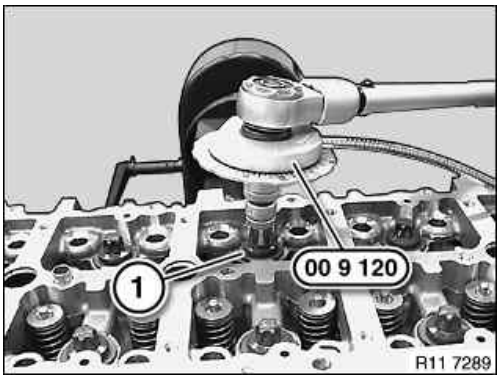
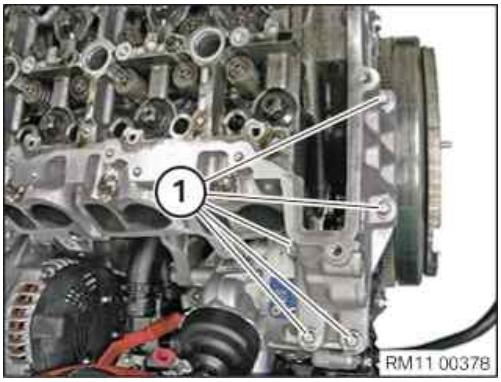


- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

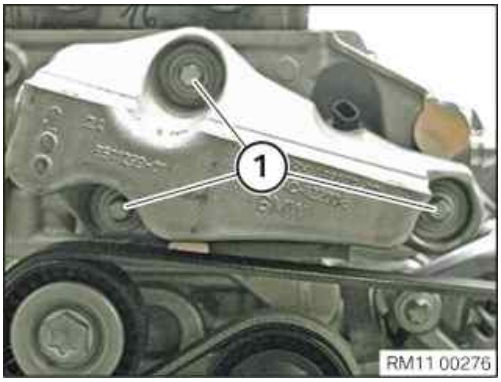


- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

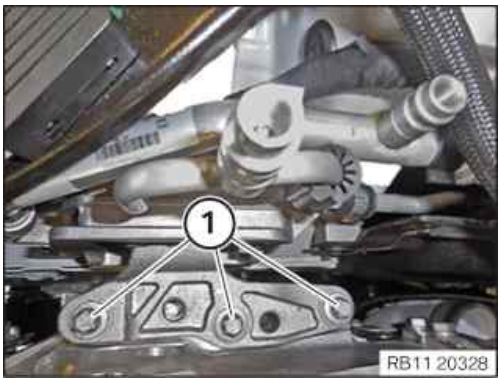
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.



- Tighten the screws (1).

Engine support to cylinder head

M10X45		Tightening torque	41 Nm



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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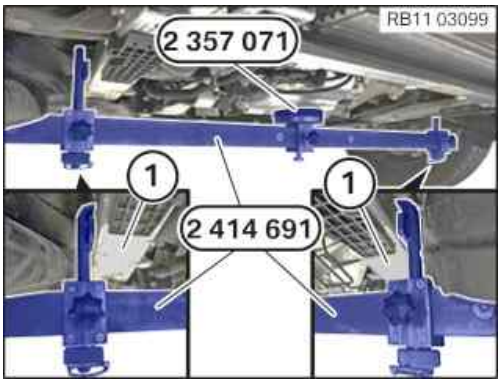
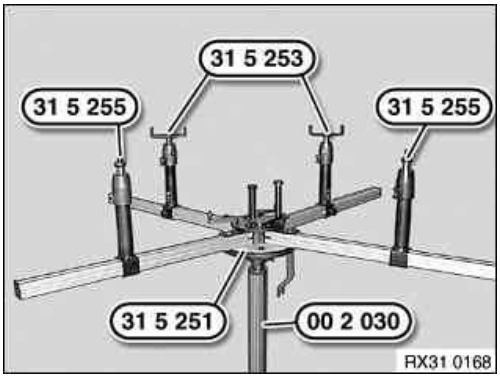
- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

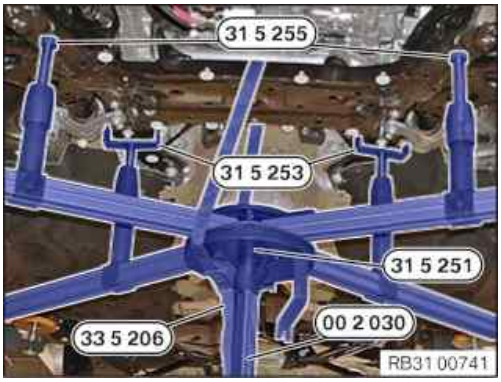


- Disassemble special tool **2 414 691** using special tool **2 357 071**.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

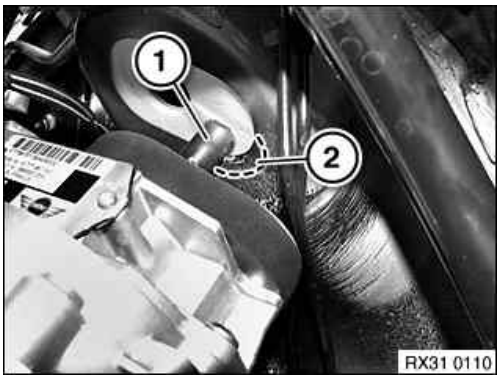
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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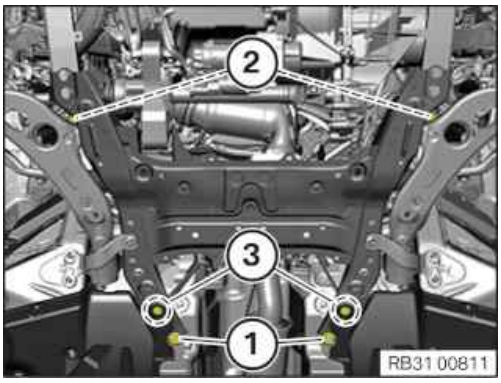


- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

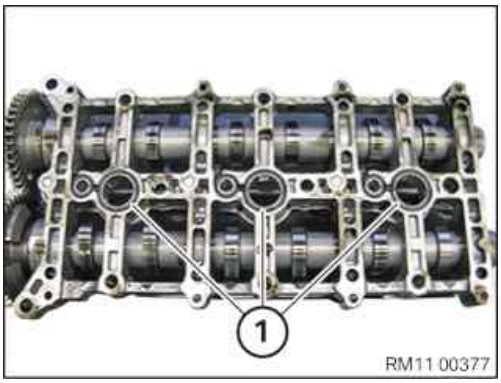
72 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

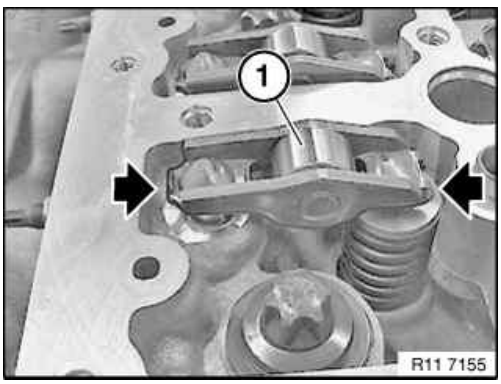
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

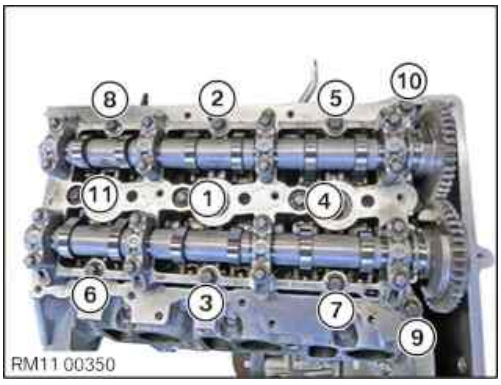


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

73 – Installing the camshaft sprocket on the intake camshaft

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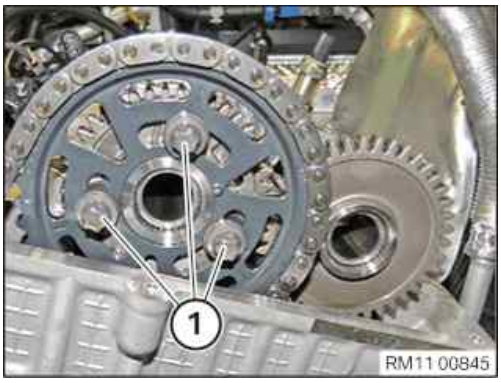
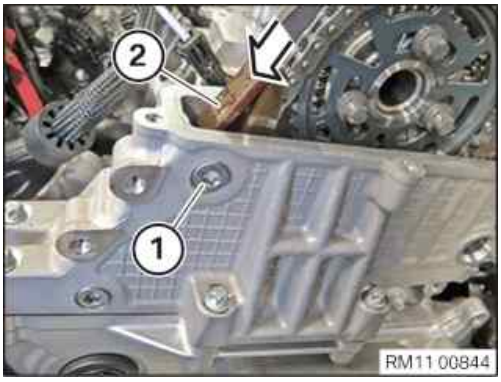


- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

74 – Install the timing chain guide rail



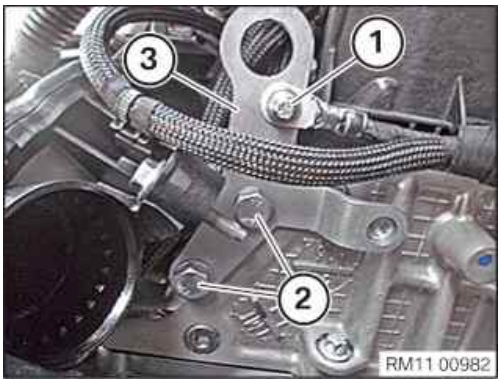
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

75 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

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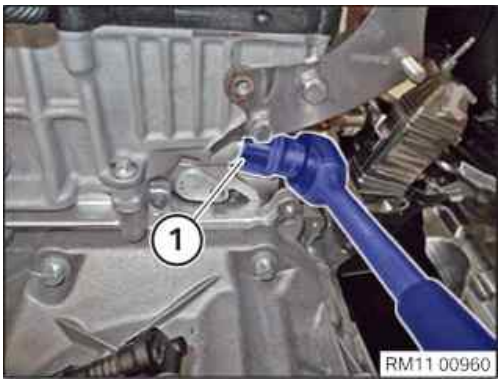
TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

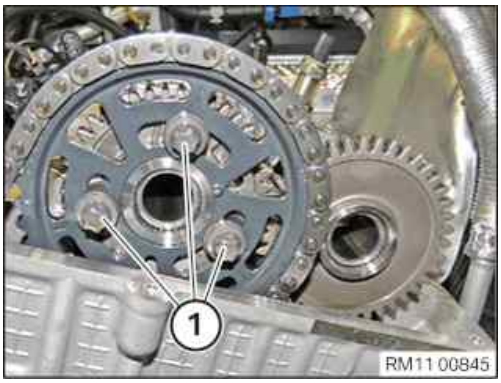


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

76 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

77 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

78 – Remove special tool to disconnect the crank shaft

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- Remove special tool **2 288 380**.

79 – Checking camshaft timing

- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

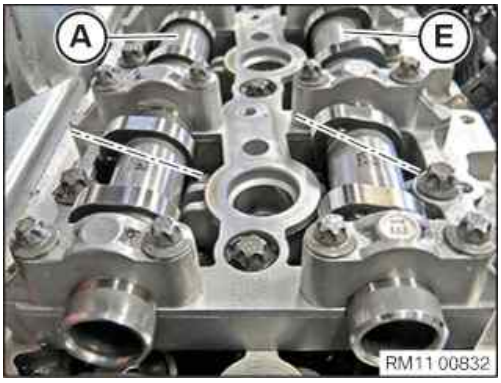
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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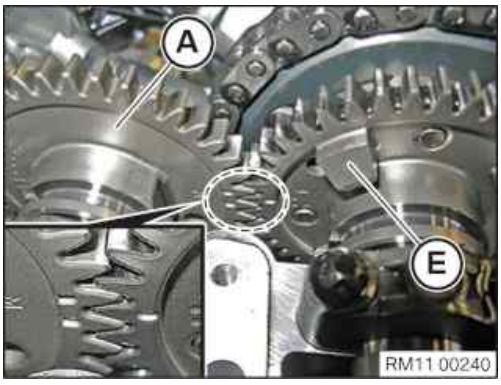
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

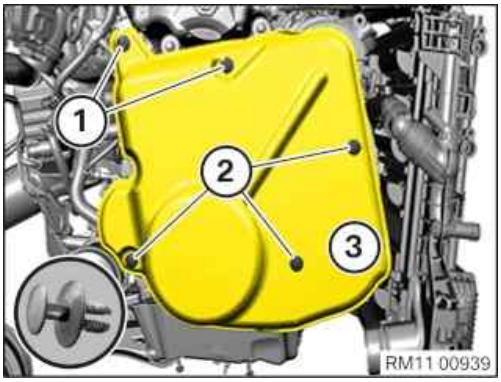
TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

80 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

81 – Installing exhaust manifold

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

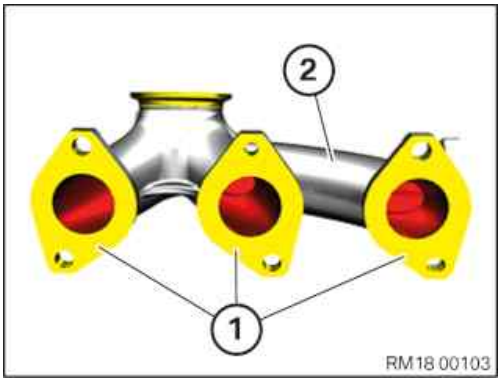
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

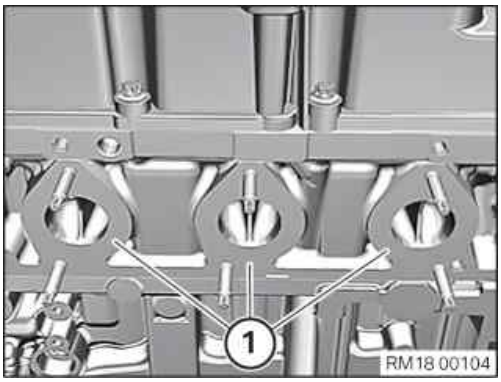
- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

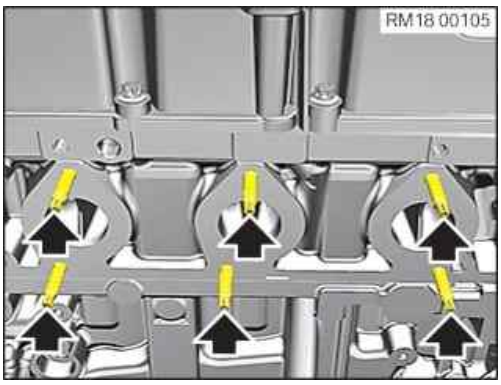
The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean the connection points (1) on the exhaust manifold (2) with the special tool **0 495 102 (11 4 470)**.



- Clean the connection points (1) on the cylinder head with the special tool **0 495 102 (11 4 470)**.



- Check the stud bolts (arrows) on the cylinder head for **correct** fit.

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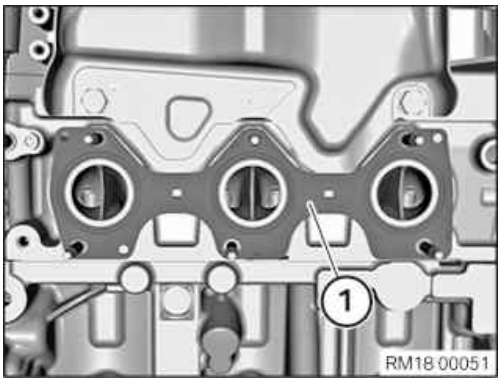
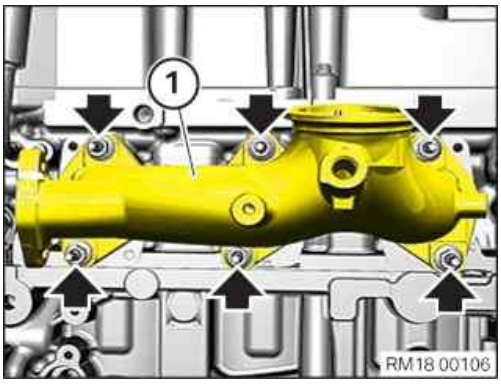


TECHNICAL INFORMATION

The **coated side of the** seal must be mounted facing towards the exhaust manifold.

- Renew the gasket (1).

  Parts: Gasket
- Insert and install the gasket (1).

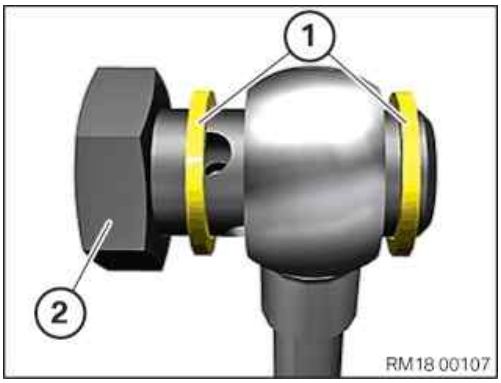


- Insert and install the exhaust manifold (1).
- Renew the nuts (arrows).

  Parts: Nuts
- Hand-tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.
- Tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.

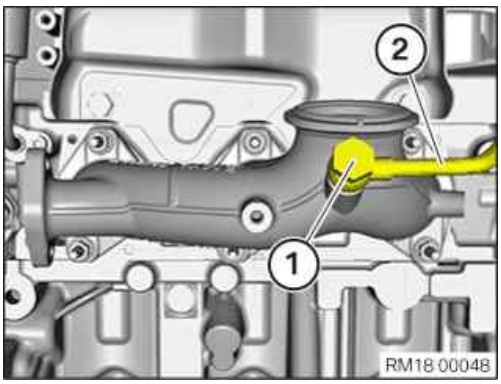
Exhaust manifold to cylinder head

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm



- Renew the sealing rings (1) from the banjo bolt (2).

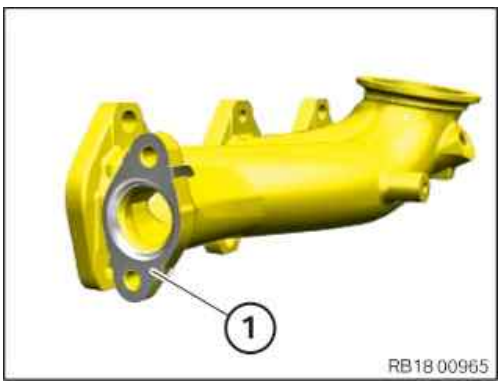
  Parts: Sealing ring



- Insert and install the exhaust gas pressure pipe (2).
- Tighten the banjo bolt (1).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt		Renew sealing rings.	30 Nm



- Renew seal (1) between exhaust-gas recirculation cooler and exhaust manifold.

  Parts: Gasket

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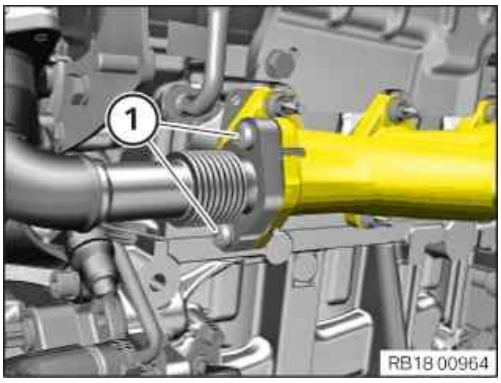

- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

82 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

83 – Installing exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the exhaust turbocharger

Inadequate initial filling of exhaust turbocharger leads to dry running.

- Make sure the initial filling is correct when replacing exhaust turbocharger.
- Fill the exhaust turbocharger with the suitable additive (see electronic Parts Catalogue).

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TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

TECHNICAL INFORMATION

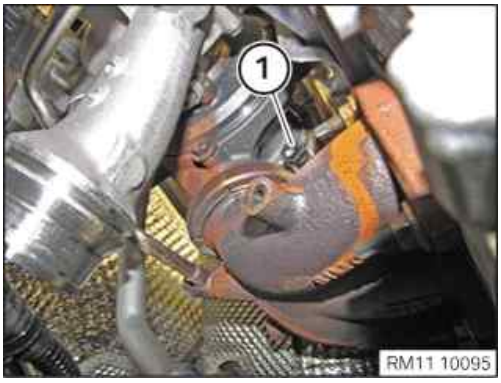
For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger



- Renew gasket.

  Parts: Gasket
- Position seal on exhaust manifold.
- Guide the exhaust turbocharger in from the top and position it.
- **Ensure that gasket is correctly seated.**
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Renew sealing rings.

  Parts: Sealing ring
- Position oil feed line with banjo bolt (1) and sealing rings and tighten hand-tight.

  There are 2 sealing rings fitted on the banjo bolt (1).
- Align oil feed line and tighten banjo bolt (1).

  The oil feed line must not sit on the exhaust turbocharger.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

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- Renew gasket.

  Parts: Gasket
- Position oil return line (2) with **seal** on exhaust turbocharger.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Feed in and tighten screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

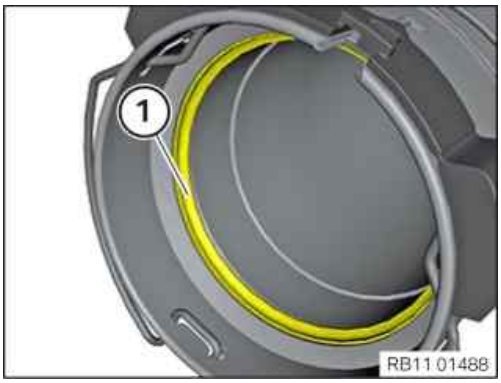
84 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

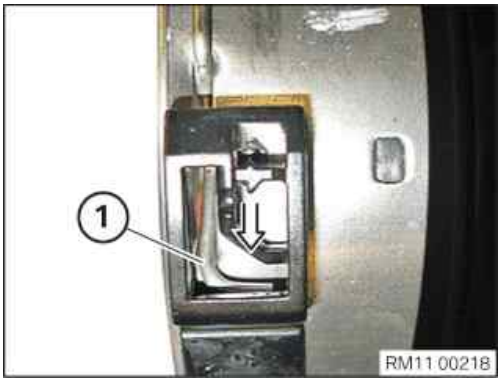
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

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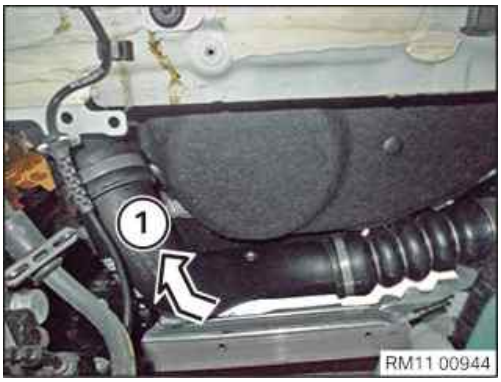
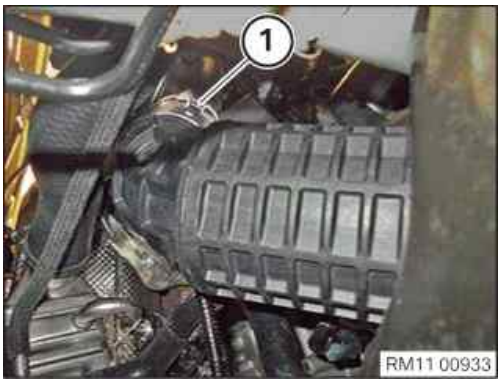
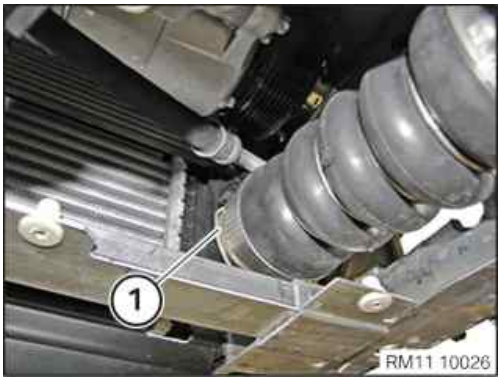


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



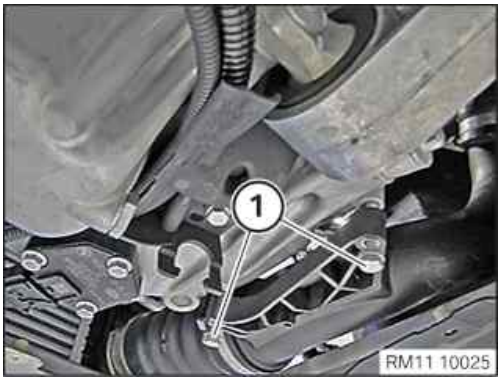
- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm



- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

85 – Installing heat shield on exhaust turbocharger at the rear

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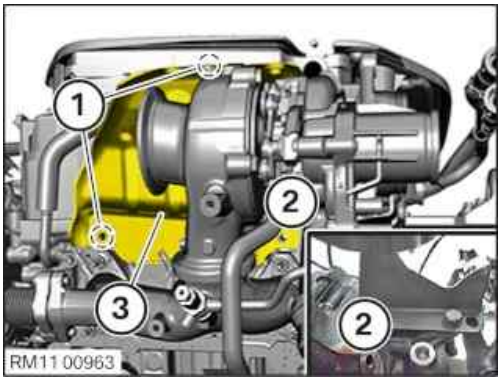
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

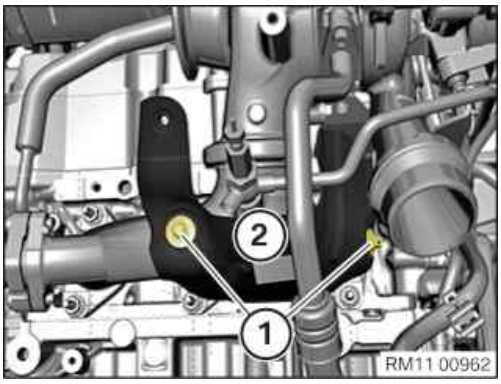
86 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

87 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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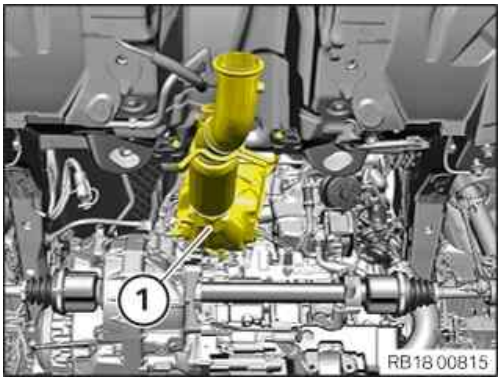
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

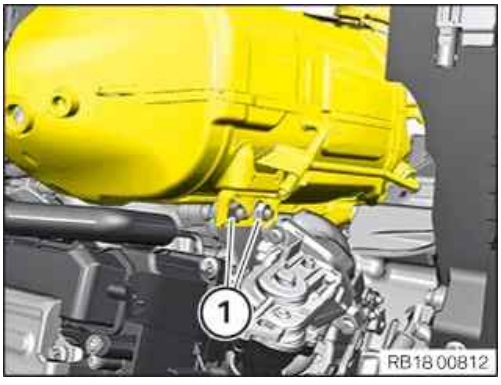
  Parts: Gasket

- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.

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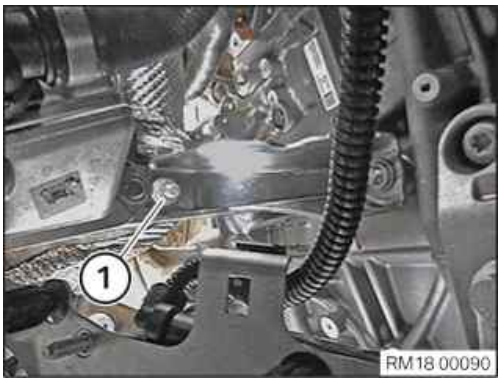


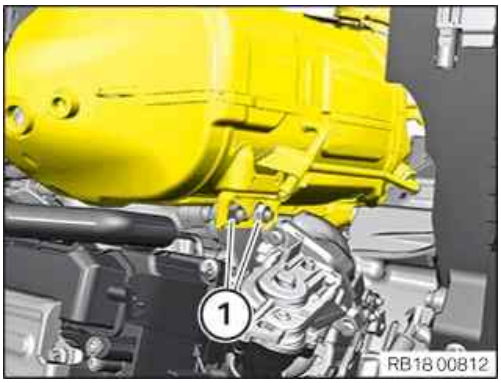
- Tighten the nut (1) hand-tight.

- Remove fitting aid (1) for the flexible tube.

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

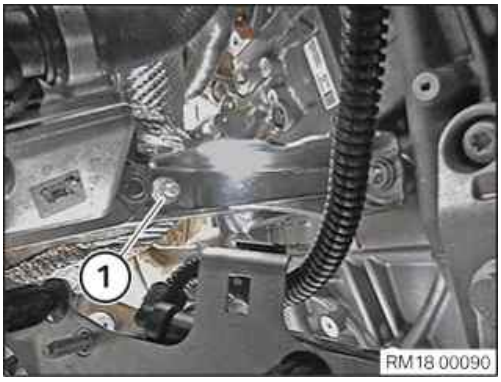
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten nut (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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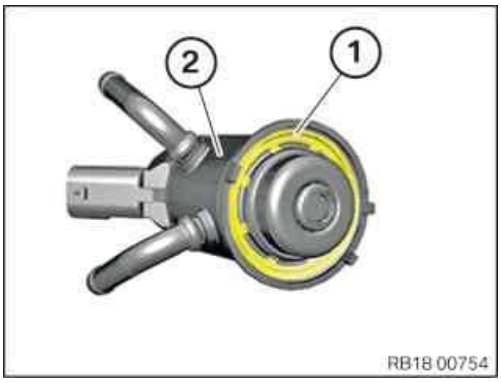
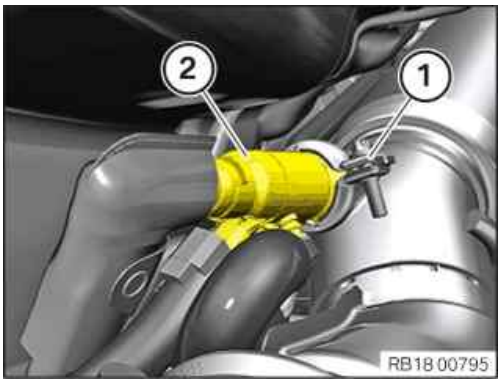


- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

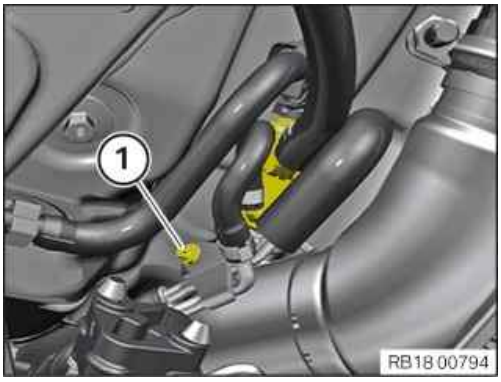


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

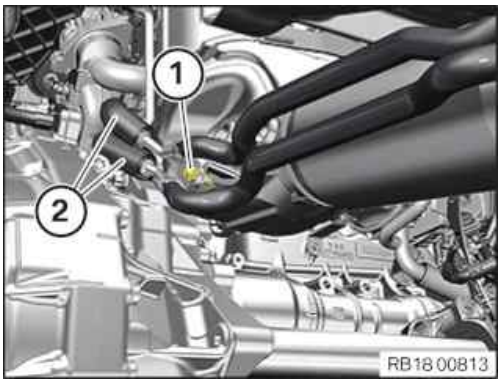
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

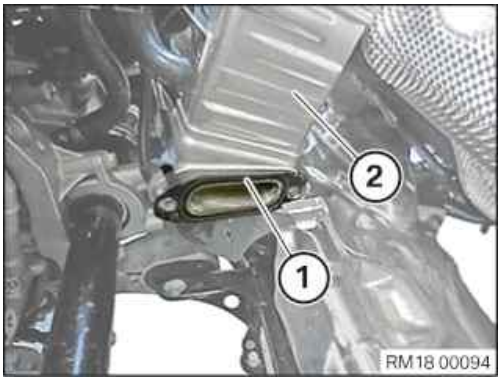
Torx bolt BM6x16		Tightening torque	8 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm



- Replace seal (1) of the low pressure exhaust-gas recirculation cooler (2).

  Parts: Gasket

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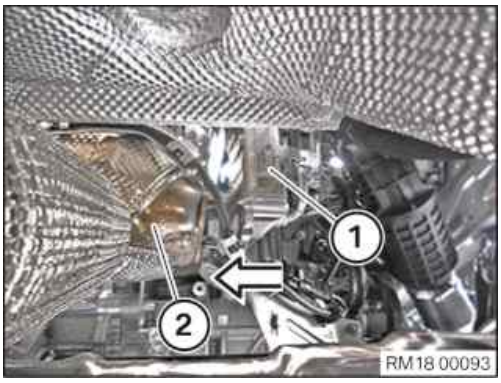
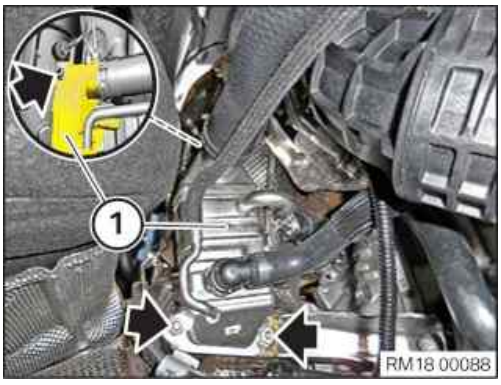


- Feed in and install the low pressure exhaust-gas recirculation cooler (1) in at the diesel particulate filter (2) in the direction of arrow.



- Tighten nuts (arrows) of the low pressure exhaust-gas recirculation coolers (1).

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

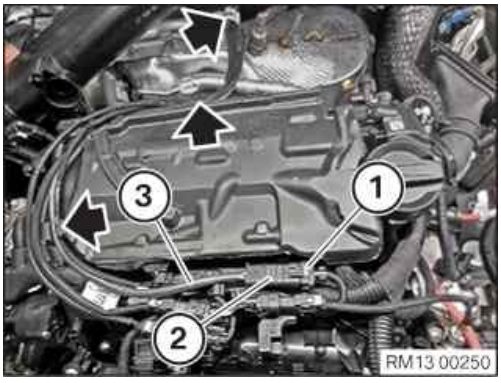
Flange nutM8		Tightening torque	19 Nm

88 – Install the control sensor

- Feed in front oxygen sensor (1) and install.
- Tighten the front oxygen sensor (1) with the special tool **0 491 075 (11 7 030)**.

Control sensor

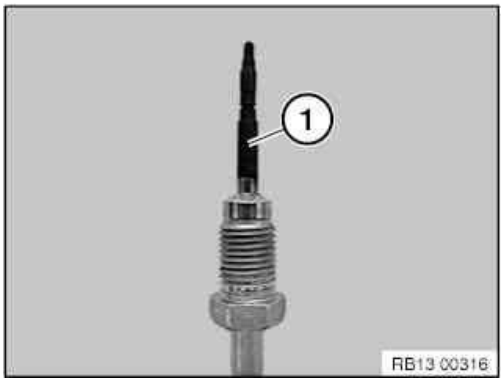
Control sensor		Tightening torque	50 Nm



- Feed in and install cable (3) from the oxygen control sensor into the clamps (arrows).
- Secure connector (2) on holder.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

89 – Install the exhaust-gas temperature sensor on the diesel particulate filter



RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.
- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.

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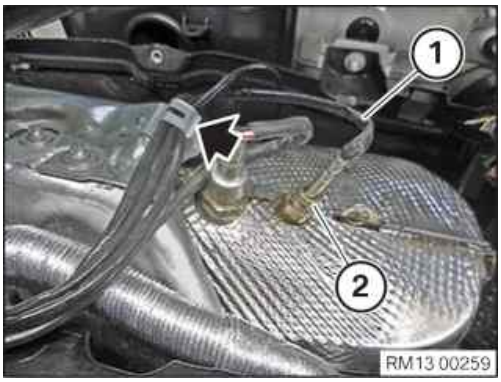


- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

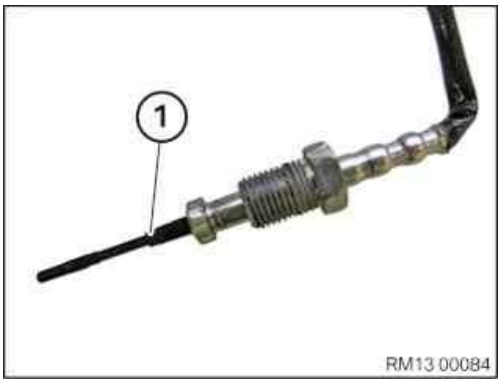
90 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

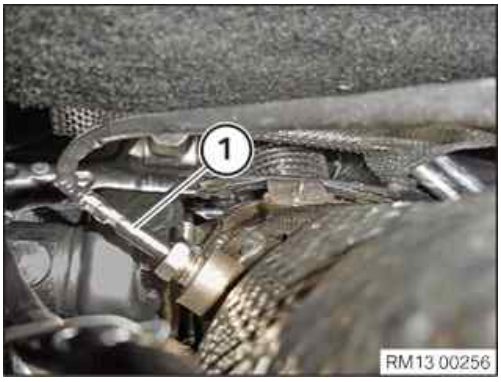
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.



- Feed in and install the exhaust temperature sensor (1).

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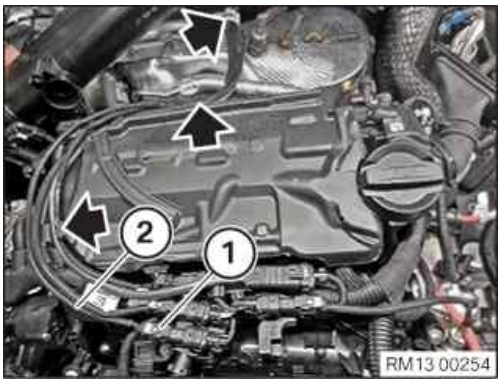
- Tighten the exhaust temperature sensor (1) with conventional tools (2).

Exhaust temperature sensor to diesel particulate filter

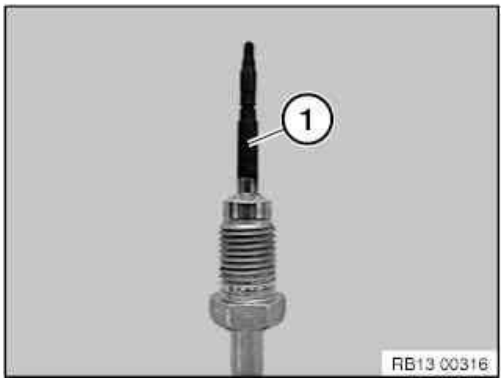
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

91 – Installing exhaust temperature sensor on catalytic converter



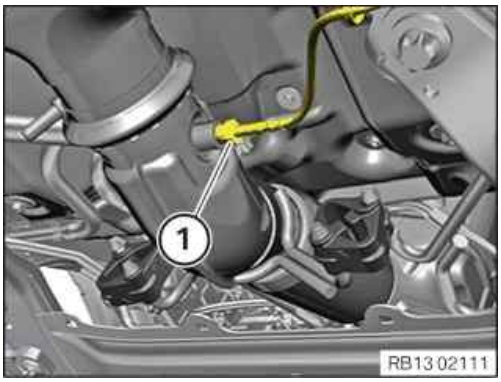
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Secure the cable clips (1).

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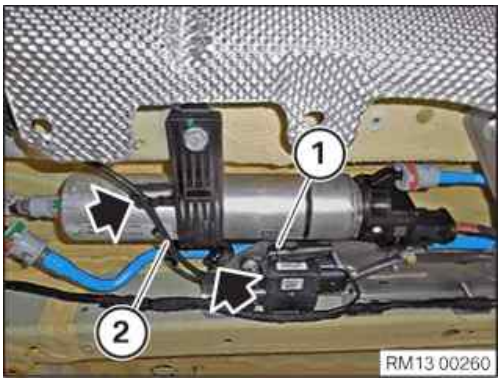
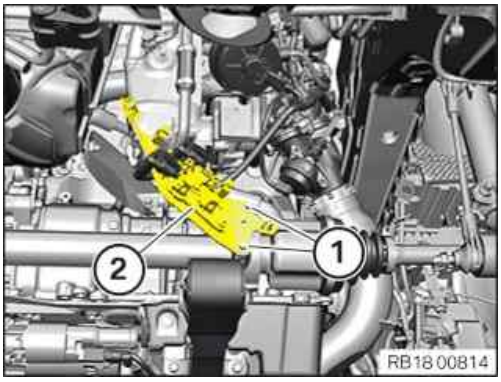


- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

92 – Install holder for oxygen sensor

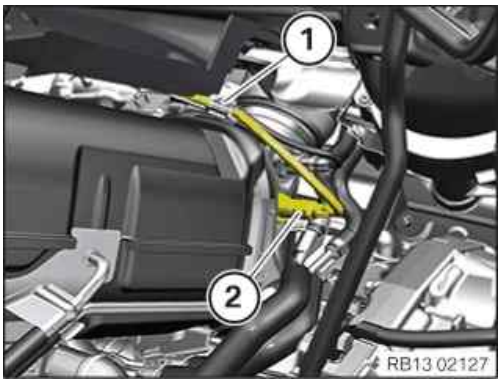


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

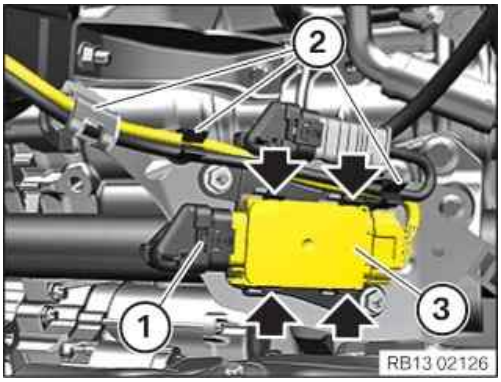
93 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

94 – Install the monitoring sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

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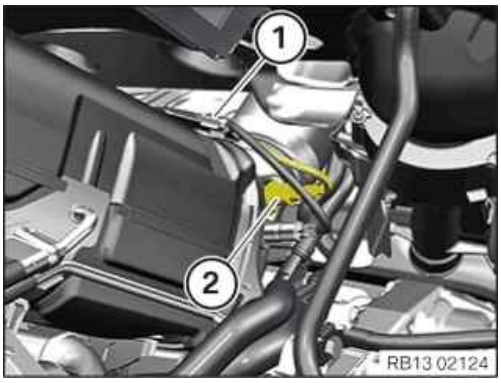
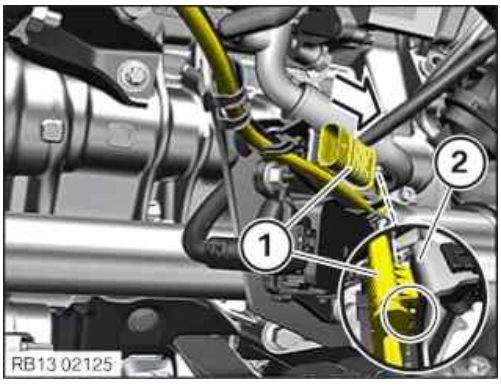


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

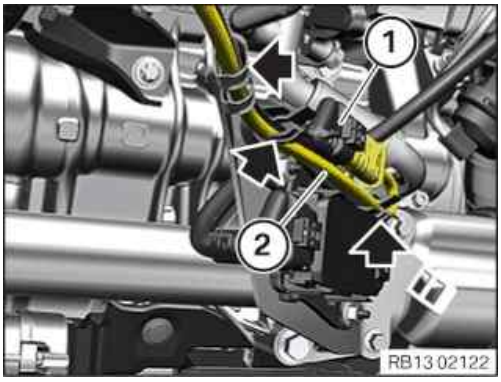
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

95 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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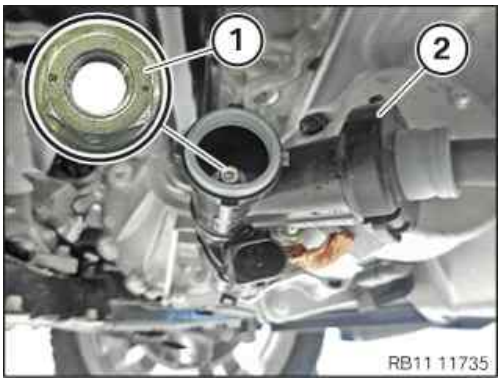


- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

96 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

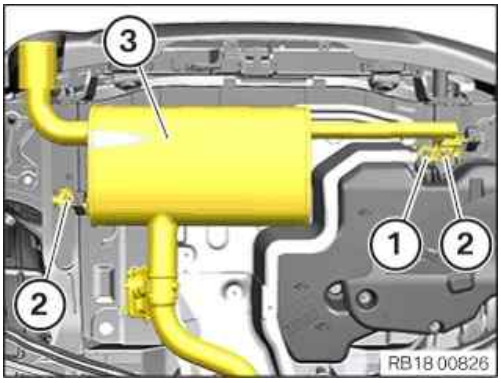
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert and install the exhaust system (3) with the help of another person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

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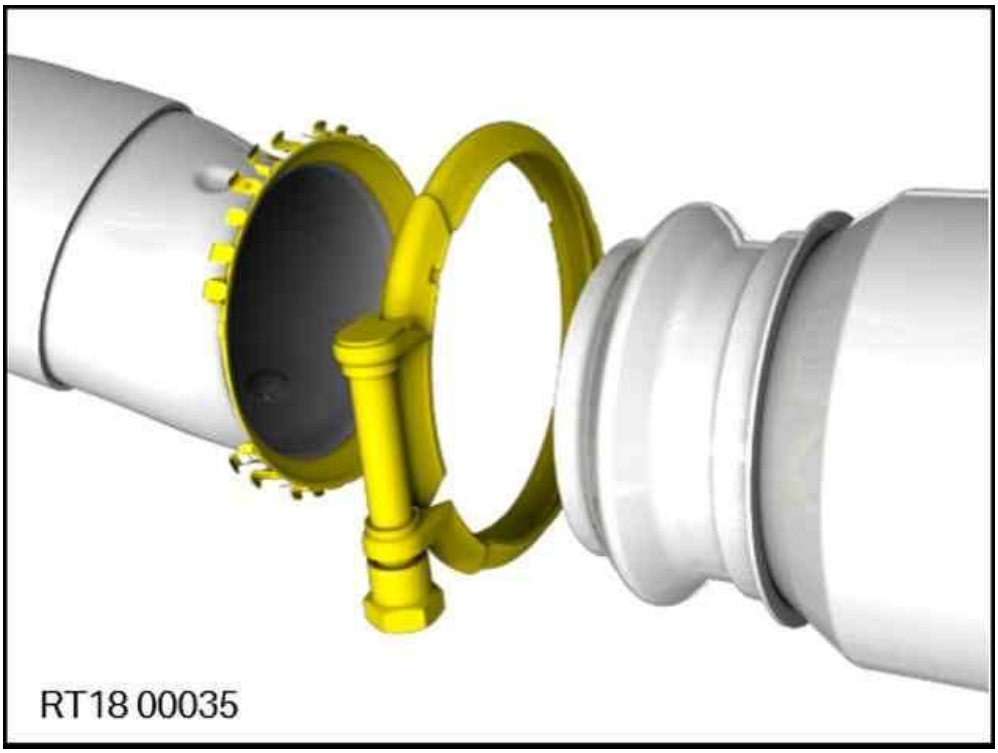
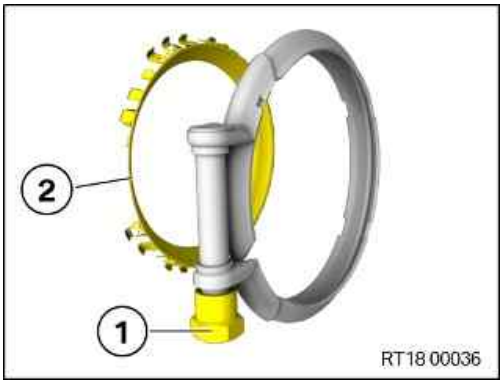
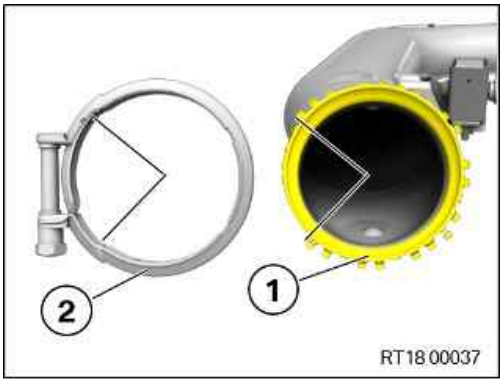
▶ **Install the V-clip**

V-band clamp



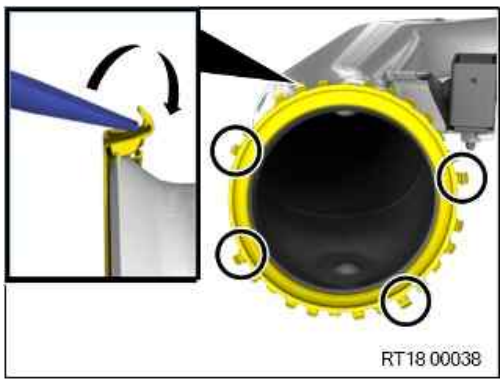


- Unscrew the nut (1) and remove the sealing ring (2).



- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

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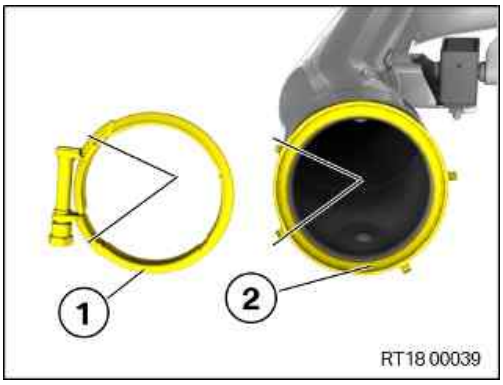
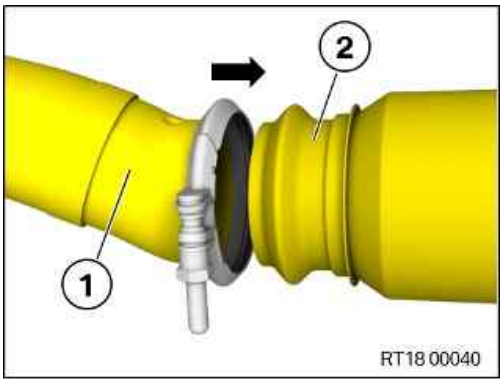
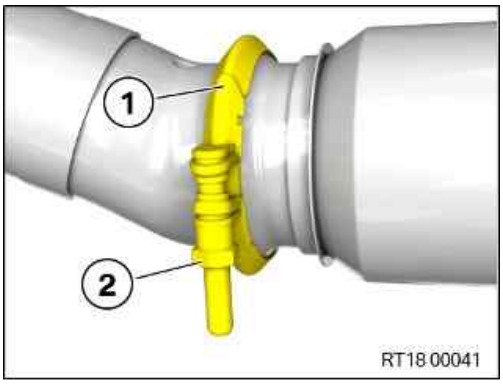


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



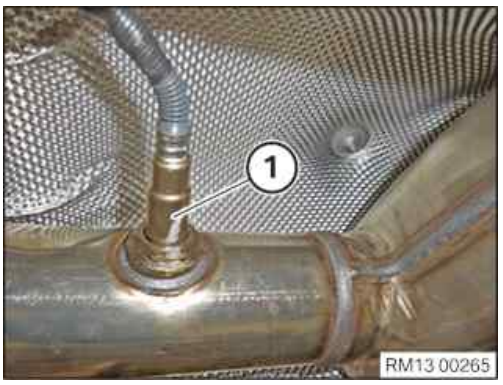
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Guide in, position and tighten the diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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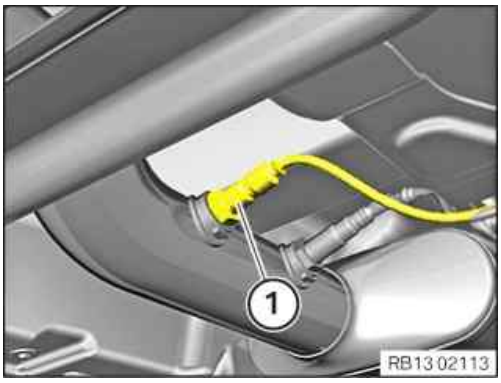
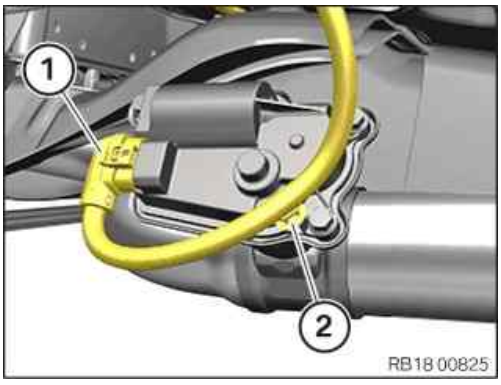


- Guide in, position and tighten the nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

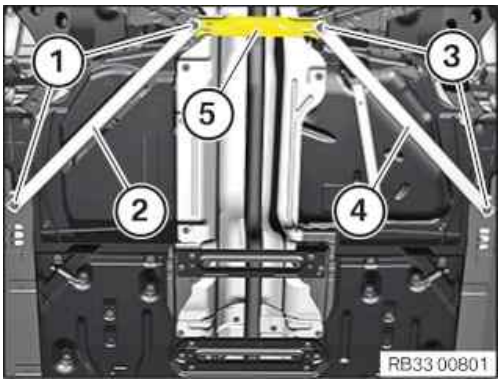
Sensor		Tightening torque	50 Nm



- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

97 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

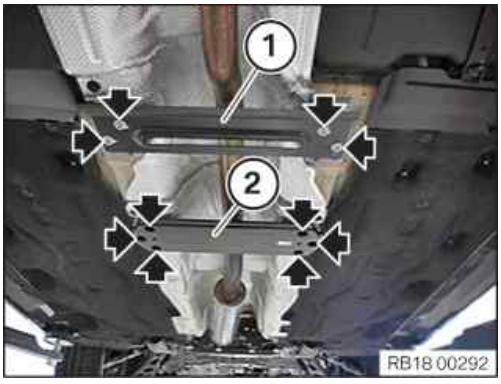
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

98 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

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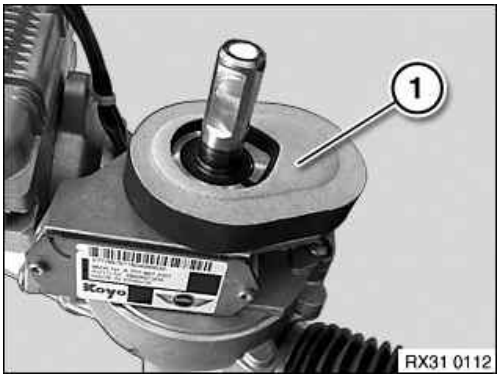
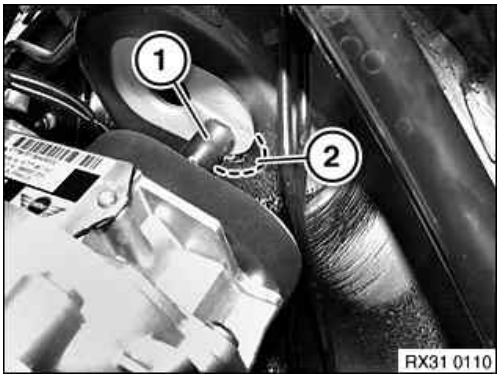
99 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

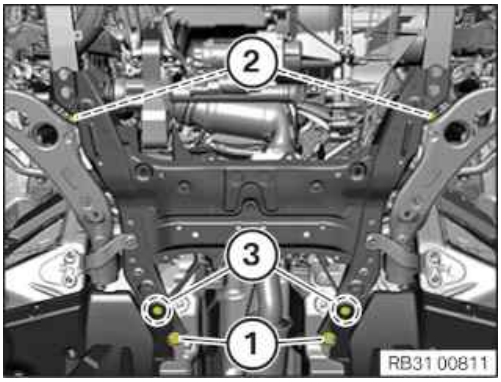


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

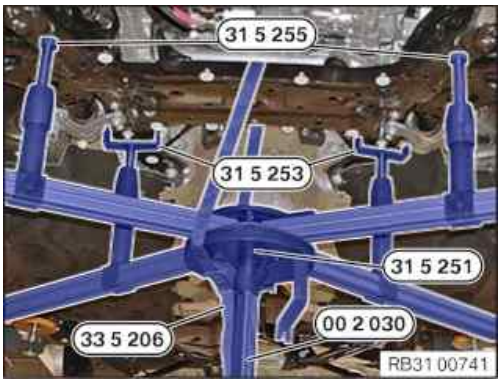
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.

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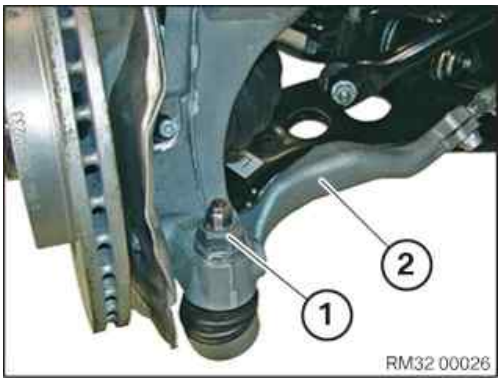


NOTICE

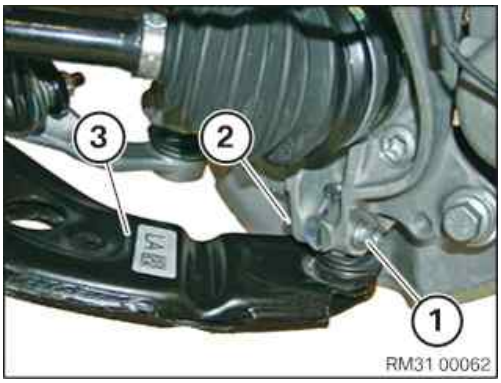
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

100 – Install the mounted parts on the front axle support

NOTICE

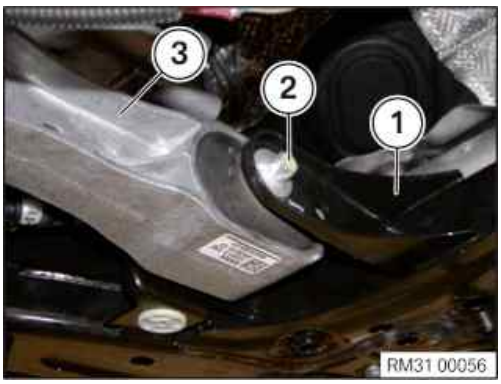
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

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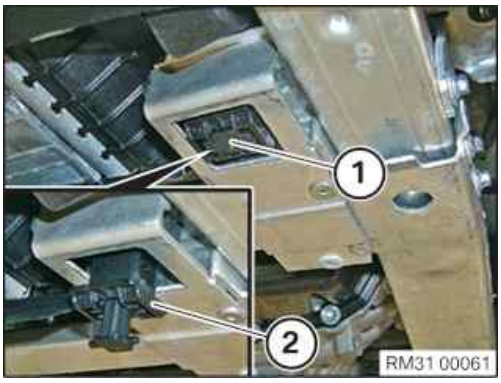
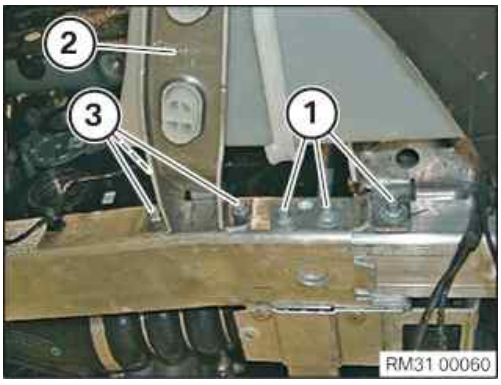


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

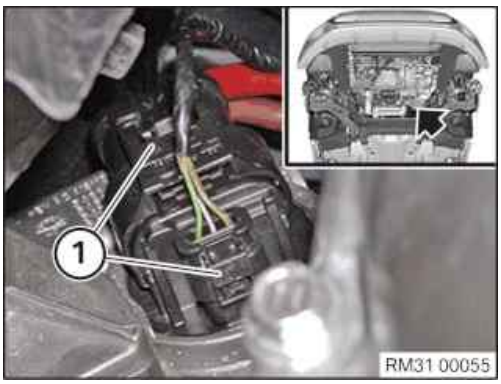
Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

101 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.

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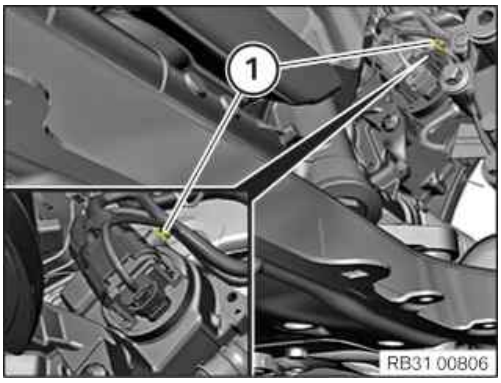
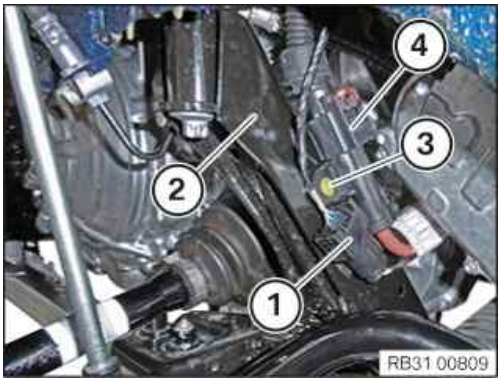


- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

102 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

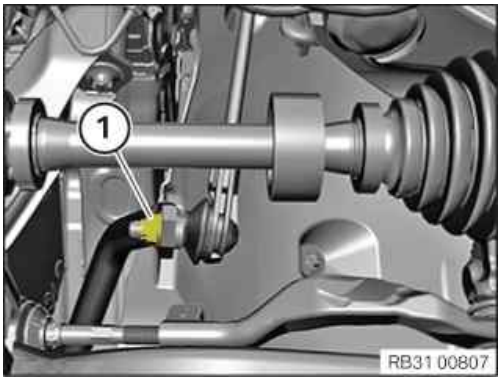
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

103 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

104 – With right installation: Securing the cable for the ride height sensor

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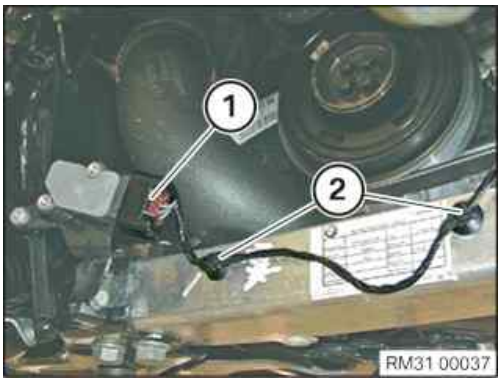


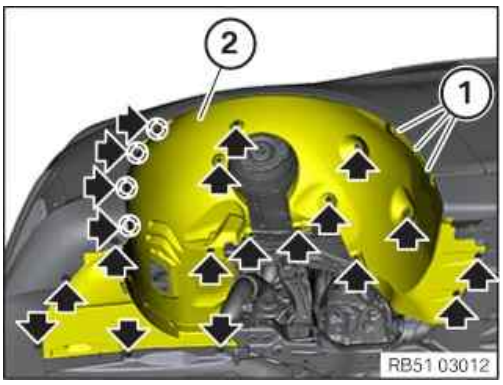
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

105 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▶ Installing the front wheel arch cover



- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

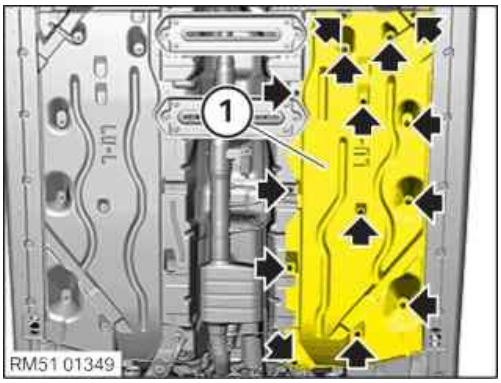
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

106 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

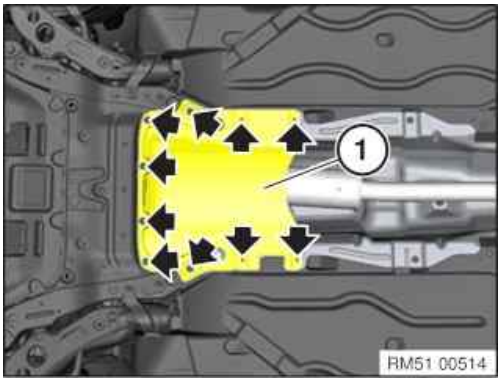
Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

107 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

108 – Mount the front left and right wheels

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▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

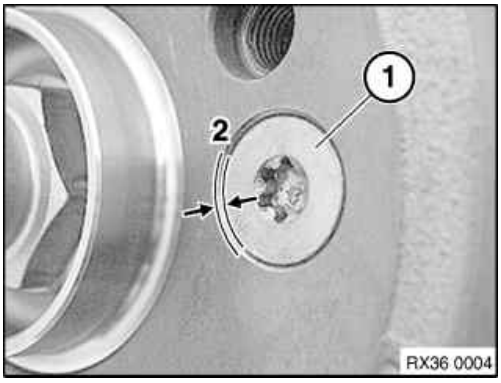
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

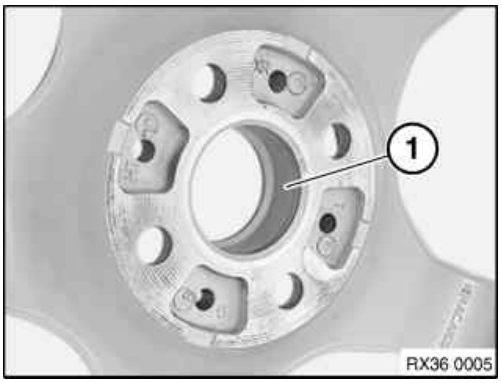
  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

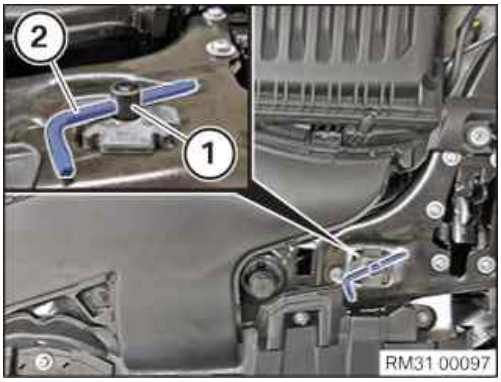
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

109 – Removing fastener for left and right radiator



NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

110 – Secure the steering shaft at the bottom on the steering gear

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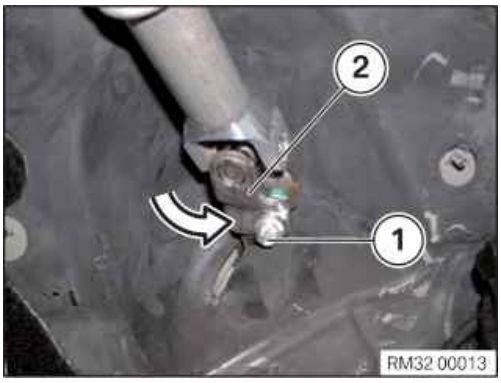
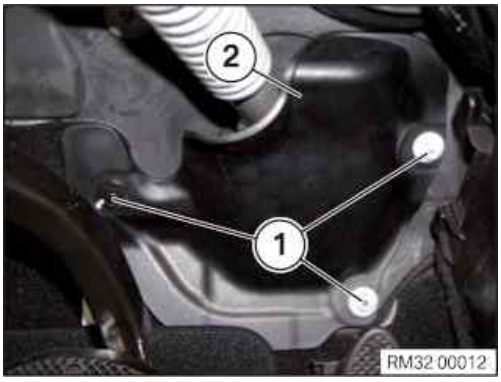


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

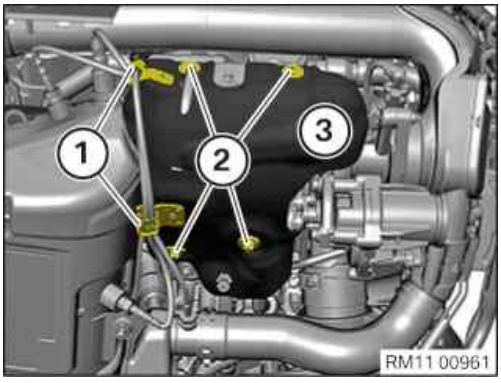
111 – Install the heat shield on the exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



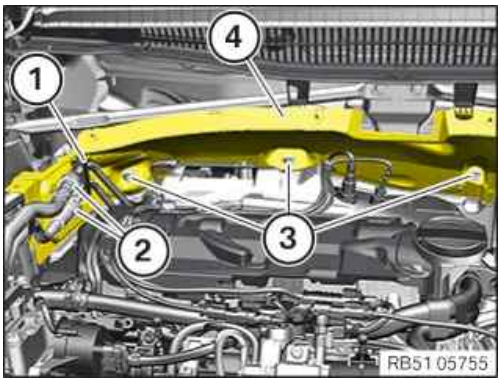
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

112 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

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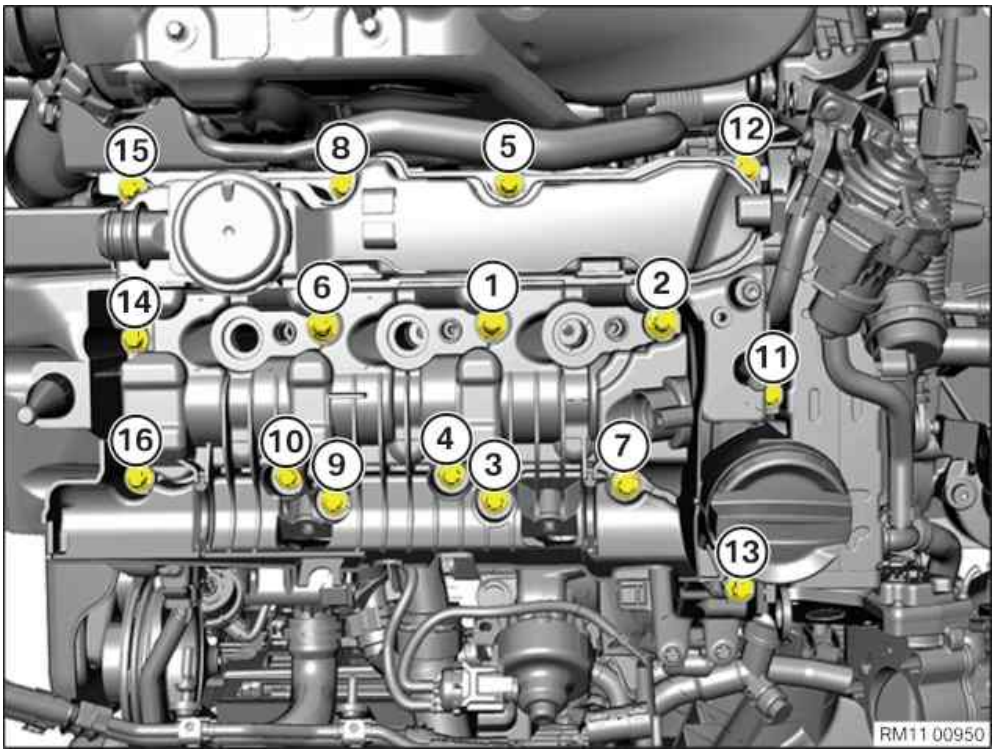
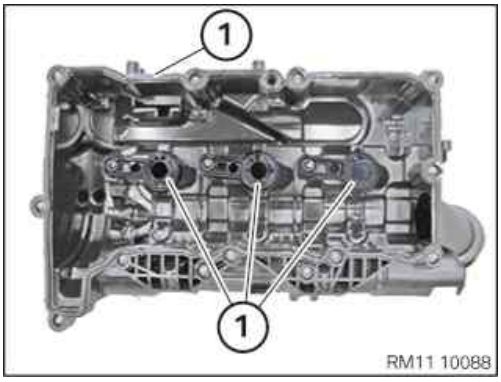
113 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover

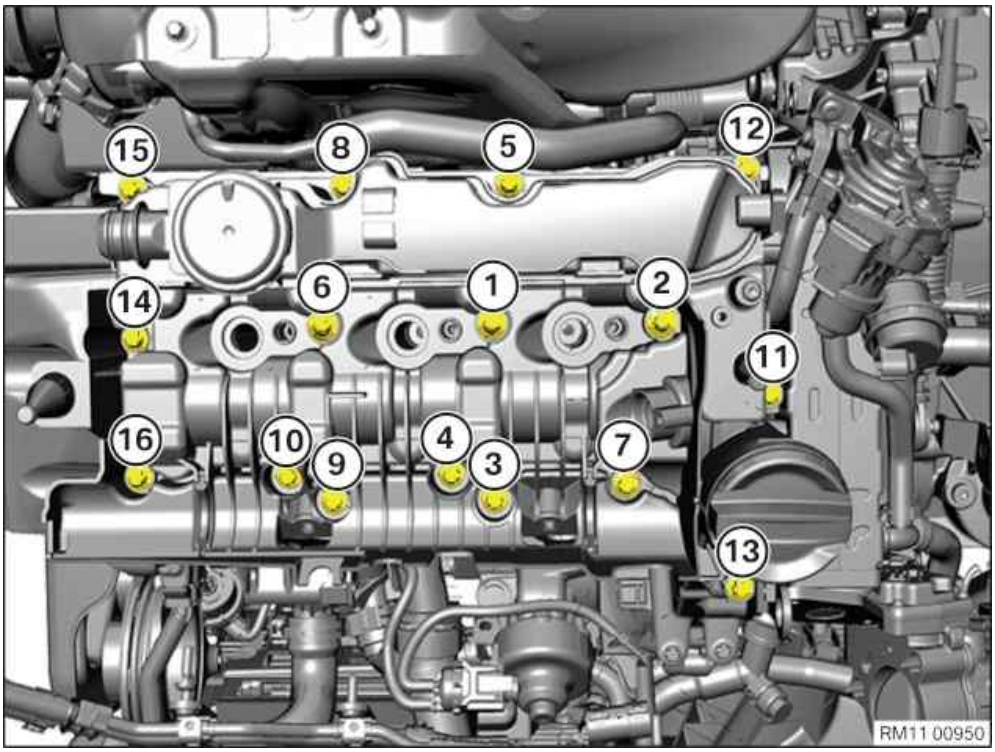


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm

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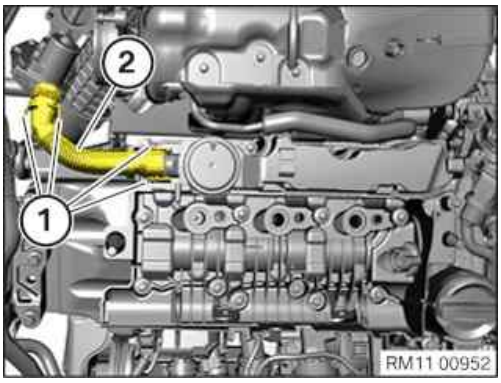
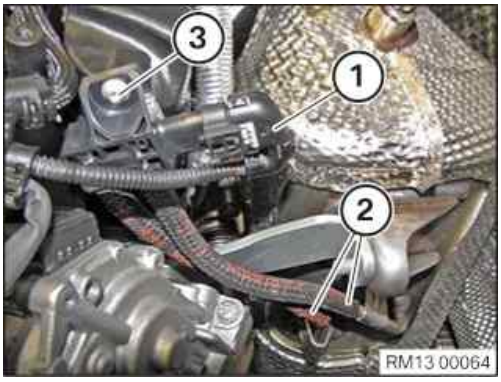


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

114 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

115 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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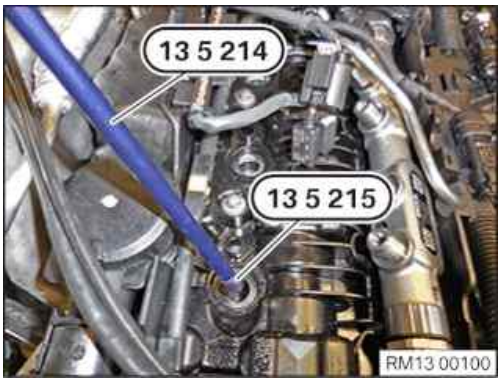
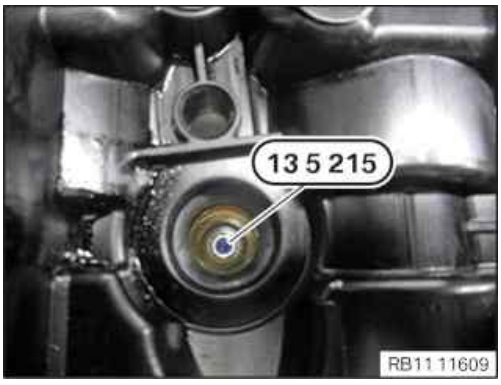


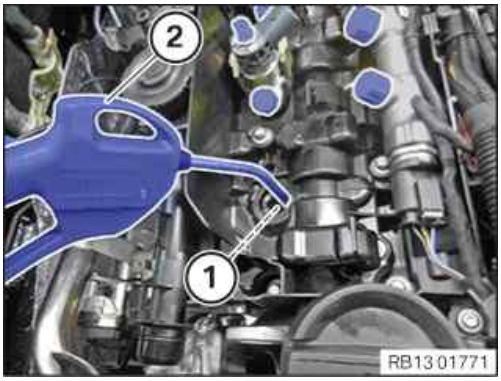
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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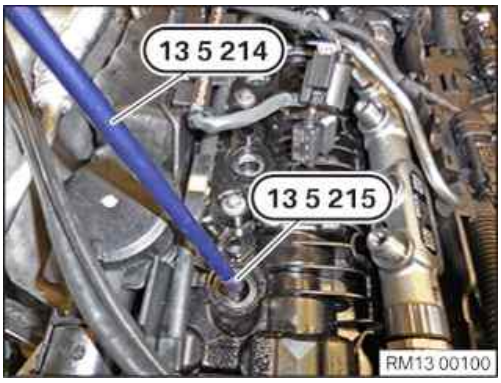


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

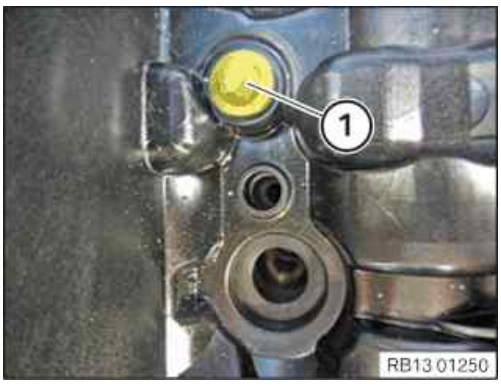
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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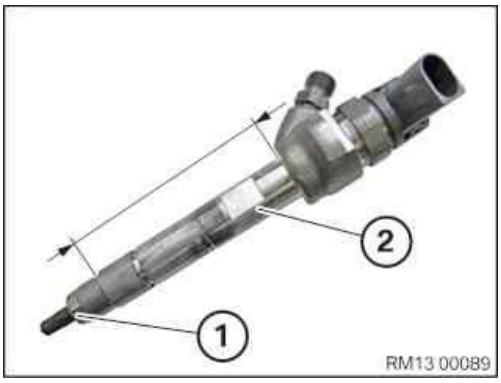


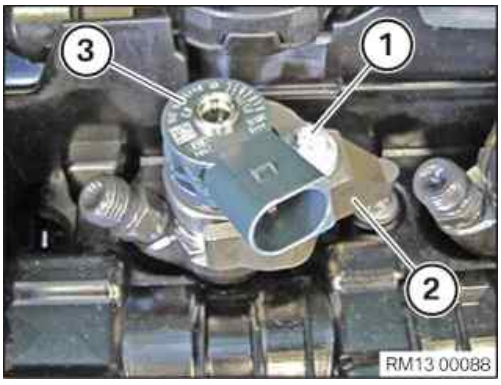
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

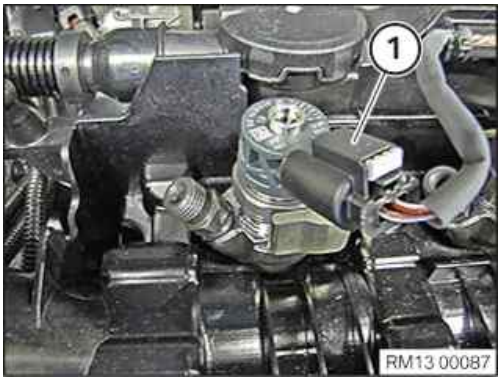
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

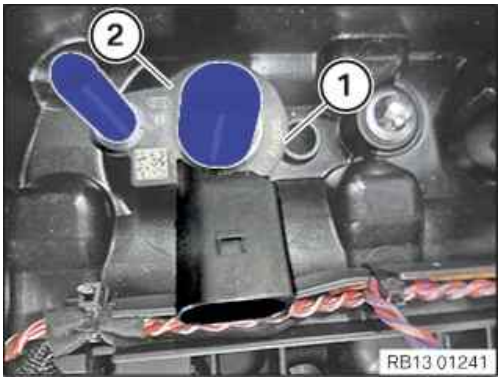
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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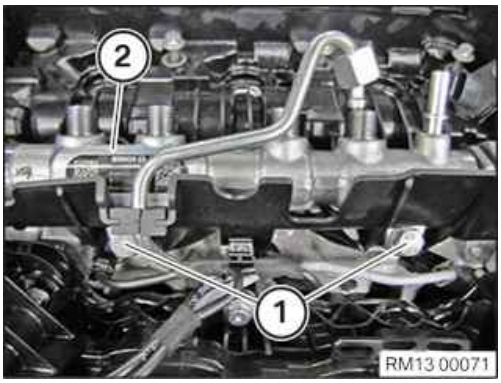
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

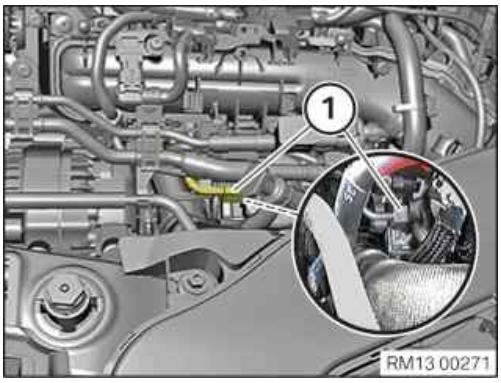
116 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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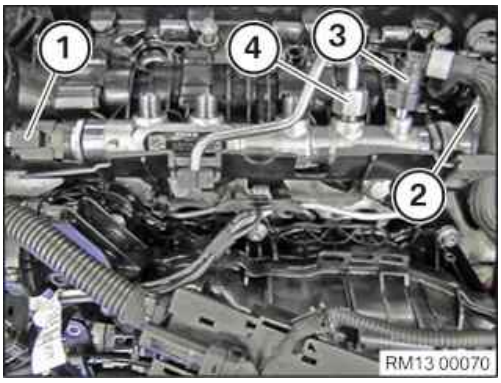

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

117 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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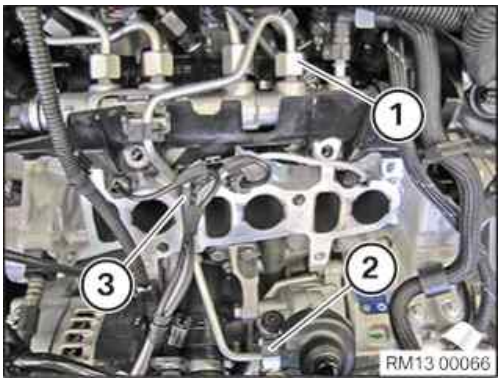

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

118 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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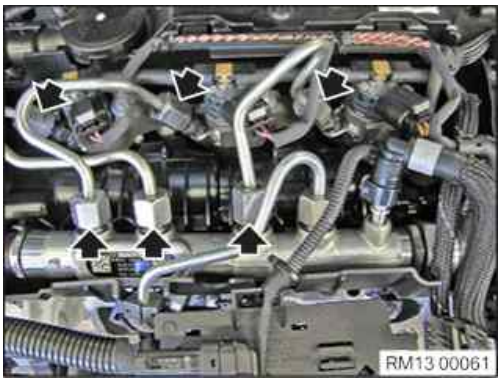

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

119 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

120 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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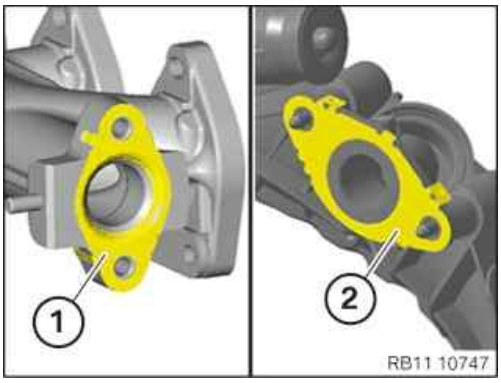
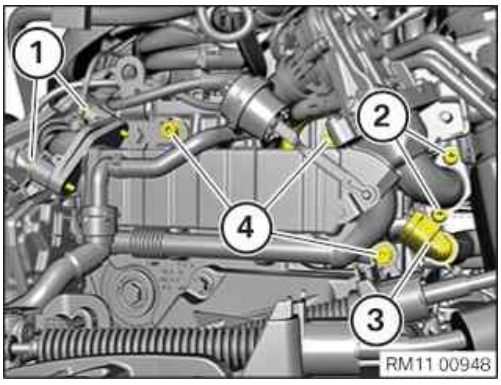


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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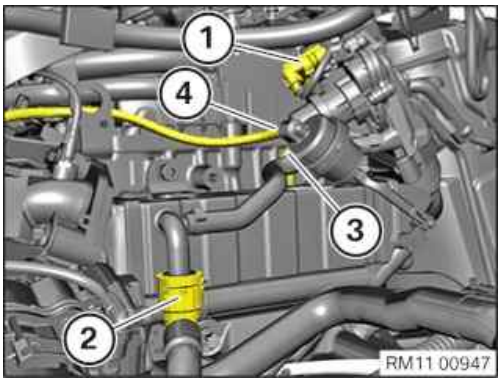


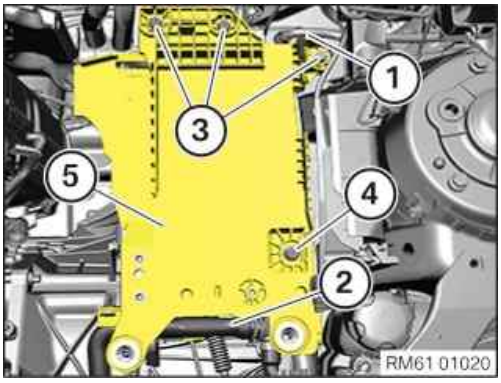
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

121 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

122 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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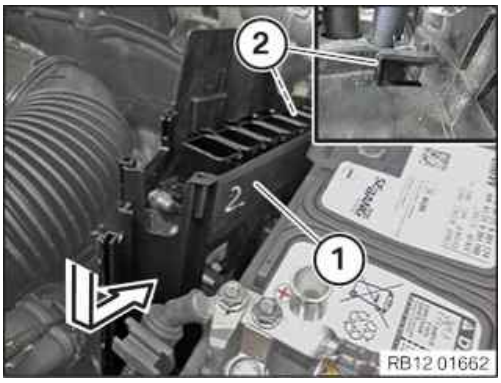
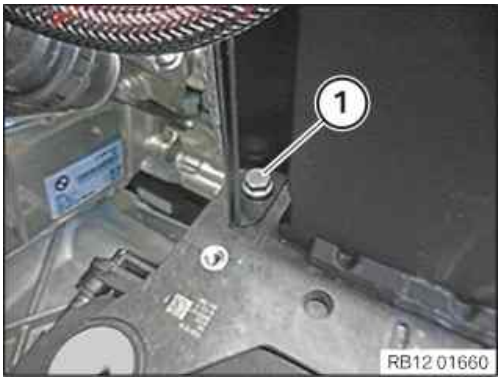


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

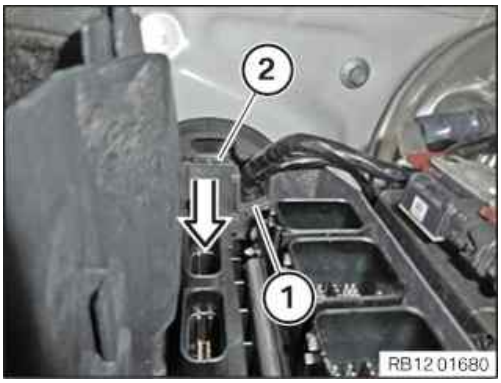
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



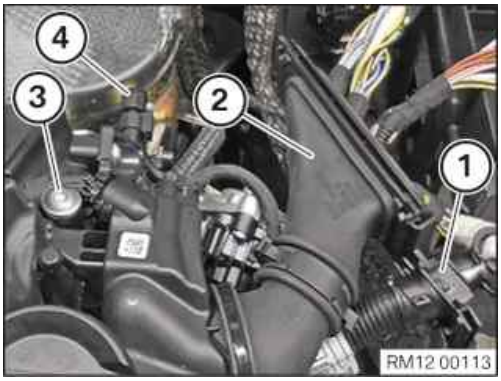
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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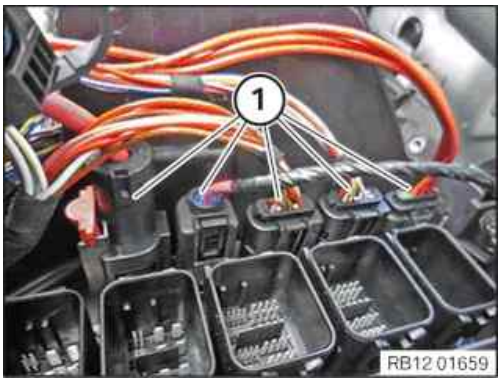
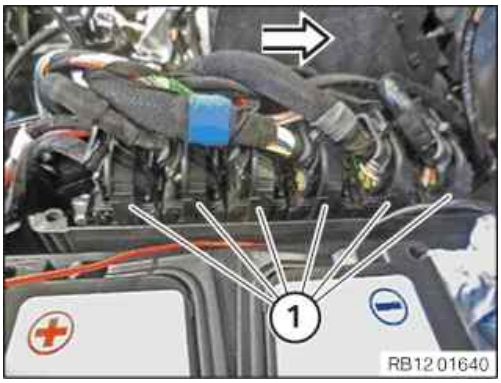
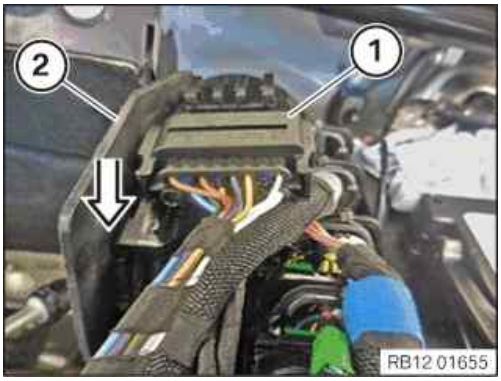


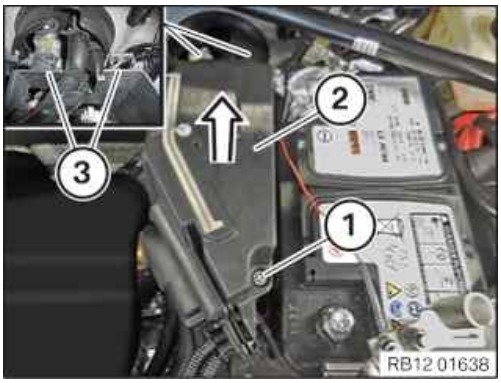
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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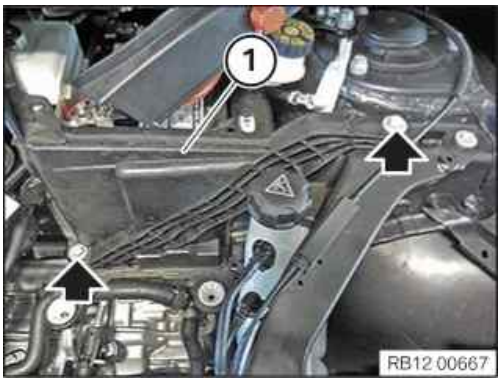


- Feed in and install tension strut (1).
- Tighten screws (arrows).

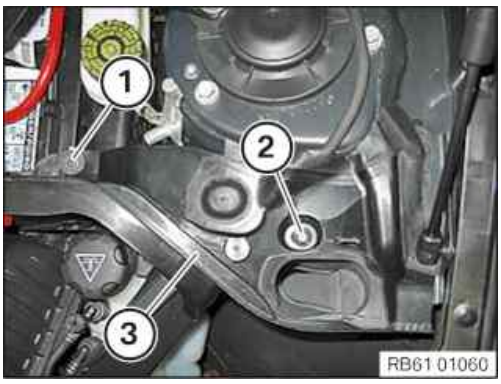
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

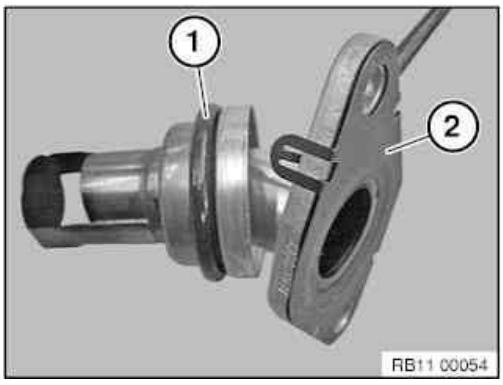


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

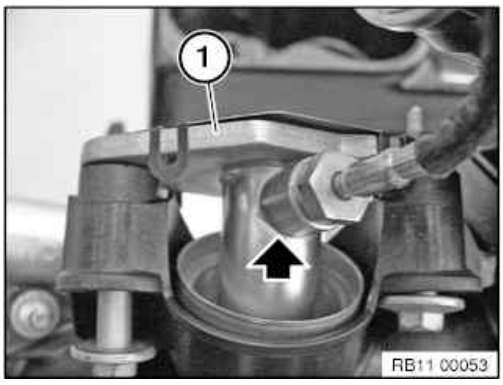
123 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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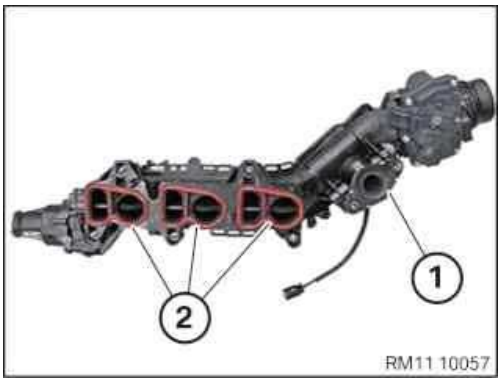
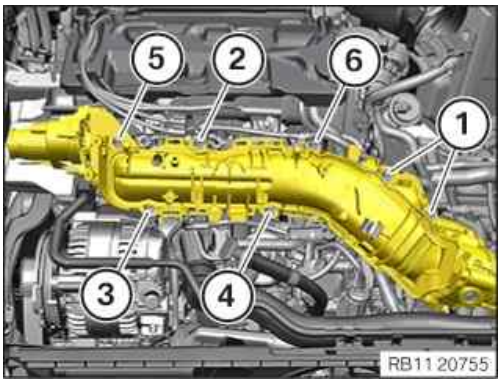


- Renew gaskets (2).

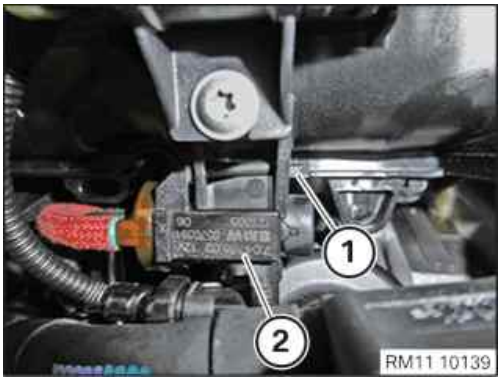
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



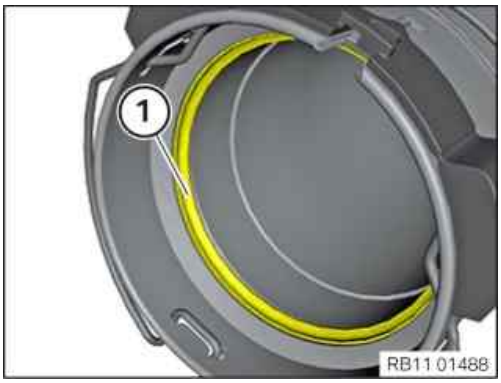
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

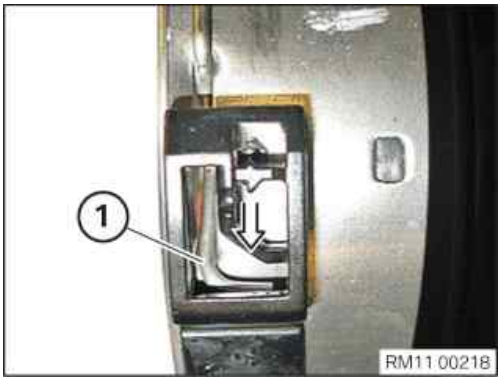


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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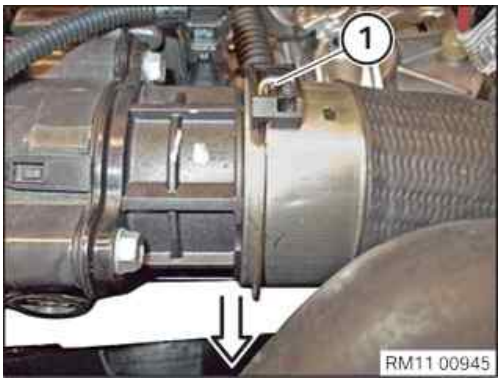
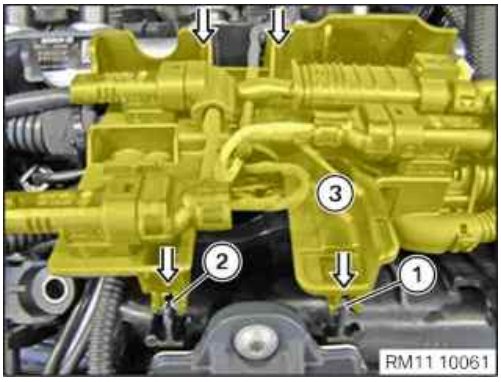


- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

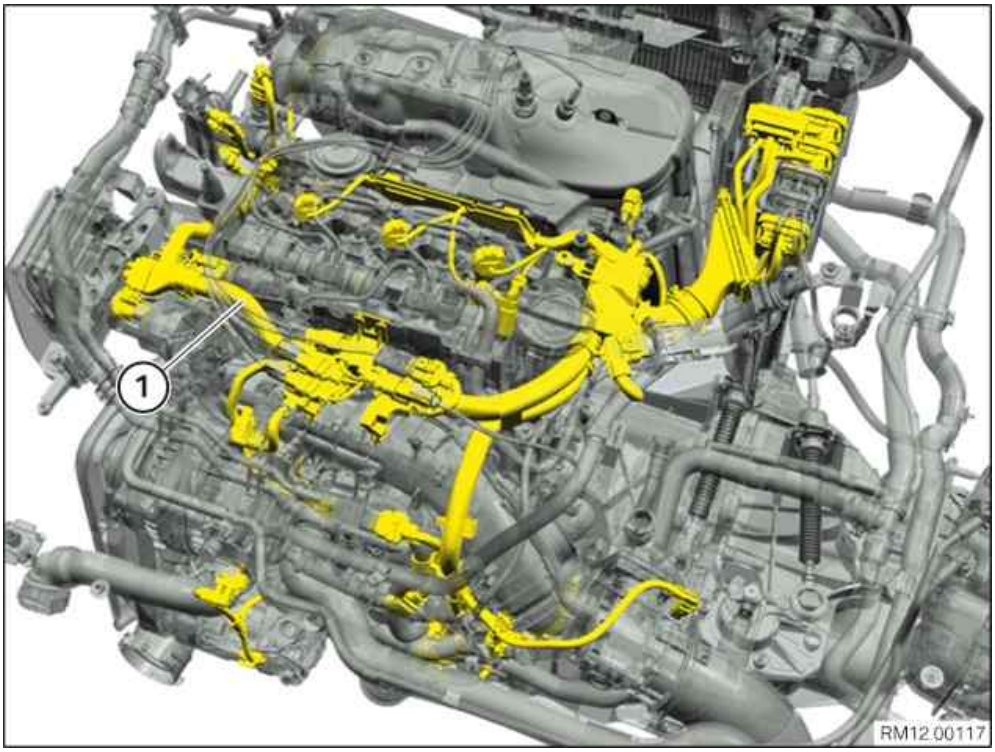
124 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

125 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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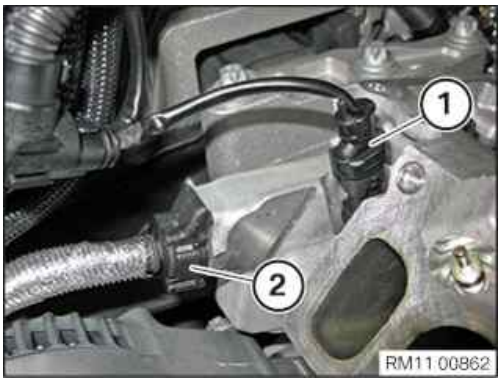
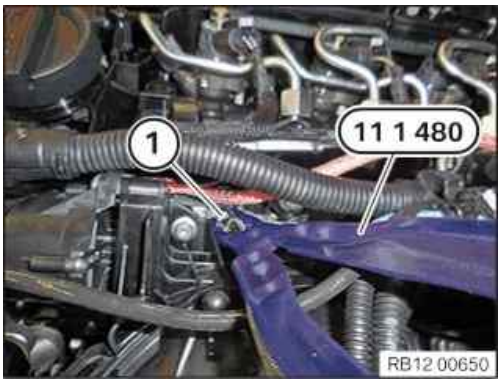
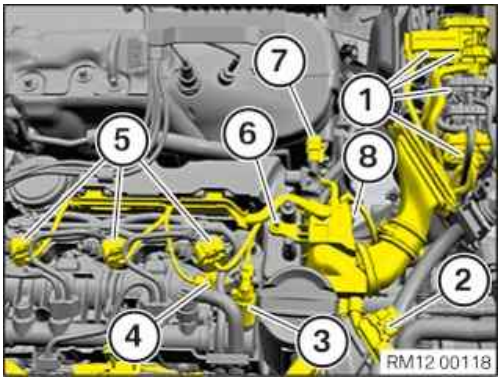


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

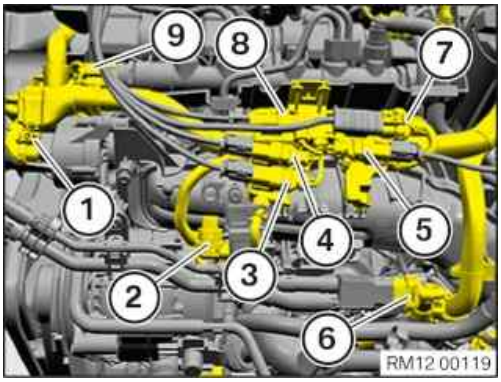


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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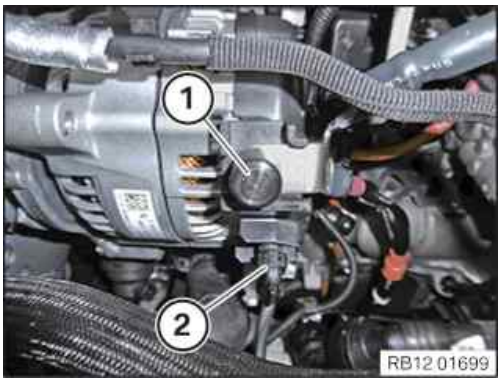
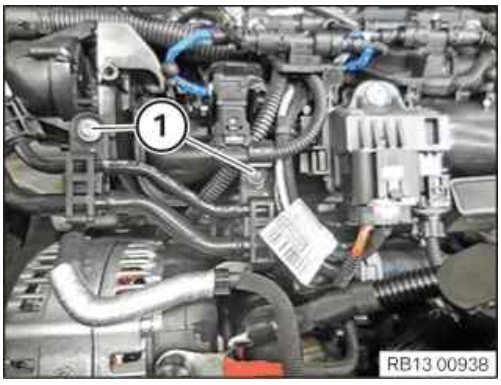


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

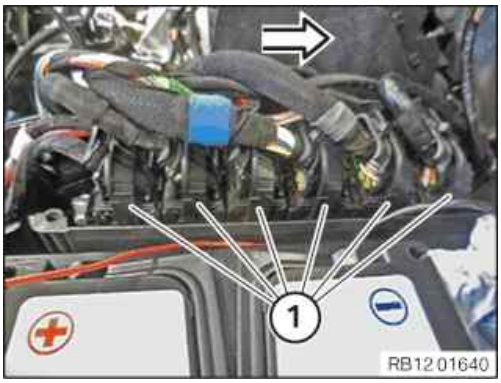


- Position fuel lines.
- Tighten the screws (1).

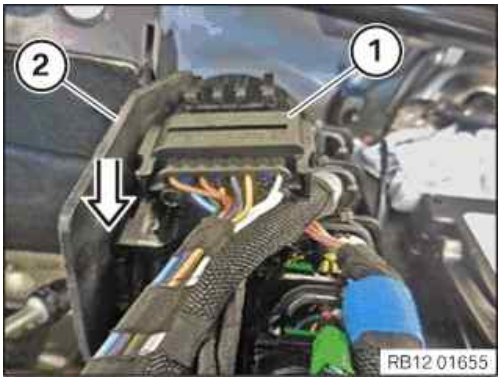
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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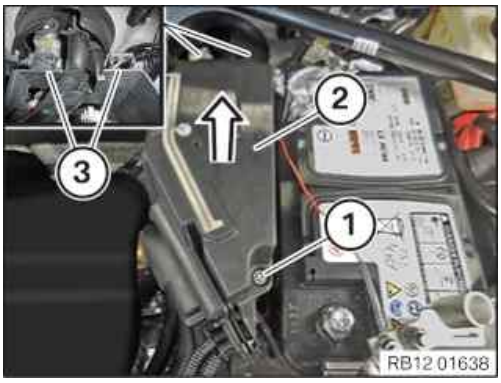
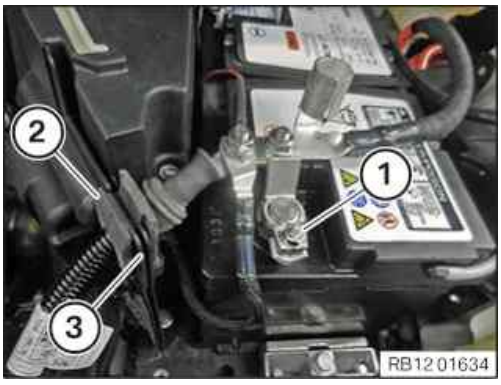


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

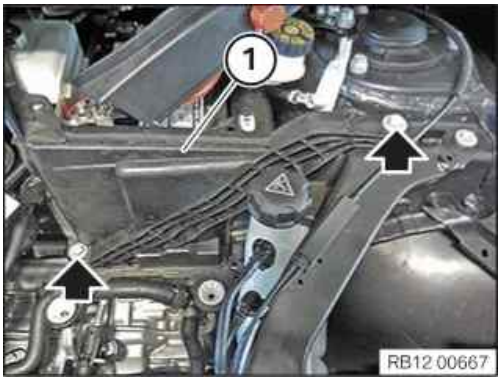
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

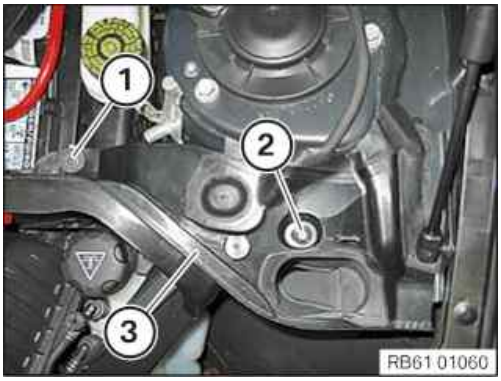
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

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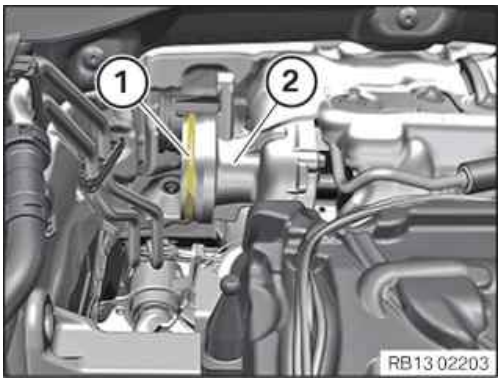
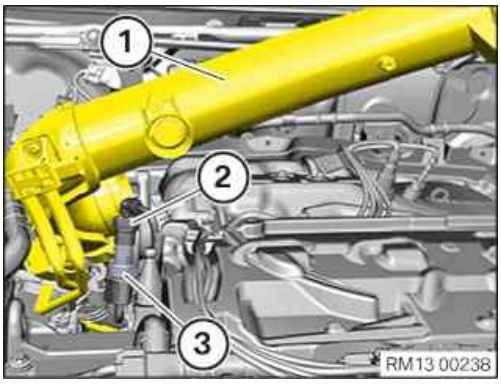


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



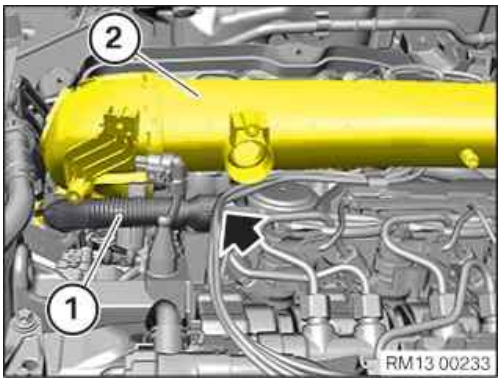
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

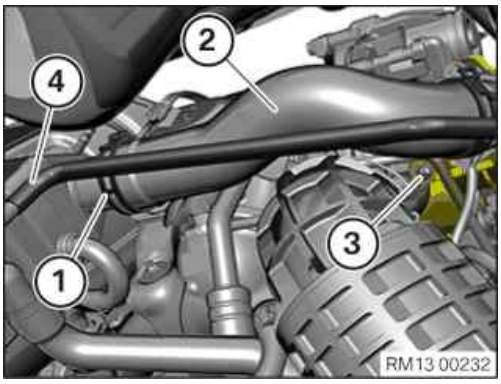
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

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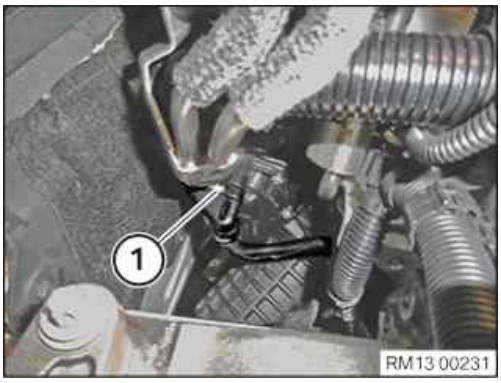
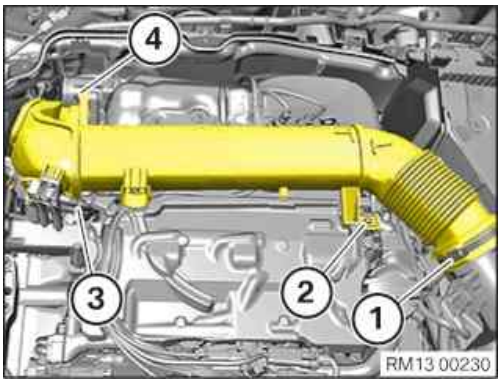


- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

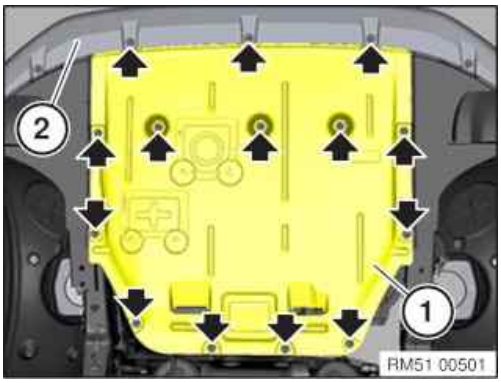
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

127 – Installing the front underbody protection

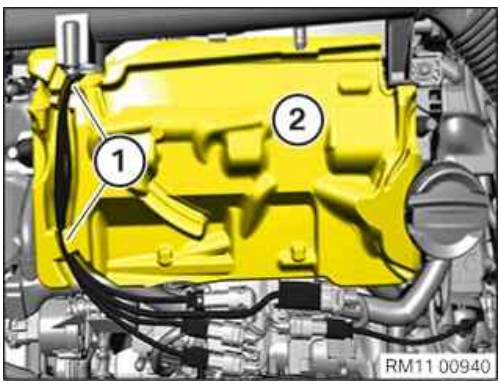


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

128 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

129 – Install resonator

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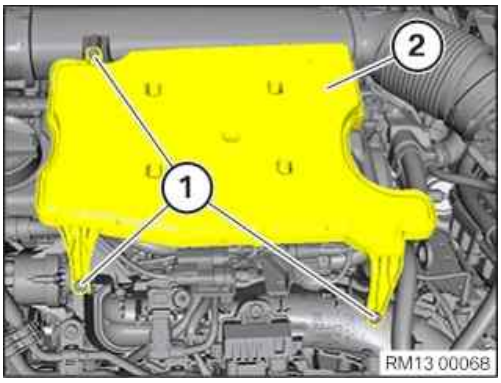

- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

130 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

131 – Install the rear cowl panel cover

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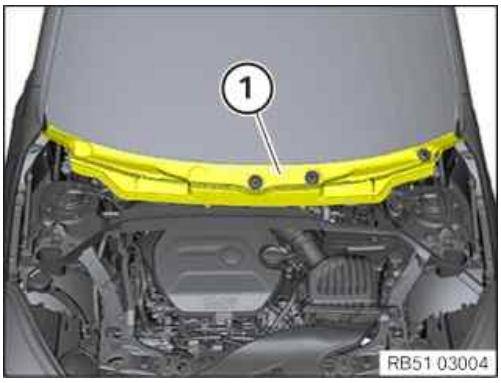
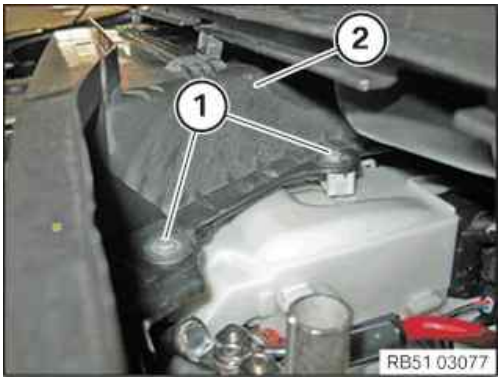


- Feed in and engage the rear cowl panel cover (1).

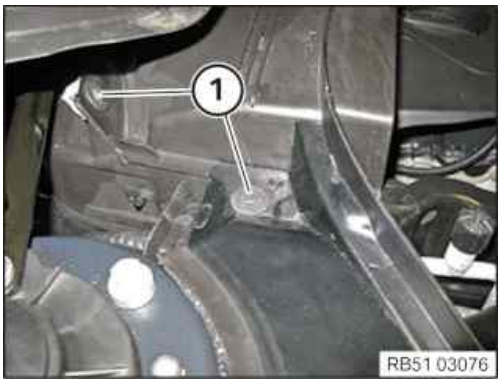
132 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

133 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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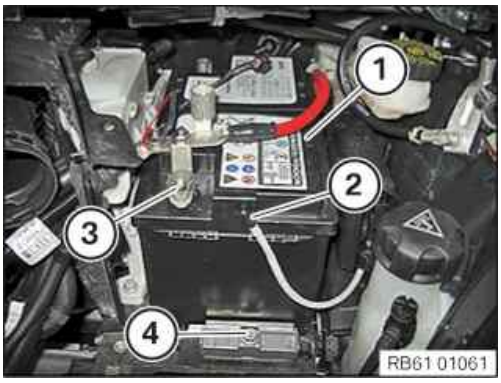


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

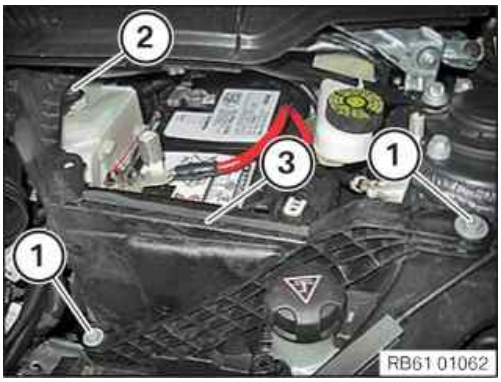
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

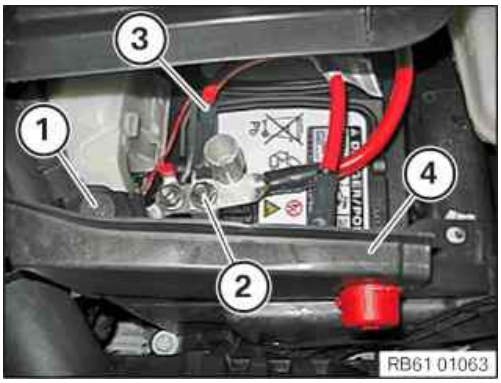
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

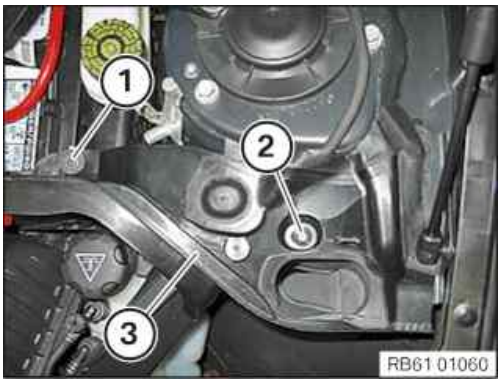
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

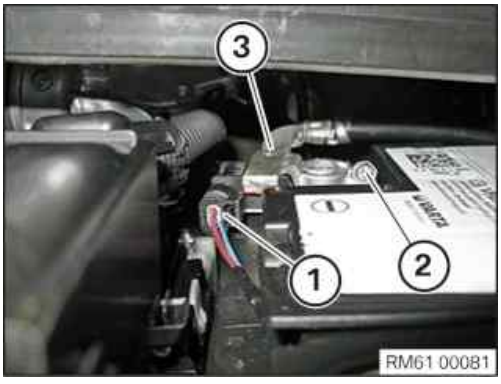
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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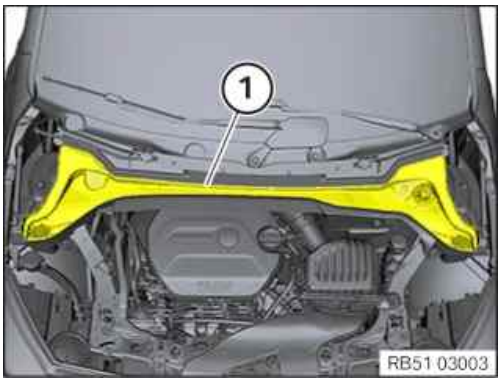
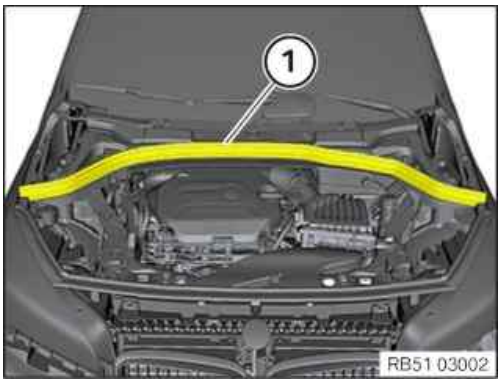


- Feed in the cowl panel cover (1).



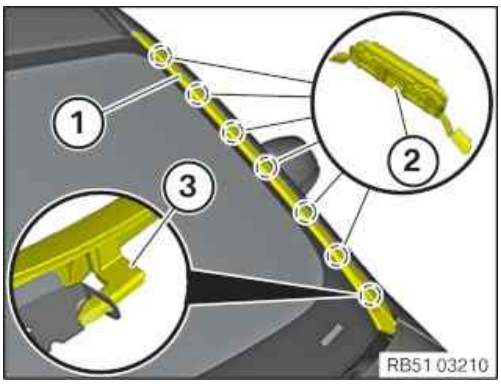
- Press the gasket (1) in a downwards direction.

134 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

135 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

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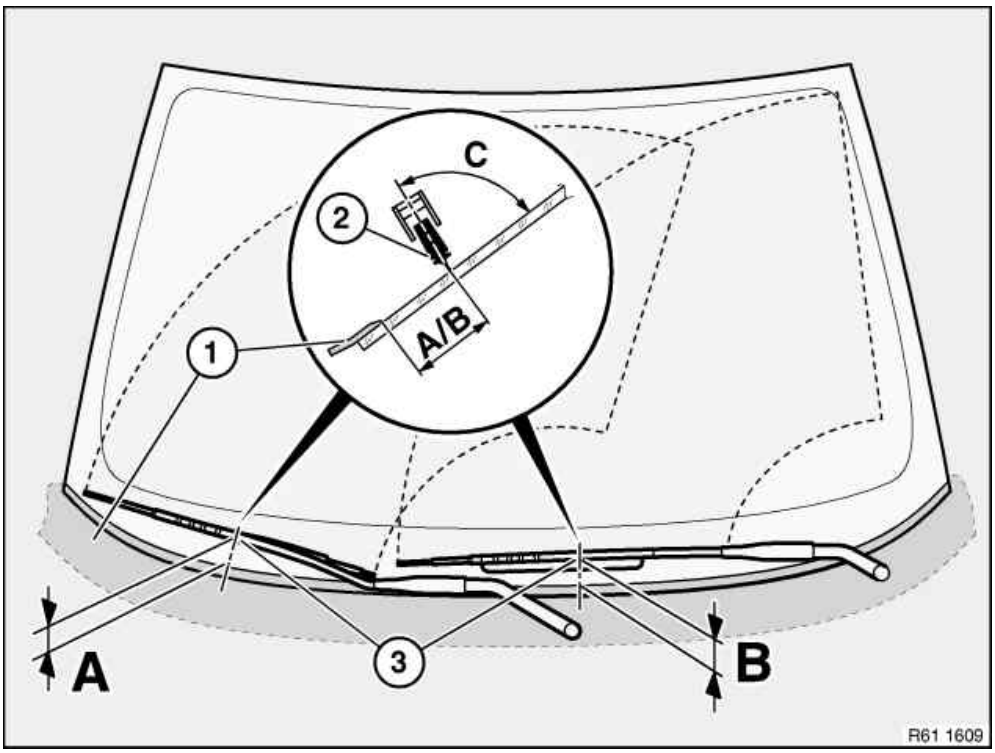
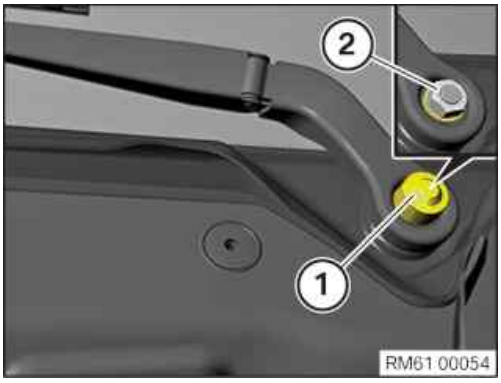
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

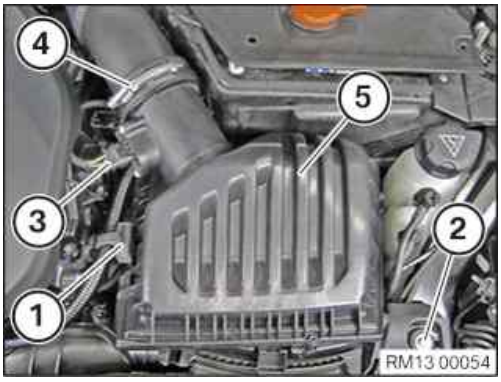
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

136 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

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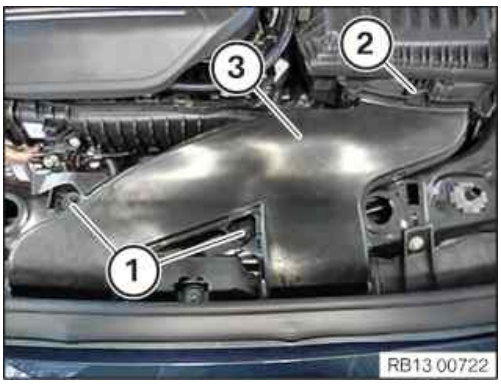
137 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

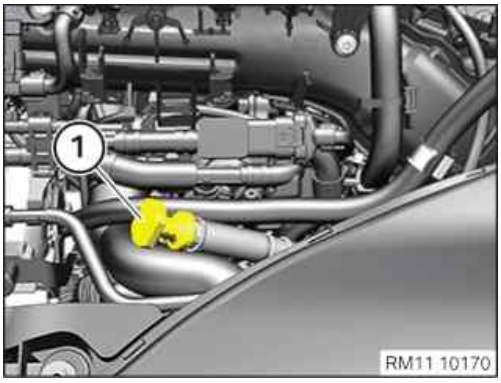
138 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

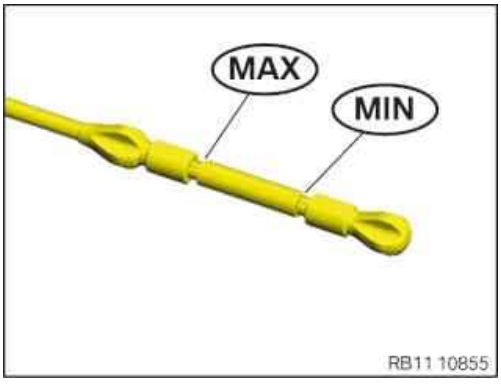


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

139 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Bracing strut to top cross connection — Used in step 32

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 32

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 32

M6x20		Tightening torque	12 Nm

Rear end of front axle support to body — Used in step 67 99

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 67 99

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 67 99 107

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 67 68

M8		Tightening torque	21,5 Nm

Exhaust manifold to cylinder head — Used in step 68 81

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold — Used in step 68 81

Hollow bolt		Renew sealing rings.	30 Nm

Exhaust-gas recirculation cooler to exhaust manifold — Used in step 68 81 120

M8x28	Replace screws	Tightening torque	32 Nm

Coolant temperature sensor at cylinder head — Used in step 68

Temperature sensor		Tightening torque	3,5 Nm

Standard screw connection M8 — Used in step 68 74

M8		Tightening torque	19 Nm

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Glow elements to cylinder head

Used in step 68 71

Glow element		Tightening torque	13 Nm

Cylinder head to crankcase

Used in step 71

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 71

M8x40		Tightening torque	19 Nm

Engine support to cylinder head

Used in step 71

M10X45		Tightening torque	41 Nm

Right engine mount to cylinder head

Used in step 71

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Camshaft carrier to cylinder head

Used in step 72

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 74

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M6

Used in step 74

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 75

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 76

M7x17.			17 Nm

Exhaust turbocharger to exhaust manifold

Used in step 83

V-band clamp		Tightening torque	19 Nm

Oil feed line to exhaust turbocharger

Used in step 83

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Oil return line to turbocharger

Used in step 83

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 83

M8x16		Tightening torque	22 Nm

Charge air line to crankcase

Used in step 84

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 84

M6		Tightening torque	8 Nm

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Heat shield for exhaust turbocharger — Used in step 85 86 111

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 85

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 87

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 87

M8 hexagon nut		Tightening torque	19 Nm

SCR metering module V-clip to exhaust system — Used in step 87

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter — Used in step 87

Torx bolt BM6x16		Tightening torque	8 Nm

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter — Used in step 87

Flange nutM8		Tightening torque	19 Nm

Control sensor — Used in step 88

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter — Used in step 89 90

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 91

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft — Used in step 92

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter — Used in step 93

Sensor		Tightening torque	50 Nm

Monitoring sensor — Used in step 94

Sensor		Tightening torque	50 Nm

Starter motor to transmission — Used in step 95

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 95

M8		Tightening torque	13,5 Nm

Exhaust system to body — Used in step 96

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 96

Hexagon screw M8x30		Tightening torque	19 Nm

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V-clip to catalytic converter

Used in step 96

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 96

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 96

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 97

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

Front connection carrier to body

Used in step 98

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 98

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing

Used in step 99

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 99

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 100

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support

Used in step 100

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 100

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 100

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 101

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 103

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 105

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 105

Plastic nut		Tightening torque	3 Nm

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Underbody panelling, side

Used in step 106

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 106

Plastic nut		Tightening torque	2,6 Nm

Brake disc to front wheel hub

Used in step 108

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

Used in step 108

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 108

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 110

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 110

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 112

Oval-head screw		Tightening torque	5 Nm

Cylinder head cover to cylinder head

Used in step 113

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 114

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 114 126

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 115

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 115

Screw		Jointing torque Angle of rotation	8 Nm 120 °

Rail on cylinder head cover

Used in step 116

Torx screw M8x25		Tightening torque	19 Nm

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High pressure line between high pressure pump and rail

Used in step 116 117

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 118

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 120

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 120

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 120

M8x20		Tightening torque	19 Nm

Battery holder to engine support

Used in step 121

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 122

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 122 125

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 122 125

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 122 125

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 122 125

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 122 125

		Tightening torque	3 Nm

Battery cover

Used in step 122 125 133

Screw			2,8 Nm

Intake plenum to cylinder head

Used in step 123

M6		Tightening torque	11 Nm

Positive battery cable to alternator

Used in step 125

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 125

TS6x20		Tightening torque	5 Nm

Exhaust gas pressure sensor

Used in step 126

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

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Clean air pipe to exhaust turbocharger — Used in step 126

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 126

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 126 136

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 127

			3 Nm

Resonator to manifold and clean air pipe — Used in step 129

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 132

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 133

M8 screw		19 Nm

Positive battery terminal — Used in step 133

NutM6		5 Nm

Trailing link — Used in step 133

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 133

Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 133

NutM6		5 Nm

Windscreen wiper arm — Used in step 135

Combination hexagon nut		Tightening torque	35 Nm

Intake silencer housing to lock bridge — Used in step 136

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 137

M6		Tightening torque	8 Nm

Overview of Special Tools

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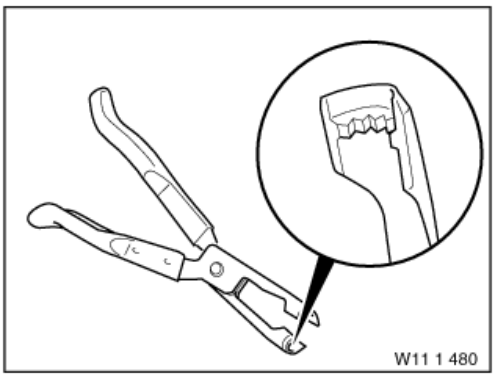
0 490 796 (11 1 480) Pliers



Common	Used in step 20 68
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common	Used in step 24 25 26 116 117 118
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

2 413 106 Fastener

Common	Used in step 24 25 117 118
Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

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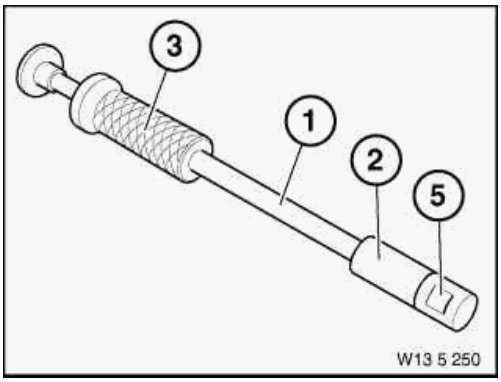
0 493 321 (13 5 250) Puller



Common Used in step 27

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common Used in step 27

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 27

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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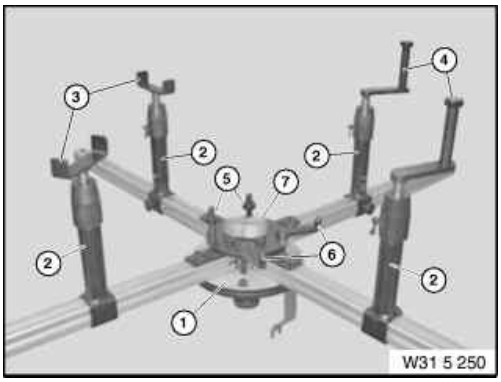
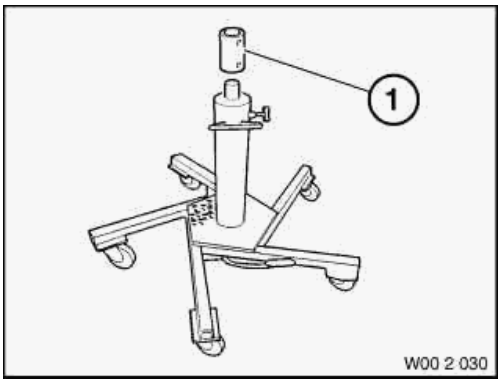
0 495 817 (31 5 251) Basic body



Common Used in step 43 67 71 99

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



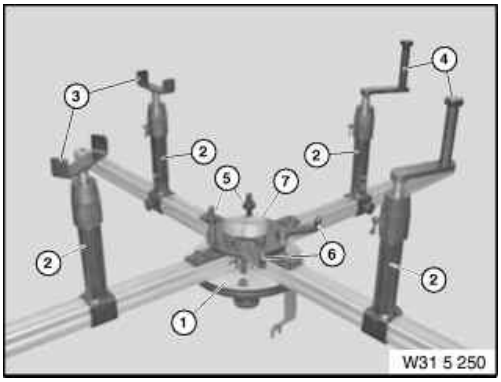
Common Used in step 43 67 71 99

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 821 (31 5 255) Adapter



Common Used in step 43 71

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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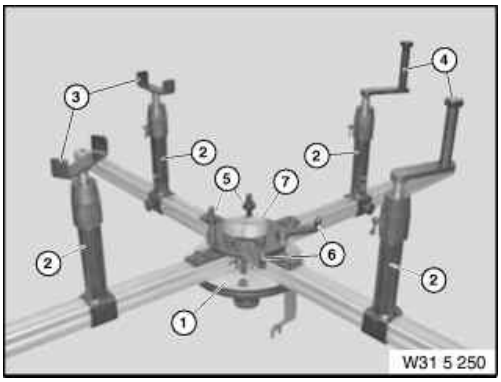
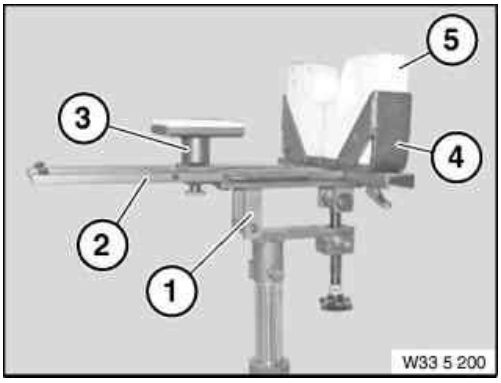
0 495 819 (31 5 253) Adapter



Common	Used in step 43 71
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt



Common	Used in step 43 67 71 99
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

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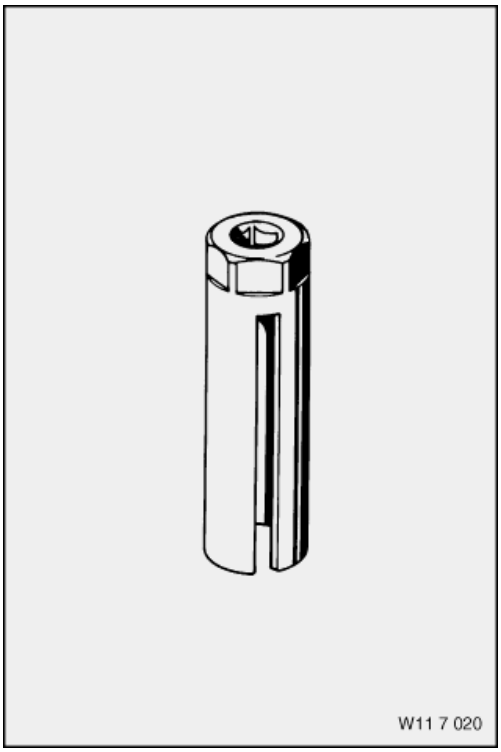
0 491 074 (11 7 020) Socket wrench insert



Common	Used in step 48 49 94
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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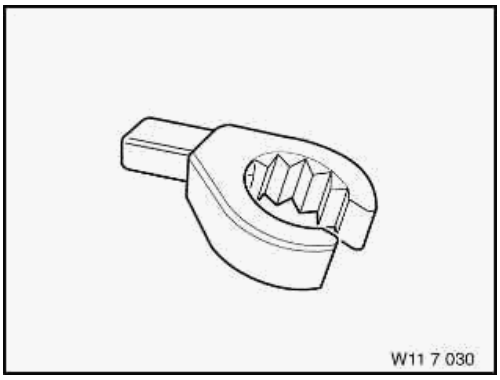
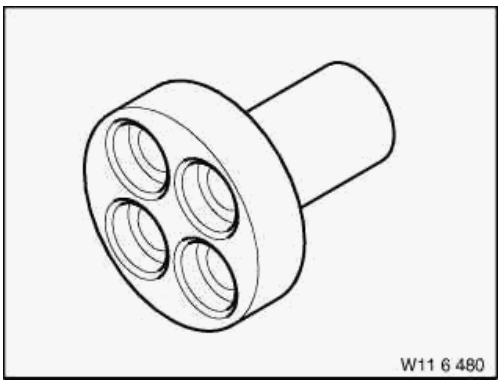
0 491 075 (11 7 030) Socket wrench insert



Common	Used in step 54 88
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

0 493 380 (11 6 480) Connector



Common	Used in step 62 79
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 62 78 79
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common	Used in step 62 77 79
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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2 414 691 Support

Common Used in step 67 71

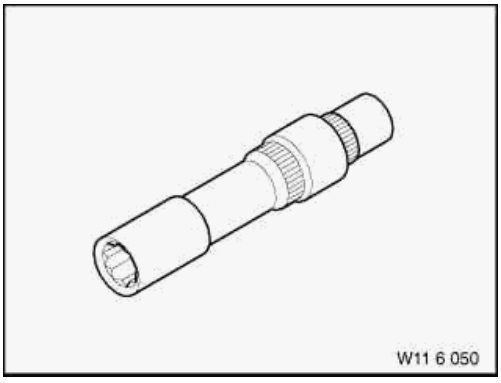
Usage	To support the engine when the engine support is removed.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	2357071
SI-Number	01 12 16 (406)

2 357 071 Panel

Common Used in step 67 71

Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 67 68 71

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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2 459 012 Holder

Common Used in step 67 71

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 490 561 (11 0 000) Lifting gear

Used in step 67 71

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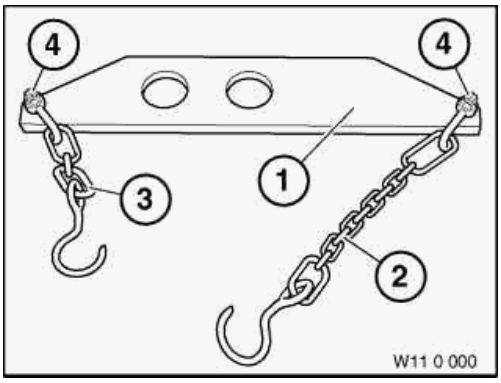

Common

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 67 68

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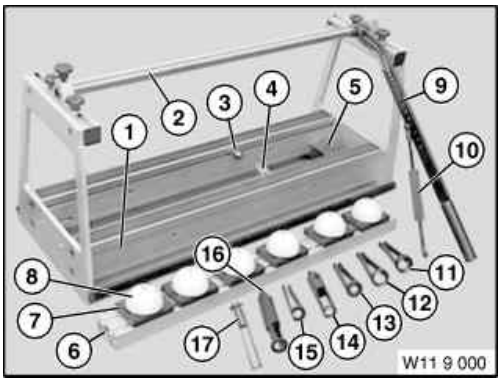

Common

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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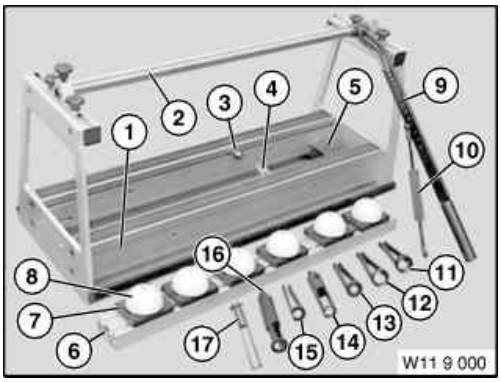
0 494 366 (11 9 001) Device



Common		Used in step 68
Usage		
Included in the tool or work	0 494 362	
Storage location		
Replaced by		
In connection with		
SI-Number		

0 495 187 (00 2 300) Assembly stand

Used in step 68

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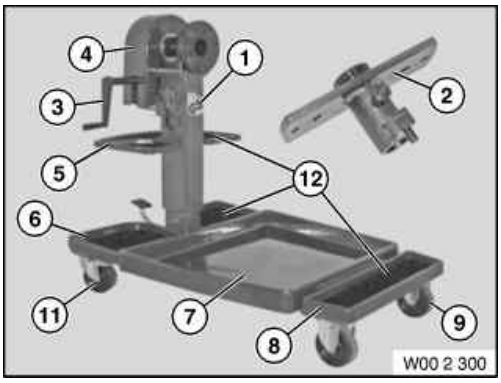

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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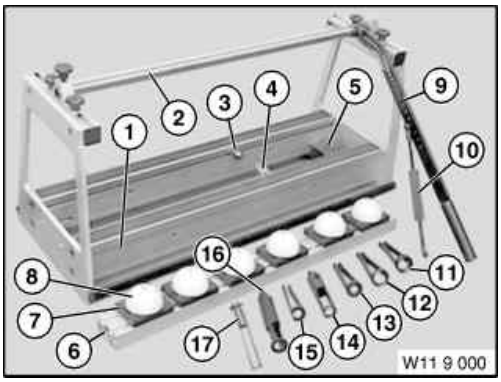
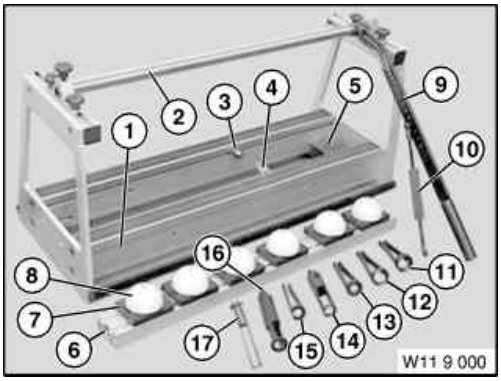
0 494 371 (11 9 006) Insert



Common Used in step 68

Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 372 (11 9 007) Shaped part



Common Used in step 68

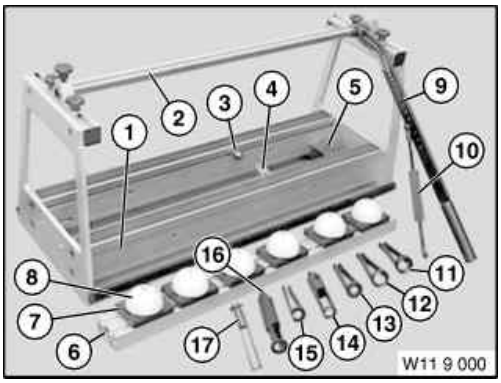
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part

Common Used in step 68

Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 370 (11 9 005) Quick fastener



Common Used in step 68

Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 494 374 (11 9 009) Lever

Common	Used in step 68
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 143 (11 8 840) Basket

Common	Used in step 68
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray

Common

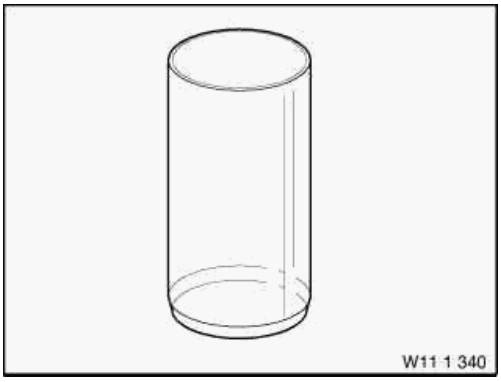
Used in step 68

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 490 746 (11 1 380) Holding sleeve



Common

Used in step 68

Usage	(Assembly sleeve) For fitting the valve stem seal, diameter 7 mm
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	

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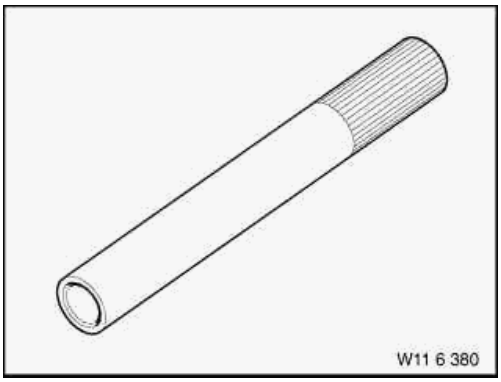
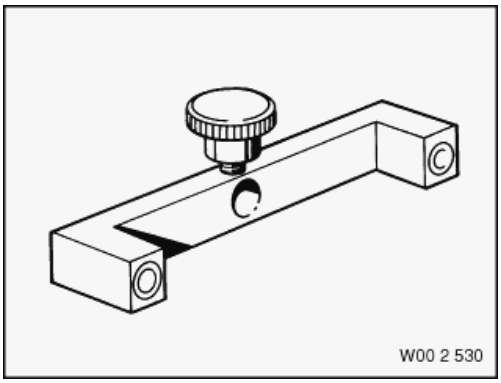
0 493 249 (11 6 380) Bush



Common	Used in step 68
Usage	For fitting valve stem seal
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

0 490 185 (00 2 530) Bridge



Common	Used in step 68
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

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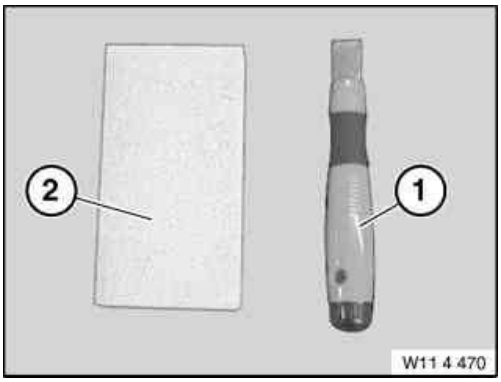
0 495 102 (11 4 470) Tool



Common Used in step 68 81

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 358 042 Holder

Common Used in step 68

Usage	For removing and installing the engine.
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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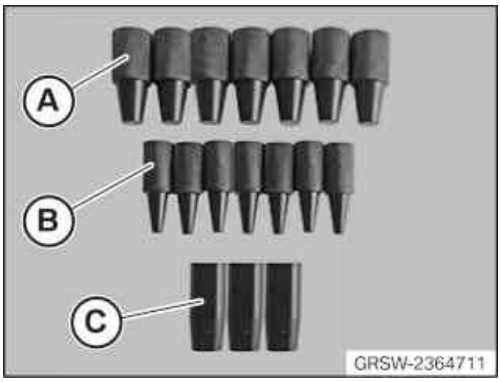
2 364 711 Plug

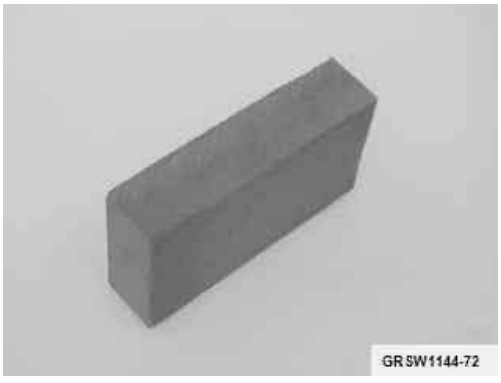


Common	Used in step 69
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common	Used in step 69
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 69
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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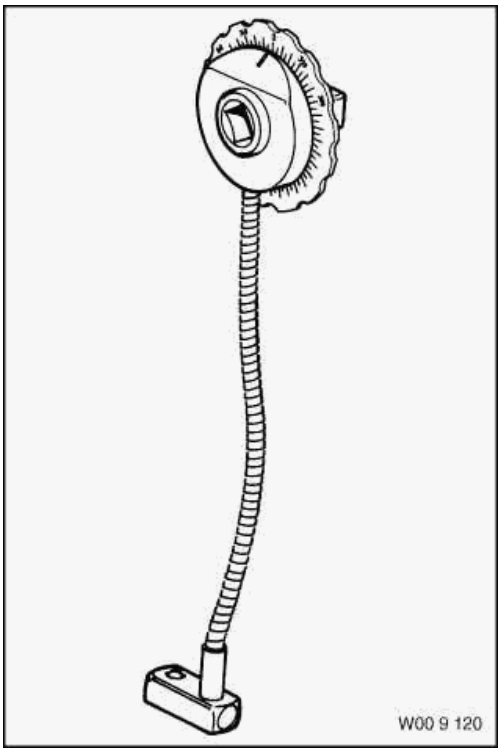
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 71

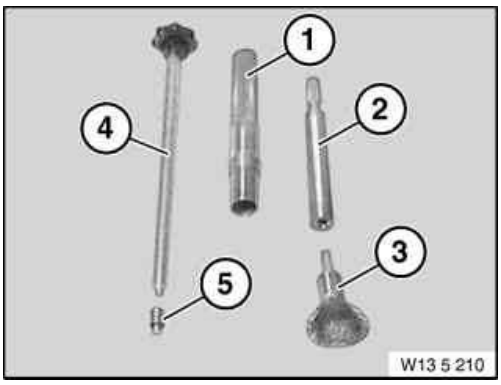
Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

2 344 011 Tool

Common Used in step 108

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common Used in step 115

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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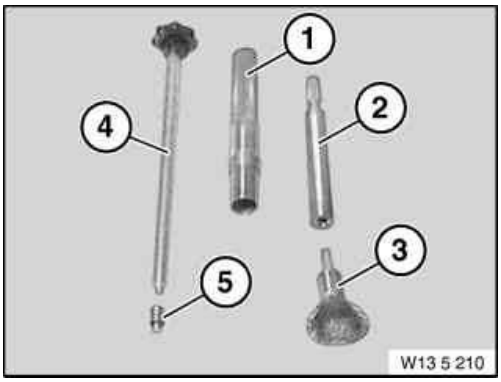
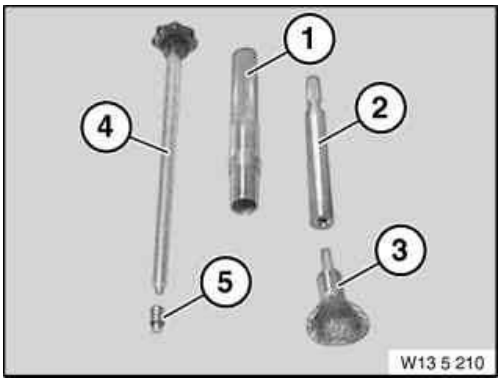
0 493 762 (13 5 214) Rod



Common Used in step 115

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



Common Used in step 115

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

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0 495 221 (36 1 323) Wheel stud

Common	Used in step 34
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 34
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 34
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 34
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud

Common	Used in step 34
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 34
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 34
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 230 (36 1 333) Wheel stud

Common	Used in step 34
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

2 299 563 Adapter

Common	Used in step 68
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Valve underprotrusion	Used in step 68
	0,8 (0,7 - 0,9) mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 120
EGR controller	19 120
Troubleshooting on the exhaust turbocharger	83

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 133
61 12 ... Notes on intelligent battery sensor (IBS)	1 133
61 00 ... Notes for disconnecting and connecting battery	1 133

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	16 27 28 48 49 51 52 53 54
11 65 020 Turbocharger damage due to blocked oil supply lines	83
11 65 ... Test steps in the event of turbocharger damage	83
17 00 008 Draining and topping up coolant for high-temperature circuit	139
17 00 008 Draining and topping up coolant for high-temperature circuit	139
17 00 008 Draining and topping up coolant for high-temperature circuit	139

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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	139
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	139
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	139
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	139
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	139
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	139
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	139
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	139
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	139
17 00 039 Bleeding cooling system (B37, B47)	139
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	139
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	139
17 00 008 Draining and topping up the high-temperature coolant circuit	139
17 00 008 Draining and topping up the high-temperature coolant circuit	139
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	139
17 00 008 Draining and topping up the high-temperature coolant circuit	139
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	139
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	139
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	139
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	139

Operating materials	Used in step

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2.0 Grease for wheel centring 108

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	75
Exhaust-gas recirculation cooler seal on exhaust manifold	120
Exhaust-gas recirculation cooler seal on intake plenum	120

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11 12 631 replace cylinder head

PRELIMINARY WORK

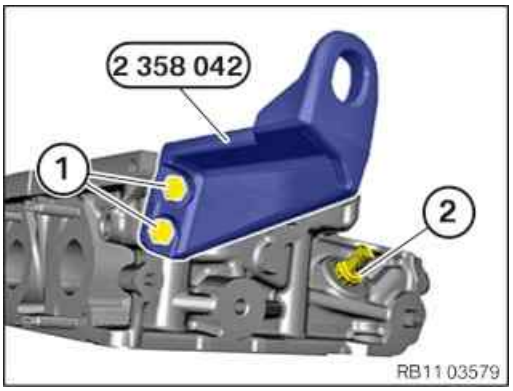
1 – Remove cylinder head.

- See additional information.

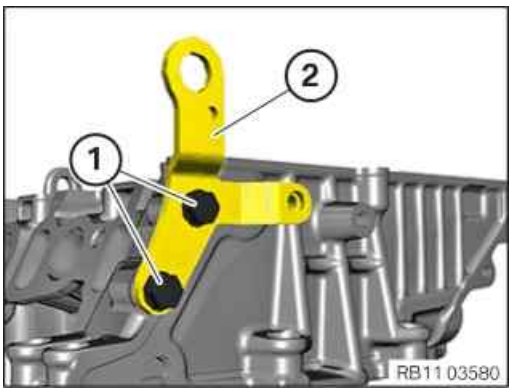
MAIN WORK

2 – replace cylinder head

- Unscrew the preheating elements with special tool **0 491 068 (11 6 050)**.



- Loosen screws (1).
- Remove the special tool **2 358 042** from the cylinder head.
- Loosen the coolant temperature sensor (2).



- Loosen screws (1).
- Remove mounting lug (2) from cylinder head.

▸ **Remove exhaust manifold**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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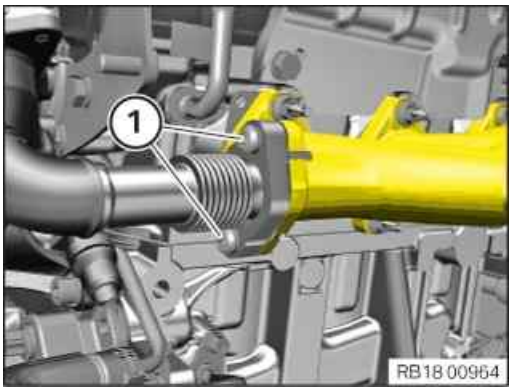
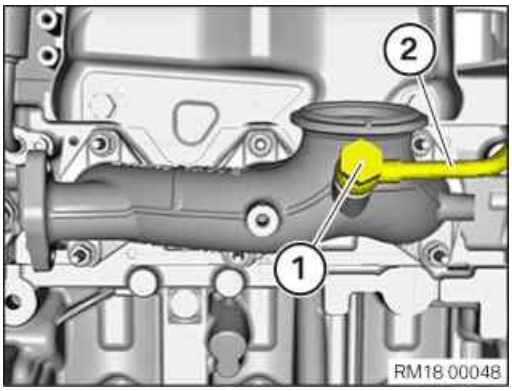
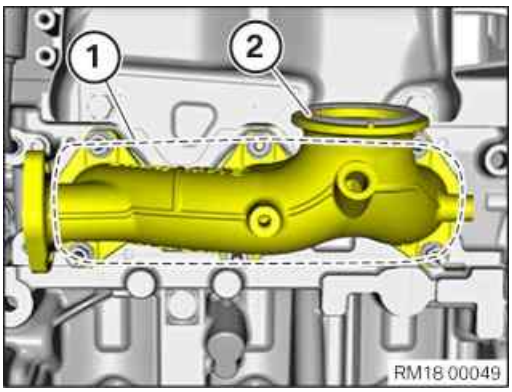


- Loosen screws (1).



- Unscrew the banjo bolt (1).
- Feed out exhaust gas pressure pipe (2) and place to one side.



- Evenly release nuts along the dashed line (1) from outer to inner side.
- Feed out exhaust manifold (2) and remove.

▸ **Remove all valve springs**

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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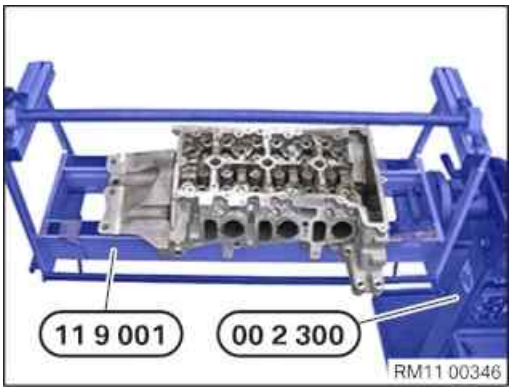
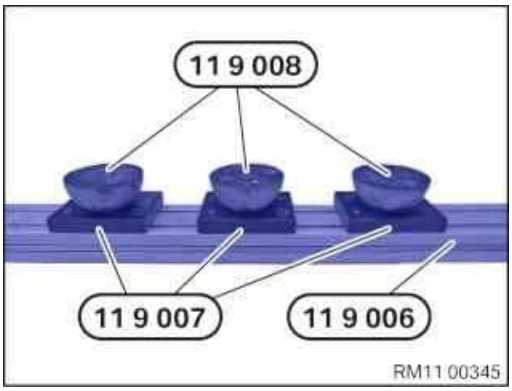
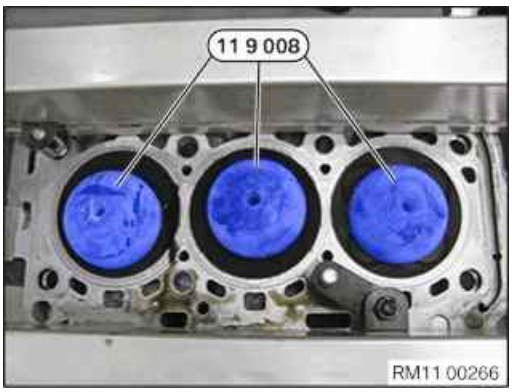


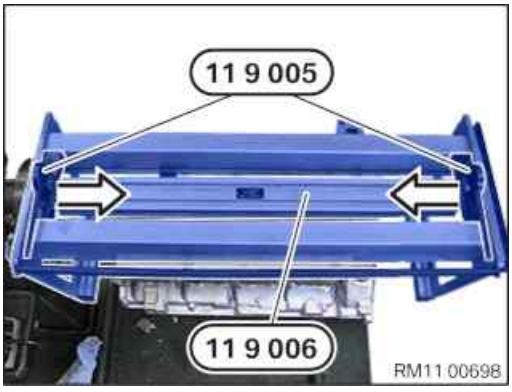
- Mount and bolt special tool **0 494 366 (11 9 001)** on special tool **0 495 187 (00 2 300)**.
- Mount and bolt the cylinder head to the special tool **0 494 366 (11 9 001)**.



- Prepare special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- Make sure that the special tools **0 494 373 (11 9 008)** are positioned as shown in the next operation.



- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Slide the special tool **0 494 370 (11 9 005)** in the direction of the arrow.

- Lock special tool 1**0 494 370 (11 9 005)** in the direction of the arrow.
- Rotate the cylinder head with the special tool **0 494 362 (11 9 000)** by 180° into the installation position.

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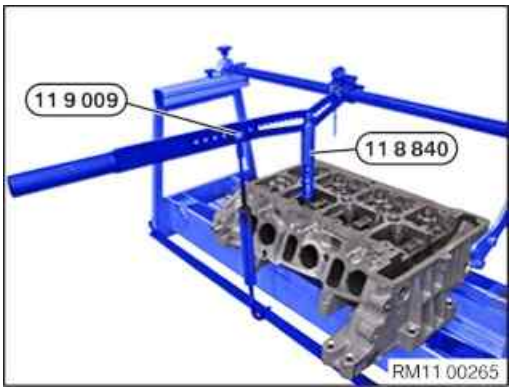


- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.

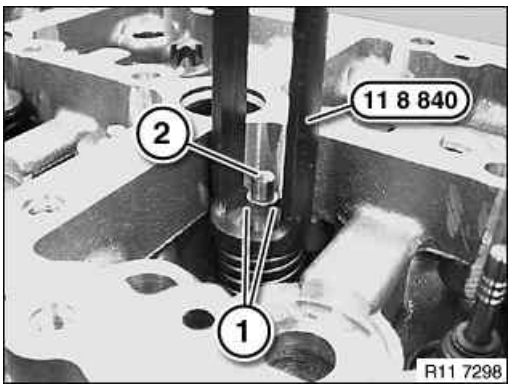
CAUTION

Component with preload.

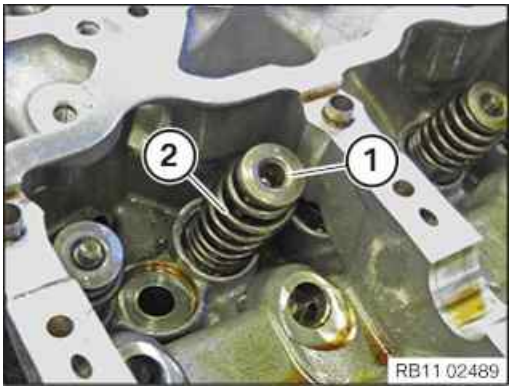
Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Remove the valve shims (1) with a magnet from the valve (2).
- Carefully relieve the valve spring.



- Set the spring cup (1) and the valve spring (2) down in the special tool **0 495 105 (11 4 480)** in order.

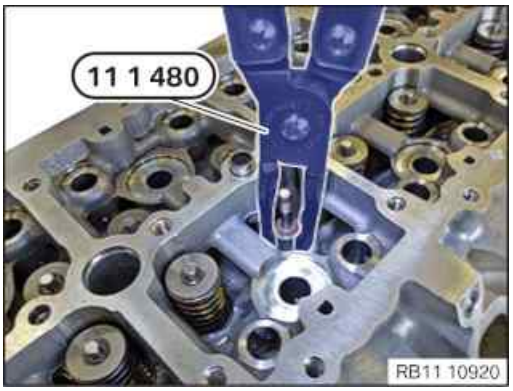
▸ **Remove valve stem seals**

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.



- Disassemble the valve stem seal (1) using the special tool **0 490 796 (11 1 480)** .

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▶ **Remove all valves**

RISK OF DAMAGE

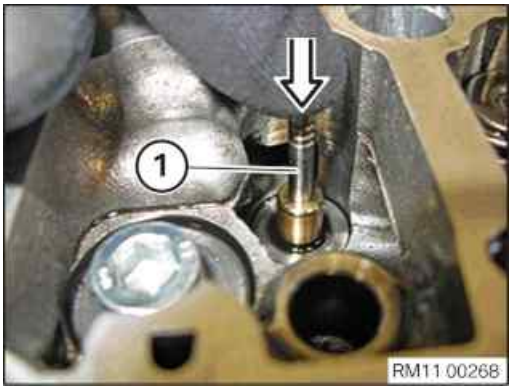
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

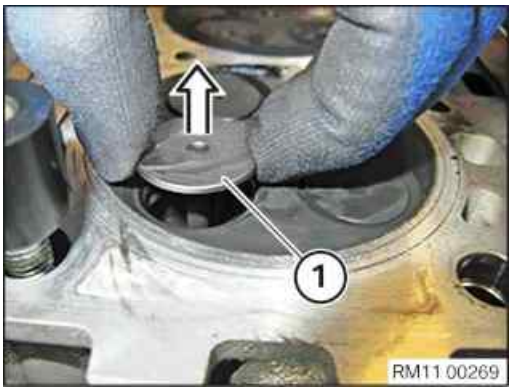
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Turn the cylinder head with the special tool **0 494 362 (11 9 000)**.
- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Remove special tool **0 494 371 (11 9 006)**.

- Remove special tool **0 494 373 (11 9 008)** if necessary.



- Push the valve stem (1) into the cylinder head in the direction of the arrow.



- Remove the valve (1) in the direction of arrow and store it properly in the special tool **0 495 105 (11 4 480)**.

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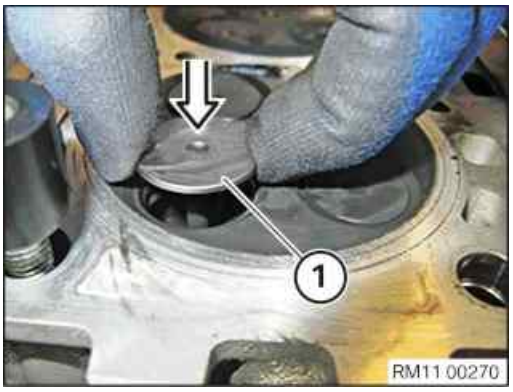
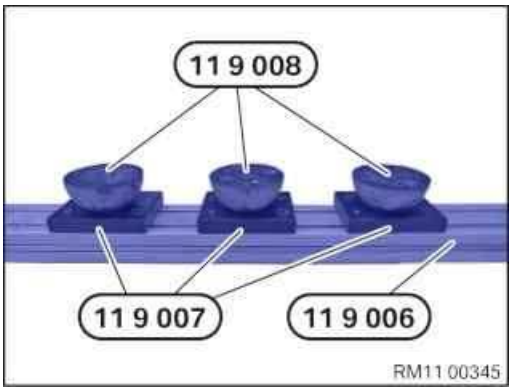
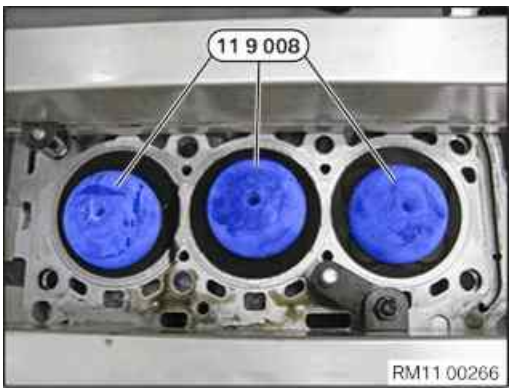


- Install valves (1) in the new cylinder head.

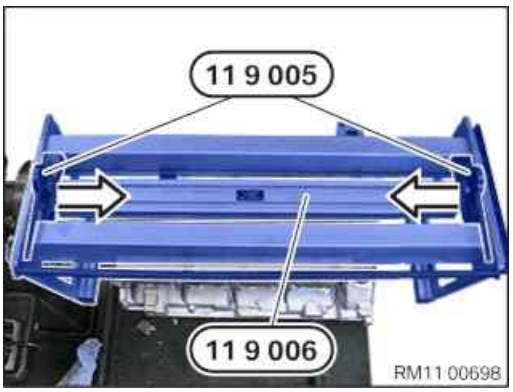
  Parts: Cylinder head
- Feed valves (1) in the direction of arrow and install.
- **Check the valves for tightness.**



- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.



- The special tools **0 494 373 (11 9 008)** must be set up accordingly in the next operation.



- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.

- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.

▸ **Installing valve stem seals**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

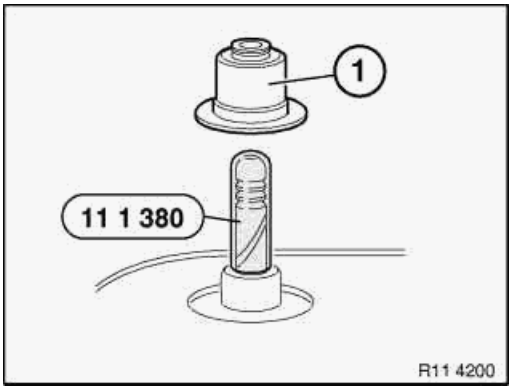
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

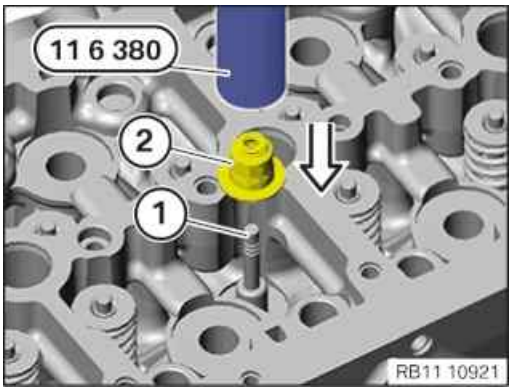
- Do not use any metal-cutting tools.

- Clean the contact surfaces (1).



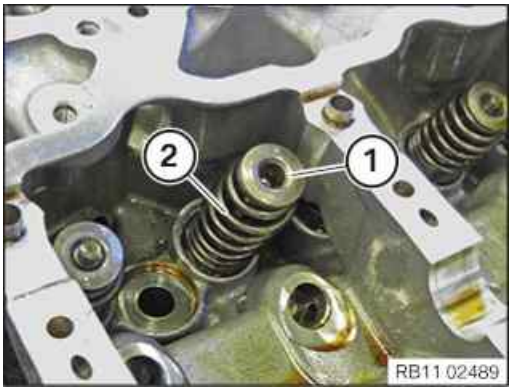
- Fit special tool **0 490 746 (11 1 380)**.
- Oil the valve stem seal (1) and install it.

  Parts: Valve stem seal



- Position the valve stem seals (2) on the valve (1).
- Use special tool **0 493 249 (11 6 380)** to press down the valve stem seal (2) until they are in contact with the cylinder head.

▸ **Install all valve springs**



- The mounting orientation of the valve springs (2) can be freely chosen.
- Install the valve spring (2) and spring cup (1).

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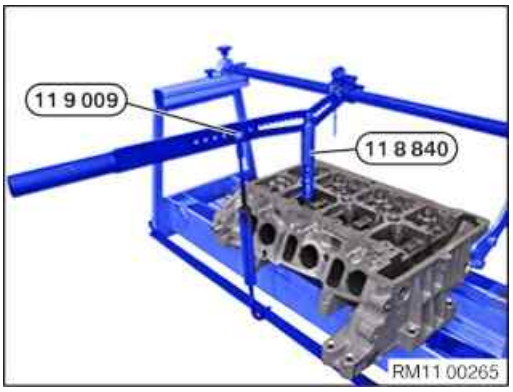


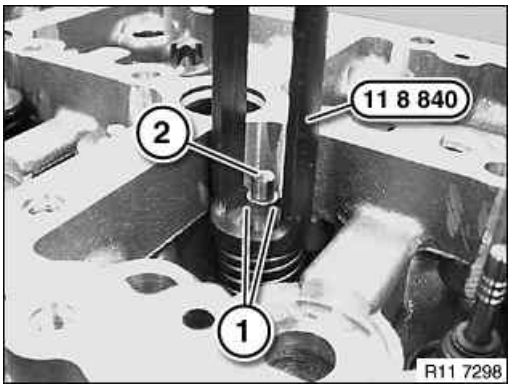
CAUTION

Component with preload.

Danger of injury!

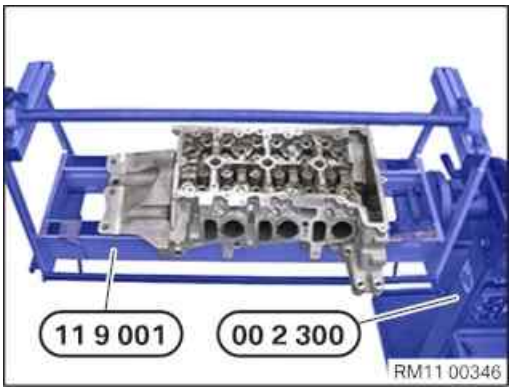
- Reduce preload as far as possible before disassembly. Relieve component.

- Align special tool in direction of valve axis.
- Select the corresponding groove using special tool **0 496 143 (11 8 840)**.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Install the valve shims (1) of the valve (2) with a magnet.
- Relieve load on valve spring.

- Unlock special tool **0 494 370 (11 9 005)** in the direction of arrow and remove.



- Remove cylinder head from special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

▸ **Checking the valve underprotrusion**

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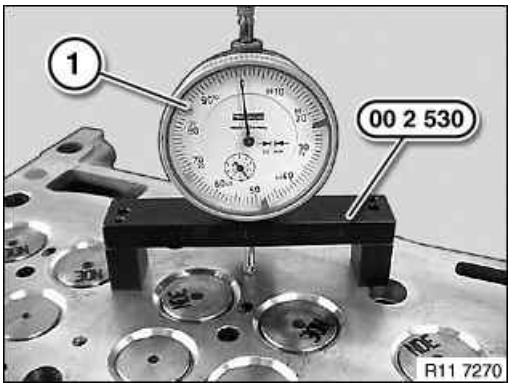
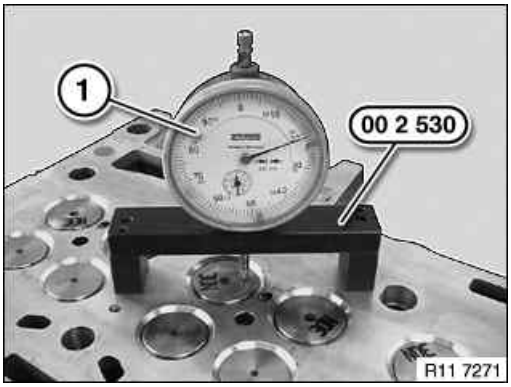


- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

▸ **Installing exhaust manifold**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

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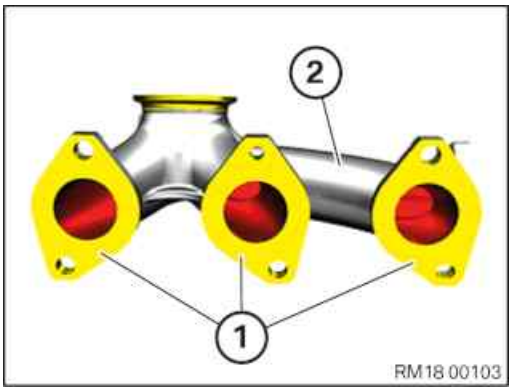
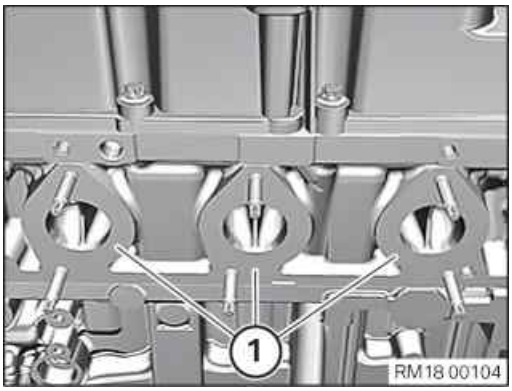
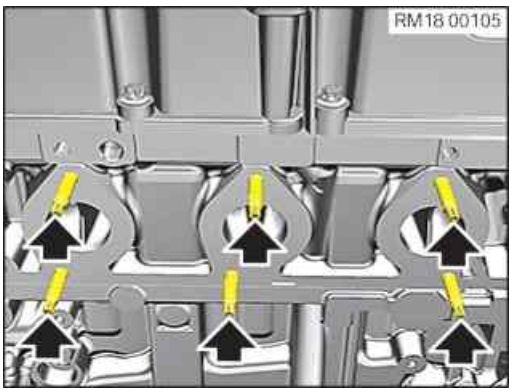


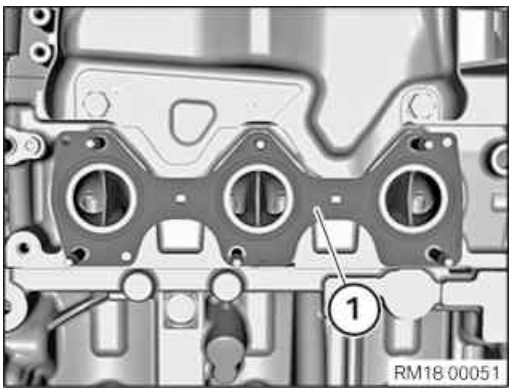
- Clean the connection points (1) on the exhaust manifold (2) with the special tool **0 495 102 (11 4 470)**.



- Clean the connection points (1) on the cylinder head with the special tool **0 495 102 (11 4 470)**.



- Check the stud bolts (arrows) on the cylinder head for **correct** fit.

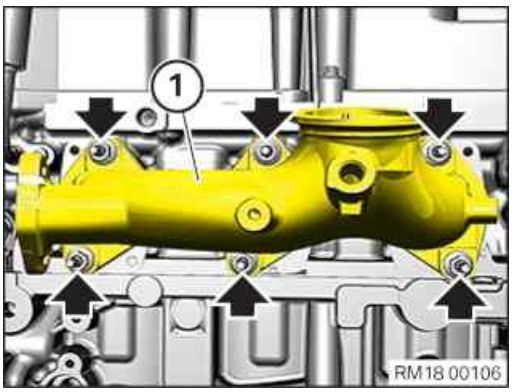


TECHNICAL INFORMATION

The **coated side of the** seal must be mounted facing towards the exhaust manifold.

- Renew the gasket (1).

  Parts: Gasket
- Insert and install the gasket (1).



- Insert and install the exhaust manifold (1).
- Renew the nuts (arrows).

  Parts: Nuts
- Hand-tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.
- Tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.

Exhaust manifold to cylinder head

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm

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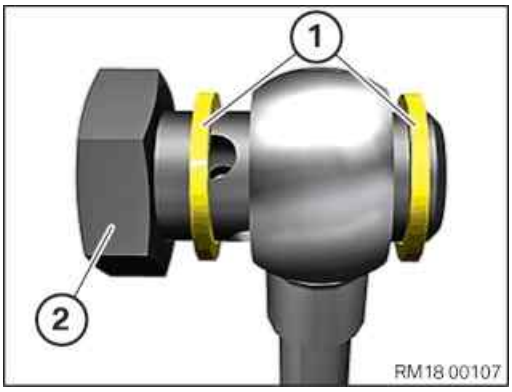
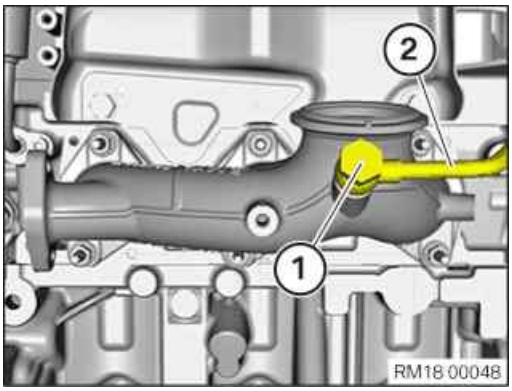


- Renew the sealing rings (1) from the banjo bolt (2).

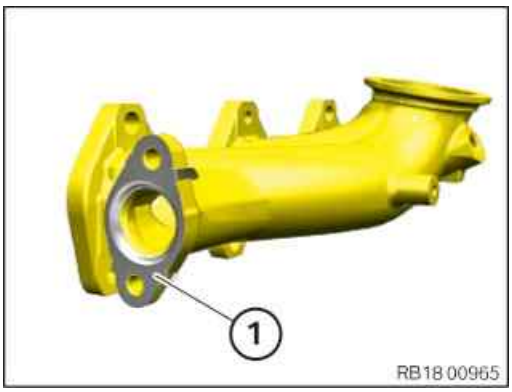
  Parts: Sealing ring



- Insert and install the exhaust gas pressure pipe (2).
- Tighten the banjo bolt (1).

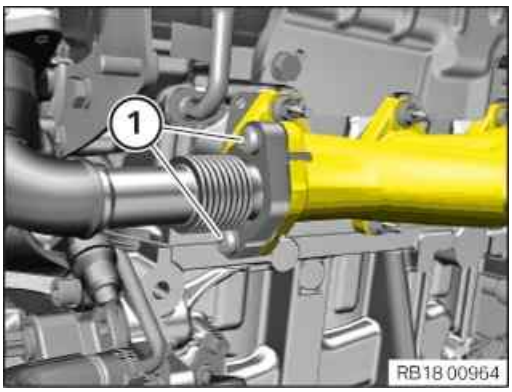
Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt		Renew sealing rings.	30 Nm



- Renew seal (1) between exhaust-gas recirculation cooler and exhaust manifold.

  Parts: Gasket



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Install valves (1) in the new cylinder head.

  Parts: Cylinder head
- Feed valves (1) in the direction of arrow and install.
- **Check the valves for tightness.**

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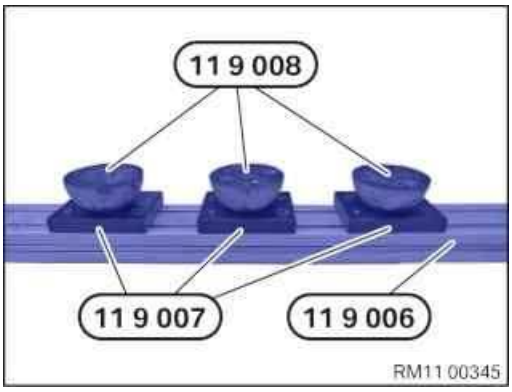
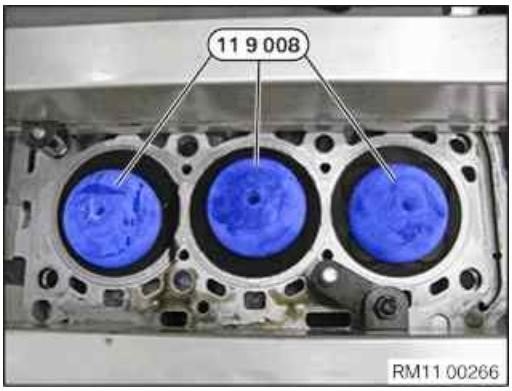
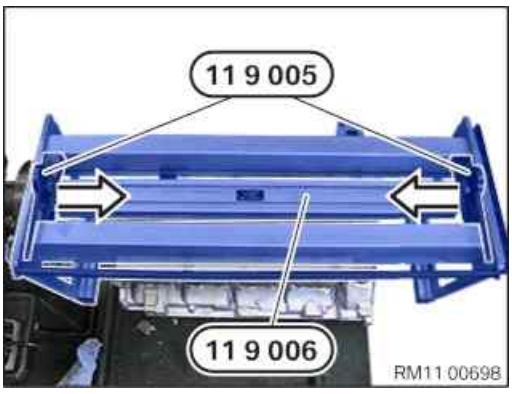


- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.

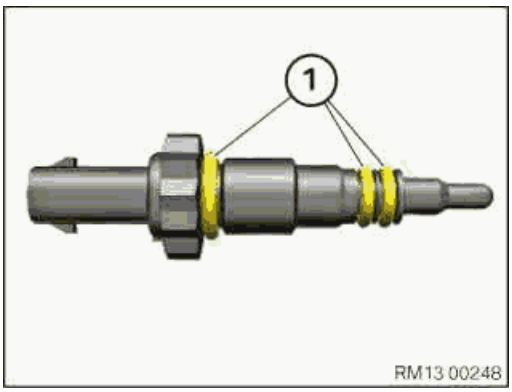


- The special tools **0 494 373 (11 9 008)** must be set up accordingly in the next operation.



- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.

- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180°.



- When reusing coolant temperature sensor sealing rings (1), check for damage, renew if necessary.

  Parts: Sealing ring

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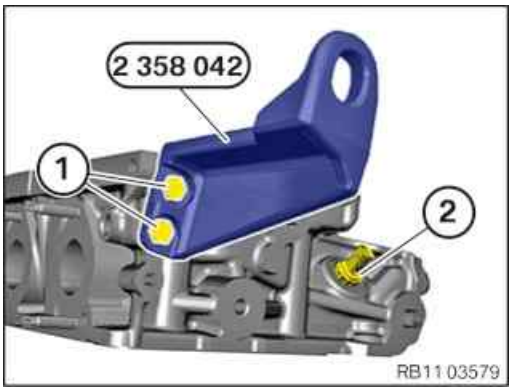


- Attach the special tool **2 358 042** on the cylinder head.
- Tighten the screws (1).

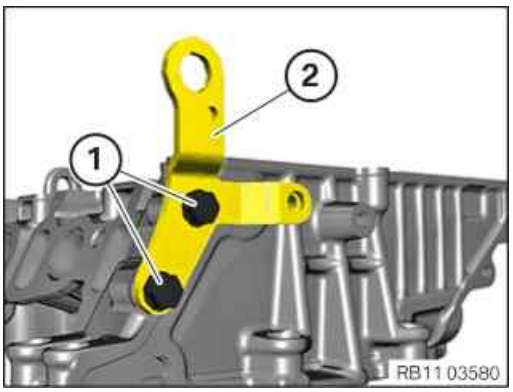
Special tool to cylinder head

M8		Tightening torque	21,5 Nm

- Tighten the coolant temperature sensor (2).

Coolant temperature sensor at cylinder head

Temperature sensor		Tightening torque	3,5 Nm



- Install mounting lug (2) on the rear cylinder head.
- Tighten the screws (1).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Screw in preheating elements using special tool **0 491 068 (11 6 050)** and tighten.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

POSTPROCESSES

3 – Installing the cylinder head

- See additional information.

Additional Information

Overview of Tightening Torques

Exhaust manifold to cylinder head Used in step 2

M7	If necessary, renew loose stud bolts. Replace nuts.	Tightening torque Tightening torque	11 Nm 13 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold Used in step 2

Hollow bolt		Renew sealing rings.	30 Nm

Exhaust-gas recirculation cooler to exhaust manifold Used in step 2

M8x28	Replace screws	Tightening torque	32 Nm

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Special tool to cylinder head Used in step 2

M8		Tightening torque	21,5 Nm

Coolant temperature sensor at cylinder head Used in step 2

Temperature sensor		Tightening torque	3,5 Nm

Standard screw connection M8 Used in step 2

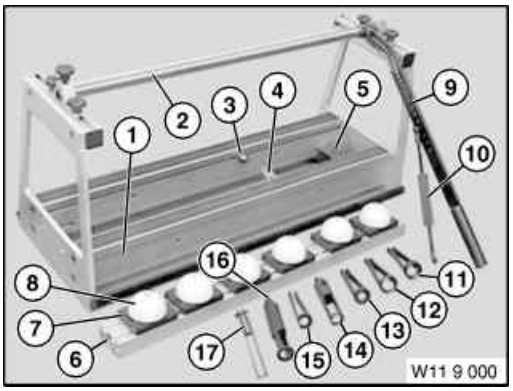
M8		Tightening torque	19 Nm

Glow elements to cylinder head Used in step 2

Glow element		Tightening torque	13 Nm

Overview of Special Tools

0 494 366 (11 9 001) Device



Common Used in step 2

Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 187 (00 2 300) Assembly stand

Used in step 2

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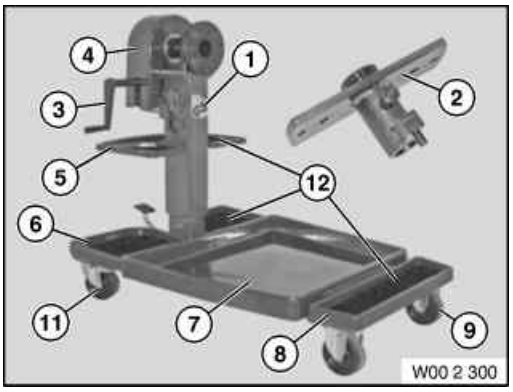

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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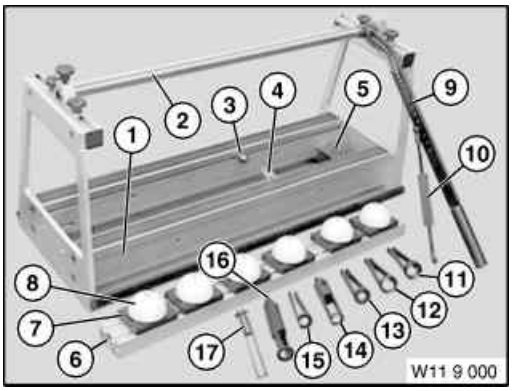
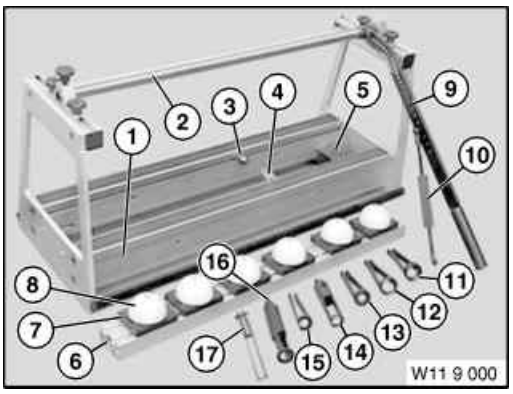
0 494 371 (11 9 006) Insert



Common	Used in step 2
Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 372 (11 9 007) Shaped part

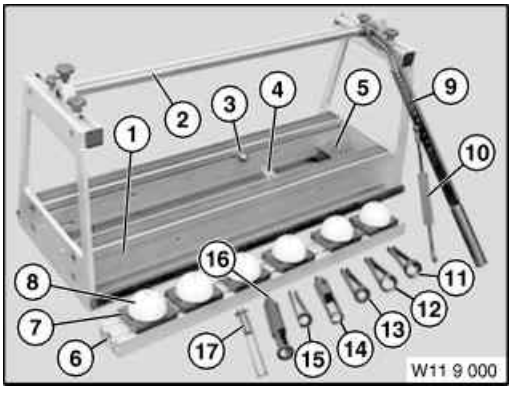


Common	Used in step 2
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part

Common	Used in step 2
Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 370 (11 9 005) Quick fastener



Common	Used in step 2
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 362 (11 9 000) Device

Used in step 2

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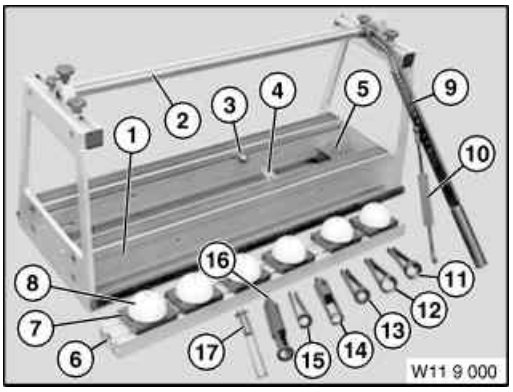

Common

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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0 494 374 (11 9 009) Lever

Common	Used in step 2
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 143 (11 8 840) Basket

Common	Used in step 2
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 495 105 (11 4 480) oddments tray

Common	Used in step 2
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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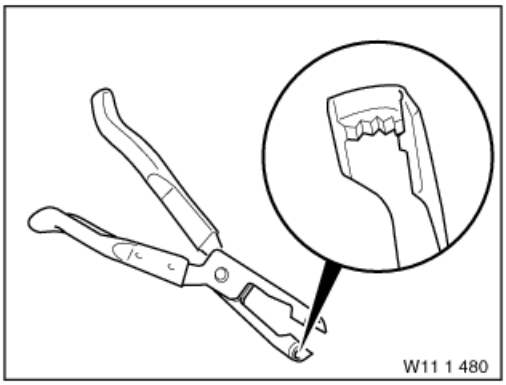
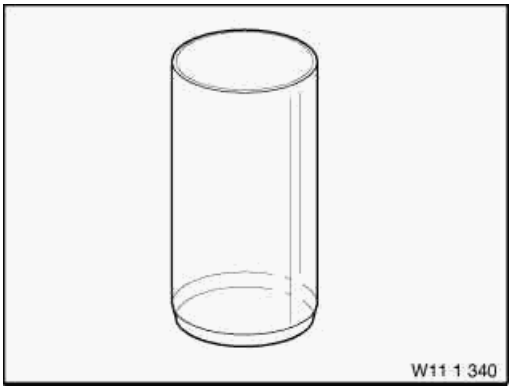
0 490 796 (11 1 480) Pliers



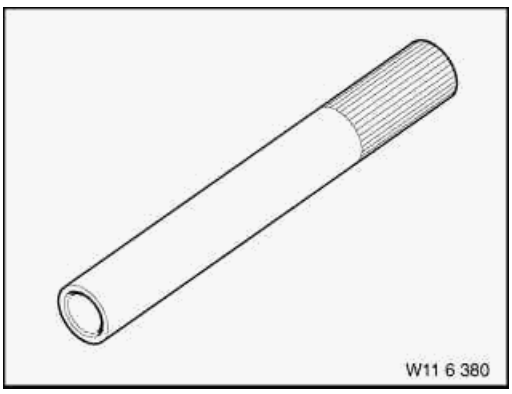
Common	Used in step 2
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 490 746 (11 1 380) Holding sleeve



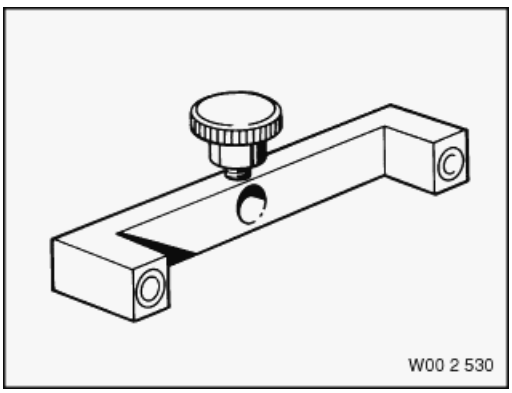
Common	Used in step 2
Usage	(Assembly sleeve) For fitting the valve stem seal, diameter 7 mm
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	

0 493 249 (11 6 380) Bush



Common	Used in step 2
Usage	For fitting valve stem seal
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

0 490 185 (00 2 530) Bridge



Common	Used in step 2
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

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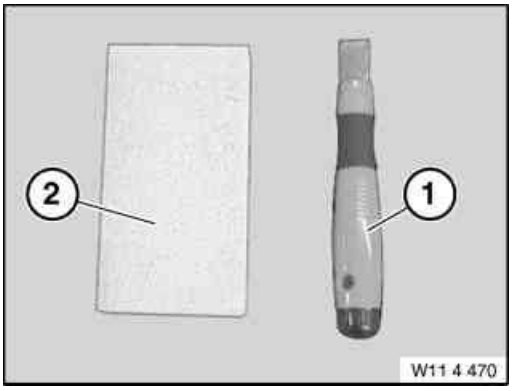
0 495 102 (11 4 470) Tool



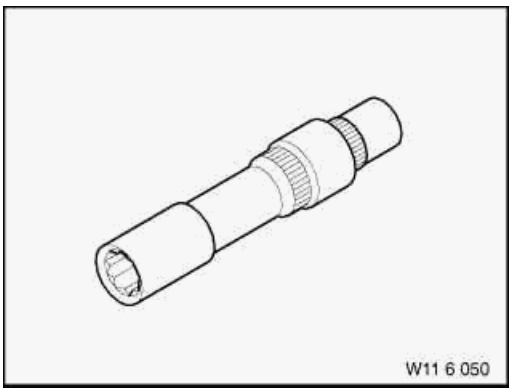
Common Used in step 2

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 2

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 358 042 Holder

Common Used in step 2

Usage	For removing and installing the engine.
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

Replacement tools:

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2 299 563 Adapter

Common	Used in step 2
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Valve underprotrusion	Used in step 2
	0,8 (0,7 - 0,9) mm

Links

Repair instructions	Used in step
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3
11 12 100 Removing and installing cylinder head	1 3

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11 12 101 Replace cylinder head gasket

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Maintain conditions of absolute cleanliness.

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1 – Remove vehicle battery

WARNING

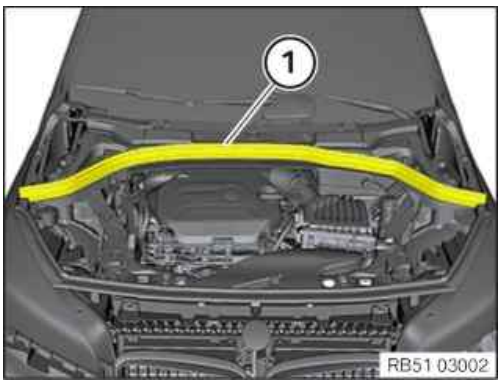
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

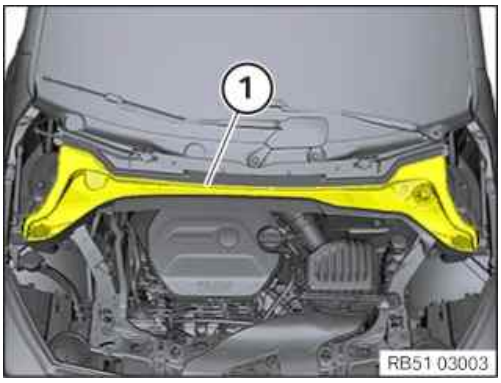
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

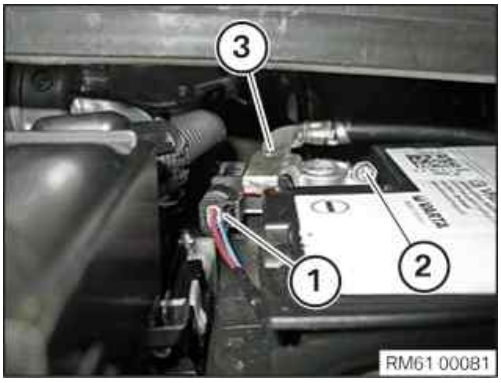
For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).

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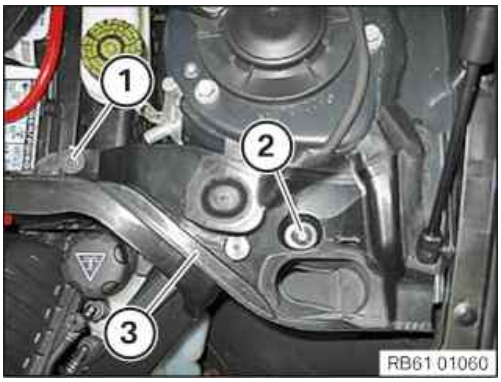
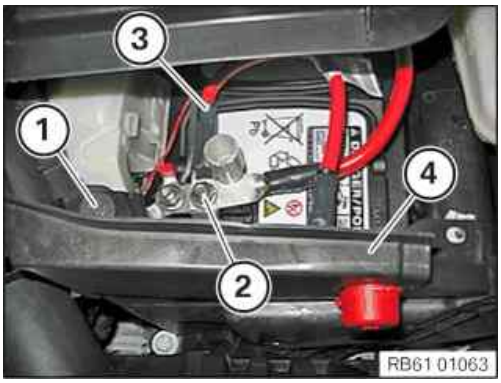
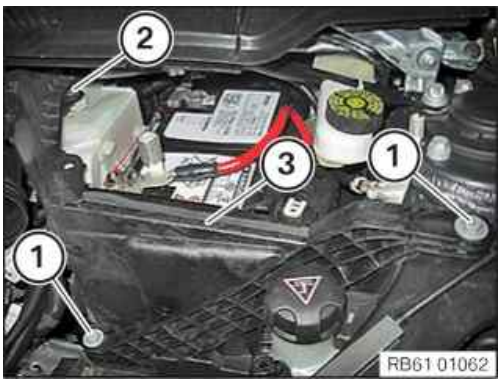


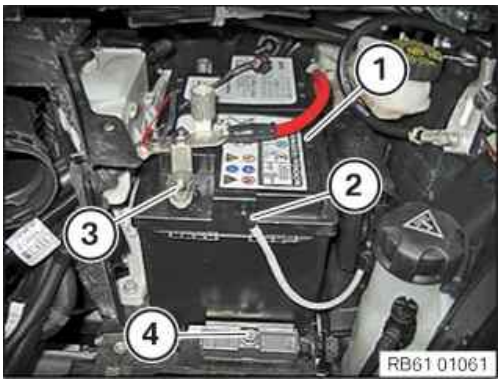
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Removing the upper bulkhead cover

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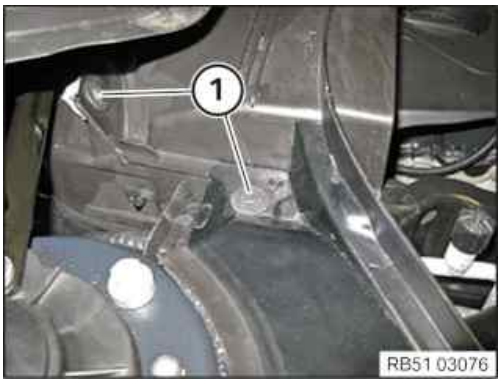
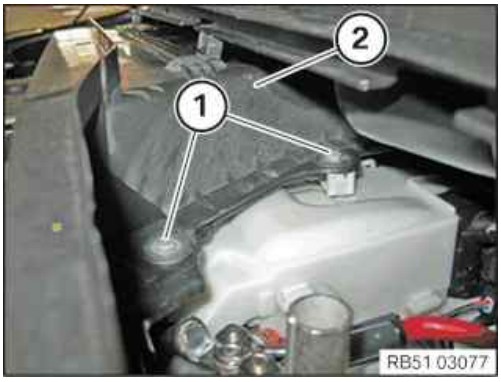
- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

3 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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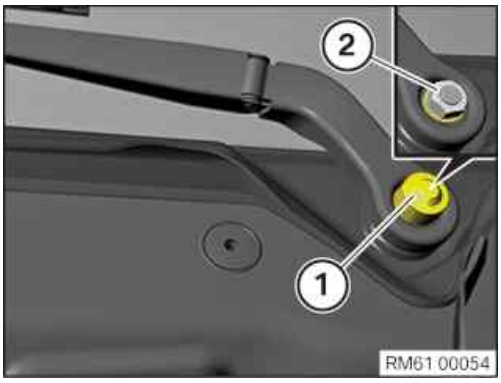
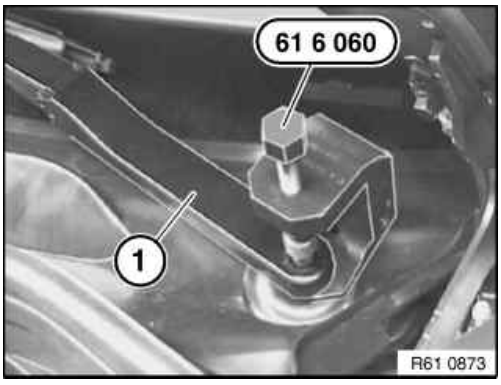


- Remove the protective cap (1).
- Loosen nut (2).



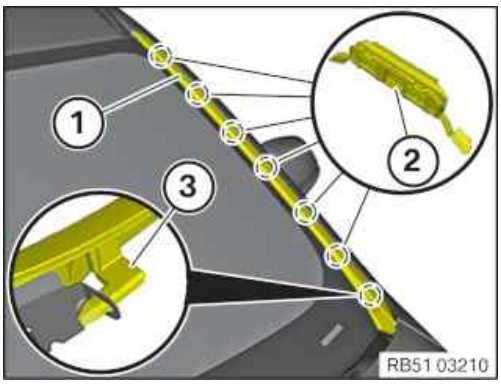
- Pull off the wiper arm (1) using special tool .

4 – Remove the gutter strip on the windscreen on the left and right

NOTICE

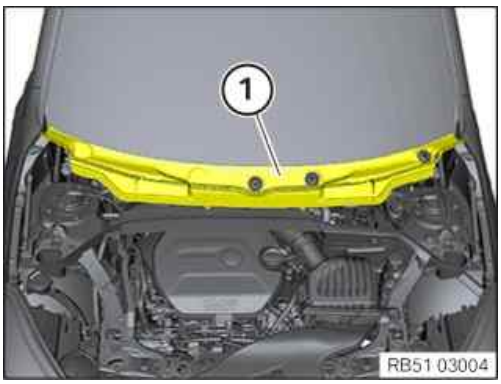
Description is for left component only. Procedure on the right side is identical.

▶ Remove the gutter strip on the windscreen



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

5 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

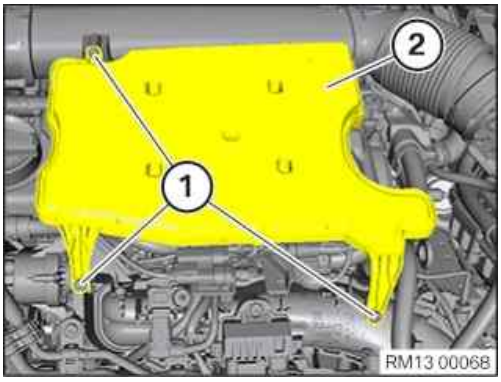
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

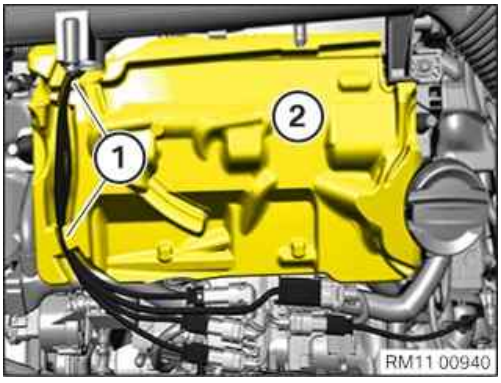
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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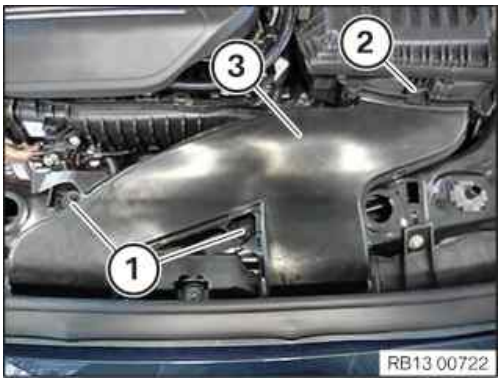
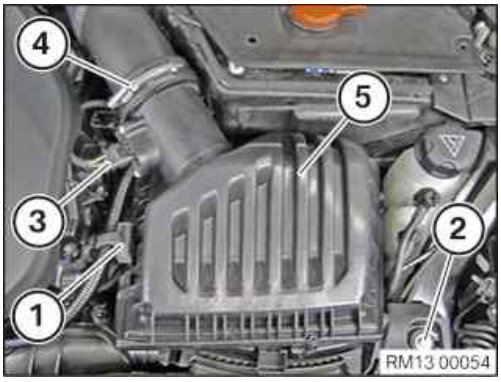


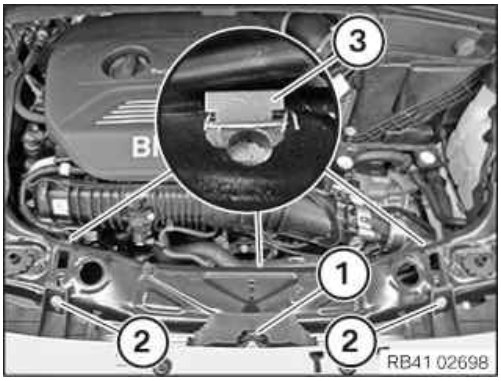
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

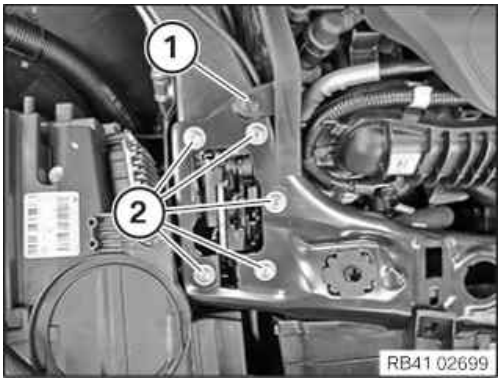


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

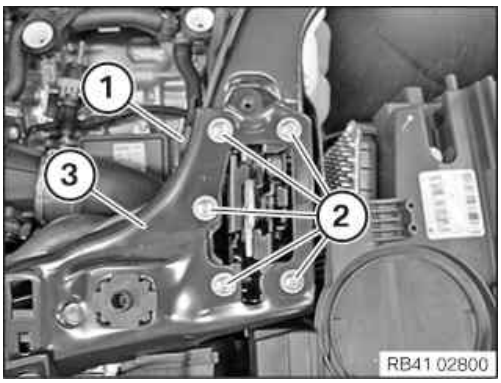
11 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

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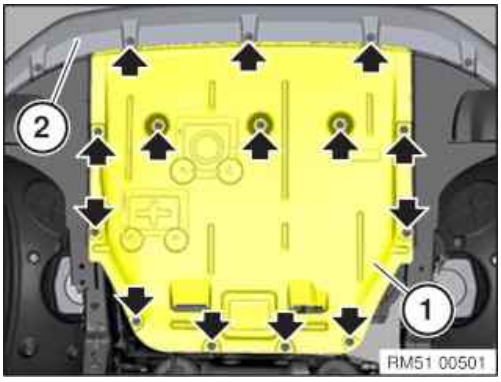
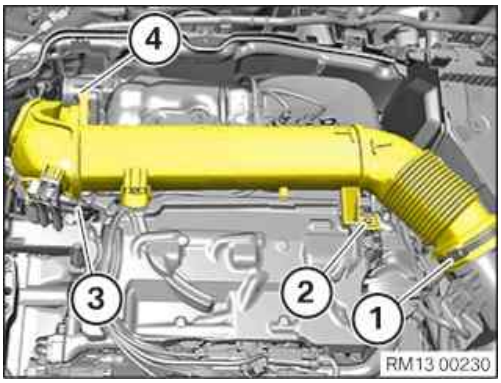
12 – Removing the front underbody protection

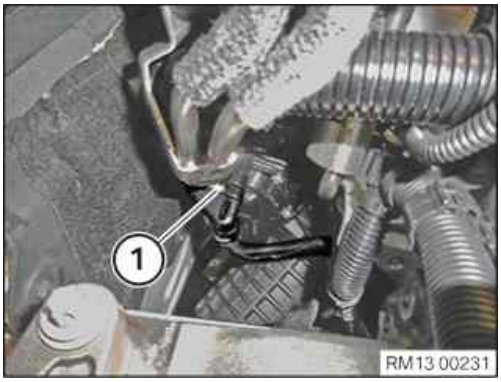


- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

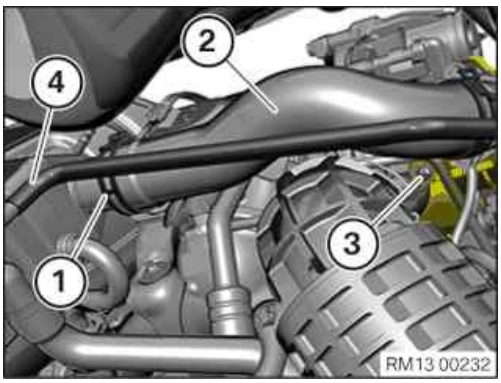
13 – Removing clean air pipe



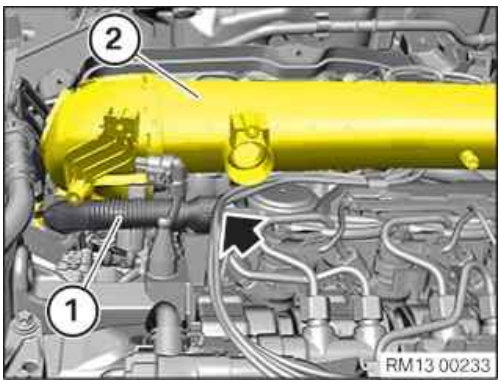
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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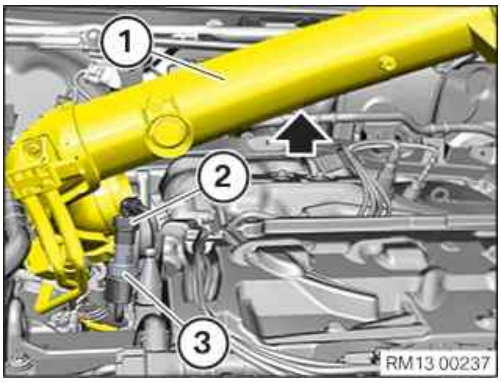

- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

14 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

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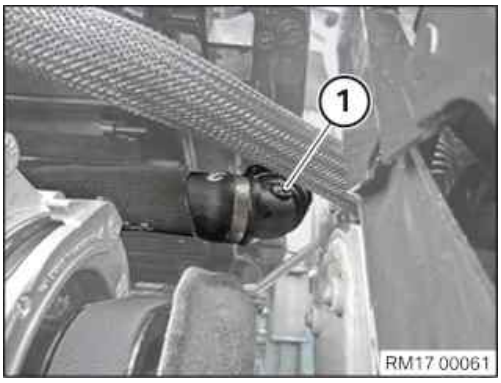
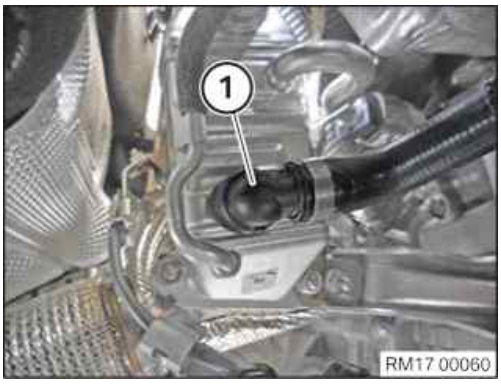


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

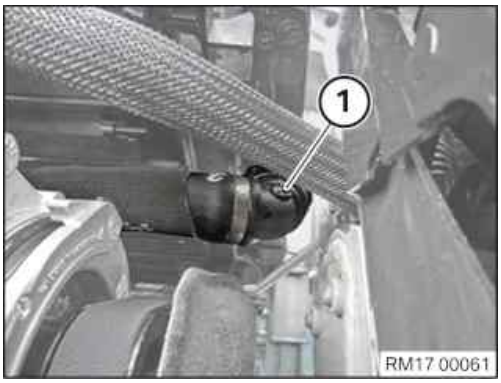


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

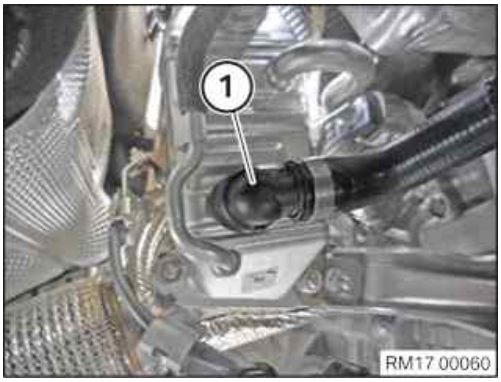
15 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

16 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

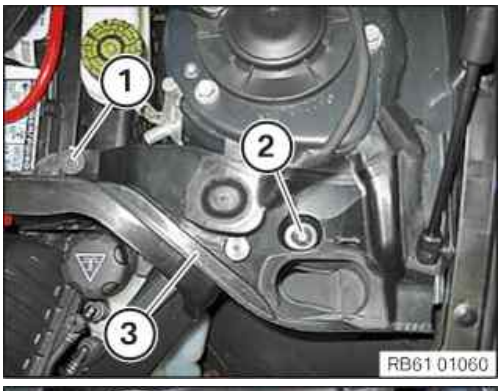
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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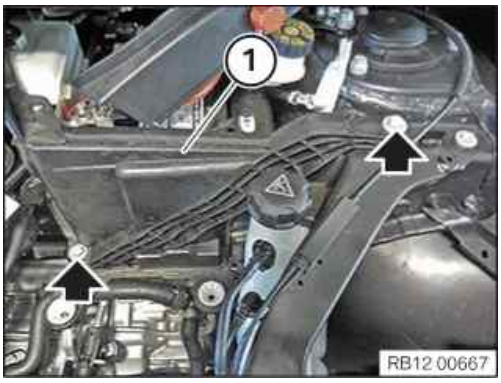
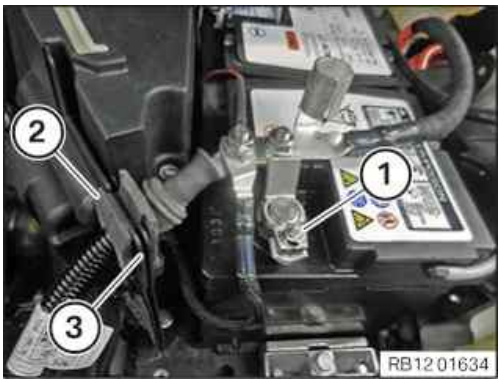
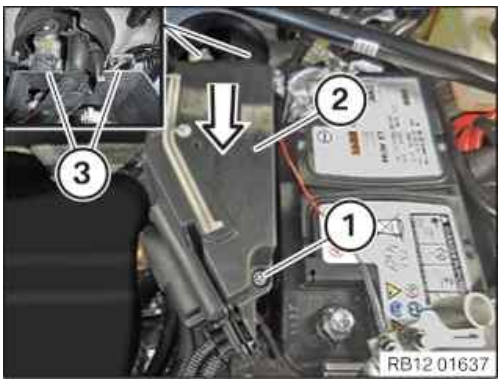


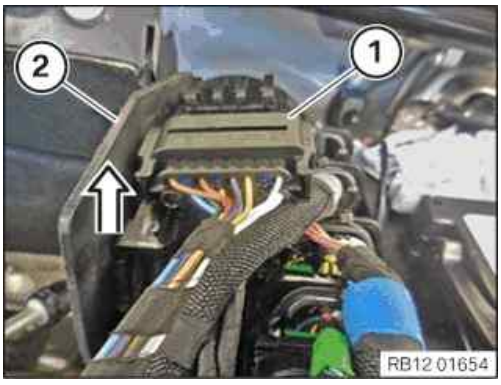
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



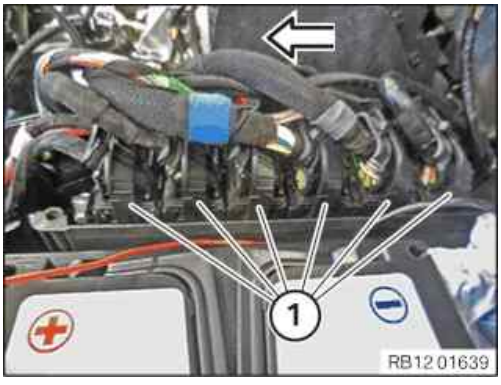
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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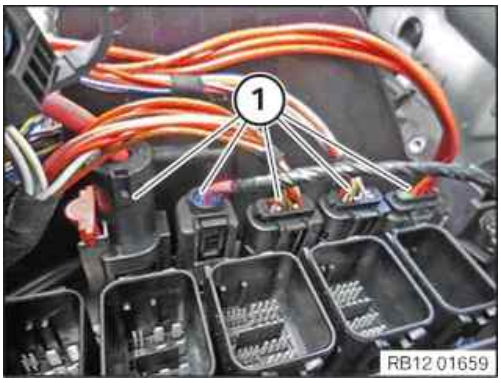
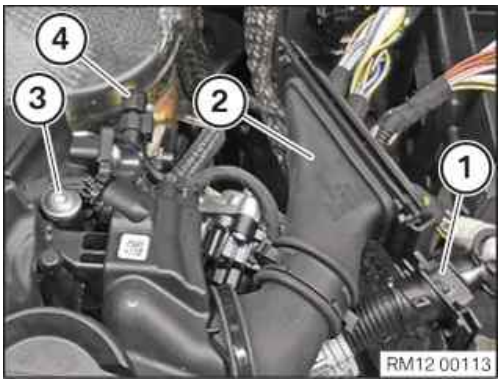
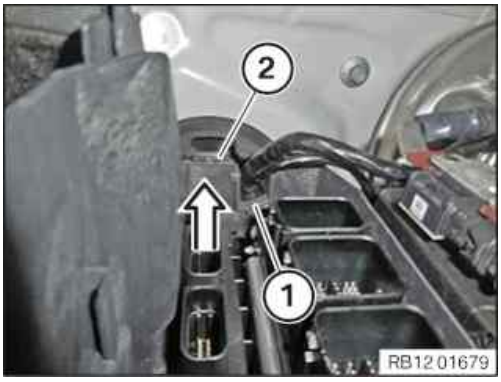


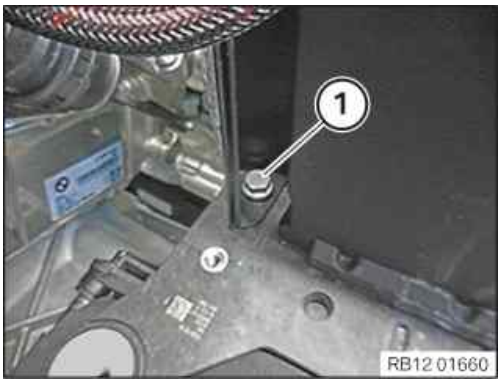
- Unlock and loosen connector (1).



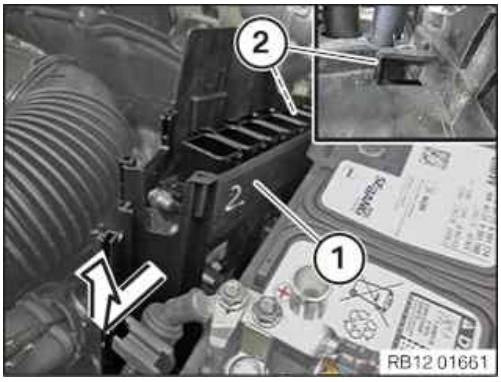
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

17 – Remove battery holder

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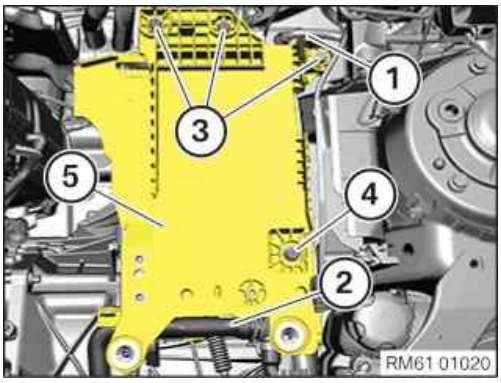
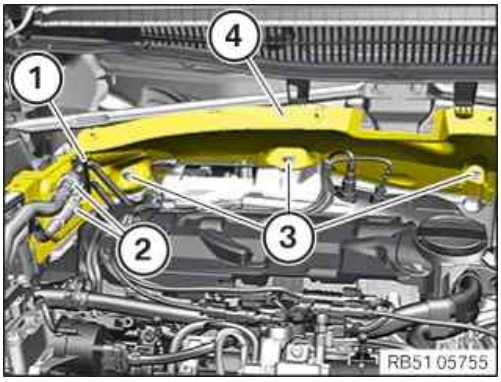


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

18 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

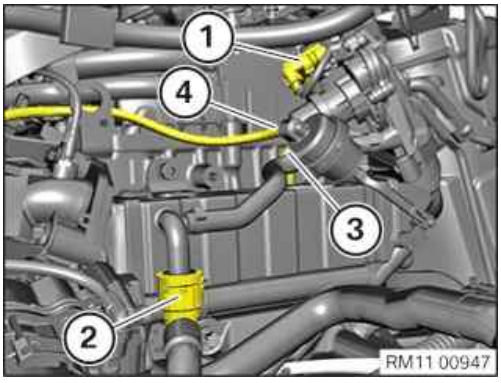
19 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

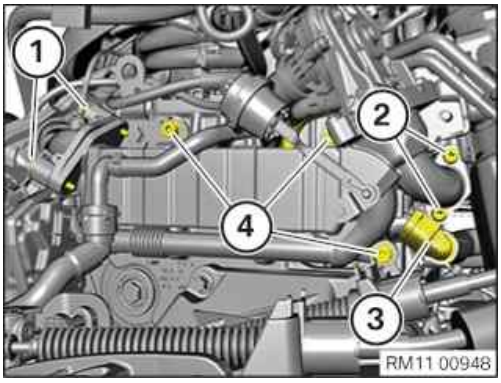
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

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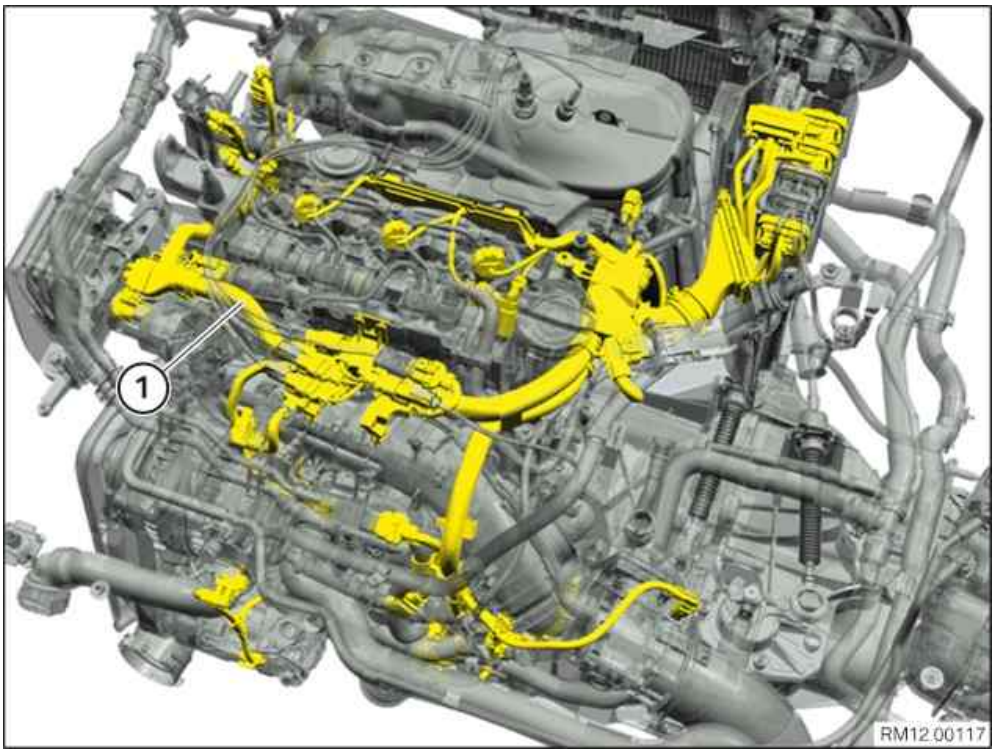
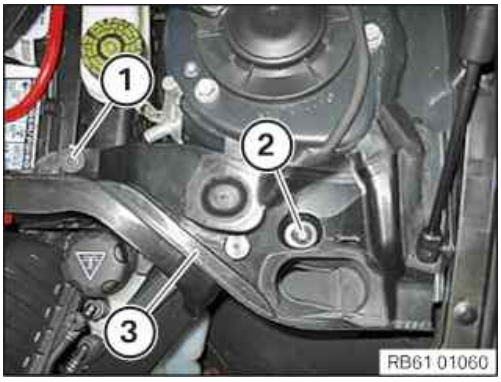
20 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine

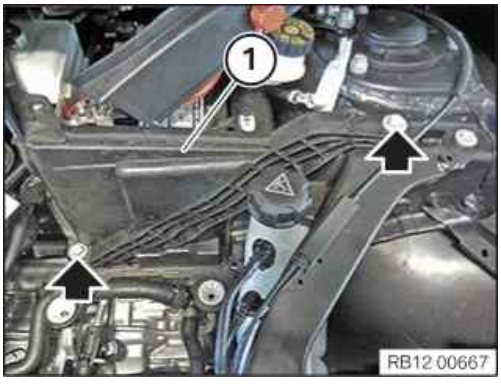


1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.

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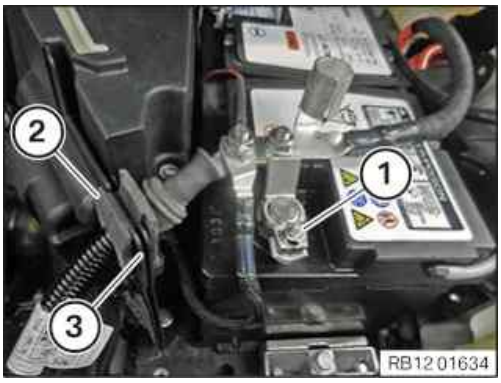
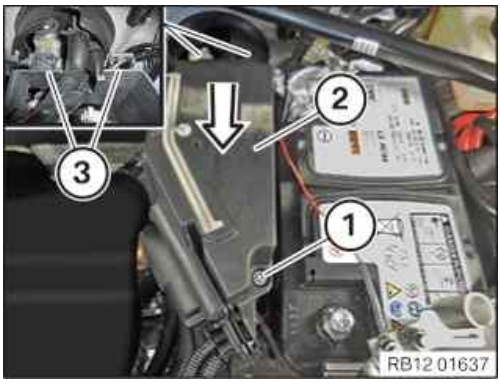
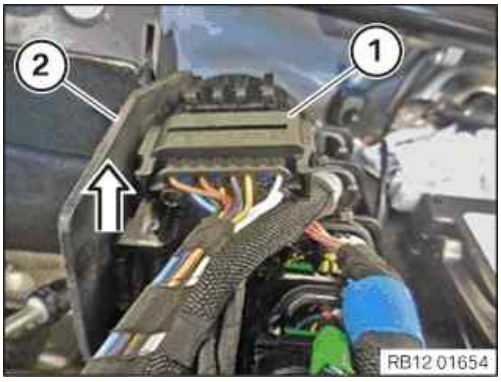


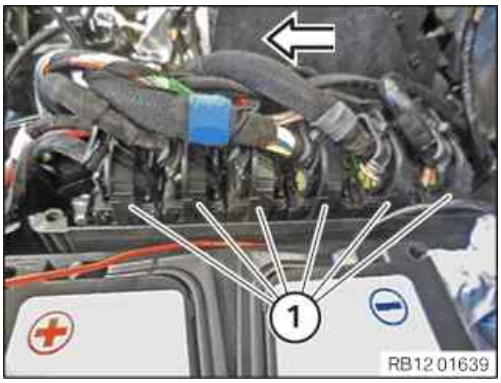
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).

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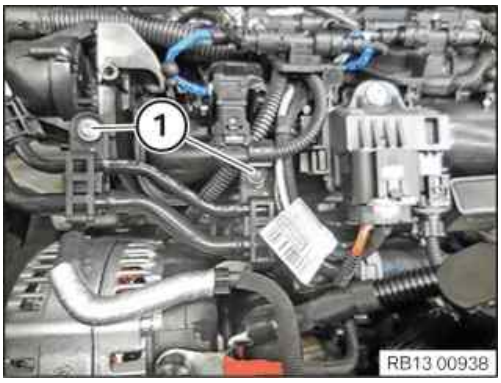
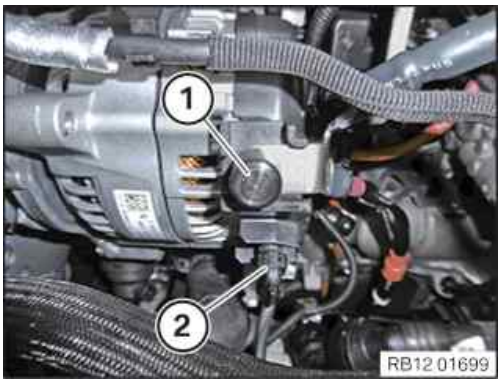
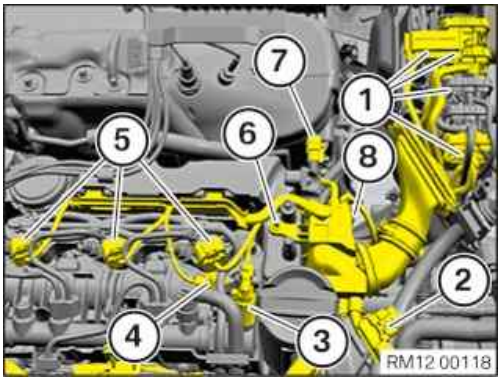


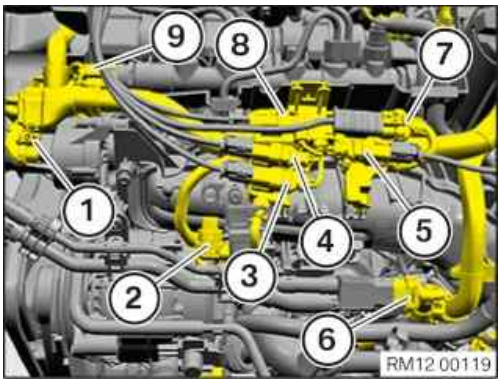
- Loosen screws (1).



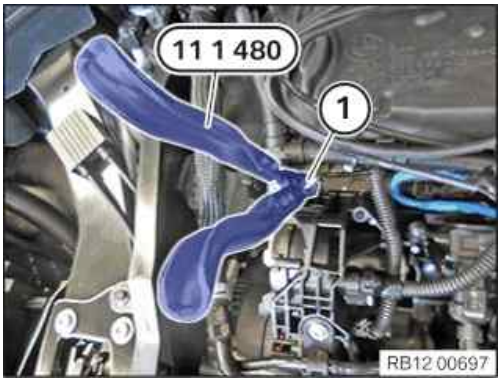
- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.



- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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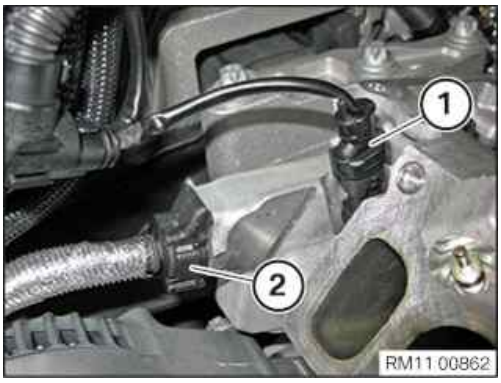
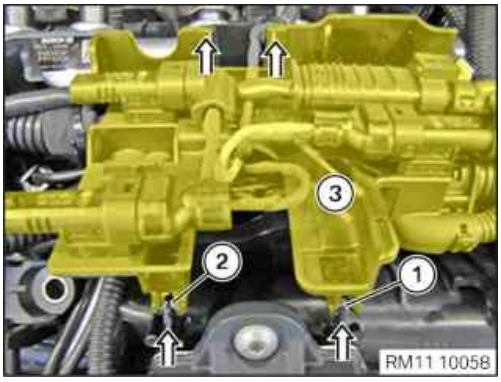


- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

21 – Removing the cable clips from the intake plenum



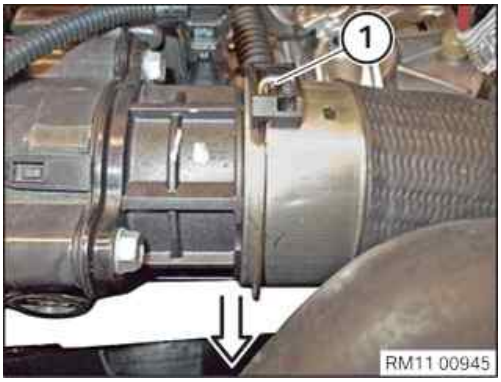
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

22 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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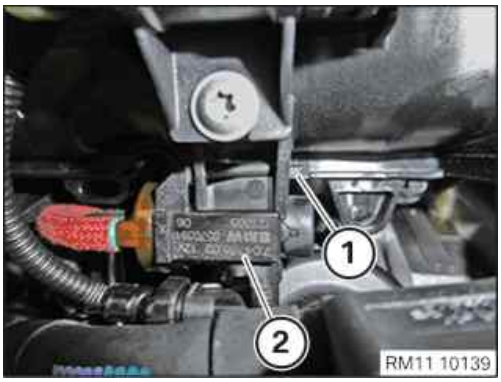
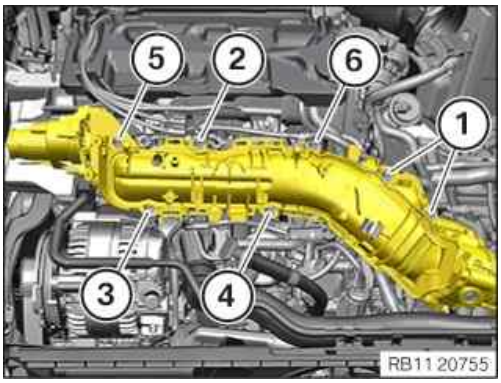
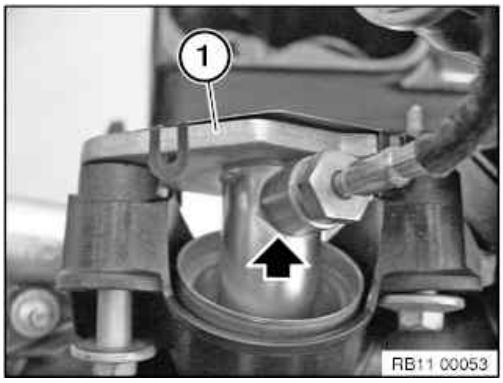


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

23 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

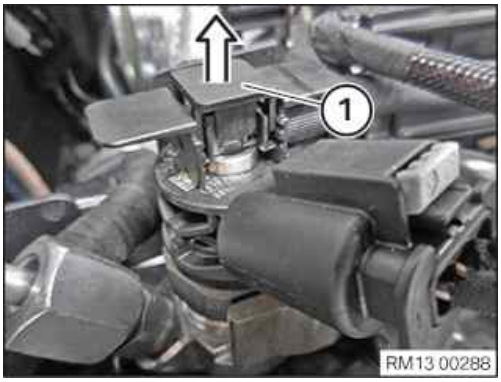
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

24 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

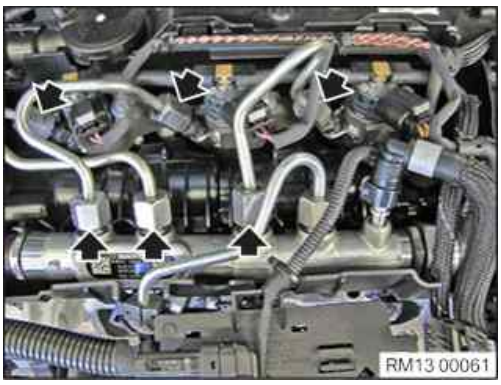
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

25 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

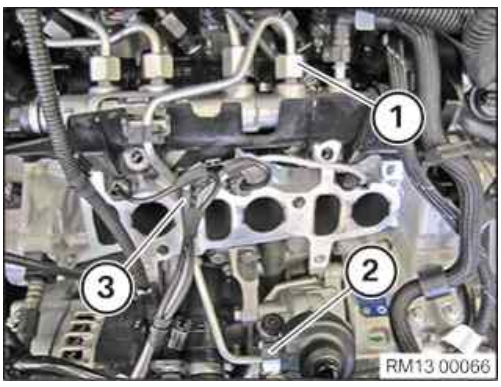
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

26 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

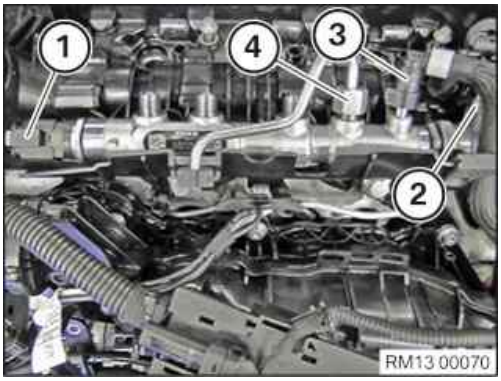
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

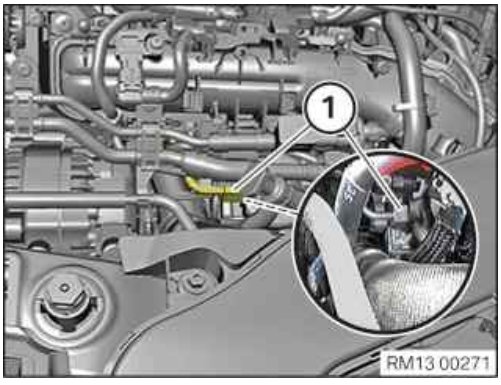
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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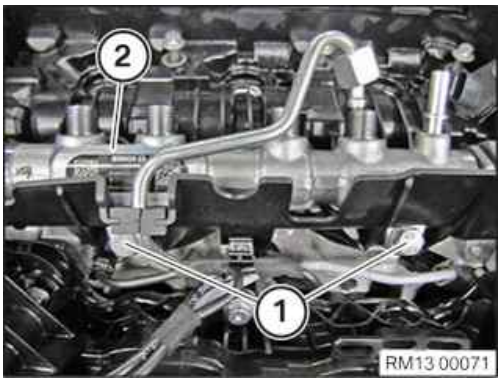

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

27 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

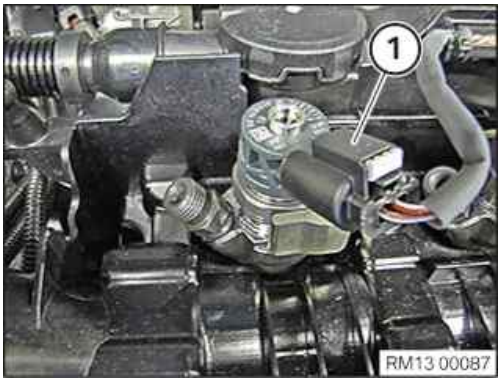
Electrostatic discharge.

Damage to or destruction of electrical components.

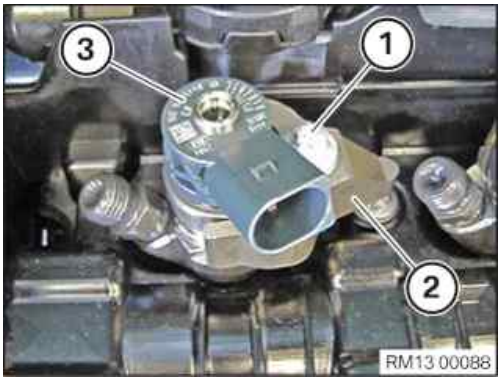
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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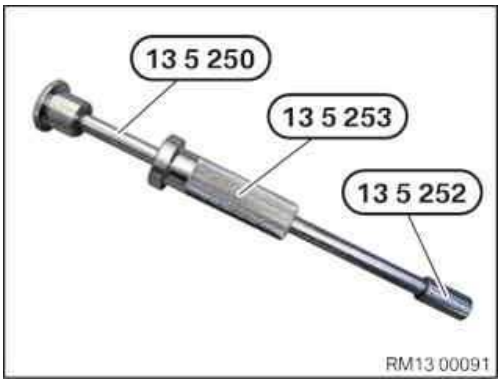
RISK OF DAMAGE

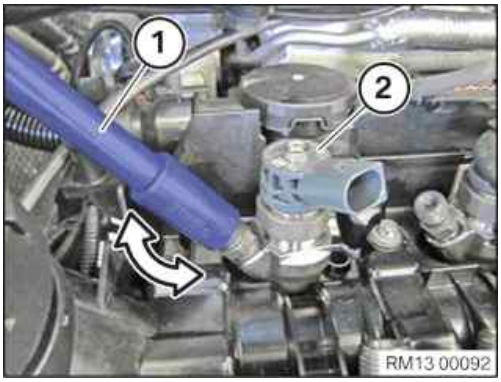
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

28 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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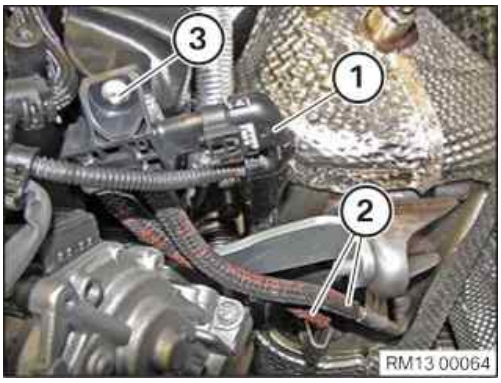
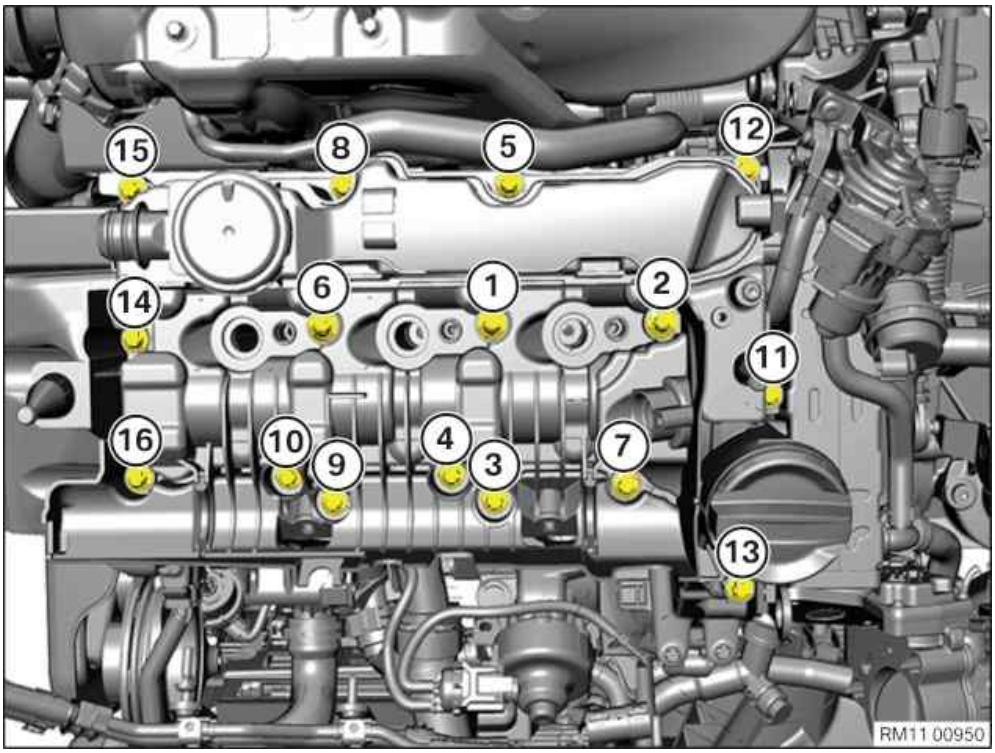


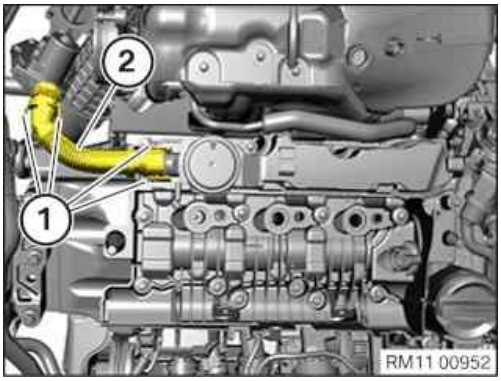
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

29 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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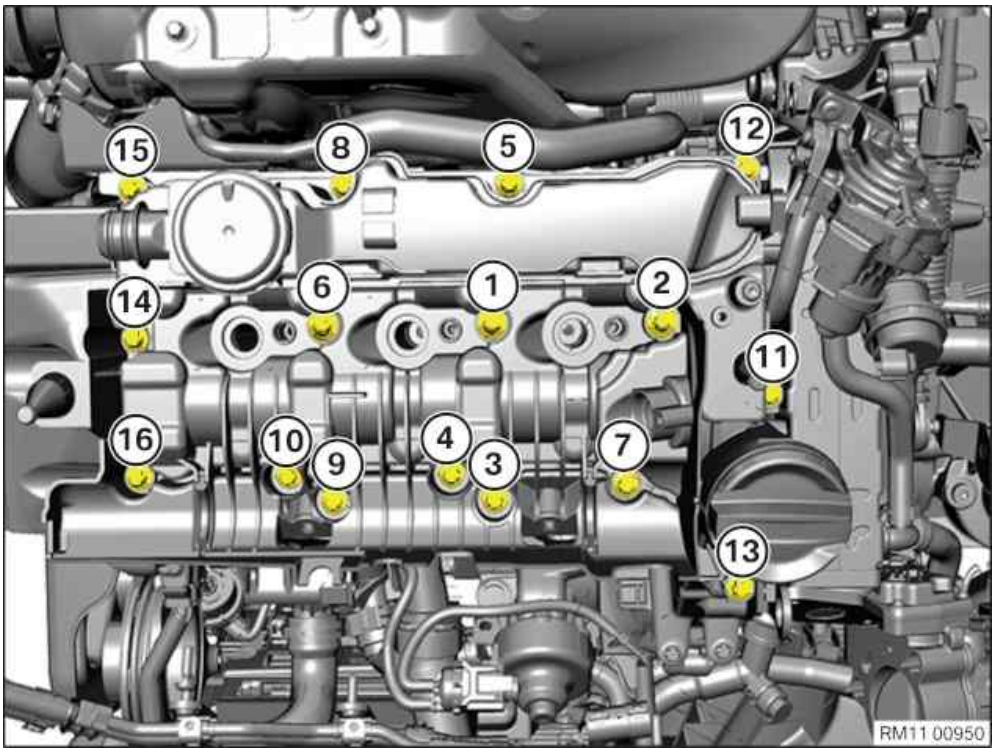


- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

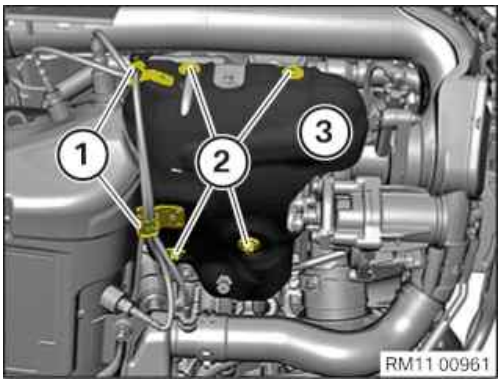
30 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

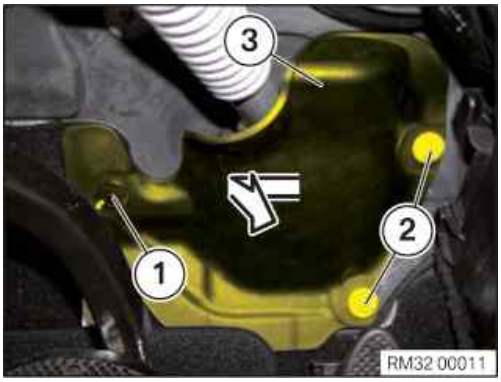
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).

31 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!

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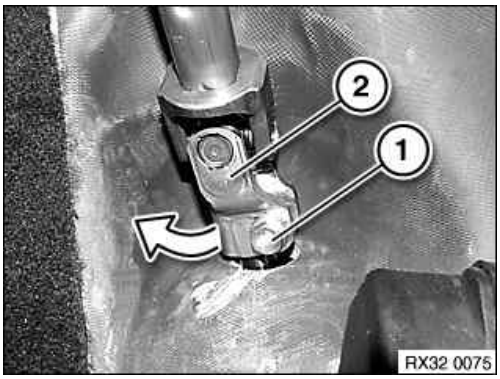
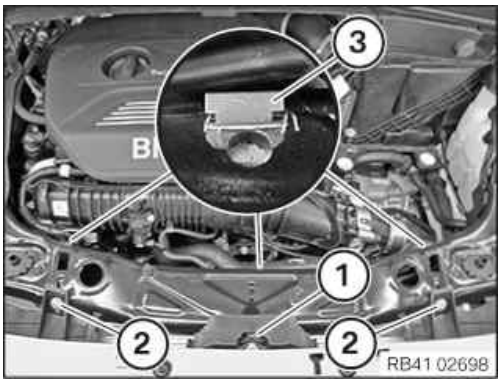


- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

32 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

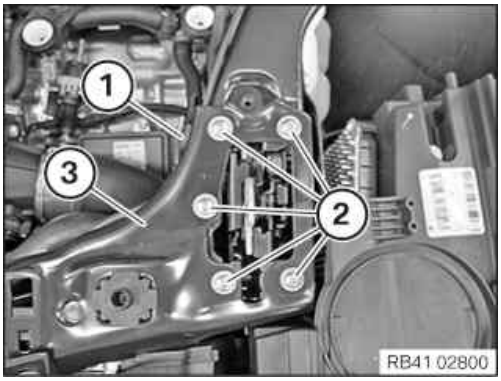
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

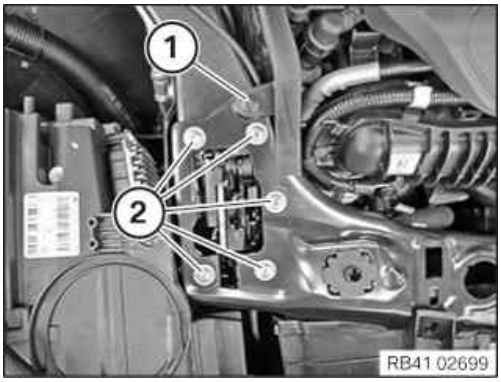


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

33 – Securing radiator on left and right

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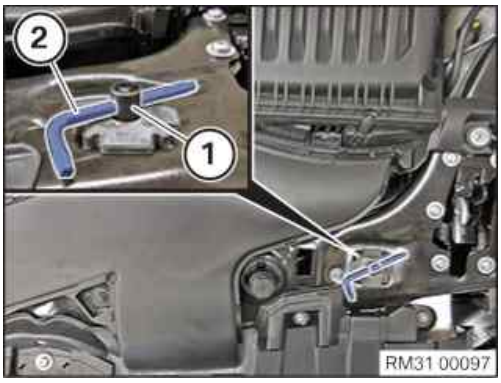


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

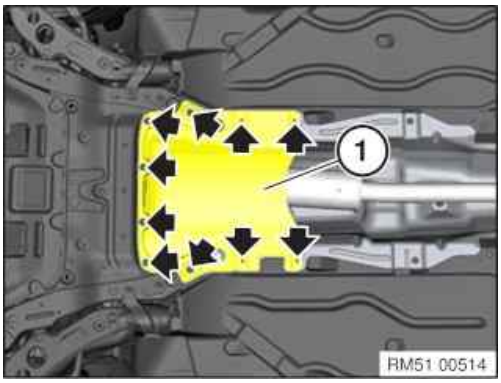
34 – Remove the front left and right wheel

▶ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

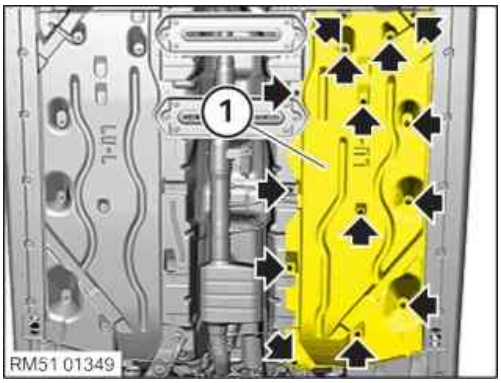
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

35 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

36 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

37 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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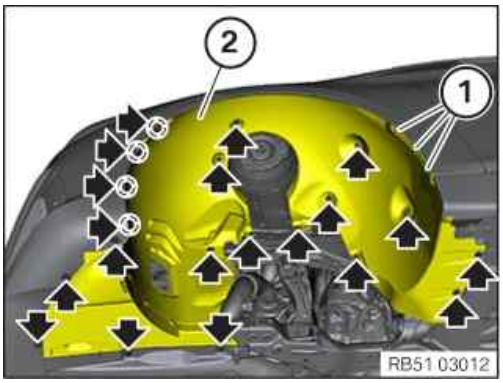
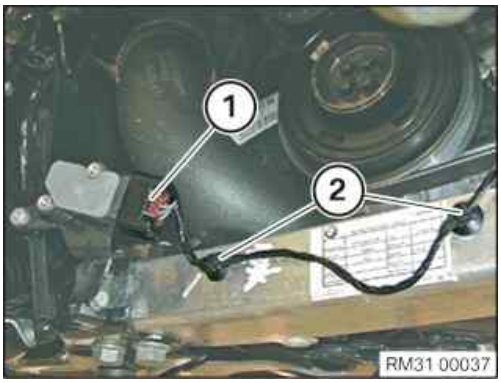
▶ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

38 – With right installation: Detaching ride height sensor cable



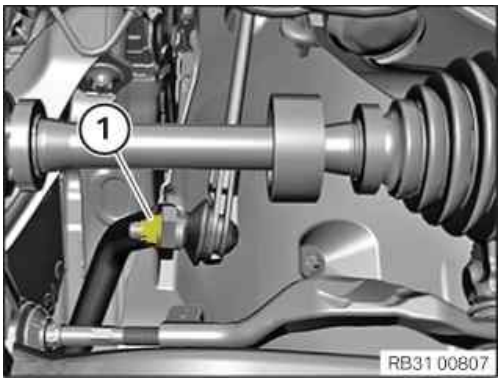
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

39 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

40 – Detaching rubber mount from front axle support

- Spray rubber mount (1) with lubricant and release from holder on front axle support.

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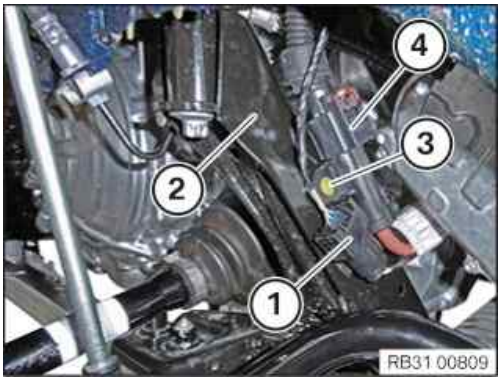
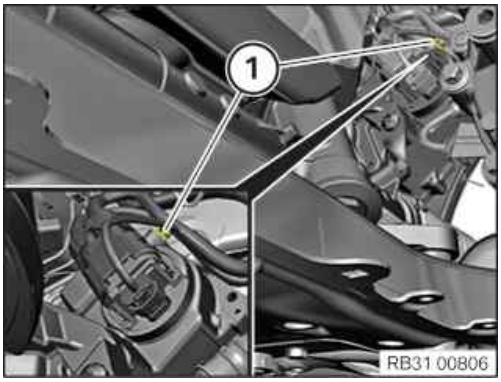
41 – Disconnecting plug connections from steering gear

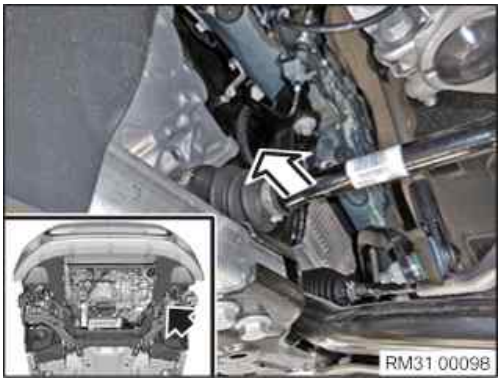
▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

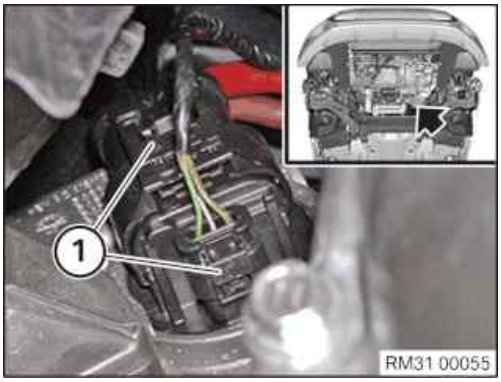


- Disconnect wiring harness (1) from steering gear.



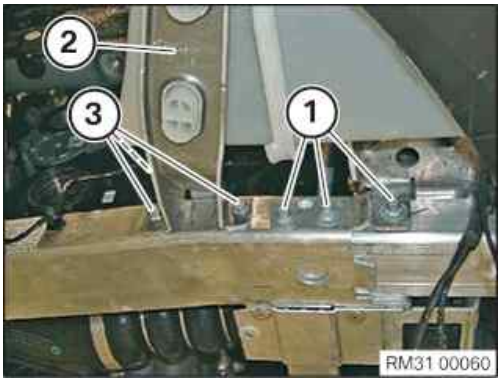
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

42 – Releasing the mounted part from the front axle support



- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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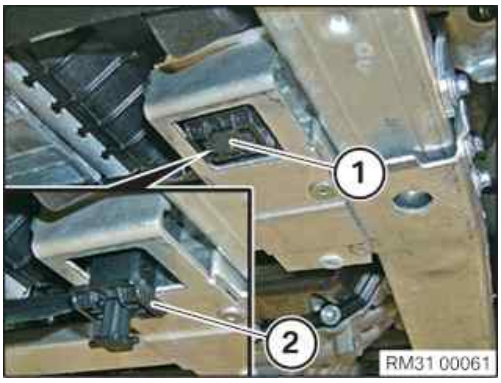
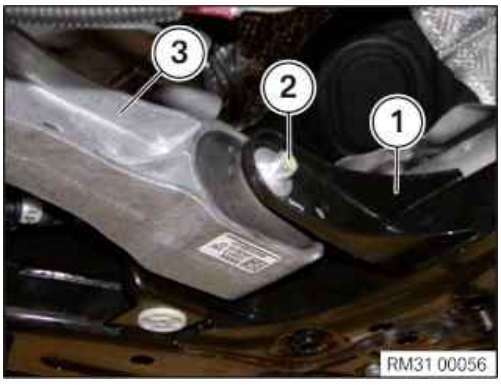


NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



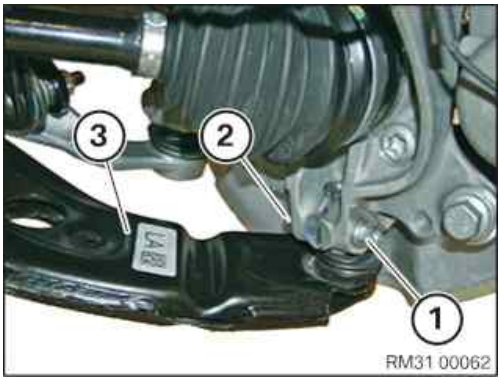
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

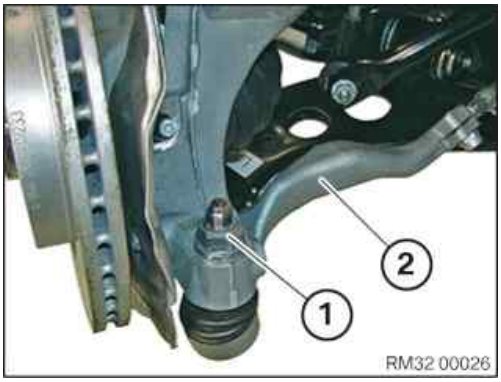
43 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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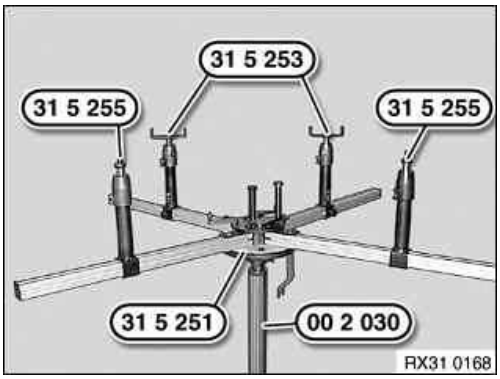
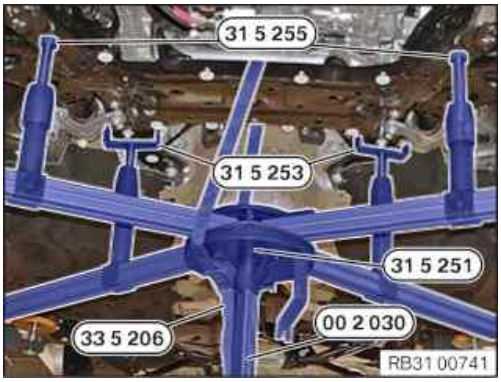


- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

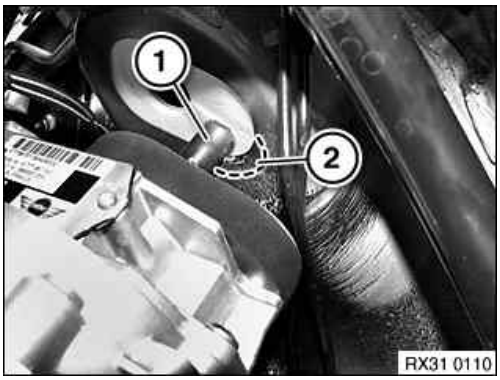
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

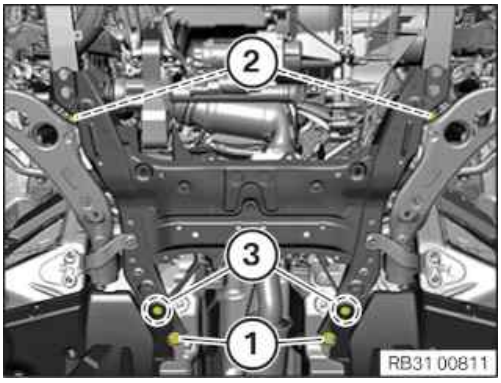


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.

For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

44 – Removing the connecting support from the tunnel in front and back

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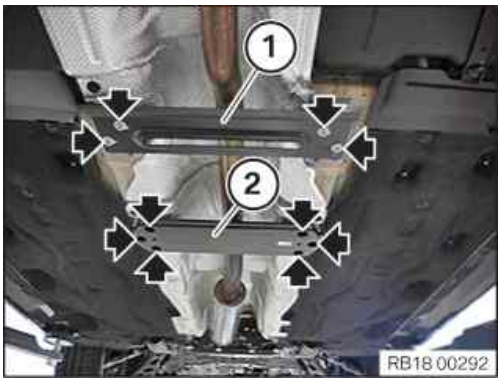
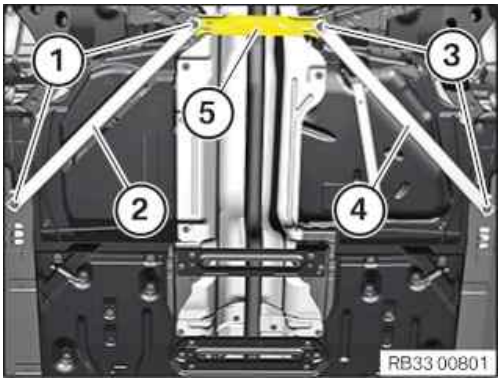


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

45 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

46 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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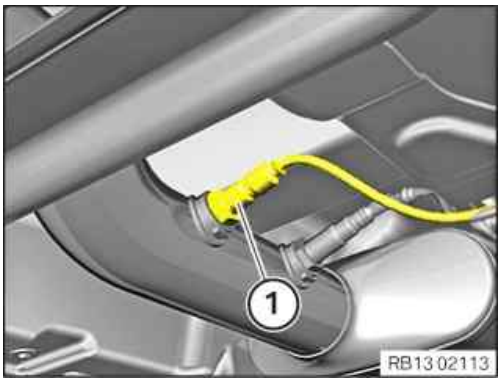
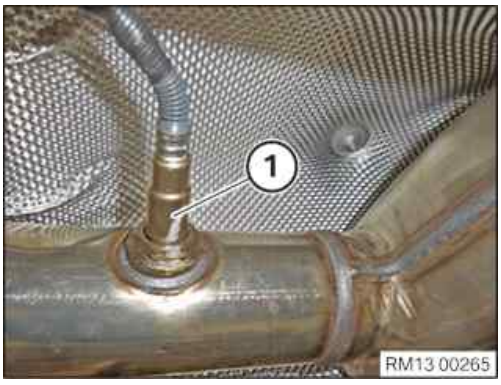
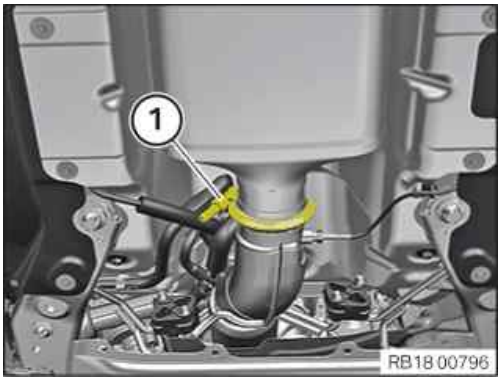


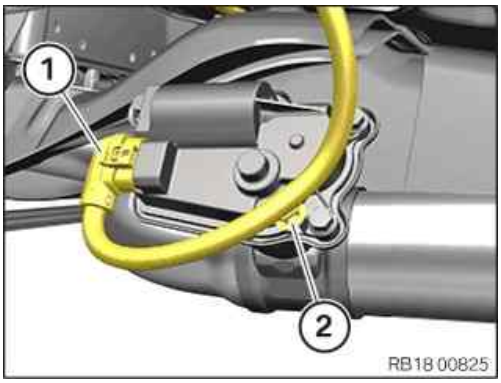
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



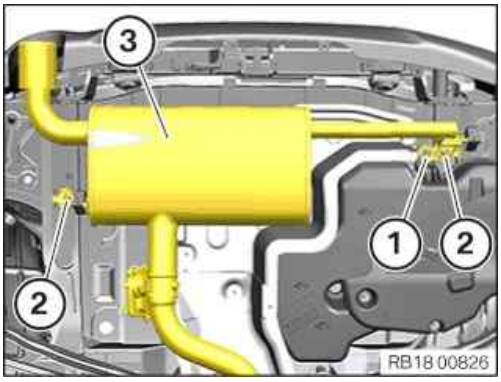
- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Unlock and disconnect connector (1).
- Loosen clamp (2).



- Loosen screw (1).
- Loosen nuts (2).
- Lower the exhaust system (3) with an auxiliary person, guide out and remove.

47 – Removing starter motor

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

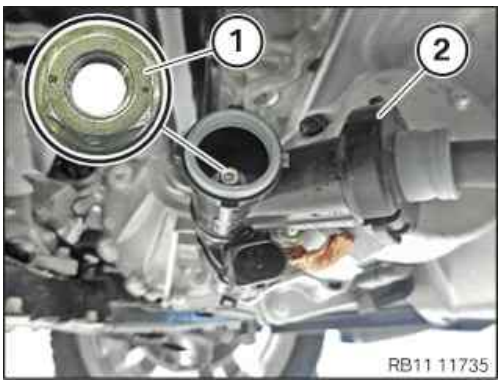
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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- Loosen screws (1).
- Feed out starter motor and remove.

48 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

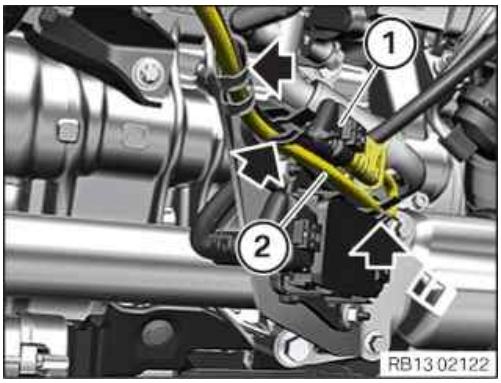
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

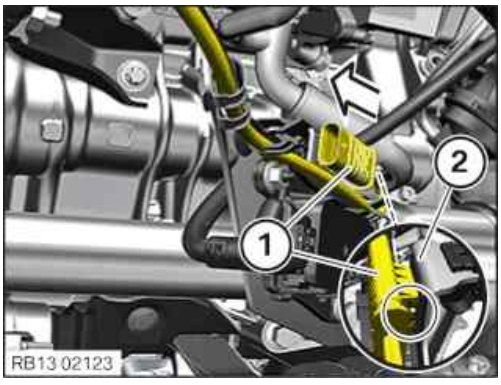
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.

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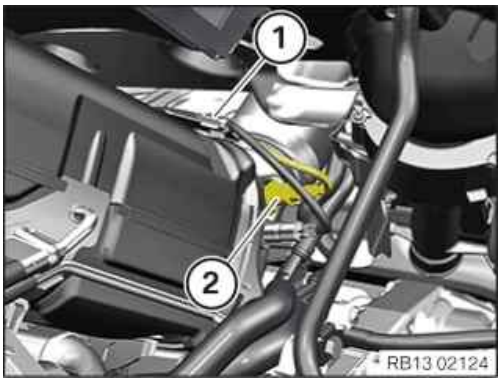


- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

49 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

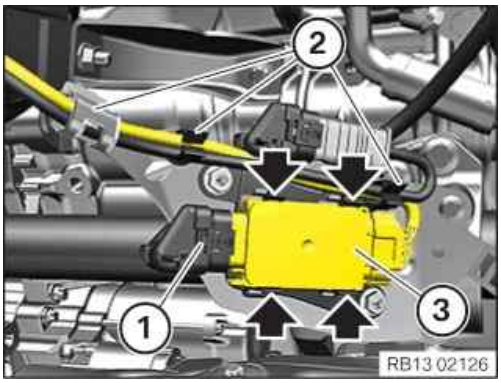
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

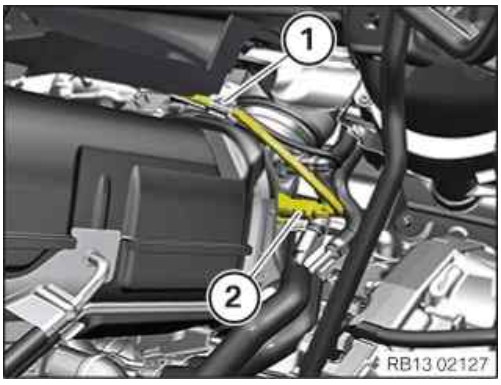
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

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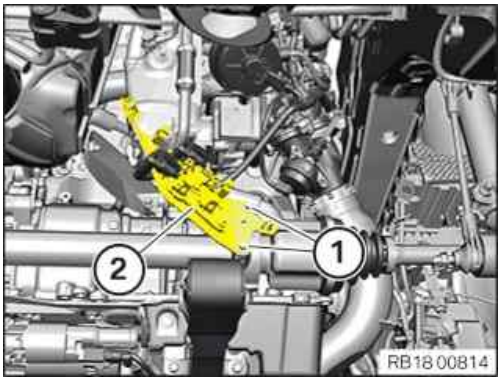
50 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

51 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

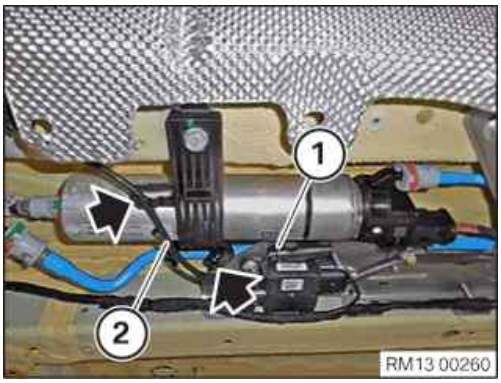
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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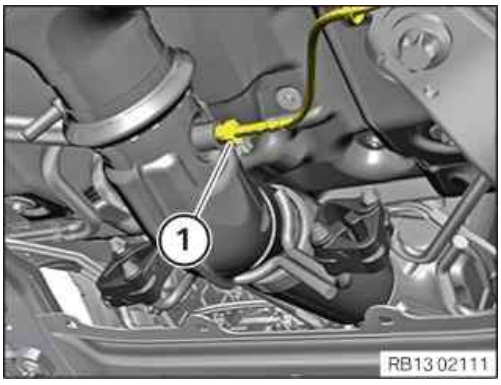
- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

52 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

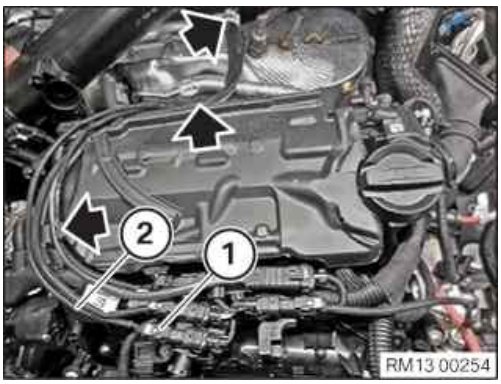
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Feed the cable (2) from the temperature sensor out of the clamps (arrows) and remove it.

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- Release the exhaust temperature sensor (1) with conventional tools (2).

- Feed out and remove exhaust temperature sensor (1).

53 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and disconnect the plug connection (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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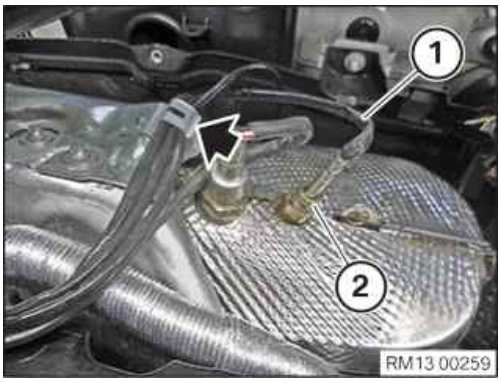


- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

54 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

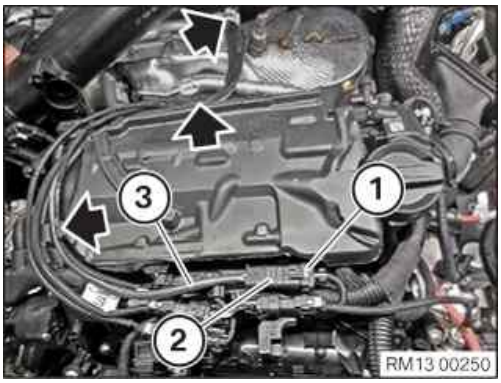
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

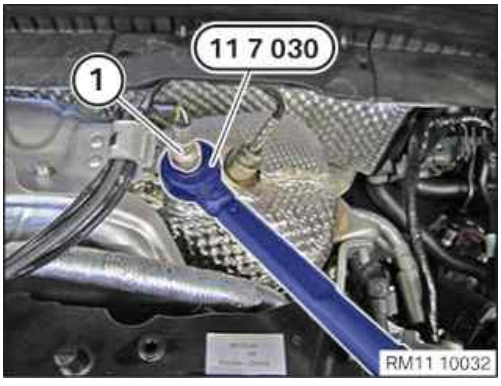
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Detach the connector (2) from the holder .
- Feed out and remove cable (3) out of the oxygen control sensor from the clamps (arrows).



- Release the front oxygen control sensor (1) using special tool **0 491 075 (11 7 030)** .
- Feed out and remove the control sensor (1).

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55 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

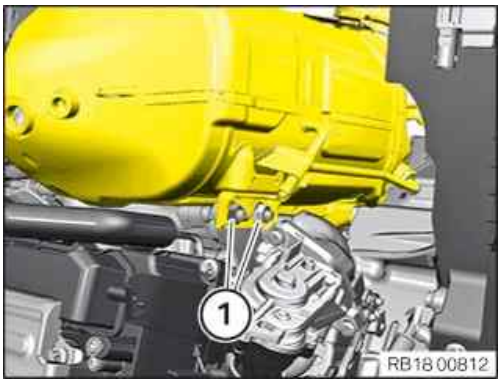
CAUTION

Heavy component.

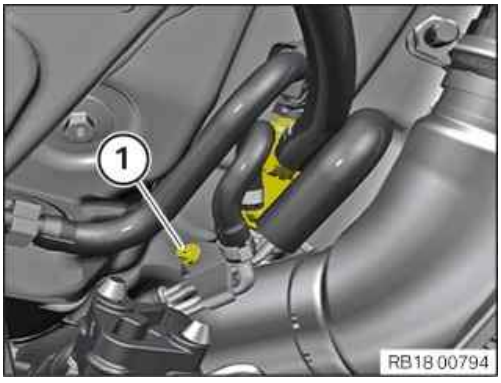
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen nuts (1).



- Loosen screw (1).

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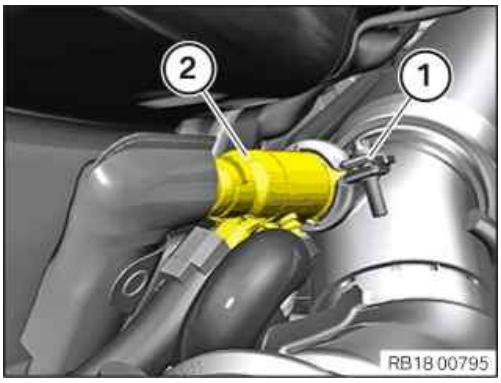
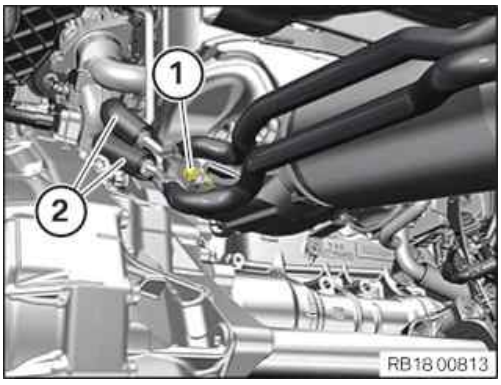
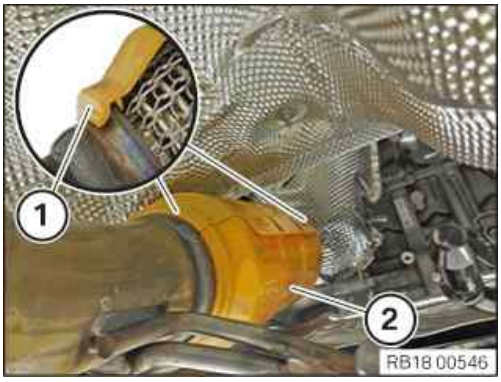


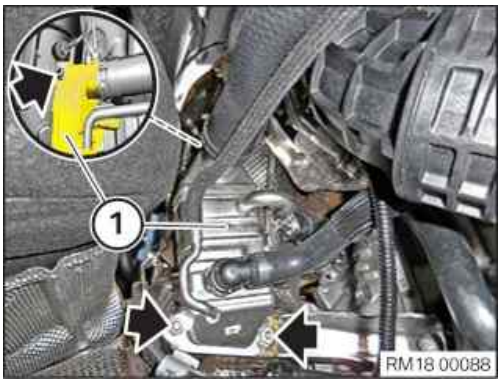
- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



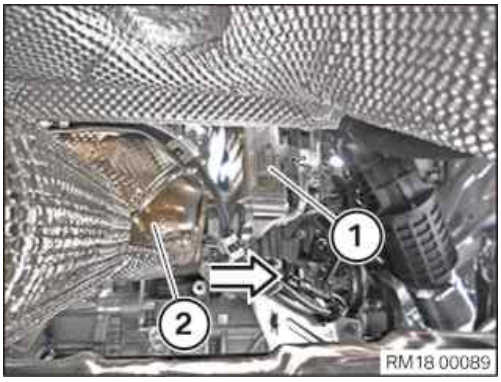
- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Detach nuts (arrows) from low pressure exhaust-gas recirculation cooler (1).



- Feed out low pressure exhaust-gas recirculation cooler (1) from diesel particulate filter (2) in direction of arrow and set aside.

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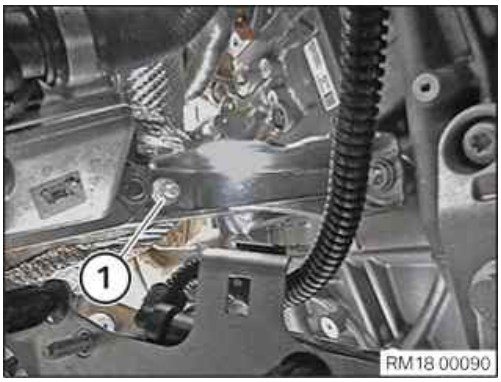
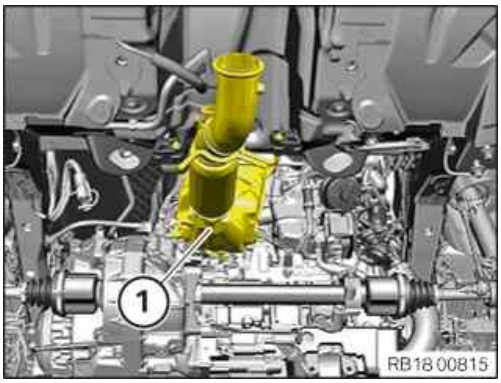


- Unfasten nut (1).



- Feed out diesel particulate filter (1) toward the bottom and remove.

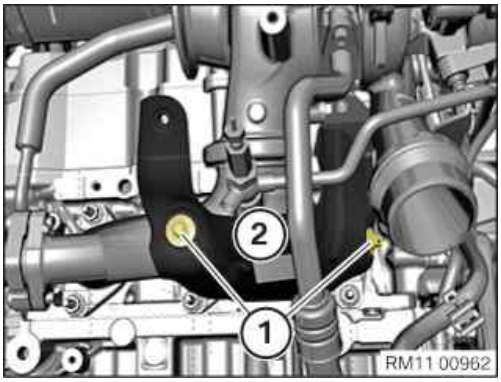
56 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

57 – Removing heat shield from rear exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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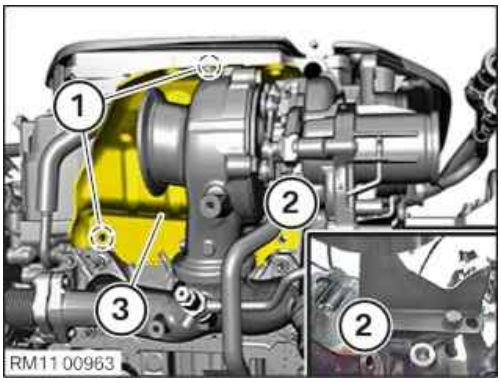
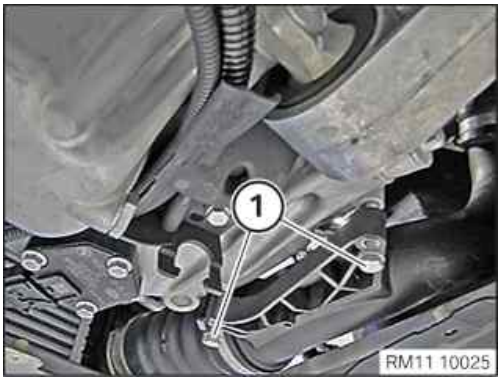


- Loosen screws (1).
- Loosen screw (2).

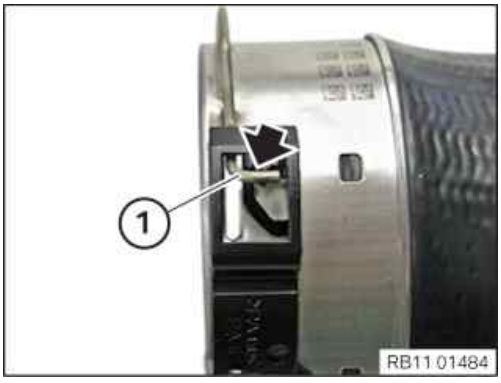
  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

58 – Remove right charge-air line

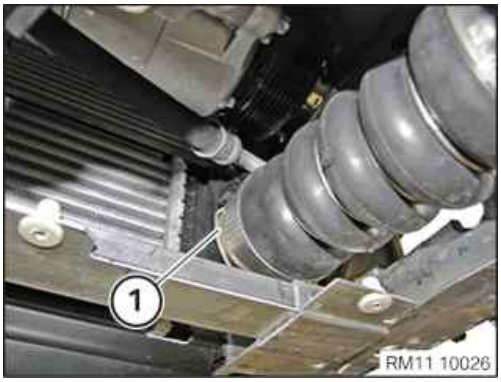


- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.



- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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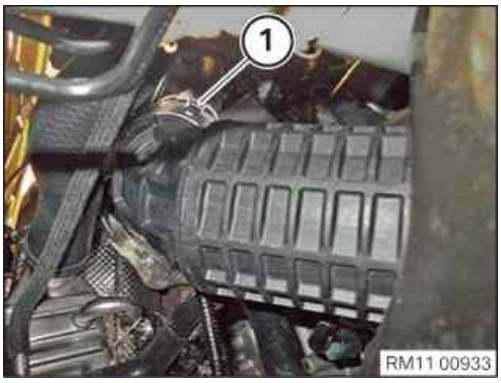

- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

59 – Remove exhaust turbocharger

- Release screw (1) from beneath with a long extension.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).
- Disconnect the oil return line (2) toward the bottom and set it aside.

- Release banjo bolt (1) of oil feed line from exhaust turbocharger and place to one side.

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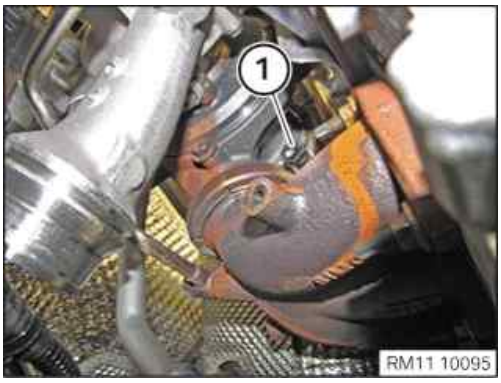


- Release screw (1) and remove V-clip.
- Pull exhaust turbocharger up and remove.
- Remove seal between exhaust turbocharger and exhaust manifold.

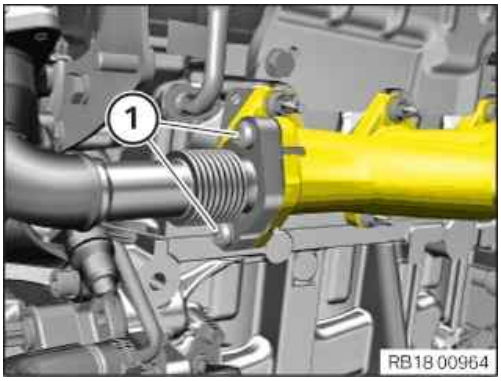
60 – Remove exhaust manifold

WARNING

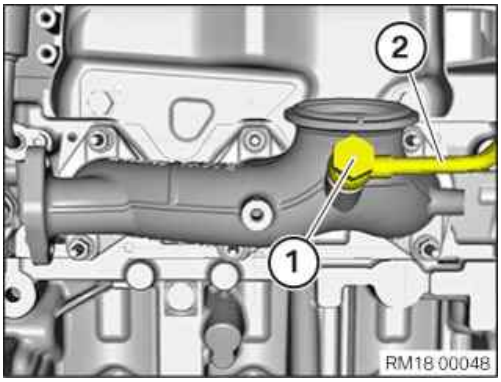
Hot surfaces.

Risk of burning!

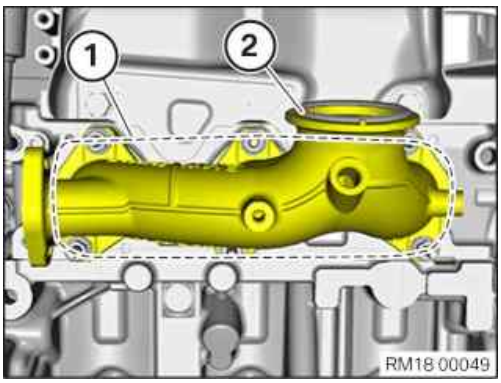
- Perform all work only on components that have cooled down.



- Loosen screws (1).



- Unscrew the banjo bolt (1).
- Feed out exhaust gas pressure pipe (2) and place to one side.



- Evenly release nuts along the dashed line (1) from outer to inner side.
- Feed out exhaust manifold (2) and remove.

61 – Removing the acoustic cover for the engine at the front

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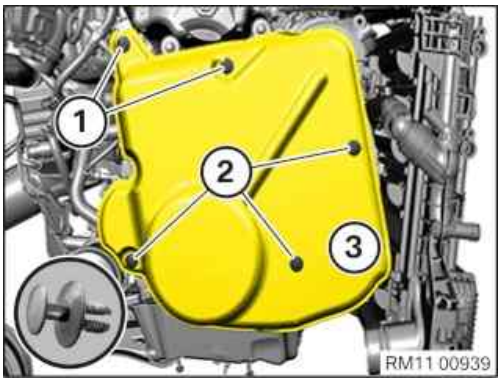


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

62 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

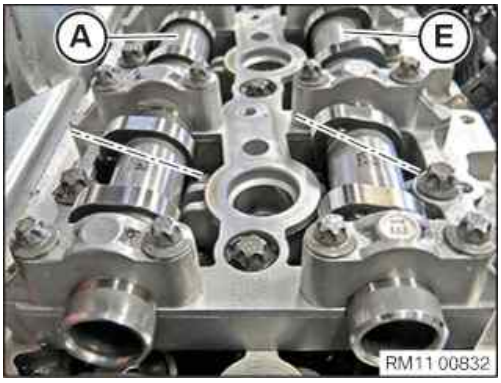
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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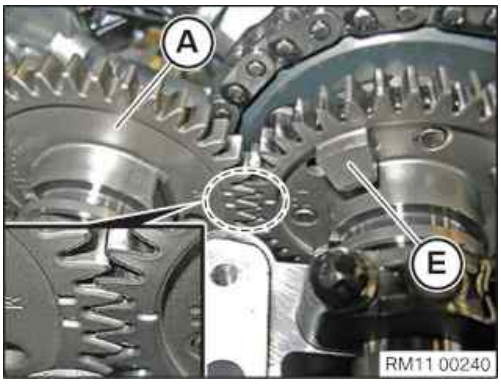
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

63 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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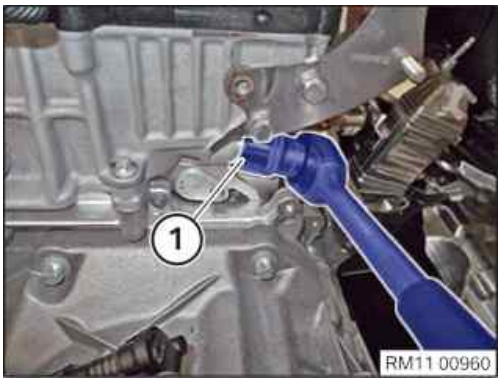
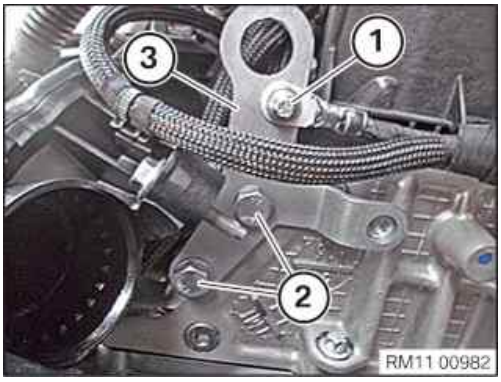


TECHNICAL INFORMATION

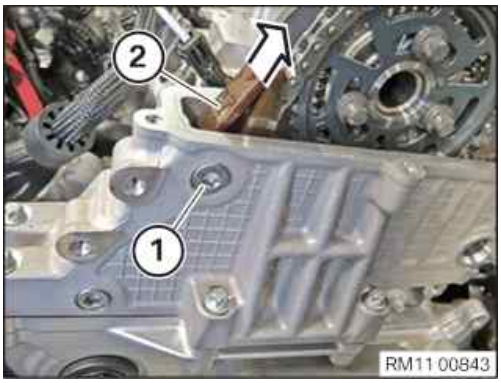
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

64 – Remove the timing chain guide rail

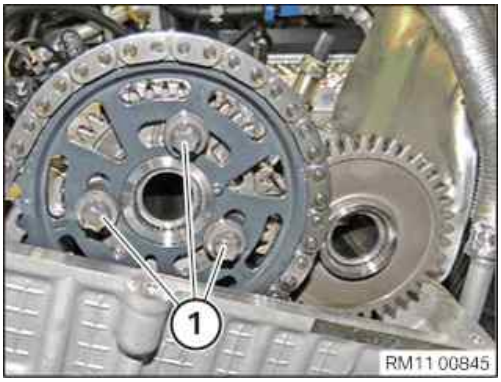


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

65 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

66 – Removing the camshaft support

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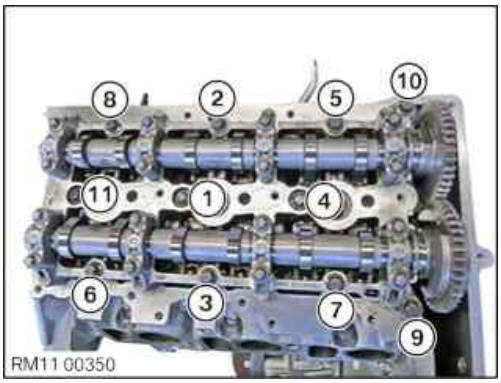
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

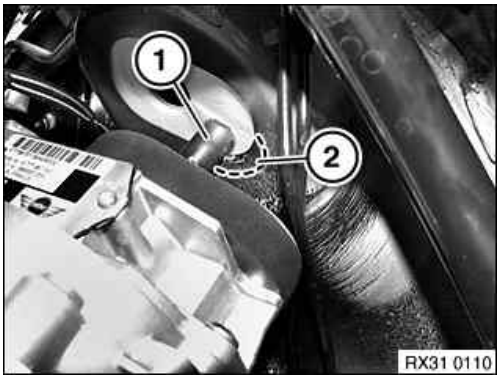
67 – Remove cylinder head.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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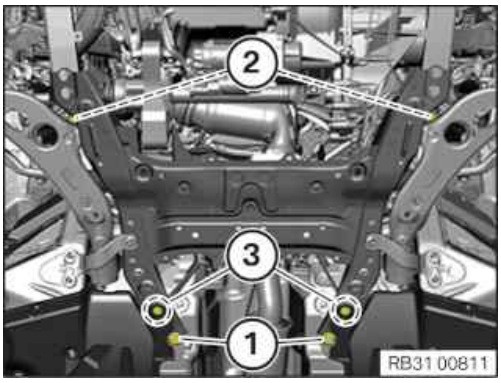


- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

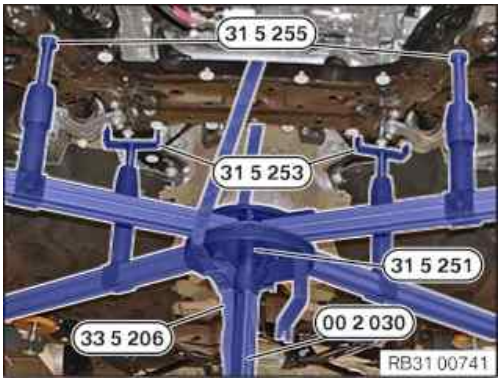
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

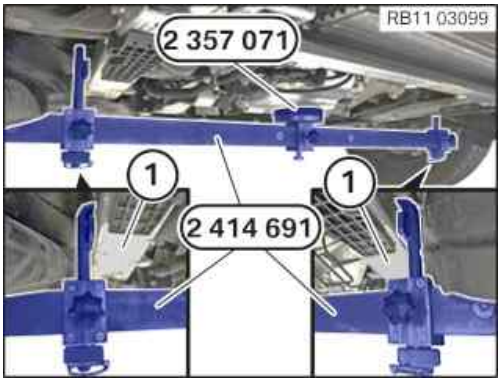
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and set it aside.



- Prepare special tool **2 414 691** together with the special tool **2 357 071**.
- Attach special tool **2 414 691** to front axle support and correctly align the special tool **2 357 071** under the oil sump and tighten.
- Turn special tool **2 414 691** at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools**2 414 691** and **2 357 071**.

- Remove all glow elements with special tool **0 491 068 (11 6 050)** or a standard tool.

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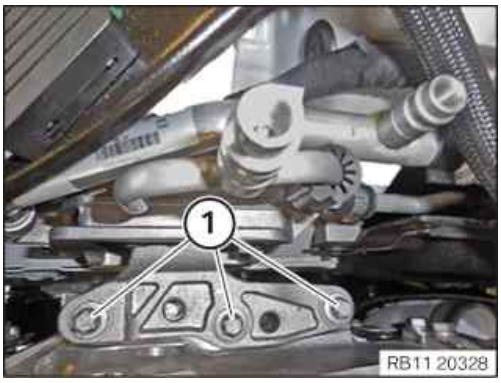
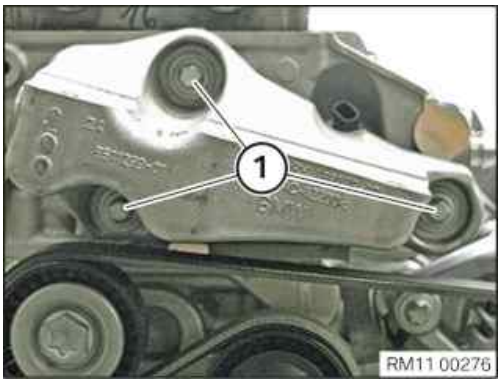


- Loosen screws (1).

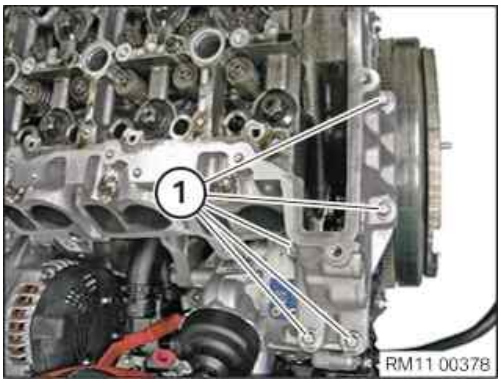


- Loosen screws (1).

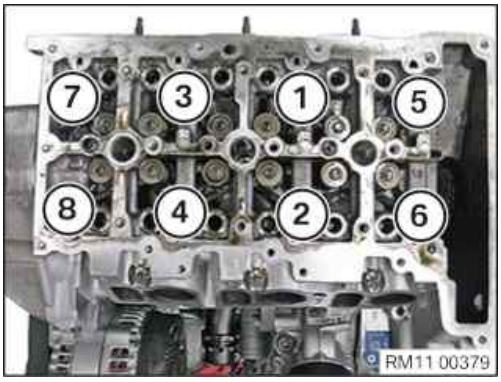
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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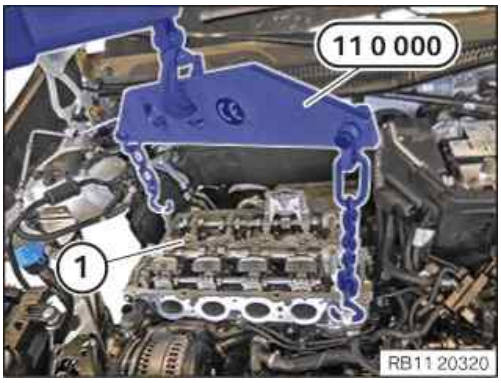


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

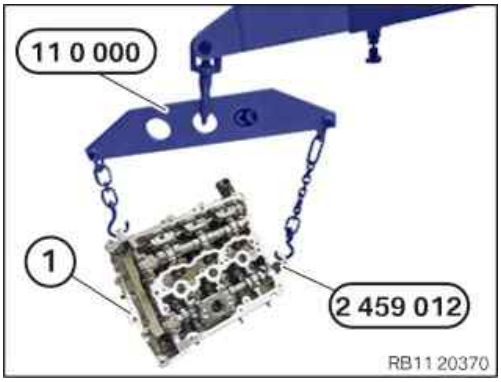
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.



- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

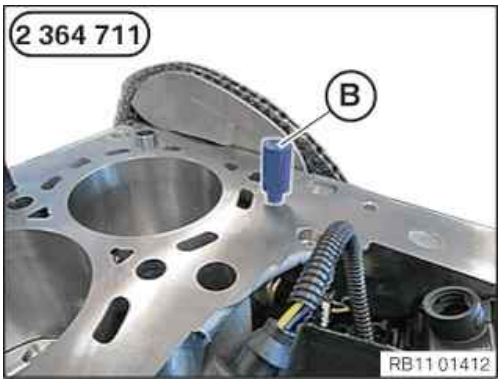
68 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

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RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

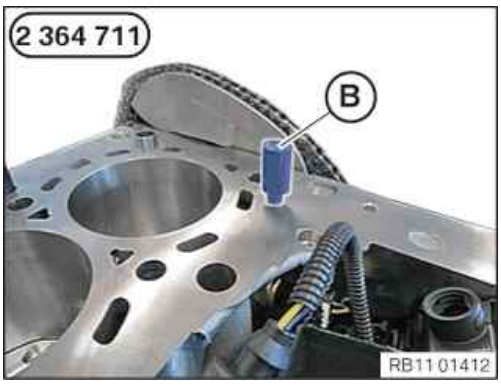
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

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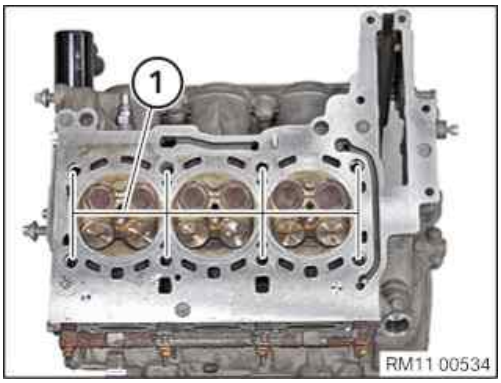
69 – Renewing the cylinder head gasket



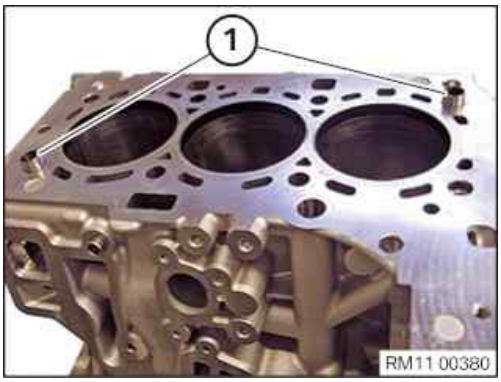
RISK OF DAMAGE

Damage to the surface.

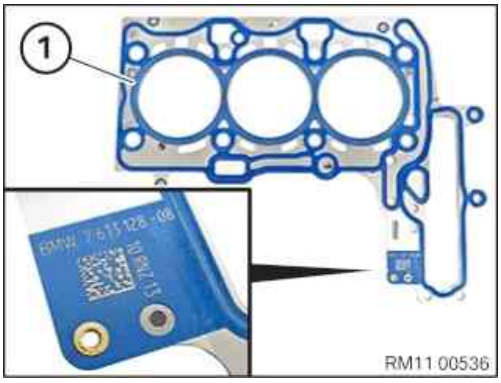
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

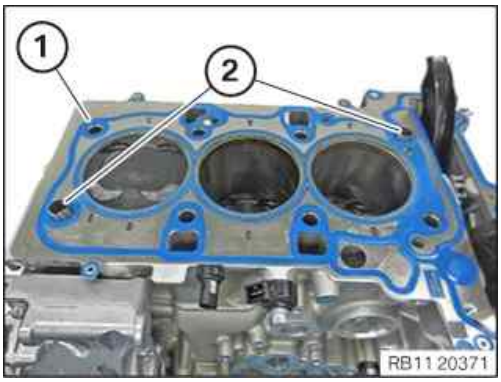
- Remove oil and dirt residue from the blind holes (1).



- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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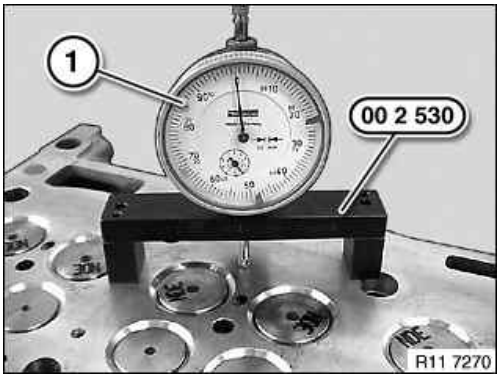
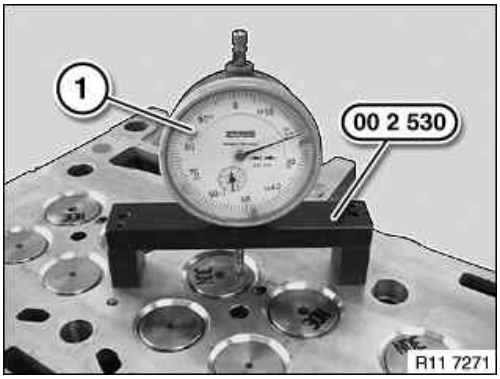
70 – Checking the valve underprotrusion



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

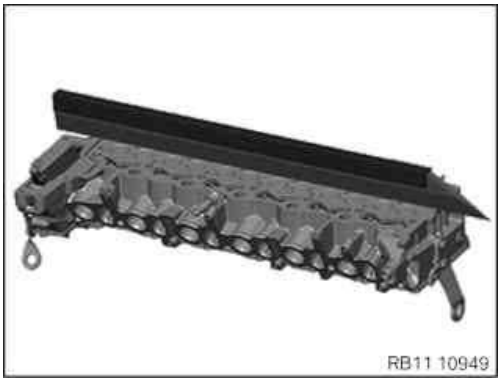
Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

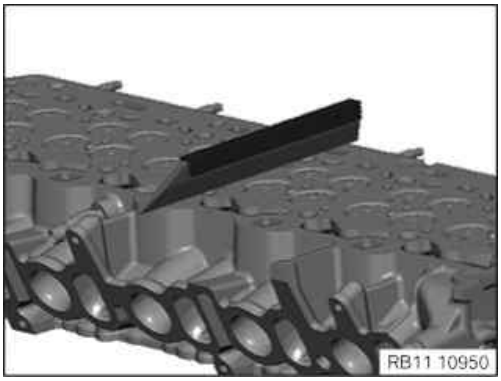
71 – Check the flatness of the cylinder head



- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm



- Check the flatness of the cylinder head crosswise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

72 – Installing the cylinder head

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CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

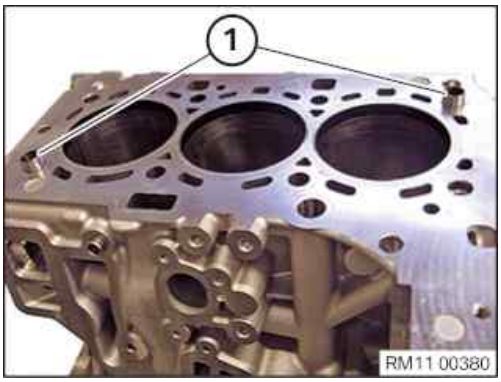
Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

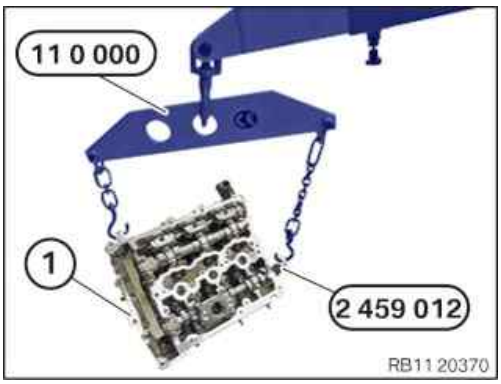
Do not remove bolt coating.



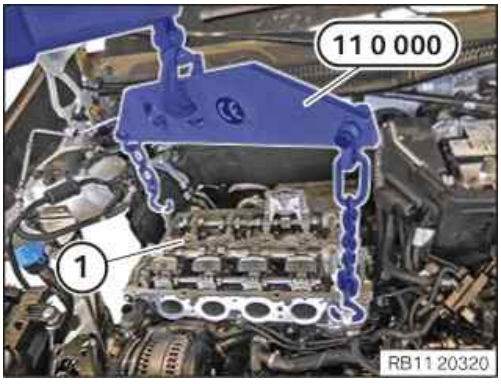
- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.

- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.

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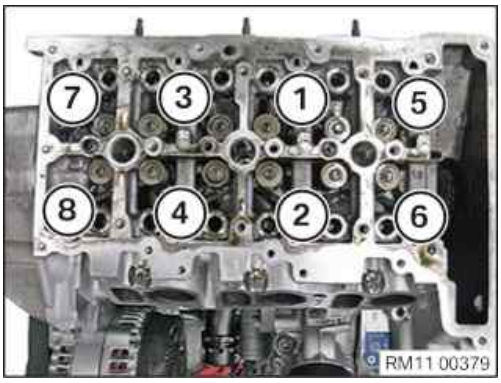


- Fit new cylinder head bolts.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

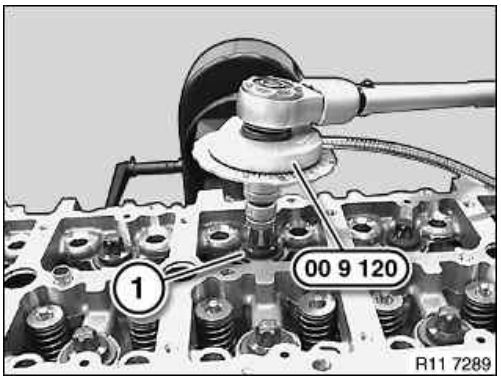
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

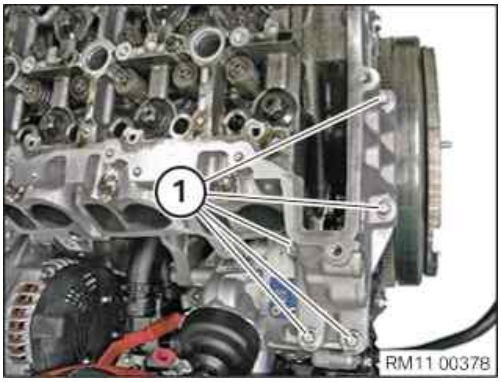
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

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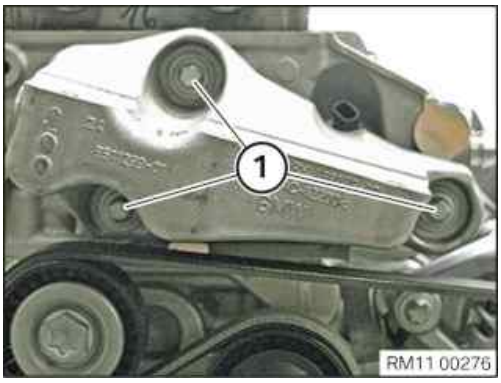
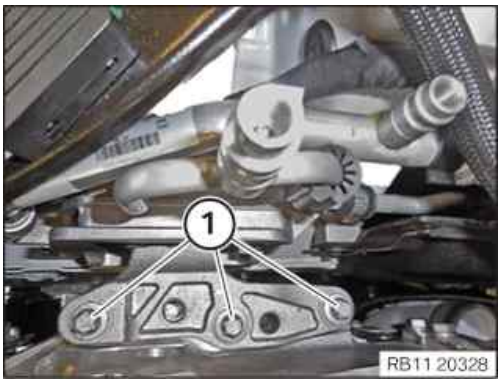


- Tighten the screws (1).

Engine support to cylinder head

M10X45		Tightening torque	41 Nm



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

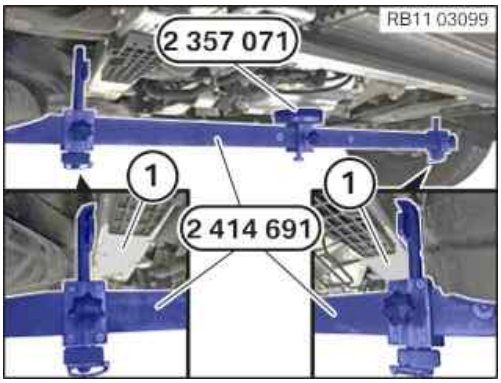
Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

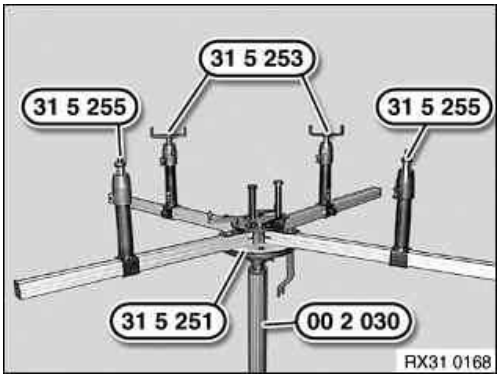
- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Disassemble special tool **2 414 691** using special tool **2 357 071**.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

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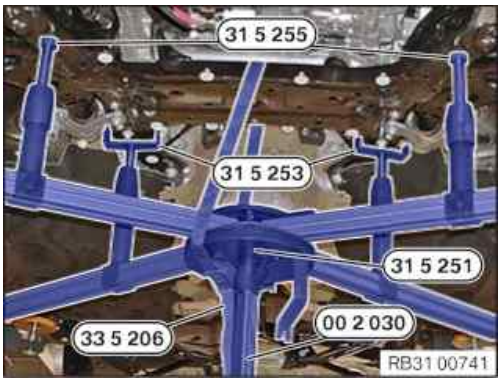
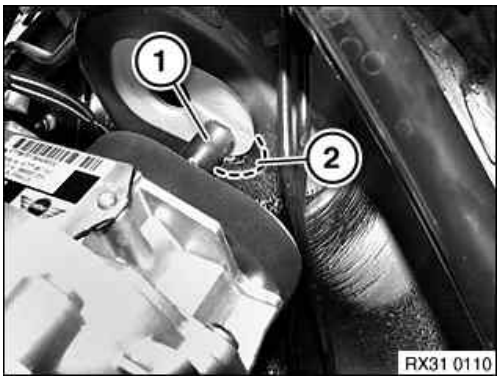


- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

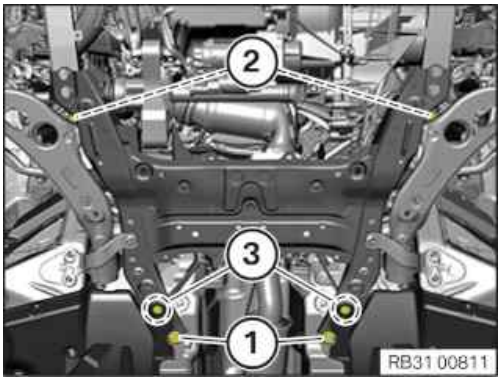


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

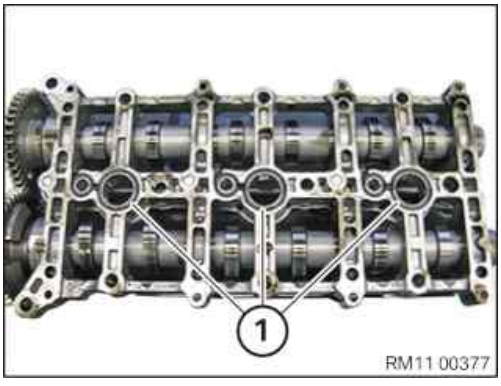
73 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Renew the seals (1) on the camshaft support.

Parts: Seals

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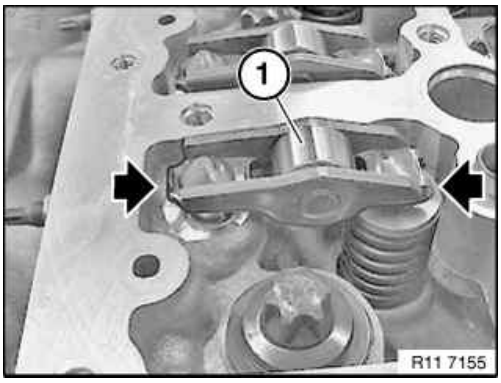
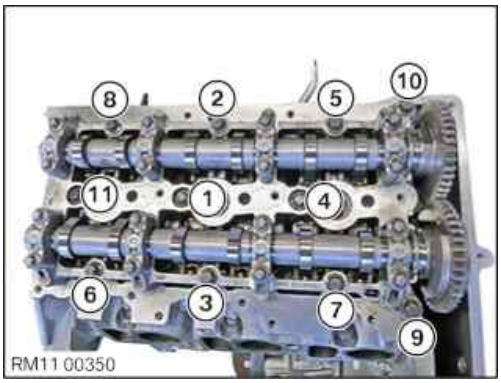


- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.

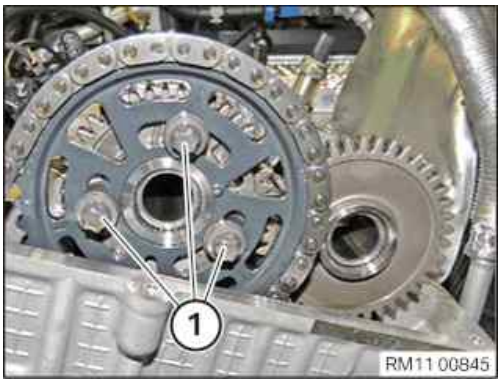


- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

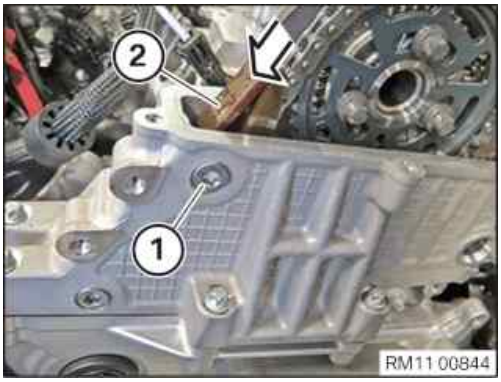
M7x35		Tightening torque	13 Nm

74 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

75 – Install the timing chain guide rail



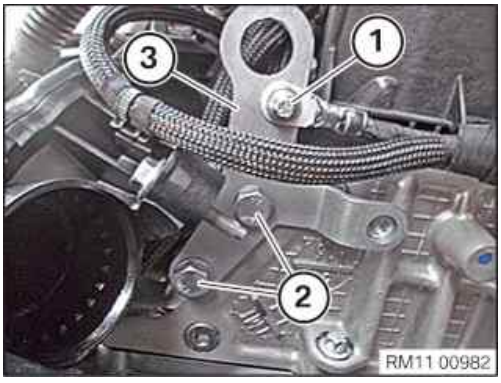
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

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76 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

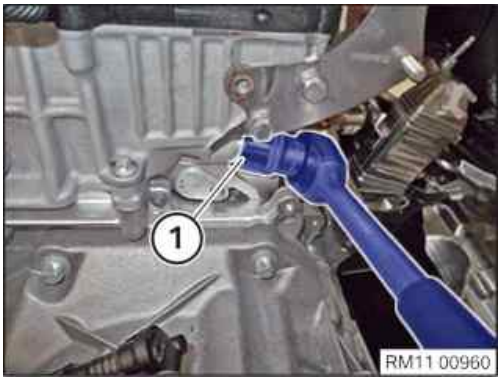
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

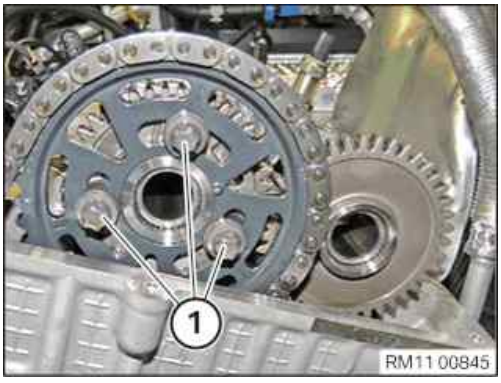


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

77 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

78 – Removing the special tool to secure the exhaust camshaft

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- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

79 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

80 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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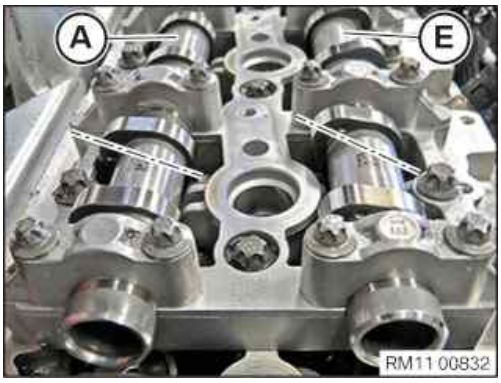
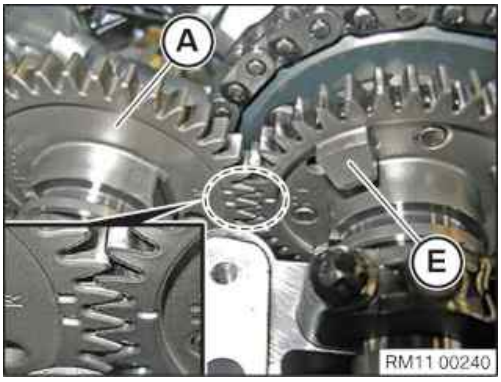


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

81 – Install the acoustic cover for the engine at the front

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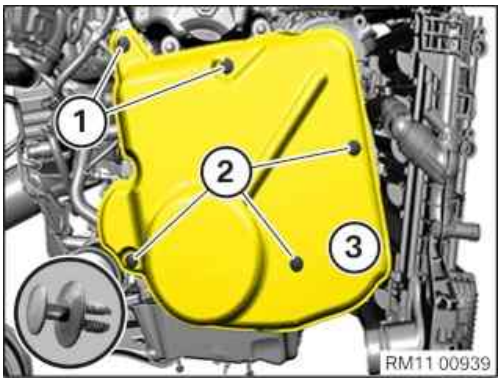


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

82 – Installing exhaust manifold

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

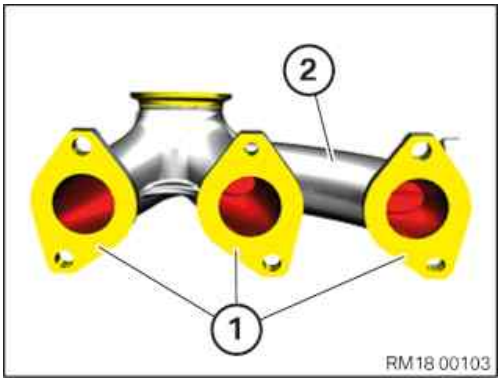
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean the connection points (1) on the exhaust manifold (2) with the special tool **0 495 102 (11 4 470)**.

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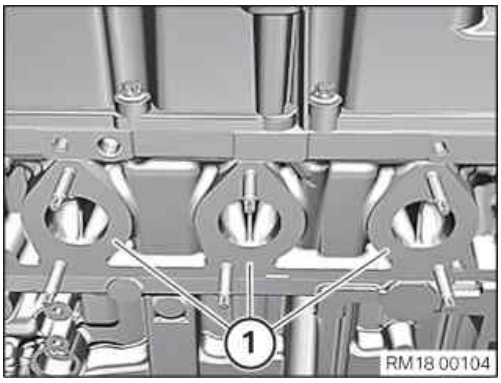
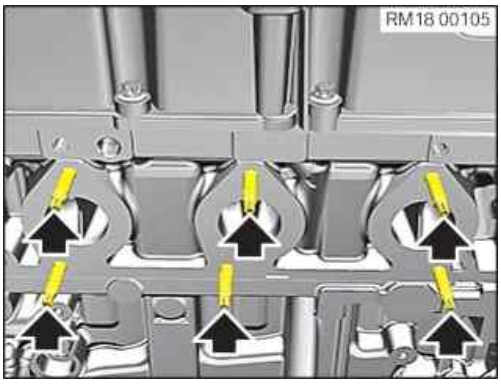
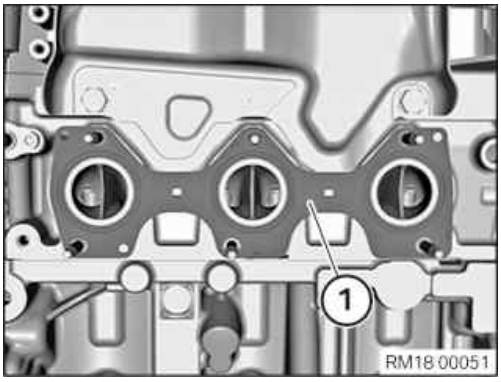


- Clean the connection points (1) on the cylinder head with the special tool **0 495 102 (11 4 470)**.



- Check the stud bolts (arrows) on the cylinder head for **correct** fit.



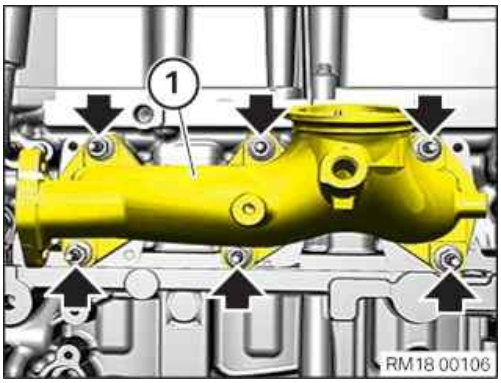
TECHNICAL INFORMATION

The **coated side of the** seal must be mounted facing towards the exhaust manifold.

- Renew the gasket (1).

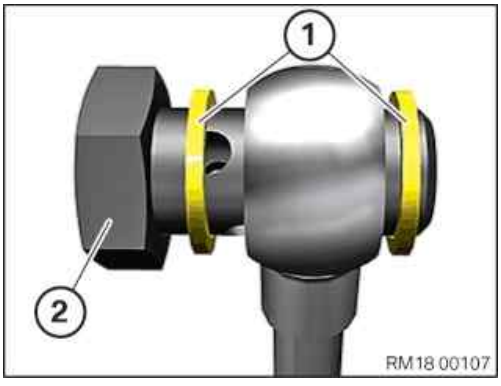
  Parts: Gasket
- Insert and install the gasket (1).
- Insert and install the exhaust manifold (1).
- Renew the nuts (arrows).

  Parts: Nuts
- Hand-tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.
- Tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.



Exhaust manifold to cylinder head

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm



- Renew the sealing rings (1) from the banjo bolt (2).

  Parts: Sealing ring

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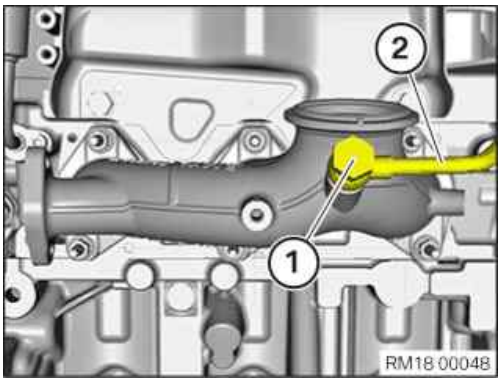
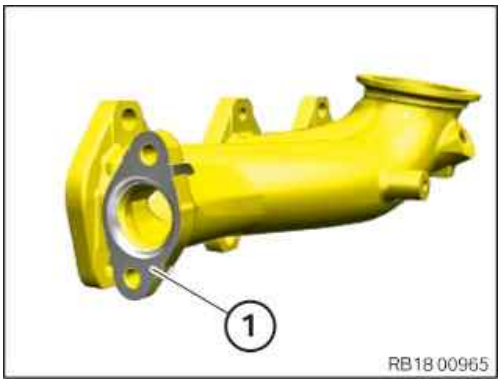


- Insert and install the exhaust gas pressure pipe (2).
- Tighten the banjo bolt (1).

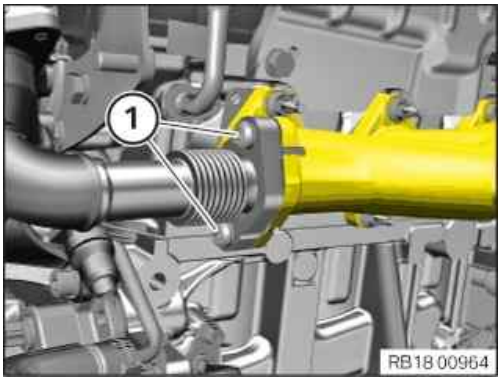
Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt		Renew sealing rings.	30 Nm



- Renew seal (1) between exhaust-gas recirculation cooler and exhaust manifold.

  Parts: Gasket



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

83 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

84 – Installing exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the exhaust turbocharger

Inadequate initial filling of exhaust turbocharger leads to dry running.

- Make sure the initial filling is correct when replacing exhaust turbocharger.
- Fill the exhaust turbocharger with the suitable additive (see electronic Parts Catalogue).

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

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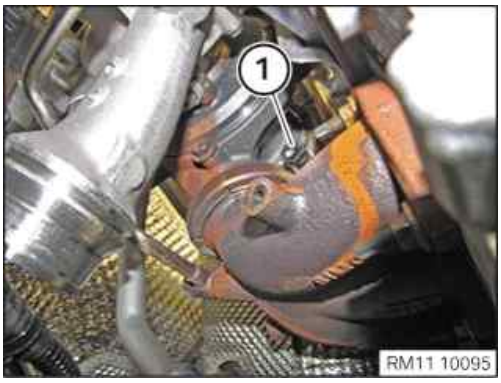

- Renew gasket.

  Parts: Gasket
- Position seal on exhaust manifold.
- Guide the exhaust turbocharger in from the top and position it.
- **Ensure that gasket is correctly seated.**
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Renew sealing rings.

  Parts: Sealing ring
- Position oil feed line with banjo bolt (1) and sealing rings and tighten hand-tight.

  There are 2 sealing rings fitted on the banjo bolt (1).
- Align oil feed line and tighten banjo bolt (1).

  The oil feed line must not sit on the exhaust turbocharger.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

- Renew gasket.

  Parts: Gasket
- Position oil return line (2) with **seal** on exhaust turbocharger.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Feed in and tighten screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

85 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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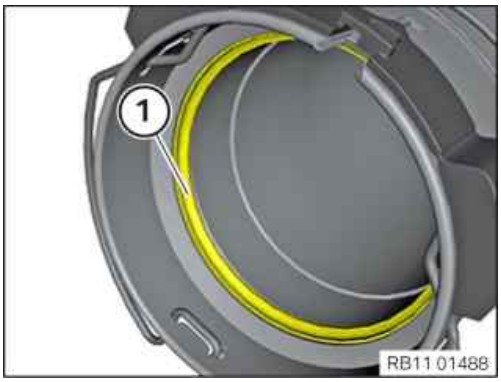
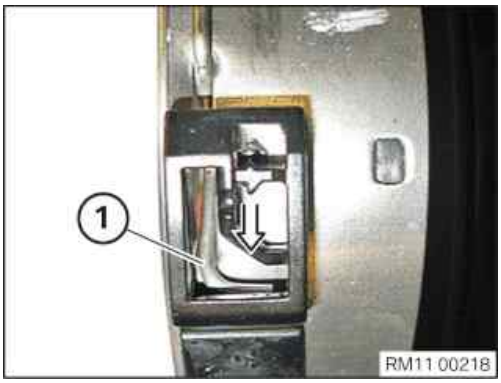
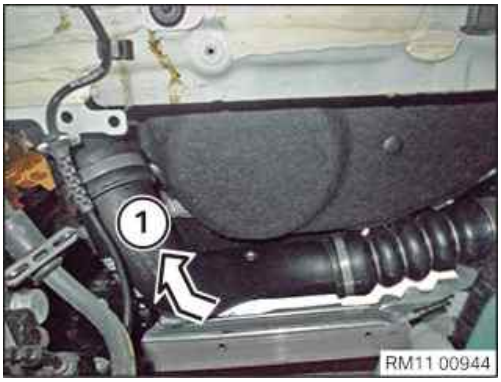


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

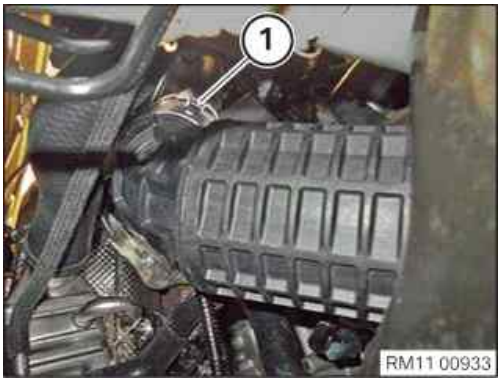
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

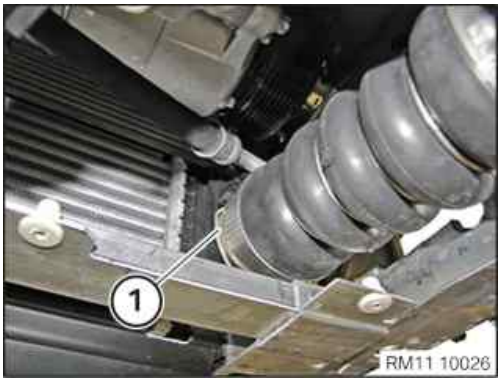


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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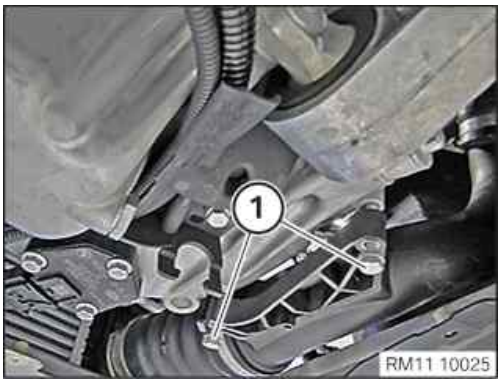
- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm



- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

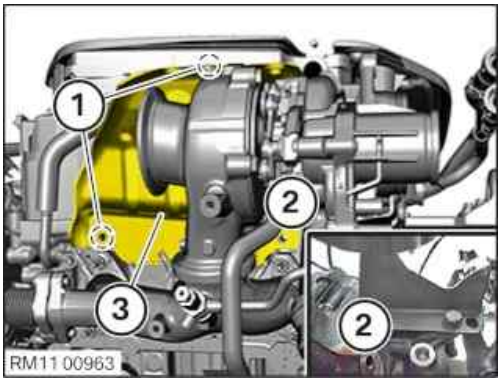
86 – Installing heat shield on exhaust turbocharger at the rear

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

87 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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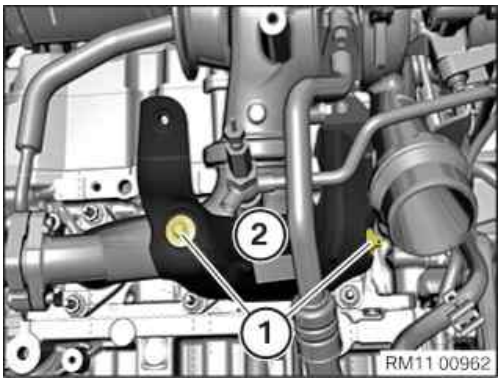


- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

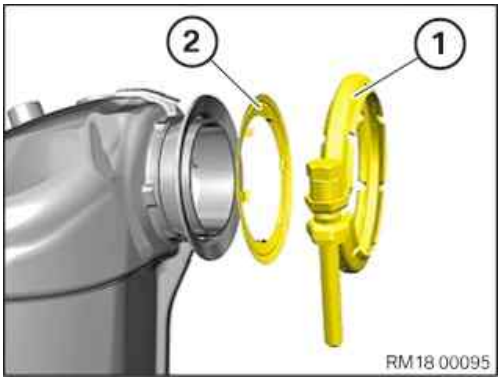
88 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

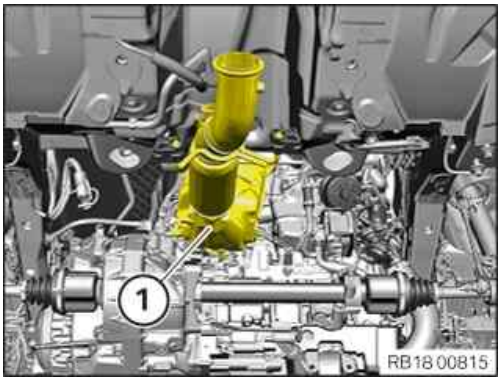


- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

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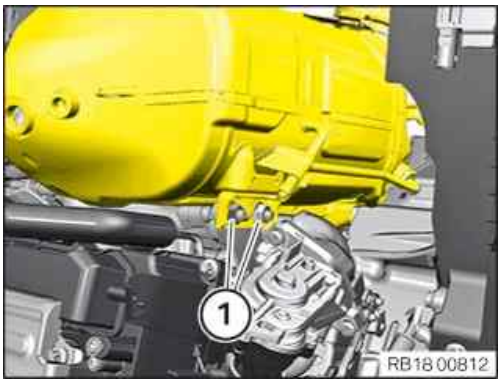
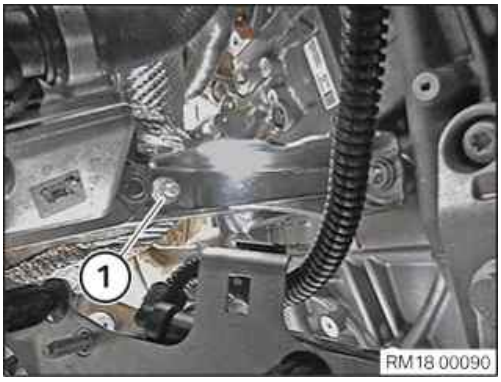
- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Tighten the nut (1) hand-tight.

- Remove fitting aid (1) for the flexible tube.

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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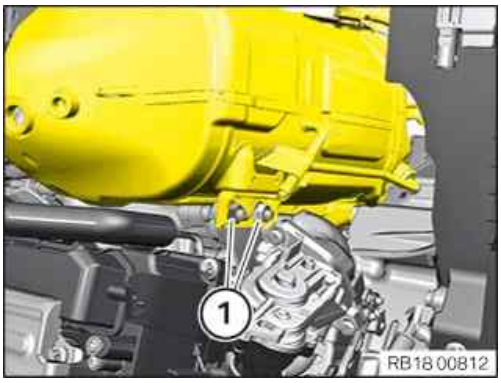
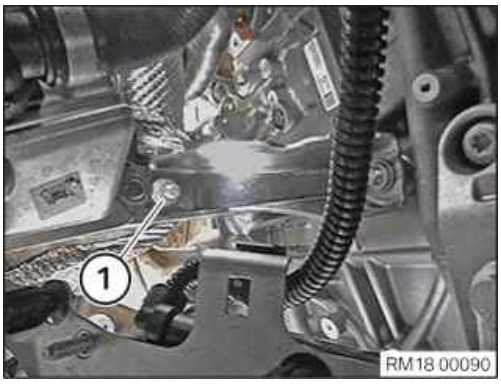


- Tighten nuts (1).

Diesel particle filter to holder

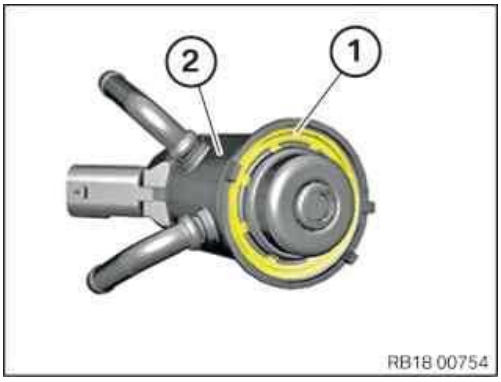
M8 hexagon nut		Tightening torque	19 Nm



- Tighten nut (1).

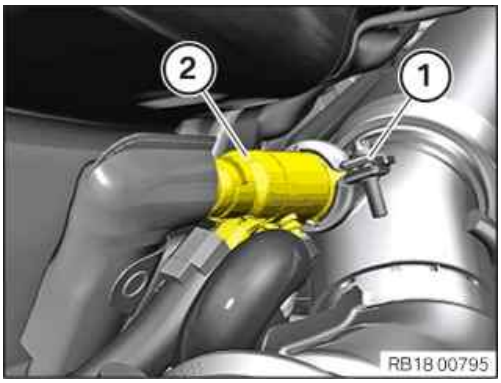
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

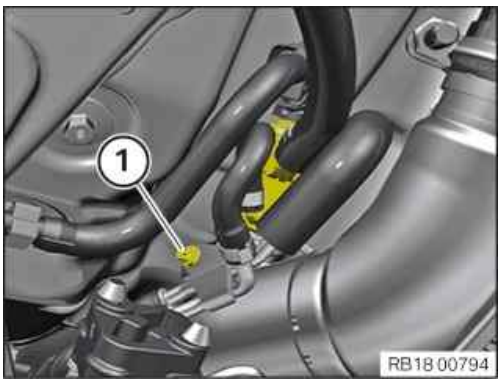


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

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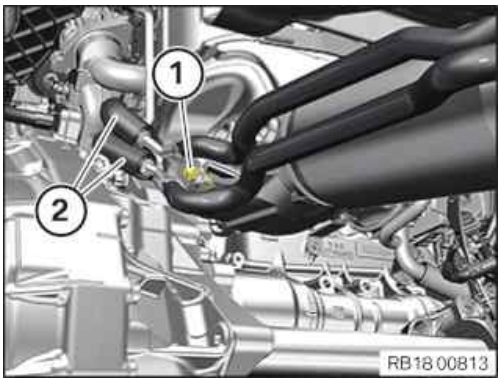
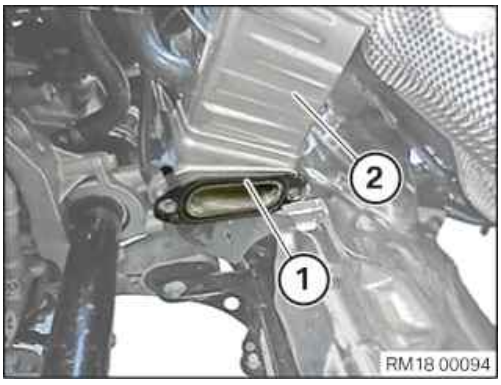


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

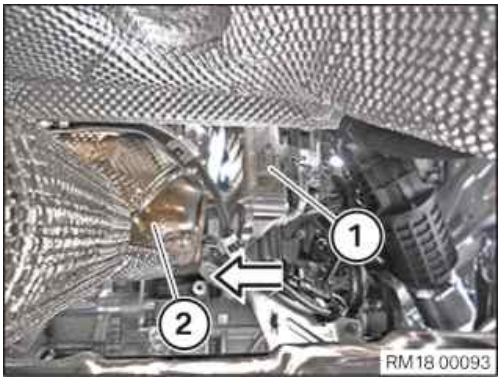
Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

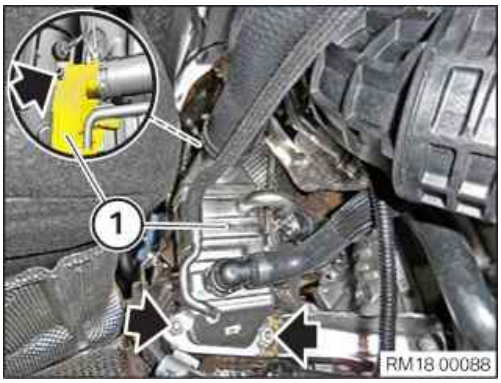


- Replace seal (1) of the low pressure exhaust-gas recirculation cooler (2).

  Parts: Gasket



- Feed in and install the low pressure exhaust-gas recirculation cooler (1) in at the diesel particulate filter (2) in the direction of arrow.

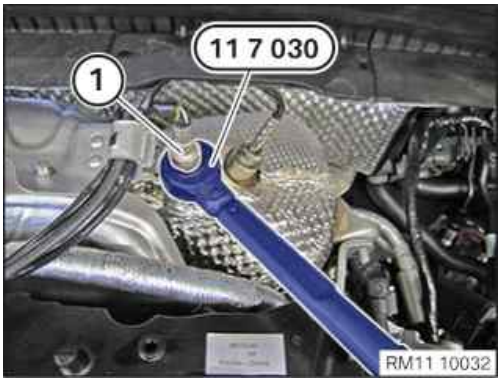


- Tighten nuts (arrows) of the low pressure exhaust-gas recirculation coolers (1).

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Flange nutM8		Tightening torque	19 Nm

89 – Install the control sensor



- Feed in front oxygen sensor (1) and install.
- Tighten the front oxygen sensor (1) with the special tool **0 491 075 (11 7 030)**.

Control sensor

Control sensor		Tightening torque	50 Nm

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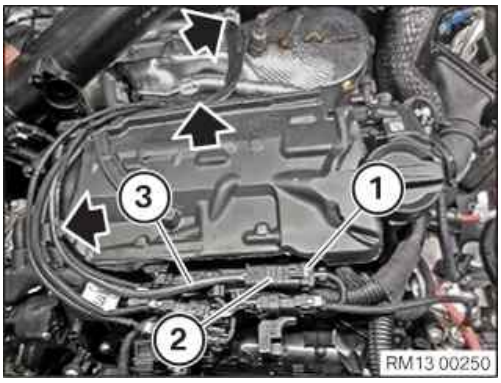
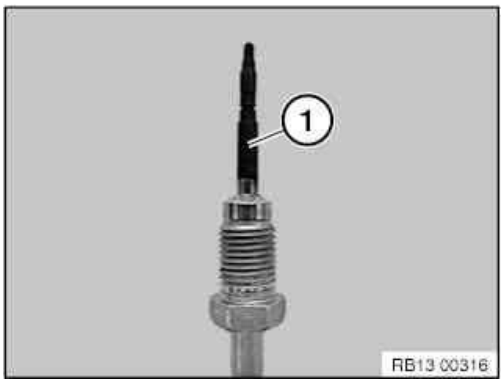


- Feed in and install cable (3) from the oxygen control sensor into the clamps (arrows).
- Secure connector (2) on holder.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

90 – Install the exhaust-gas temperature sensor on the diesel particulate filter



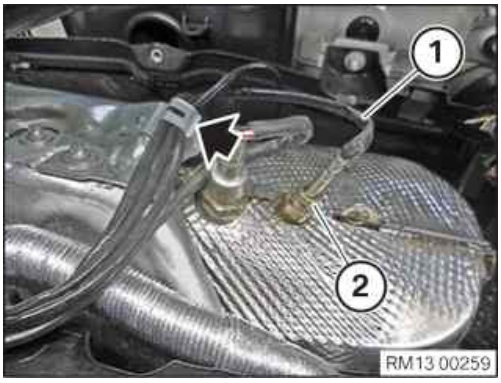
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

91 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

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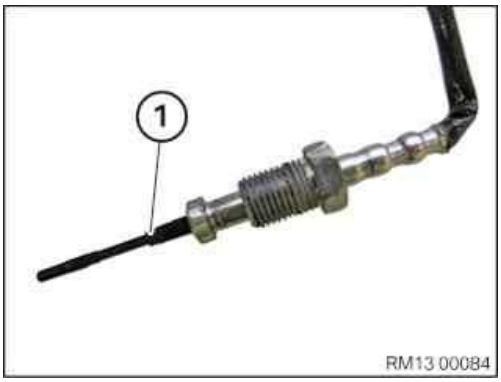


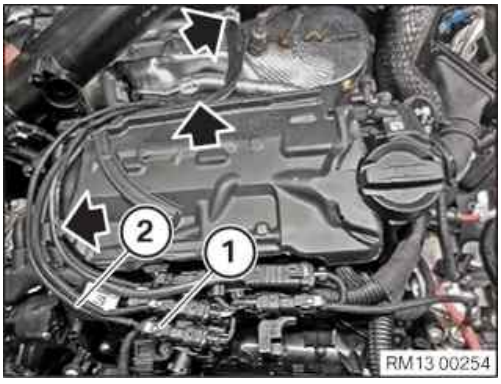
- Make sure the gauge tip (1) is not damaged during installation.

- Feed in and install the exhaust temperature sensor (1).

- Tighten the exhaust temperature sensor (1) with conventional tools (2).

Exhaust temperature sensor to diesel particulate filter

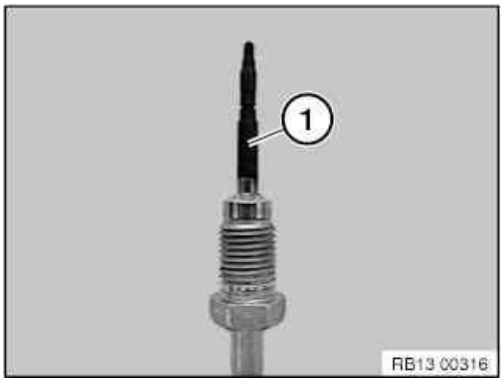
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

92 – Installing exhaust temperature sensor on catalytic converter



RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.

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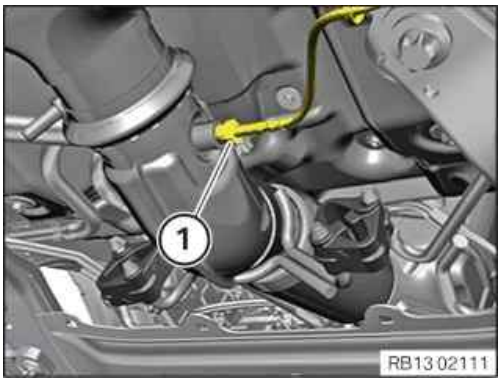
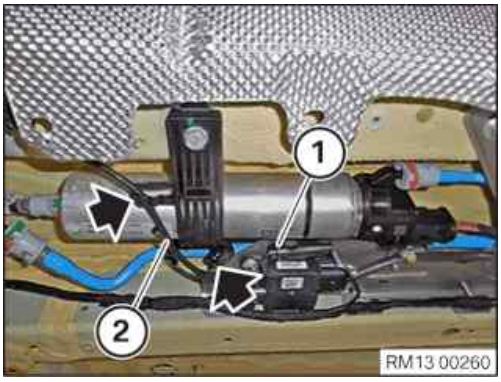


- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

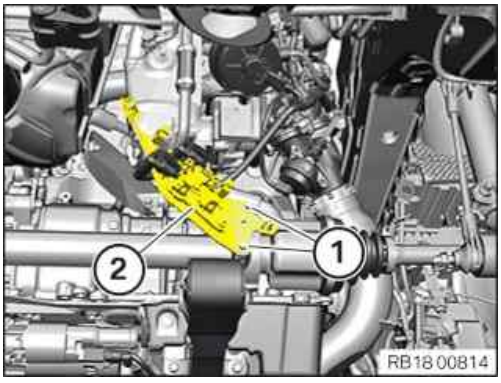
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

93 – Install holder for oxygen sensor

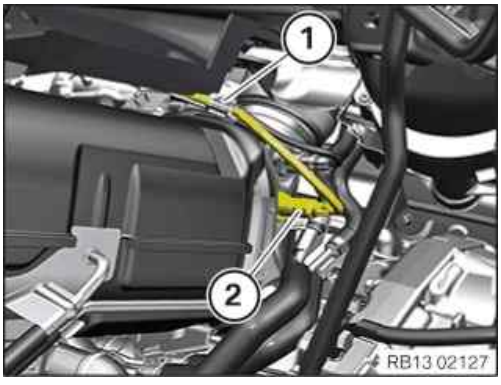


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

94 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm

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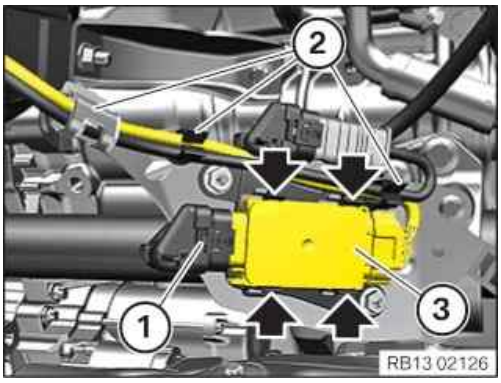


- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

95 – Install the monitoring sensor

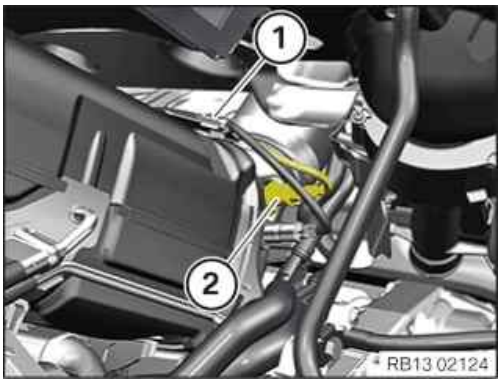
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

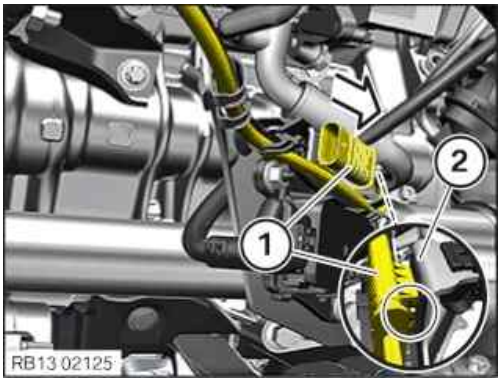


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

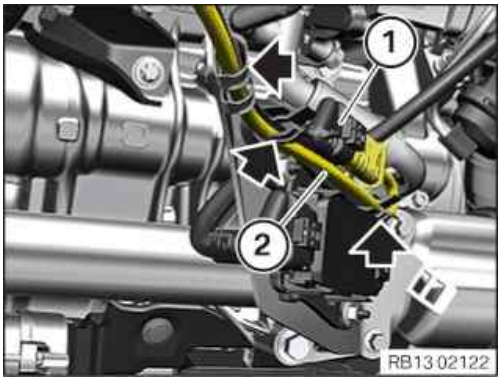
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

96 – Installing starter motor

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CAUTION

Improper routing of the positive battery cable.

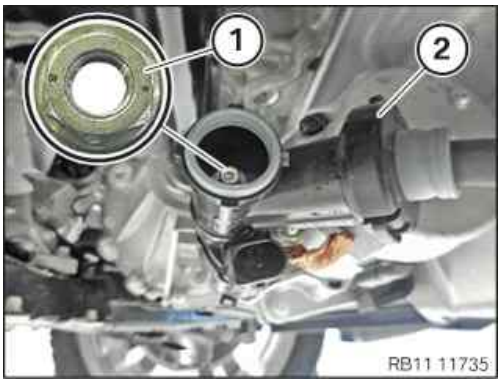
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

97 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

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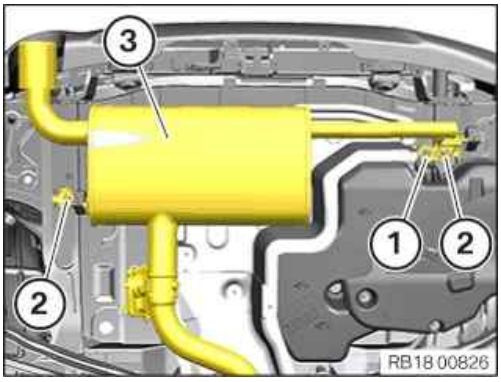
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert and install the exhaust system (3) with the help of another person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

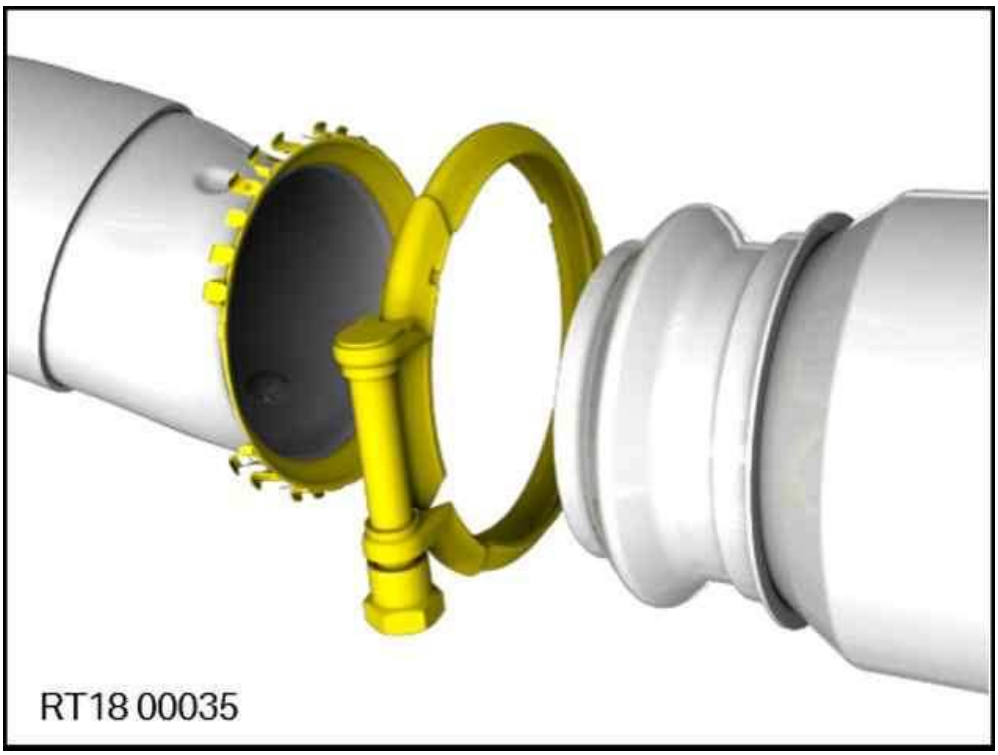
- Tighten down screw (1).

Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

▸ **Install the V-clip**

V-band clamp



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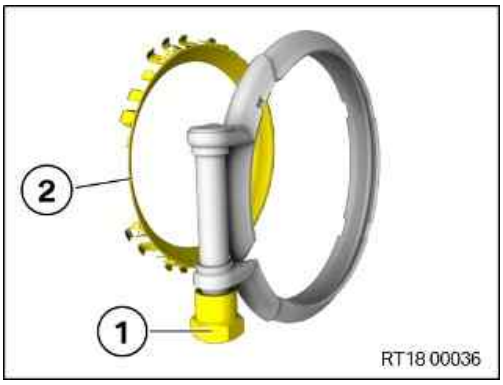
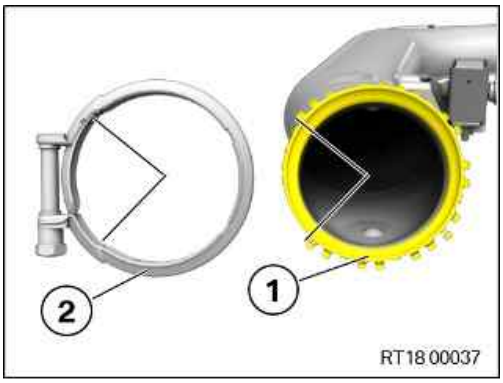
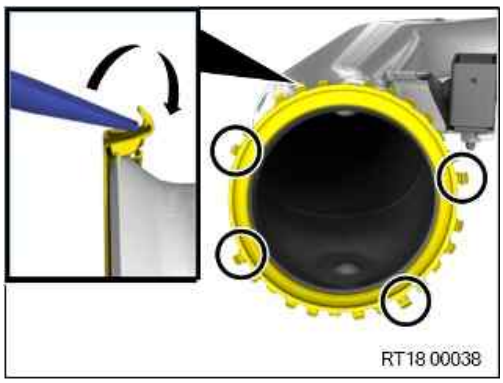


- Unscrew the nut (1) and remove the sealing ring (2).

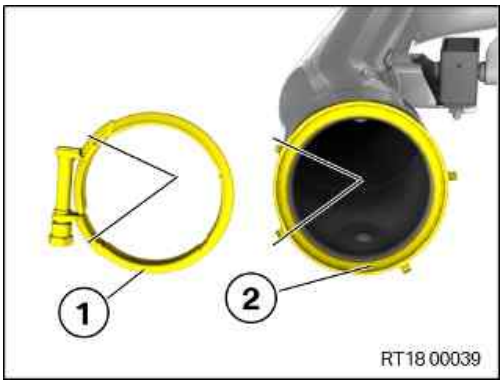


- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).

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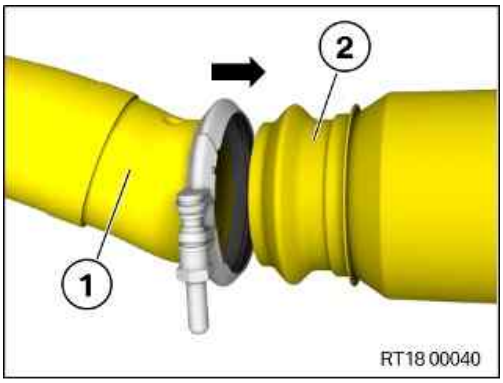
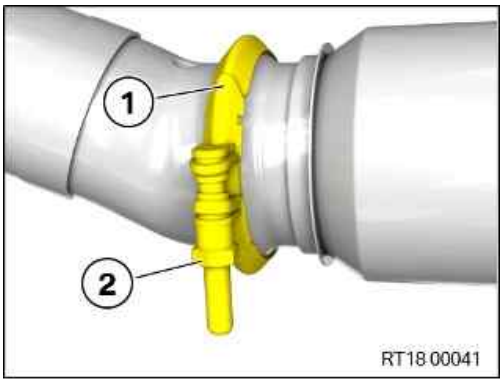


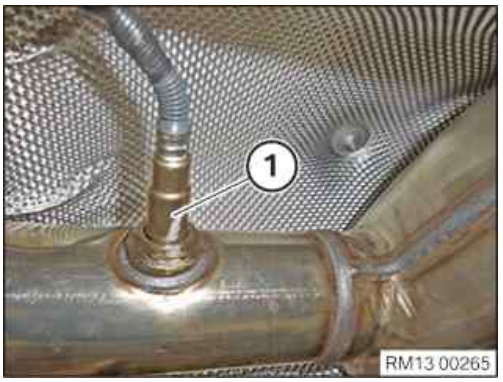
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

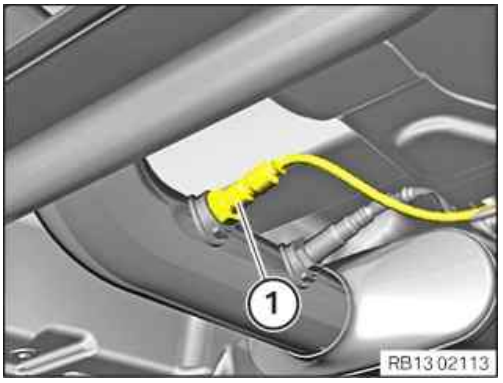
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Guide in, position and tighten the diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

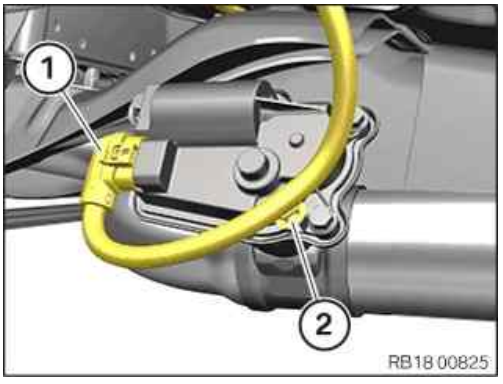
Sensor		Tightening torque	50 Nm



- Guide in, position and tighten the nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

98 – Install the cross-member with torsion struts

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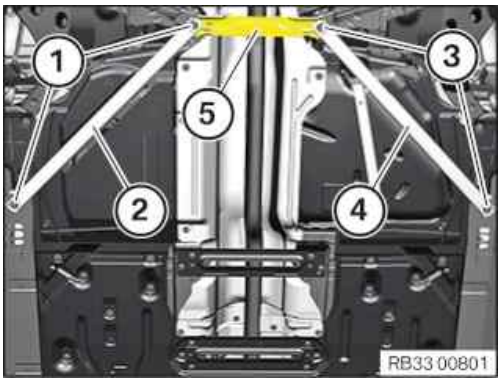


- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

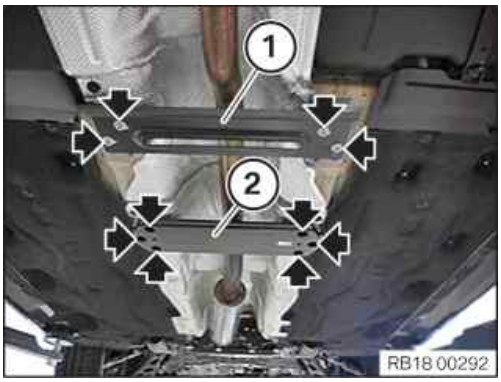
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

99 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

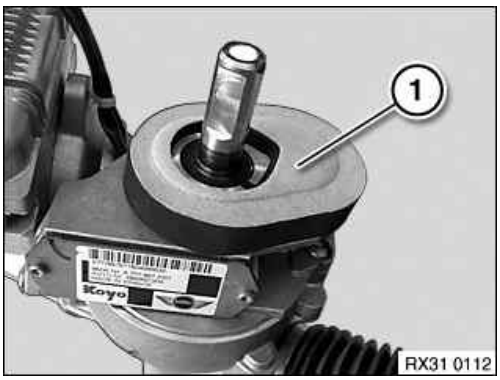
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

100 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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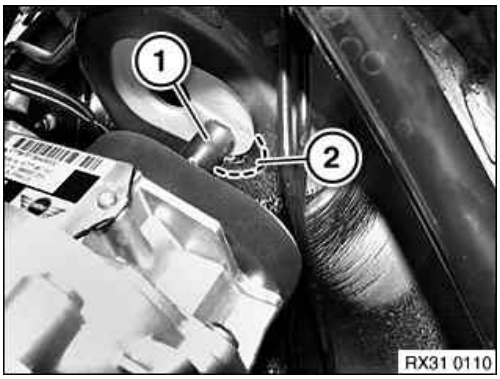
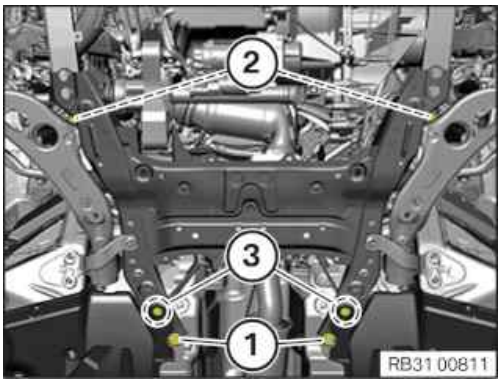


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

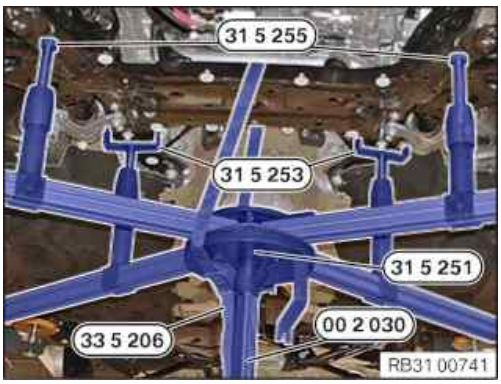
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.

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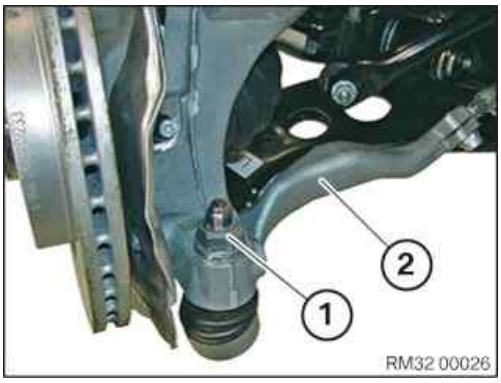


NOTICE

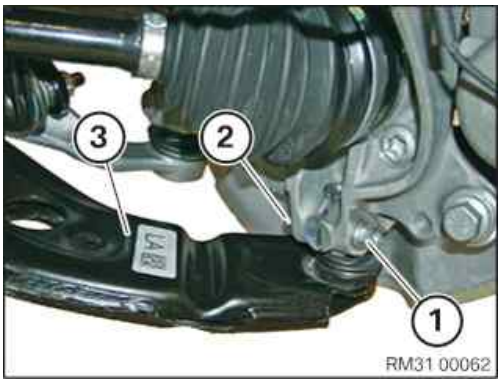
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

101 – Install the mounted parts on the front axle support

NOTICE

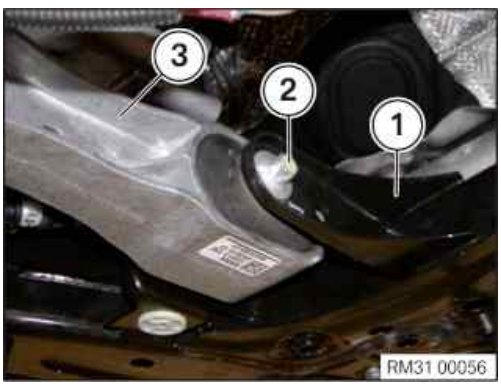
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

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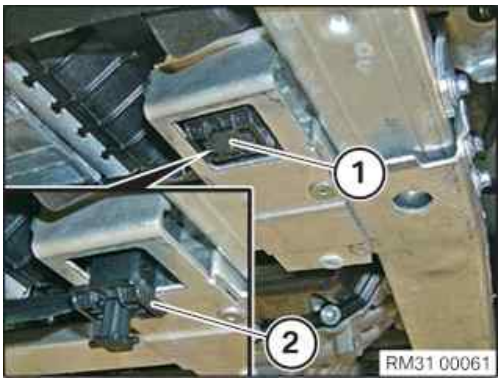
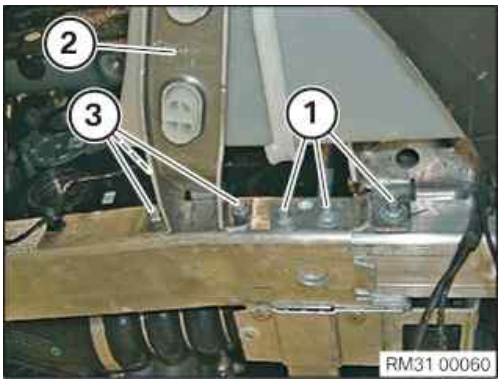


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

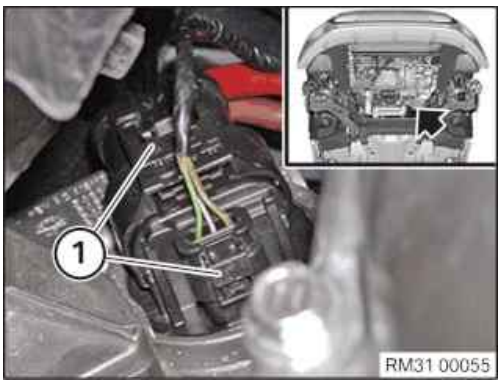
Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

102 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.

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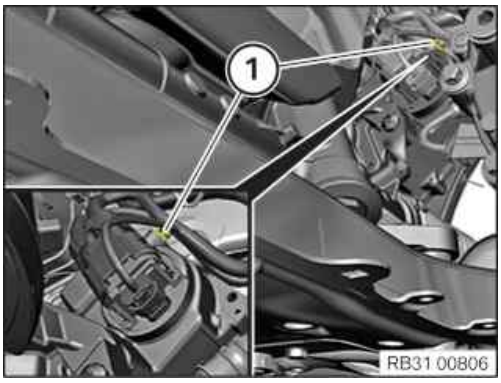
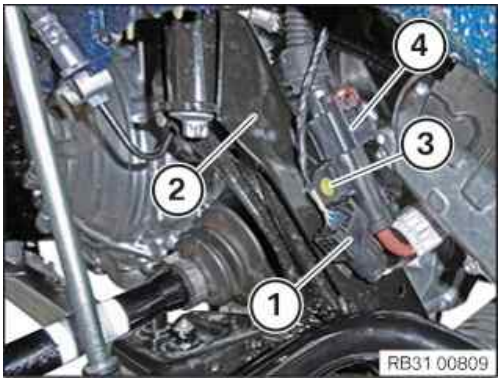


- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

103 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

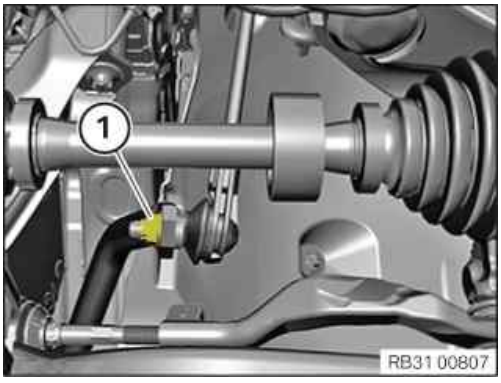
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

104 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

105 – With right installation: Securing the cable for the ride height sensor

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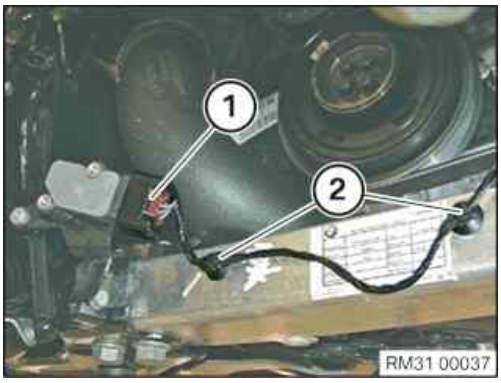


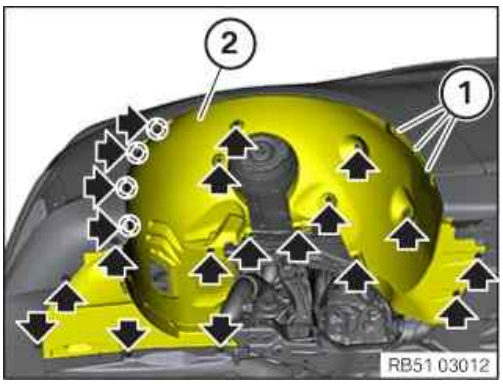
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

106 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▶ **Installing the front wheel arch cover**



- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

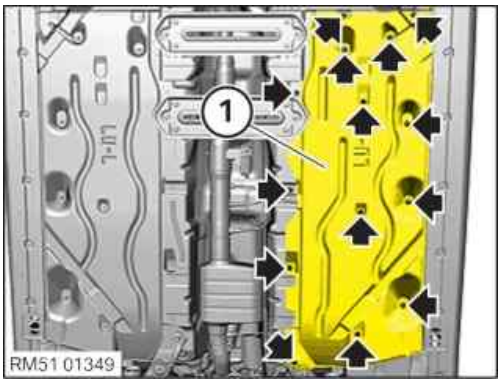
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

107 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

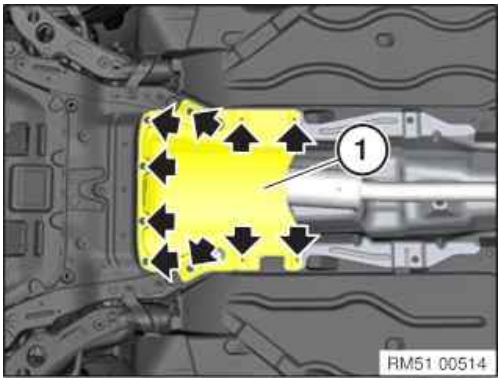
Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

108 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

109 – Mount the front left and right wheels

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▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

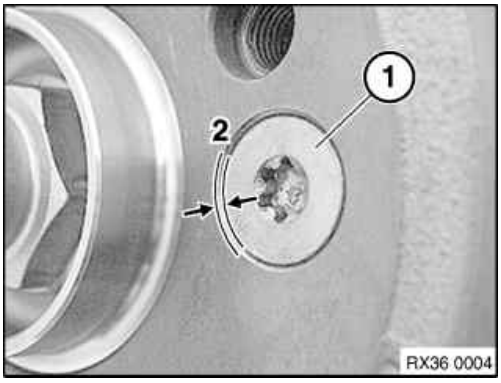
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

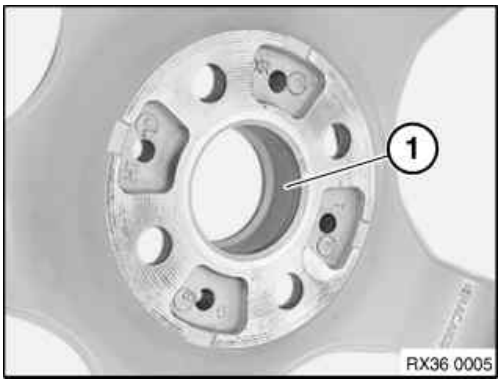
  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

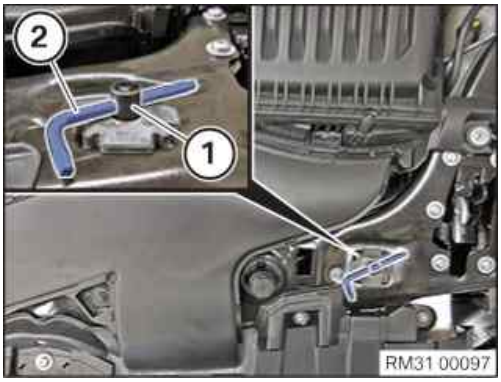
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

110 – Removing fastener for left and right radiator



NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

111 – Secure the steering shaft at the bottom on the steering gear

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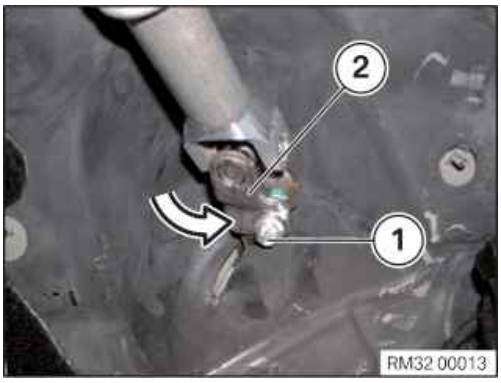
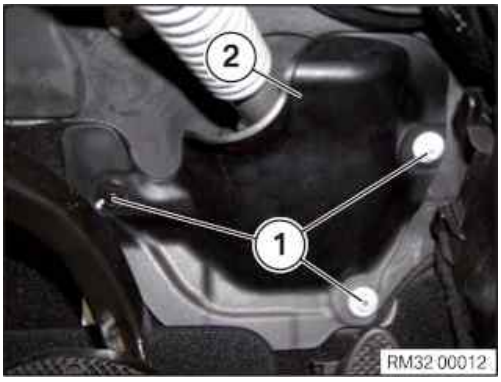


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

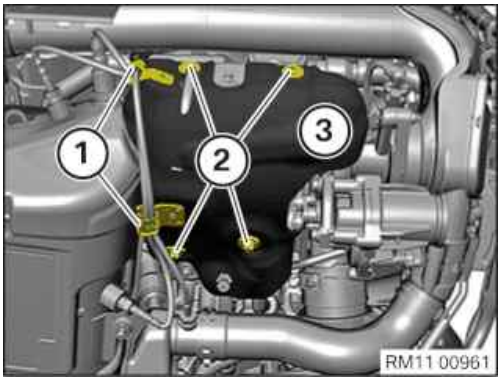
112 – Install the heat shield on the exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



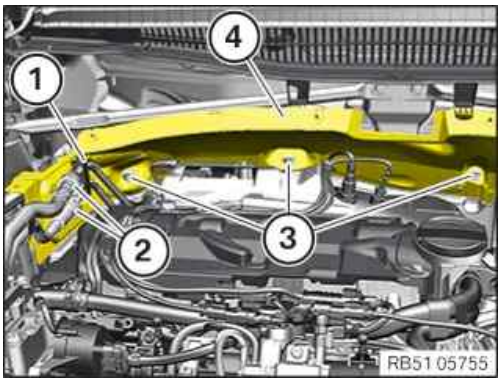
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

113 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

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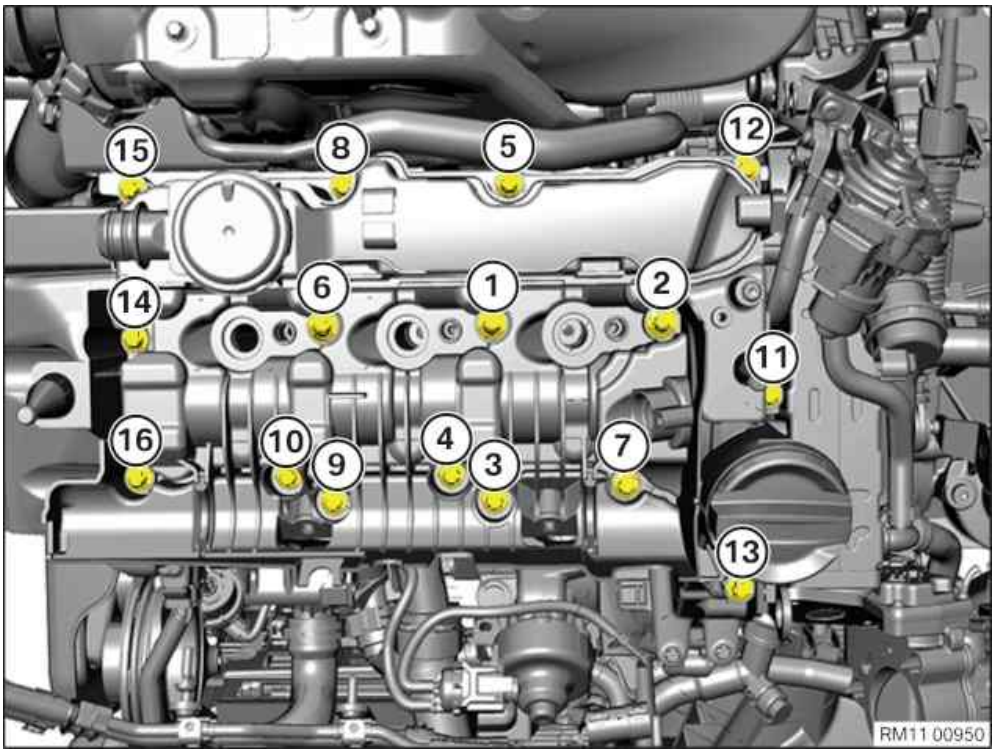
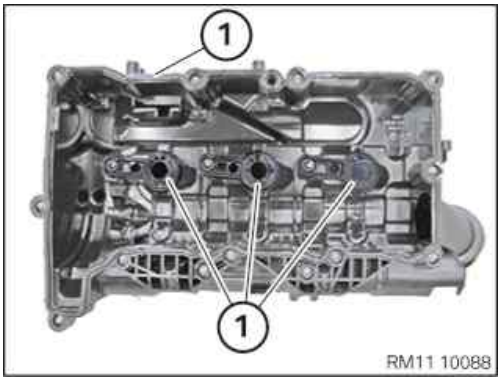
114 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover

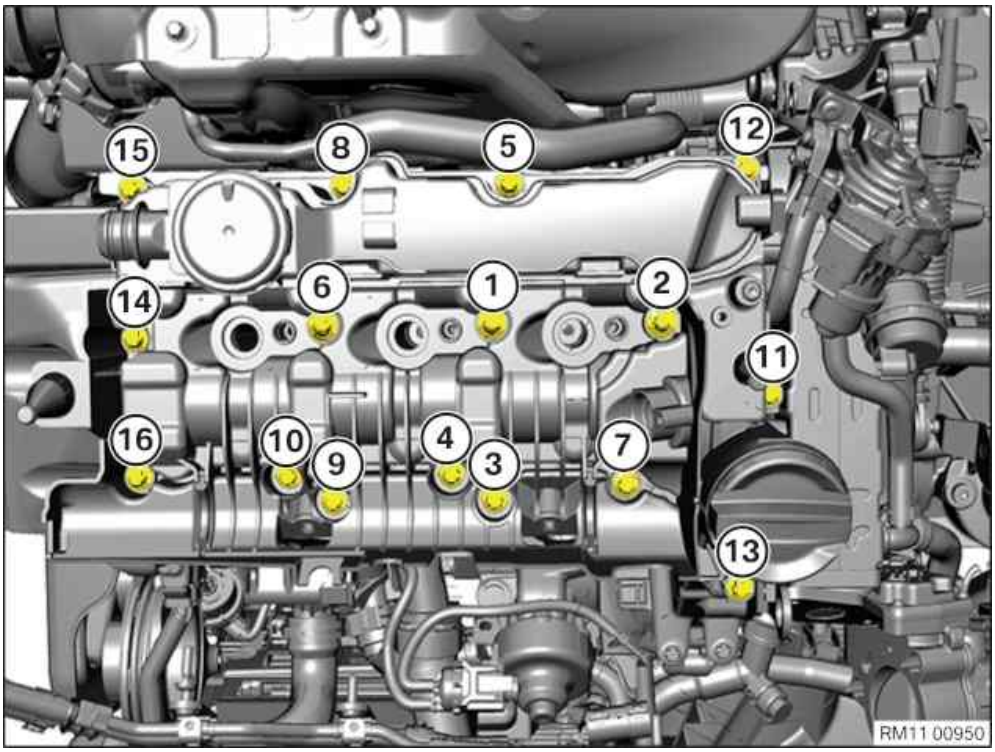


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm

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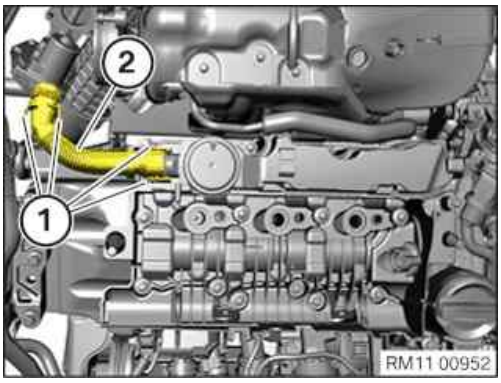
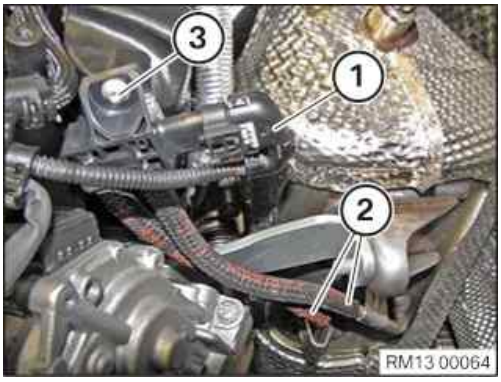


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

115 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

116 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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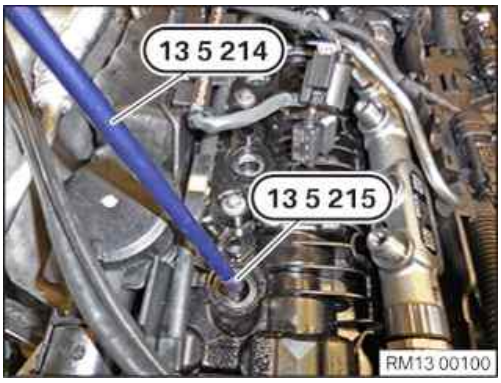
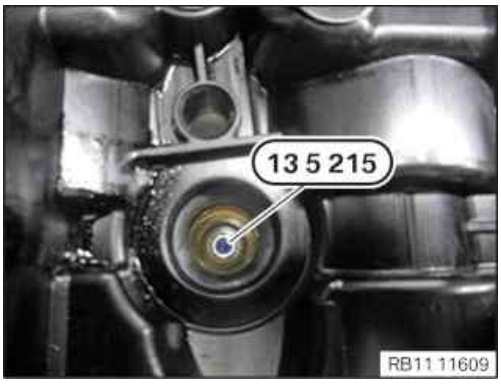


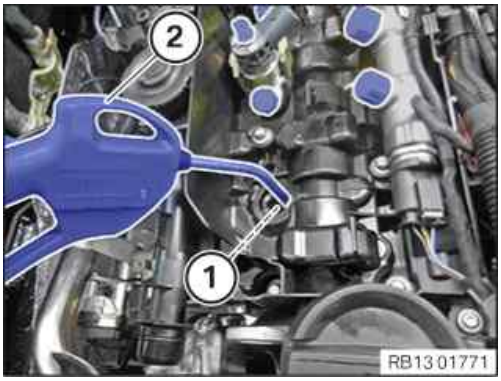
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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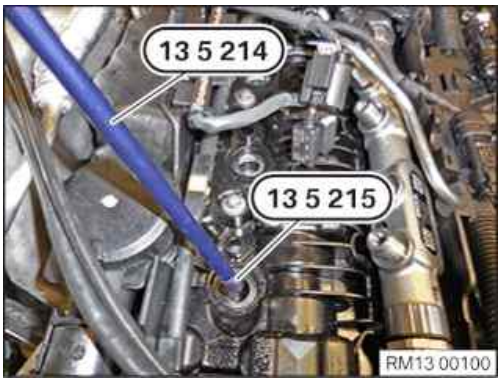


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

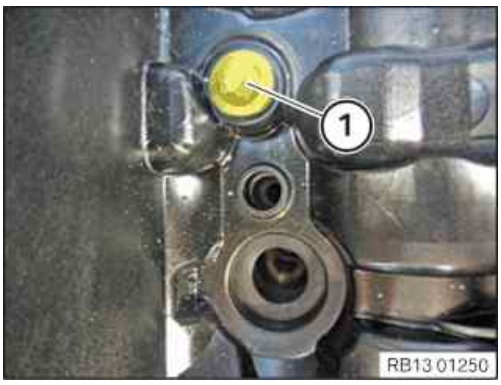
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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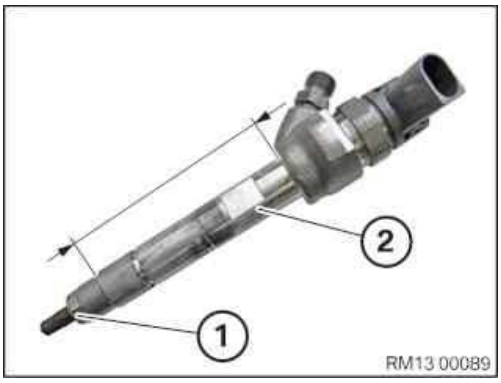


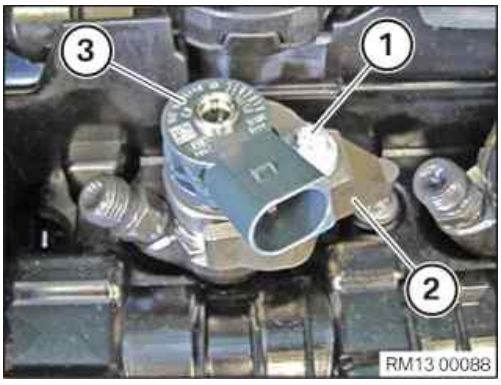
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

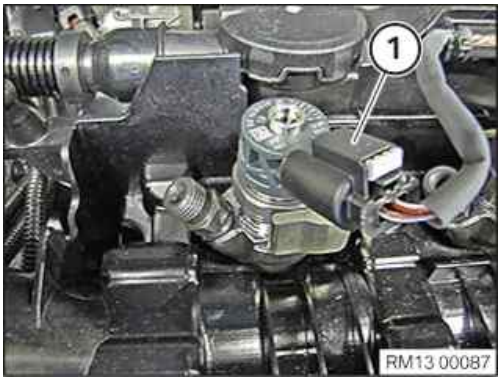
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

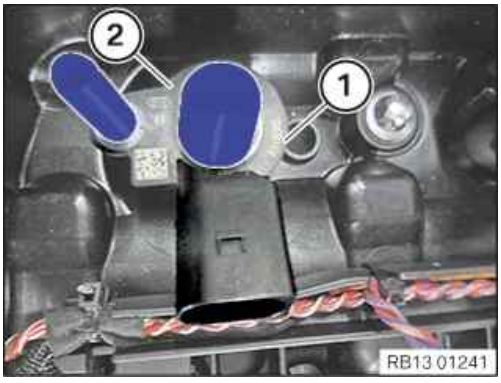
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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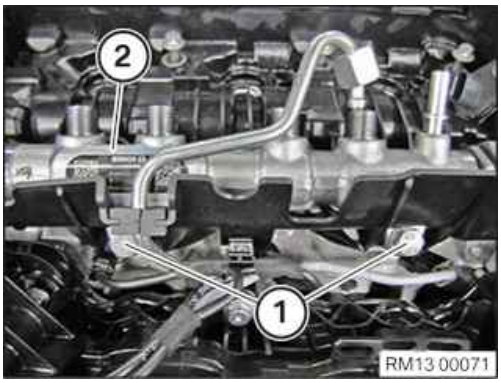
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

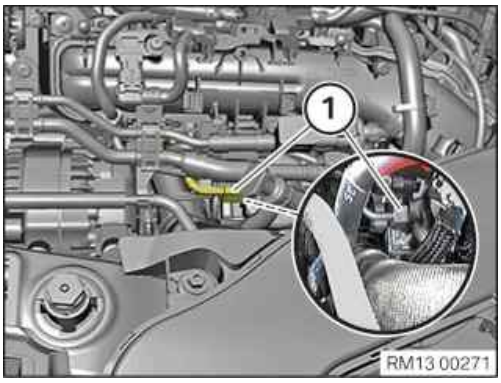
117 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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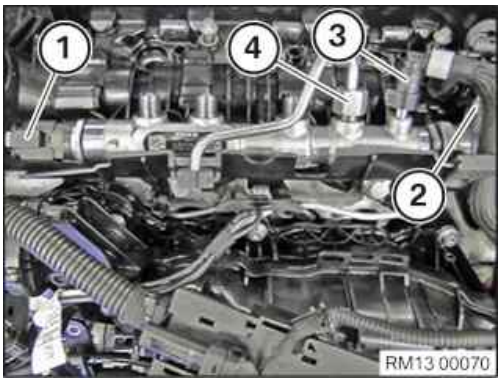

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

118 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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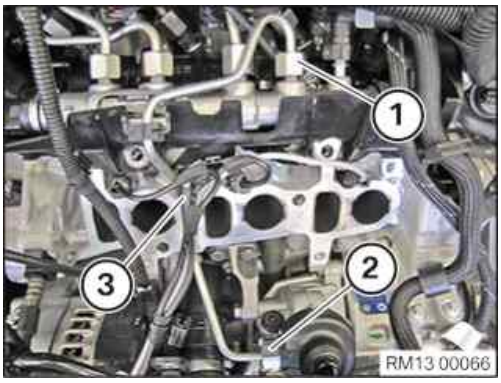

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

119 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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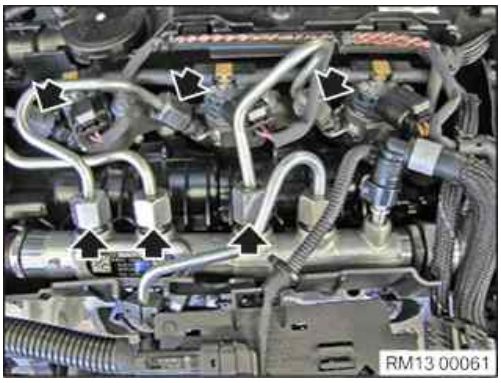

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

120 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

121 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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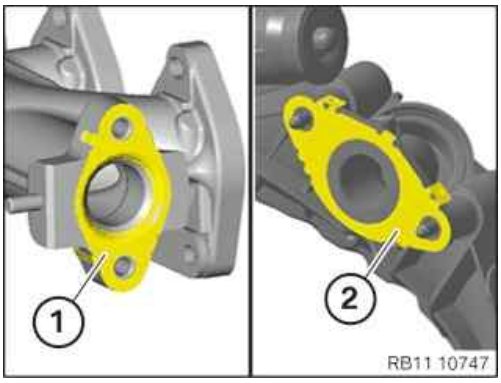
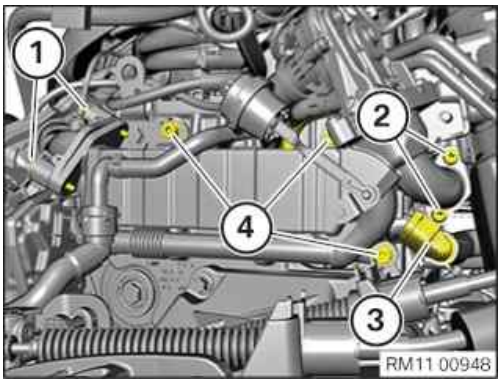


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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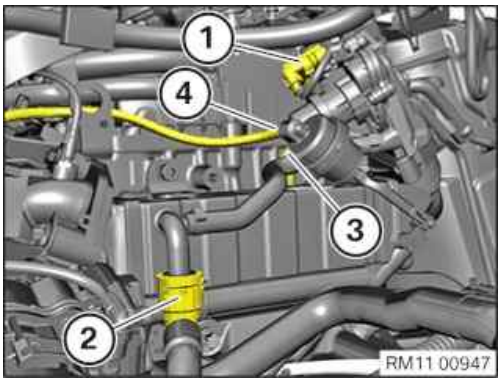


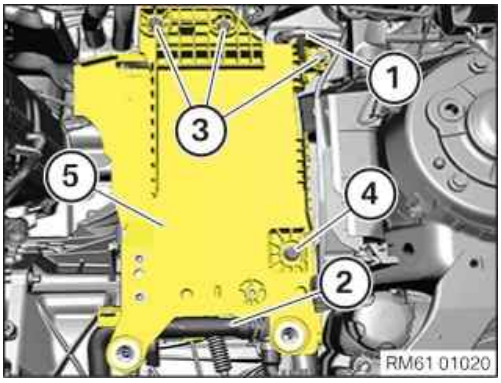
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

122 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

123 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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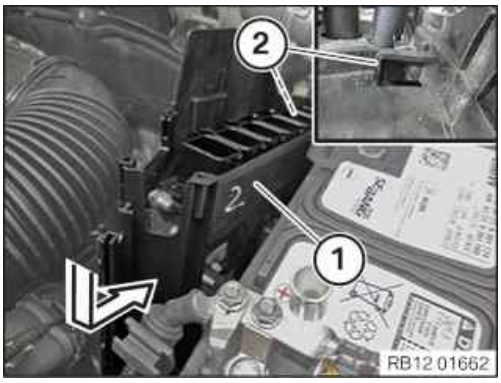
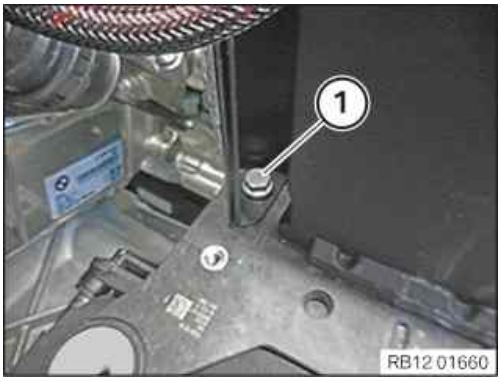


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

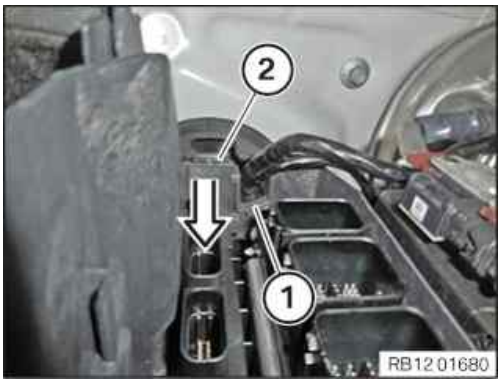
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



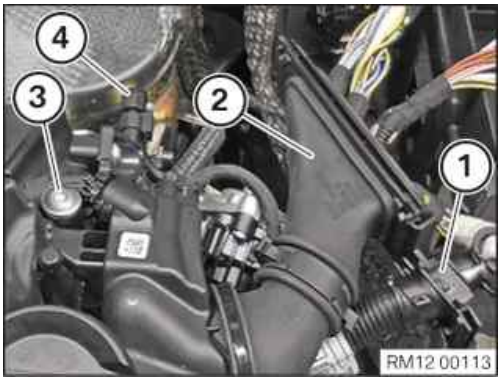
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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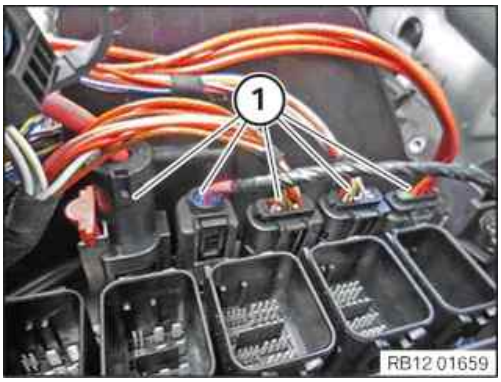
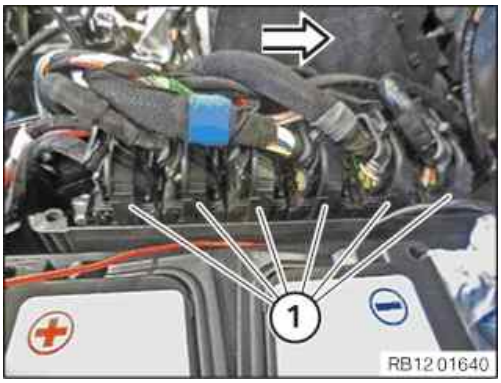
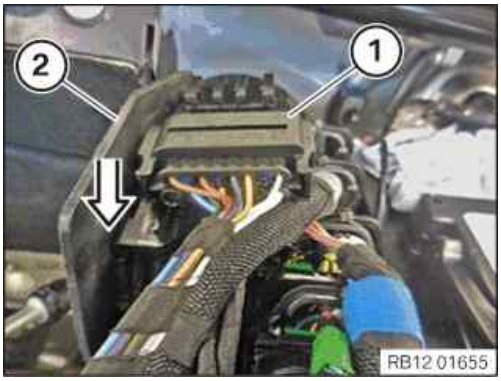


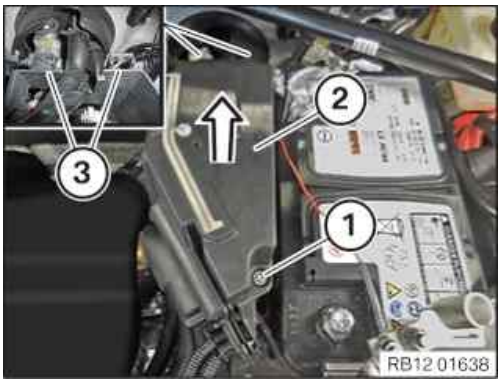
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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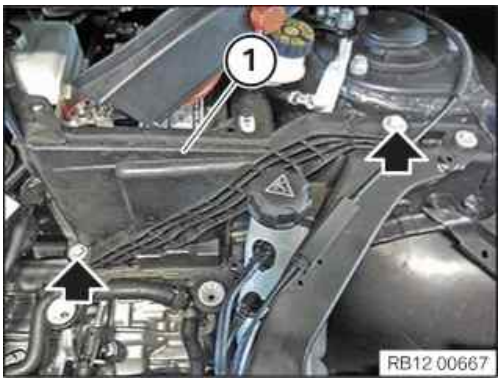


- Feed in and install tension strut (1).
- Tighten screws (arrows).

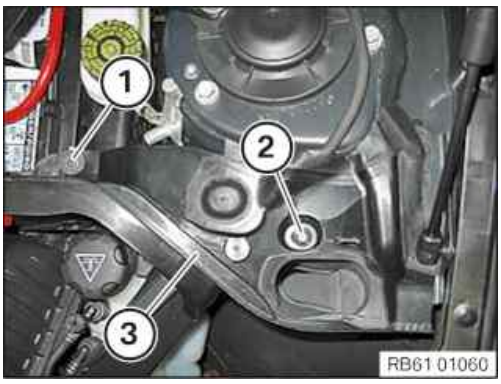
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

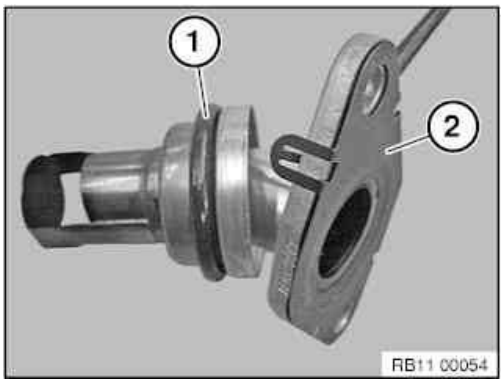


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

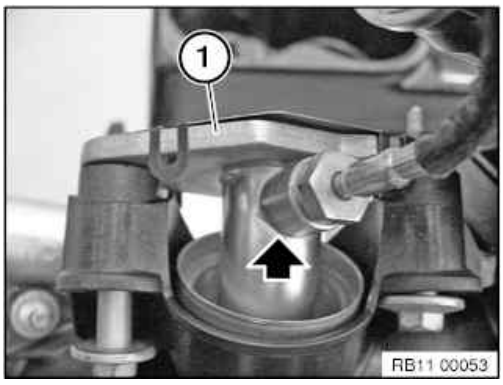
124 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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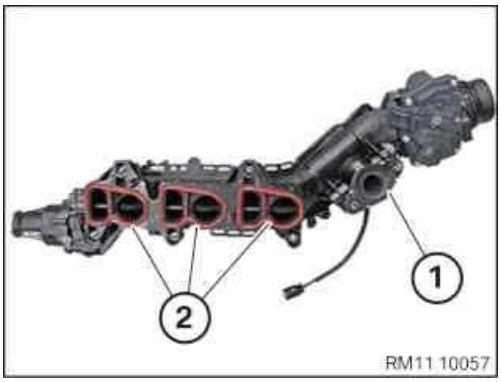
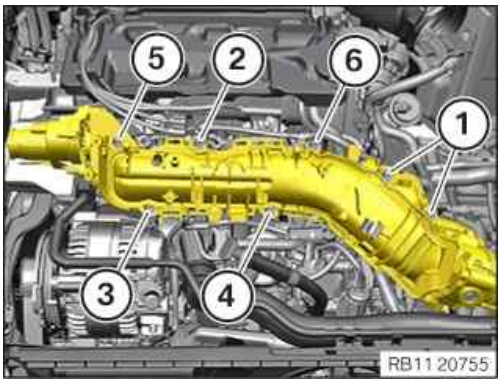


- Renew gaskets (2).

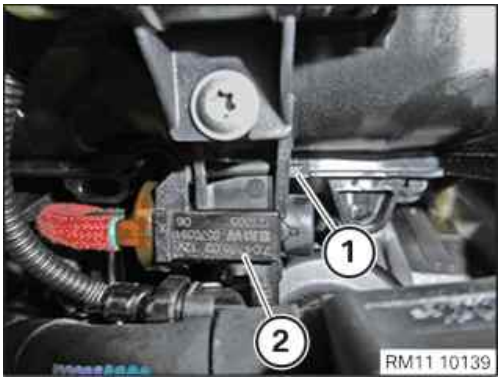
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



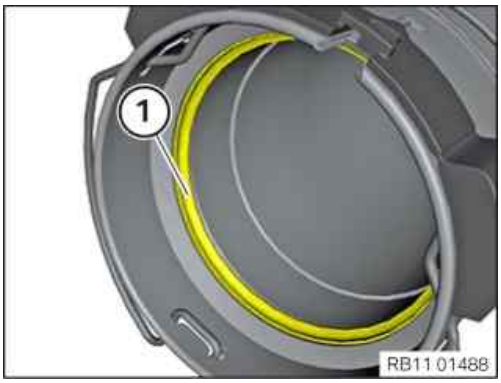
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

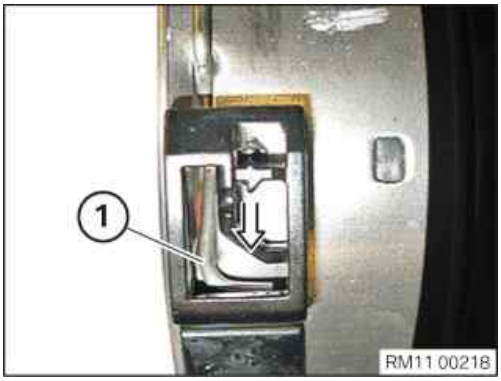


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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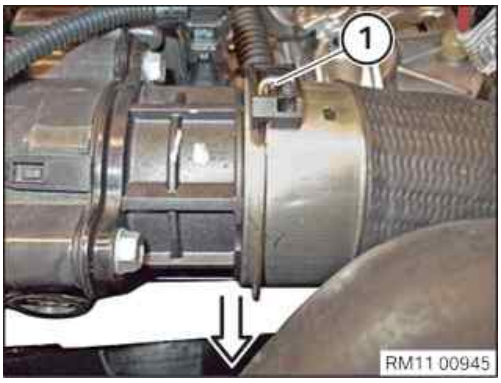
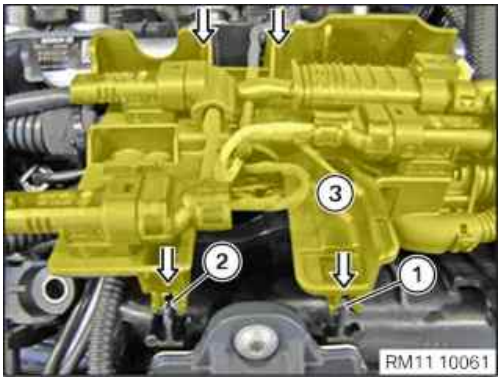


- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

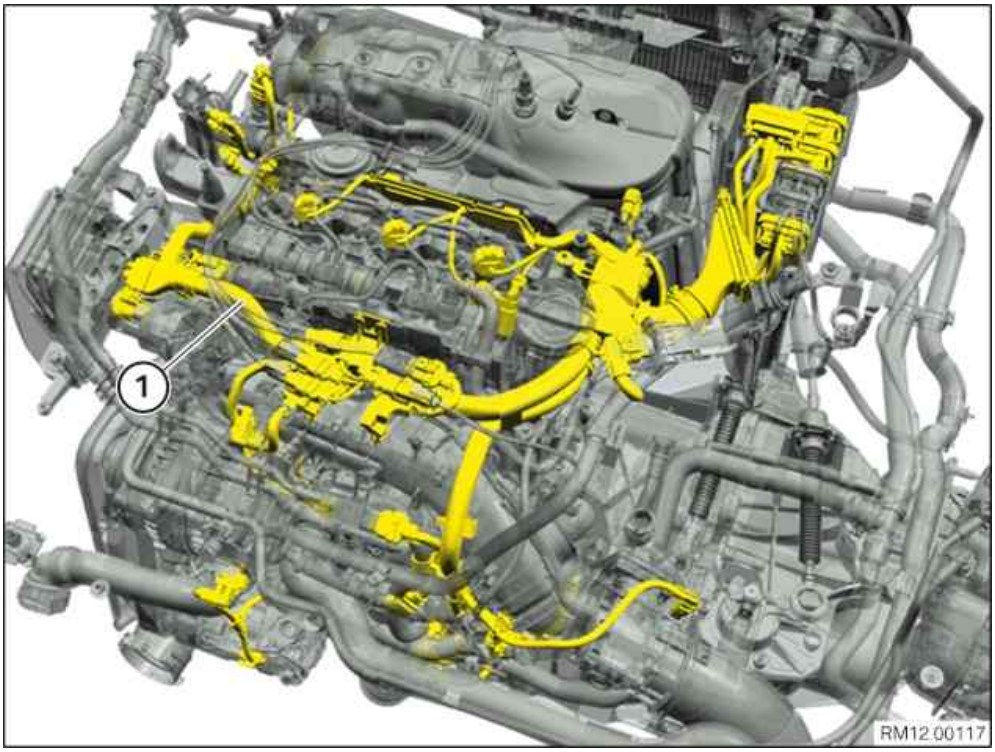
125 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

126 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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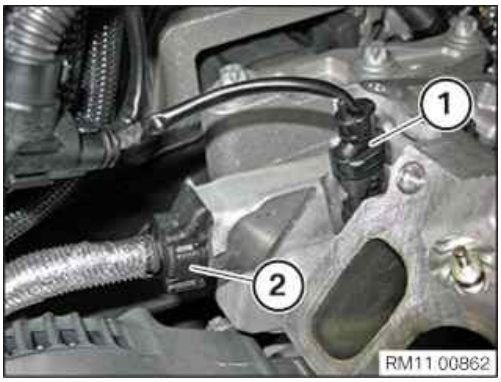
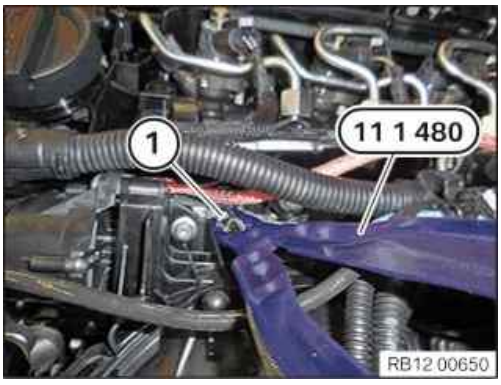
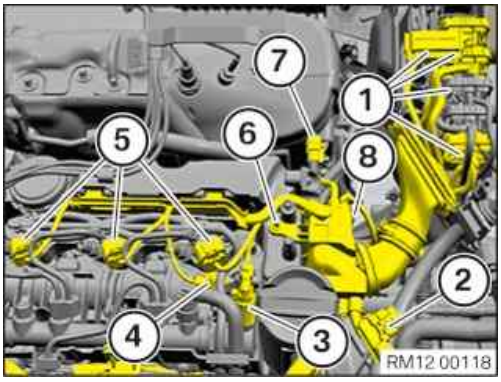


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

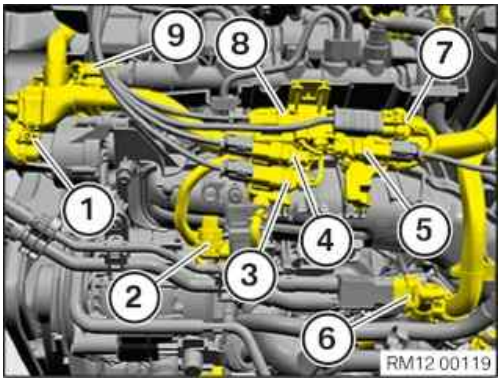


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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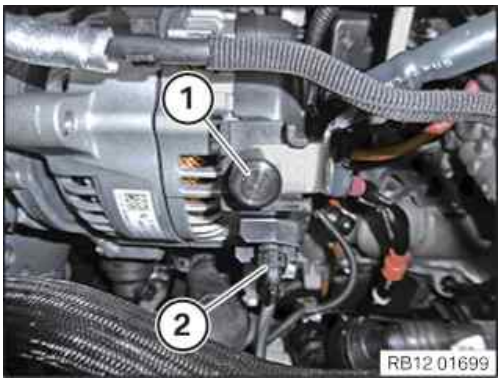
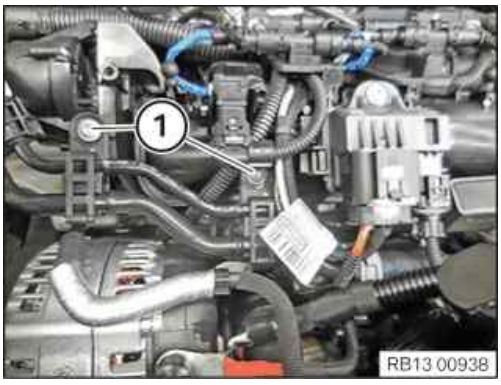


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

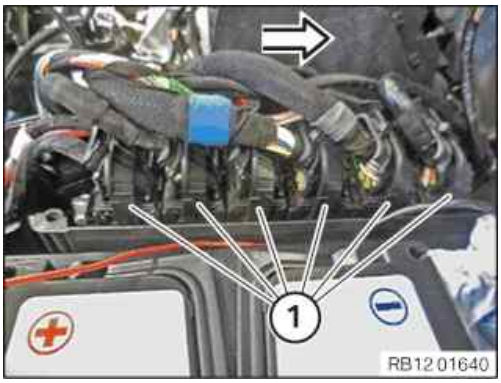


- Position fuel lines.
- Tighten the screws (1).

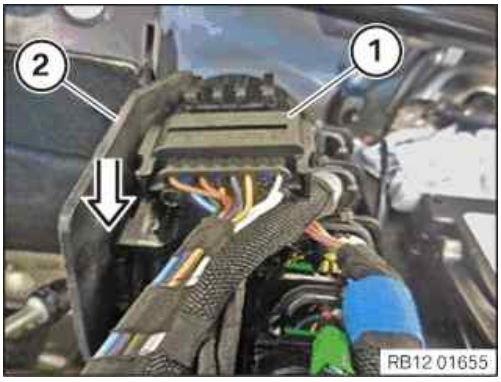
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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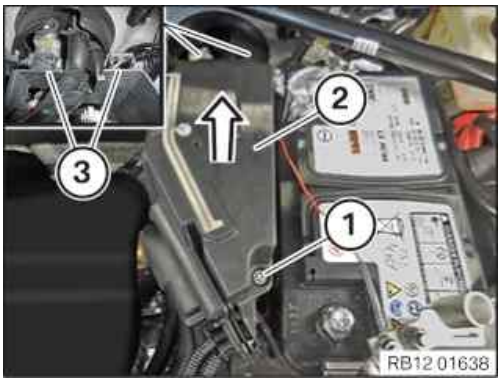
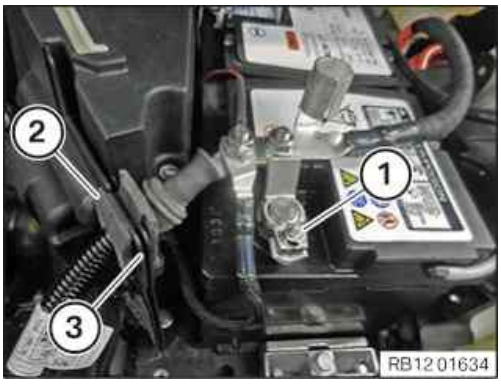


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

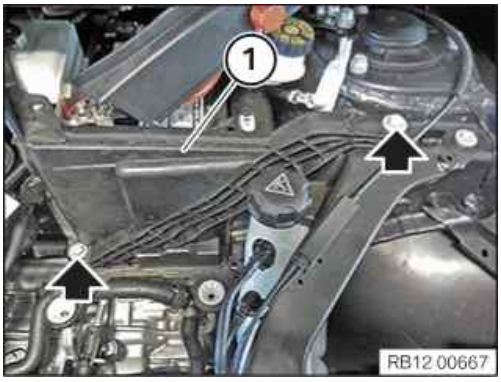
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

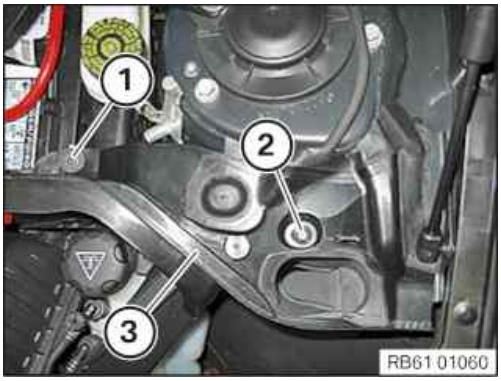
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm

127 – Installing clean air pipe

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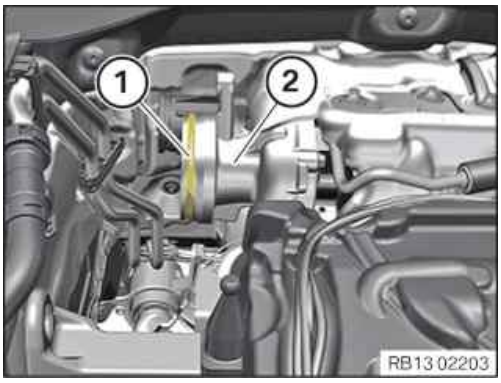
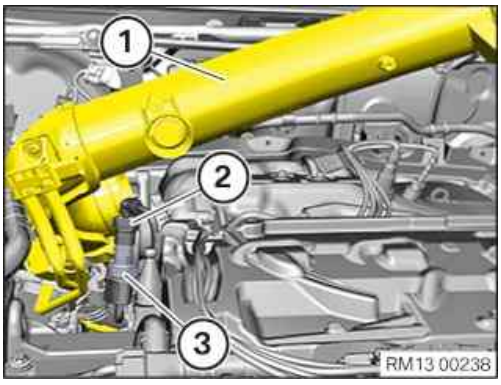


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



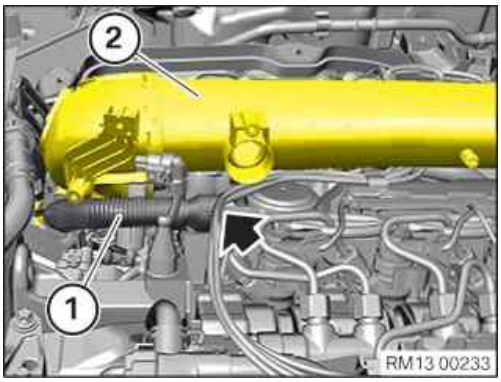
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

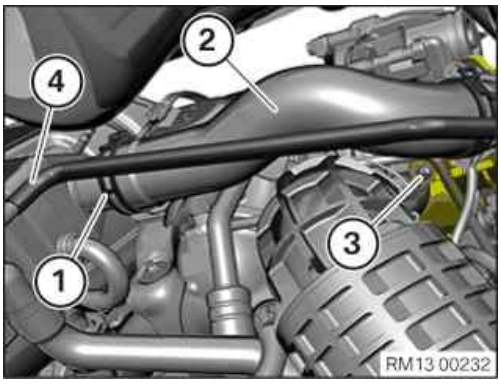
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

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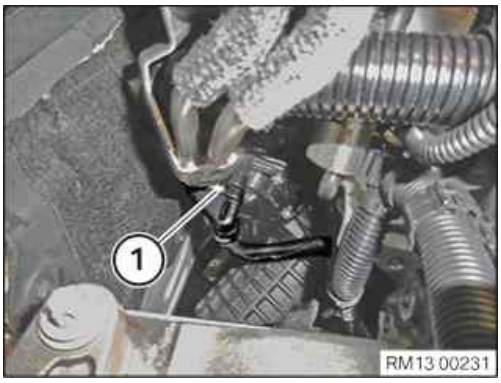
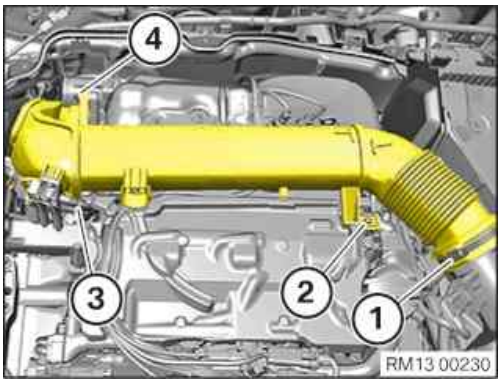


- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

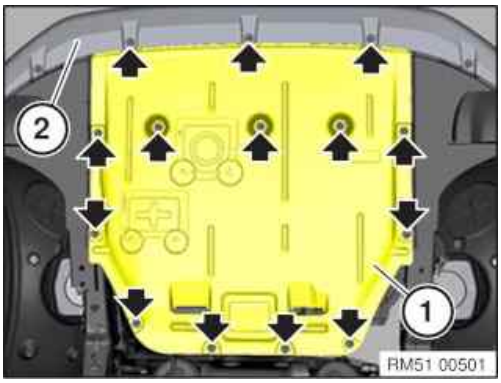
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

128 – Installing the front underbody protection

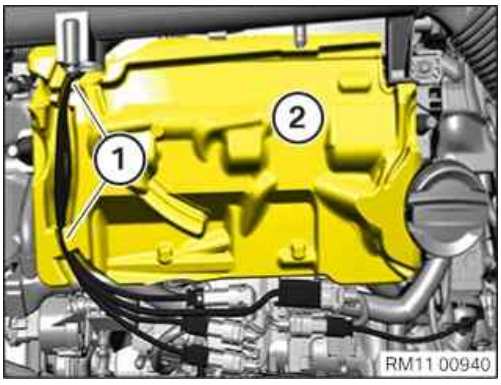


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

129 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

130 – Install resonator

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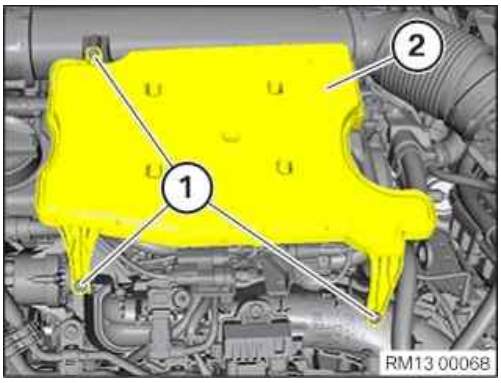

- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

131 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

132 – Install the rear cowl panel cover

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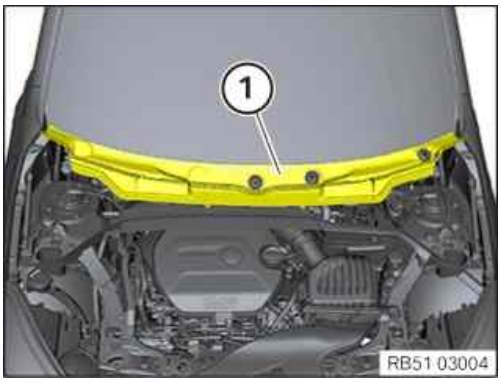
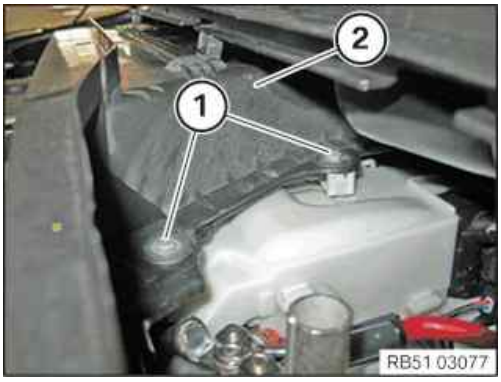


- Feed in and engage the rear cowl panel cover (1).

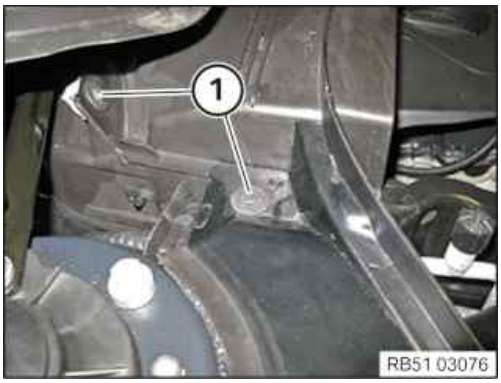
133 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

134 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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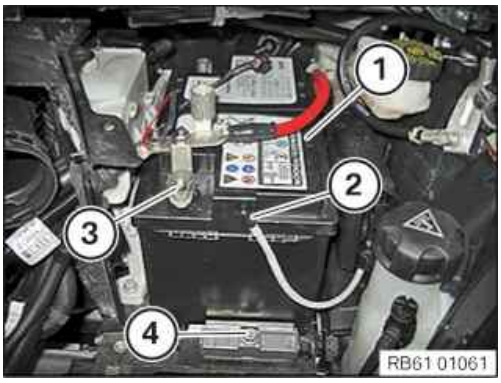


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

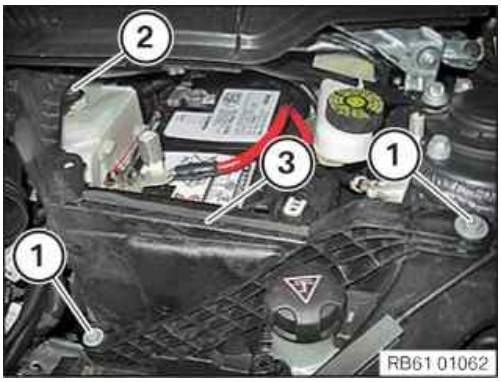
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

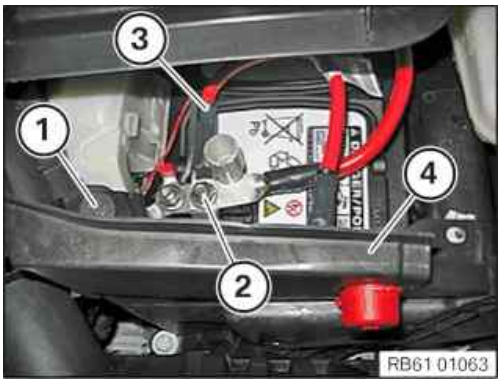
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

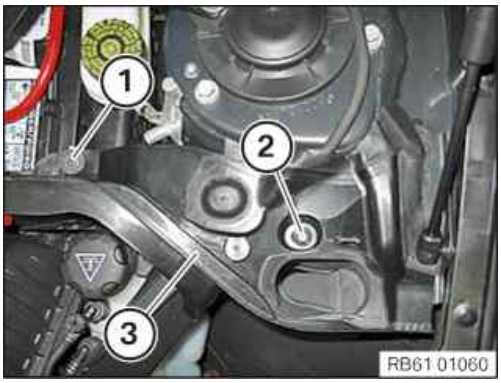
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

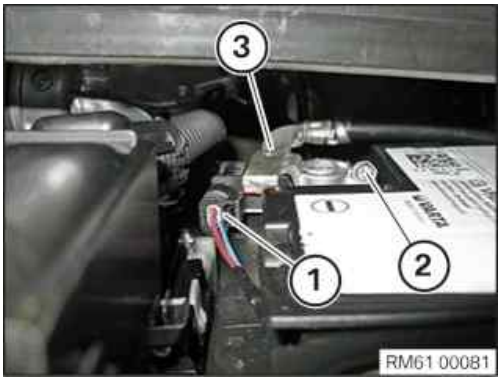
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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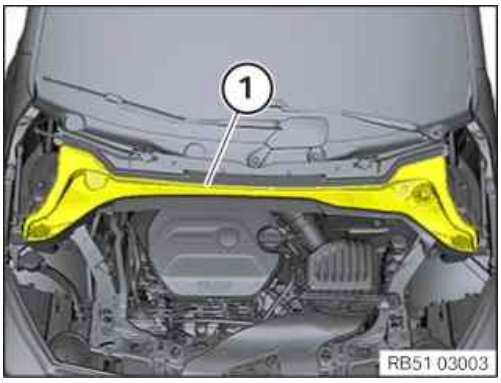
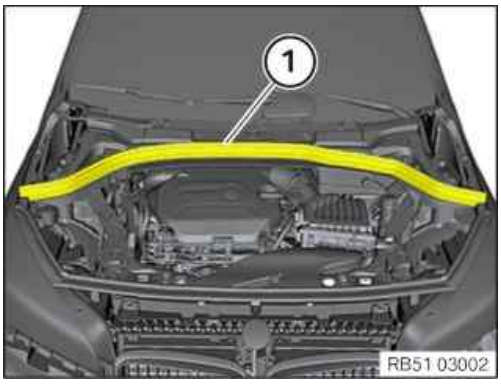


- Feed in the cowl panel cover (1).



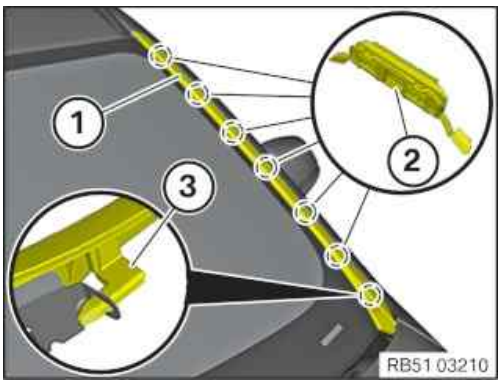
- Press the gasket (1) in a downwards direction.

135 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

136 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

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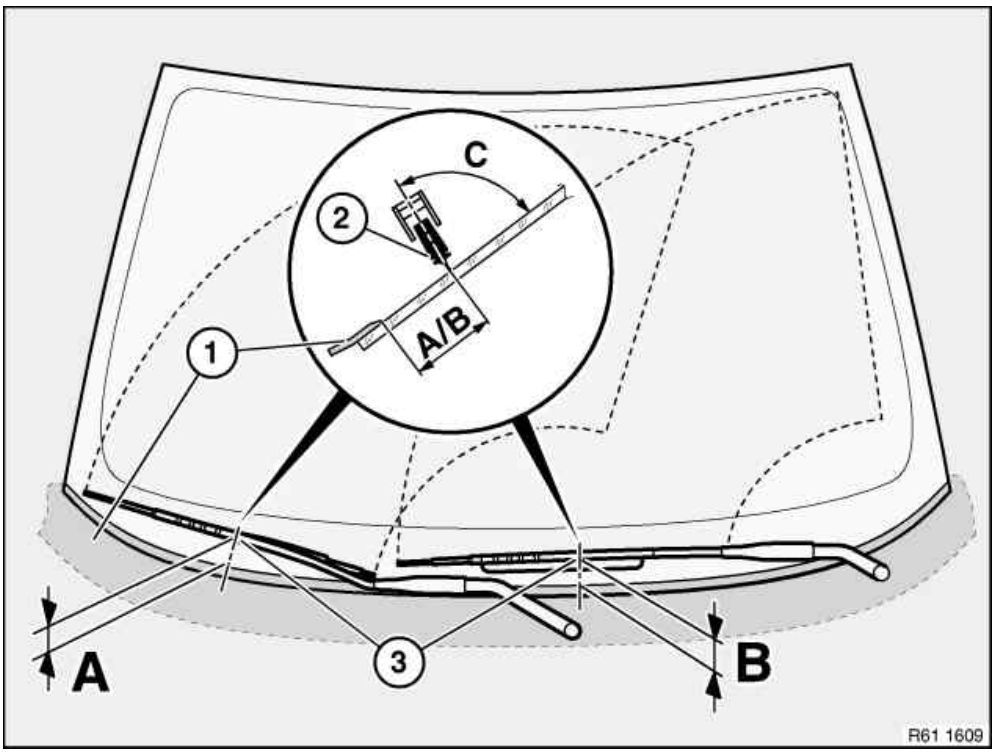
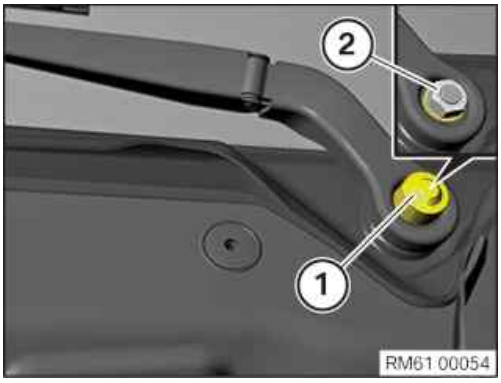
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

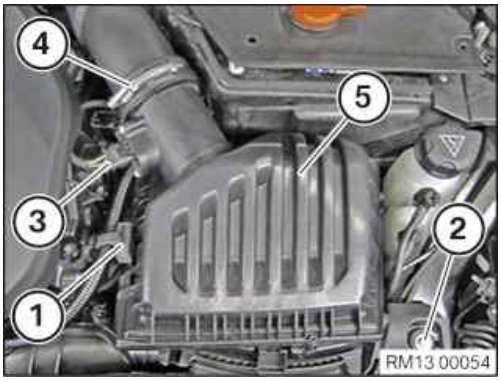
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

137 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

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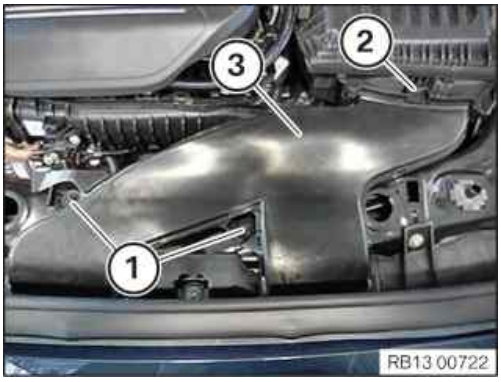
138 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

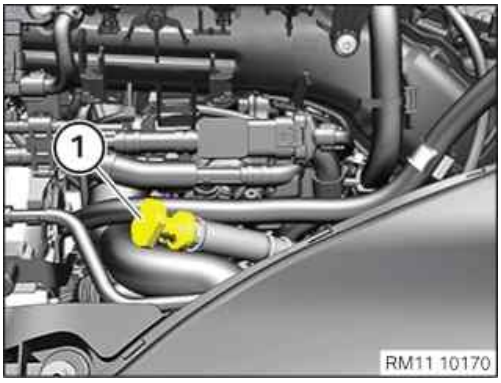
139 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

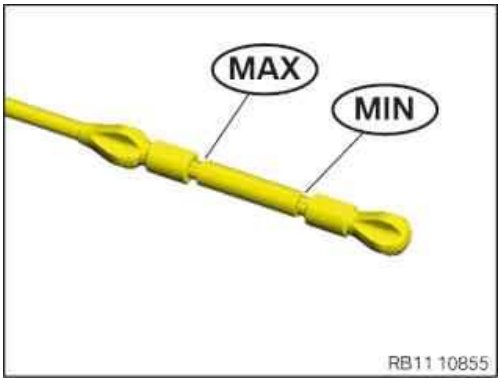


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

140 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Bracing strut to top cross connection — Used in step 32

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 32

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 32

M6x20		Tightening torque	12 Nm

Rear end of front axle support to body — Used in step 67 100

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 67 100

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 67 100 108

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 67

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase — Used in step 72

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 72

M8x40		Tightening torque	19 Nm

Engine support to cylinder head — Used in step 72

M10X45		Tightening torque	41 Nm

Right engine mount to cylinder head — Used in step 72

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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Glow elements to cylinder head

Used in step 72

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 73

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 75

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 75

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 75

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 76

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 77

M7x17.			17 Nm

Exhaust manifold to cylinder head

Used in step 82

M7	If necessary, renew loose stud bolts. Replace nuts.	Tightening torque Tightening torque	11 Nm 13 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 82

Hollow bolt		Renew sealing rings.	30 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 82 121

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust turbocharger to exhaust manifold

Used in step 84

V-band clamp		Tightening torque	19 Nm

Oil feed line to exhaust turbocharger

Used in step 84

Hollow bolt	Renew sealing rings.	Jointing torque Angle of rotation	10 Nm 45 °

Oil return line to turbocharger

Used in step 84

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 84

M8x16		Tightening torque	22 Nm

Charge air line to crankcase

Used in step 85

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 85

M6		Tightening torque	8 Nm

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Heat shield for exhaust turbocharger

Used in step 86 87 112

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head

Used in step 86

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 88

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 88

M8 hexagon nut		Tightening torque	19 Nm

SCR metering module V-clip to exhaust system

Used in step 88

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 88

Torx bolt BM6x16		Tightening torque	8 Nm

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Used in step 88

Flange nutM8		Tightening torque	19 Nm

Control sensor

Used in step 89

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 90 91

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 92

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 93

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 94

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 95

Sensor		Tightening torque	50 Nm

Starter motor to transmission

Used in step 96

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 96

M8		Tightening torque	13,5 Nm

Exhaust system to body

Used in step 97

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 97

Hexagon screw M8x30		Tightening torque	19 Nm

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V-clip to catalytic converter

Used in step 97

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 97

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 97

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 98

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body

Used in step 99

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 99

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing

Used in step 100

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 100

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 101

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 101

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 101

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 101

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 102

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 104

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 106

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 106

Plastic nut		Tightening torque	3 Nm

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Underbody panelling, side

Used in step 107

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 107

Plastic nut		Tightening torque	2,6 Nm

Brake disc to front wheel hub

Used in step 109

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

Used in step 109

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 109

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 111

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 111

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 113

Oval-head screw		Tightening torque	5 Nm

Cylinder head cover to cylinder head

Used in step 114

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 115

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 115 127

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 116

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 116

Screw		Jointing torque Angle of rotation	8 Nm 120 °

Rail on cylinder head cover

Used in step 117

Torx screw M8x25		Tightening torque	19 Nm

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High pressure line between high pressure pump and rail

Used in step 117 118

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 119

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 121

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 121

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 121

M8x20		Tightening torque	19 Nm

Battery holder to engine support

Used in step 122

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 123

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 123 126

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 123 126

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 123 126

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 123 126

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 123 126

		Tightening torque	3 Nm

Battery cover

Used in step 123 126 134

Screw			2,8 Nm

Intake plenum to cylinder head

Used in step 124

M6		Tightening torque	11 Nm

Positive battery cable to alternator

Used in step 126

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 126

TS6x20		Tightening torque	5 Nm

Exhaust gas pressure sensor

Used in step 127

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

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Clean air pipe to exhaust turbocharger — Used in step 127

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 127

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 127 137

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 128

			3 Nm

Resonator to manifold and clean air pipe — Used in step 130

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 133

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 134

M8 screw		19 Nm

Positive battery terminal — Used in step 134

NutM6		5 Nm

Trailing link — Used in step 134

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 134

Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 134

NutM6		5 Nm

Windscreen wiper arm — Used in step 136

Combination hexagon nut		Tightening torque	35 Nm

Intake silencer housing to lock bridge — Used in step 137

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 138

M6		Tightening torque	8 Nm

Overview of Special Tools

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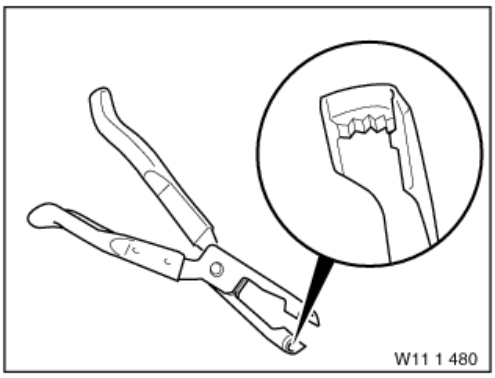
0 490 796 (11 1 480) Pliers



Common	Used in step 20
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common	Used in step 24 25 26 117 118 119
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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2 413 106 Fastener

Common Used in step 24 25 118 119

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller

Used in step 27

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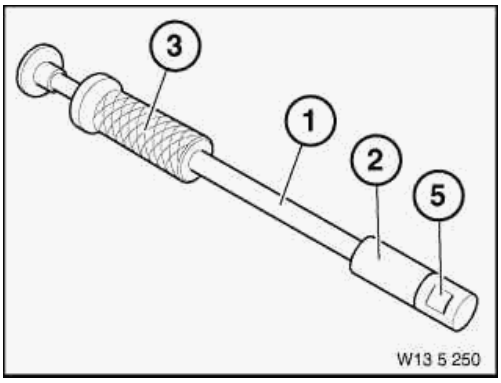

Common

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common

Used in step 27

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common

Used in step 27

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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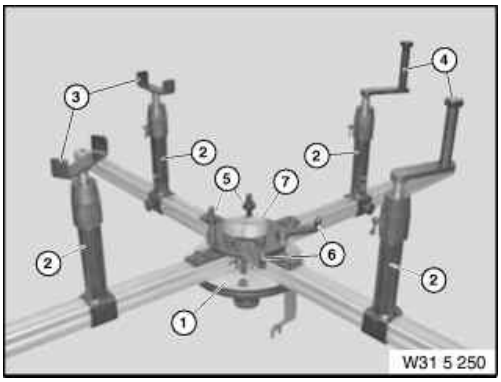
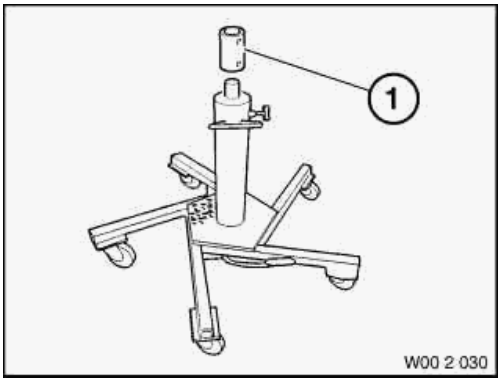
0 495 817 (31 5 251) Basic body



Common Used in step 43 67 72 100

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



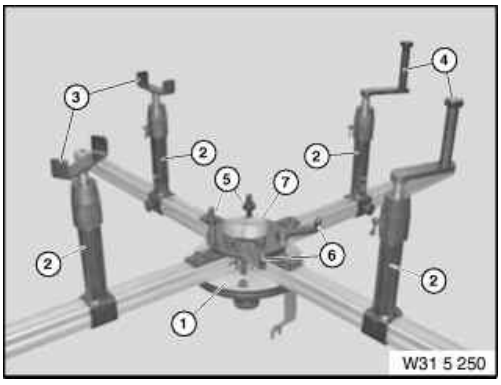
Common Used in step 43 67 72 100

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 821 (31 5 255) Adapter



Common Used in step 43 72

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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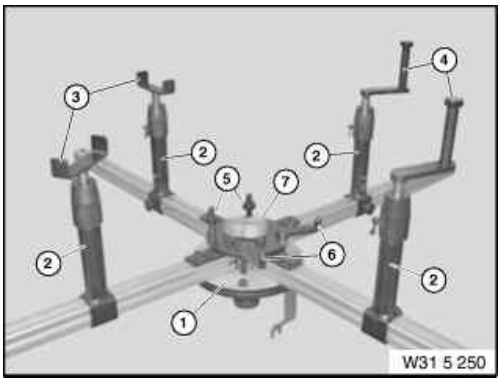
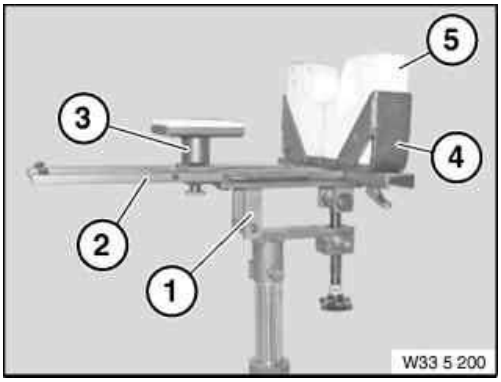
0 495 819 (31 5 253) Adapter



Common	Used in step 43 72
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt



Common	Used in step 43 67 72 100
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

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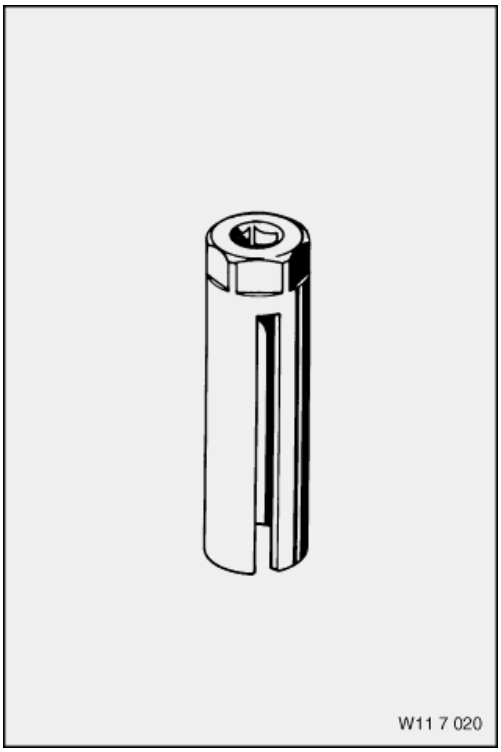
0 491 074 (11 7 020) Socket wrench insert



Common

Used in step 48 49 95

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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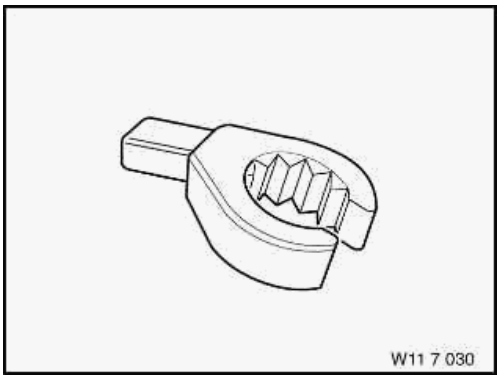
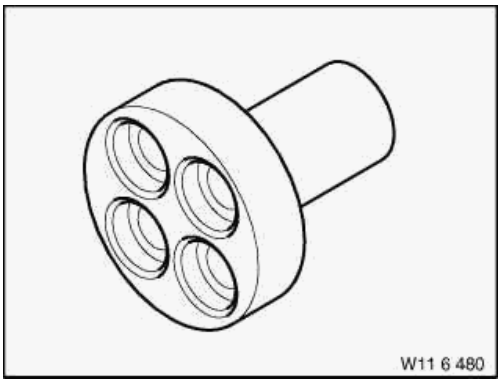
0 491 075 (11 7 030) Socket wrench insert



Common	Used in step 54 89
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

0 493 380 (11 6 480) Connector



Common	Used in step 62 80
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 62 79 80
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge

Common	Used in step 62 78 80
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 414 691 Support

Common	Used in step 67 72
Usage	To support the engine when the engine support is removed.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	2357071
SI-Number	01 12 16 (406)

2 357 071 Panel

Common	Used in step 67 72
Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

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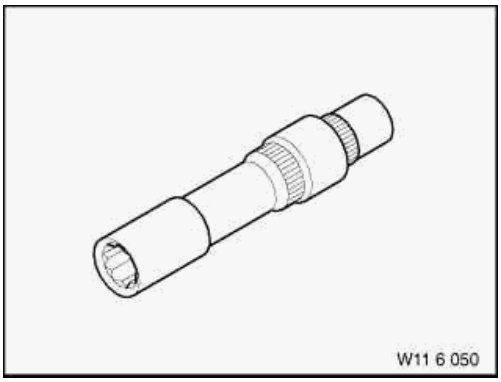
0 491 068 (11 6 050) Socket wrench insert



Common	Used in step 67 72
Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 459 012 Holder

Common	Used in step 67 72
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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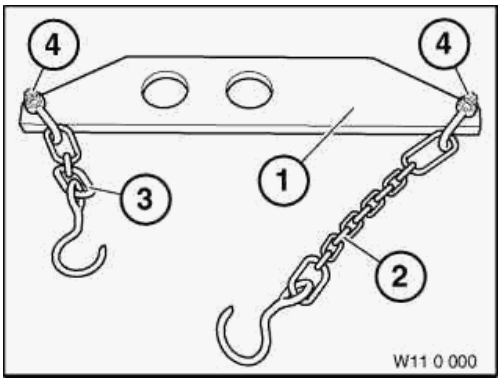
0 490 561 (11 0 000) Lifting gear



Common

Used in step 67 72

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 67

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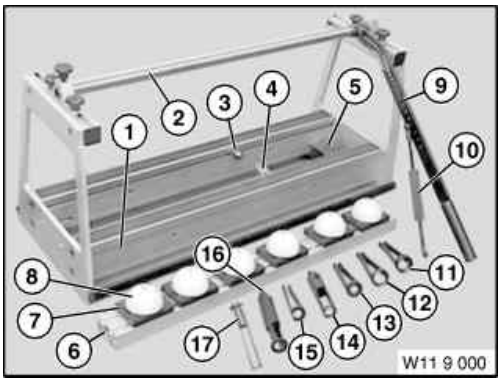

Common

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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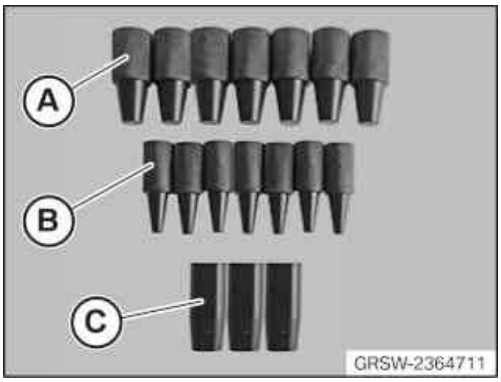
2 364 711 Plug



Common Used in step 68

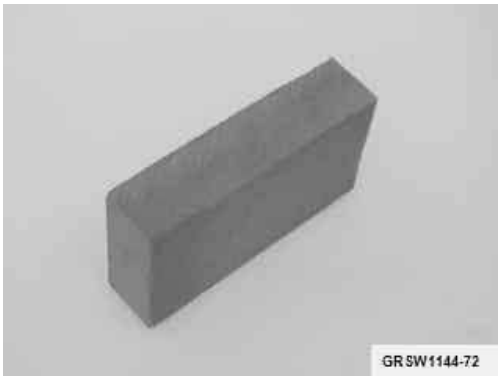
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common Used in step 68

Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

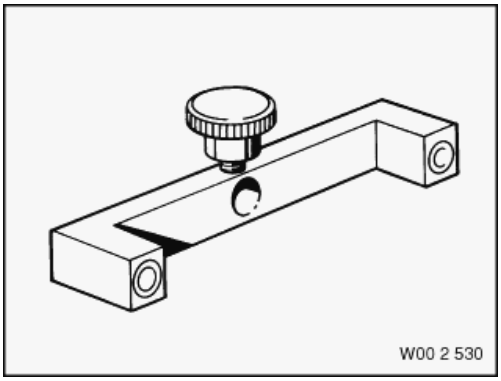
0 495 104 (11 4 472) Extractor



Common Used in step 68

Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 490 185 (00 2 530) Bridge



Common Used in step 70

Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

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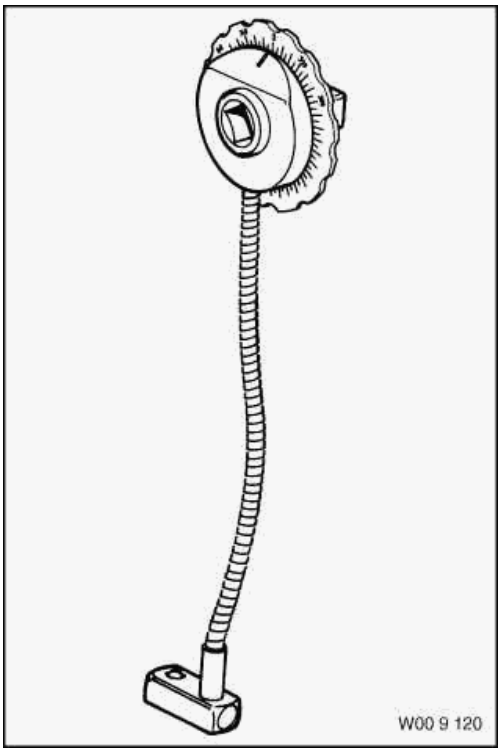
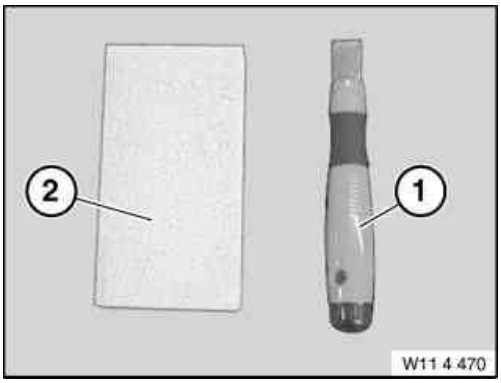
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 72

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 495 102 (11 4 470) Tool



Common Used in step 82

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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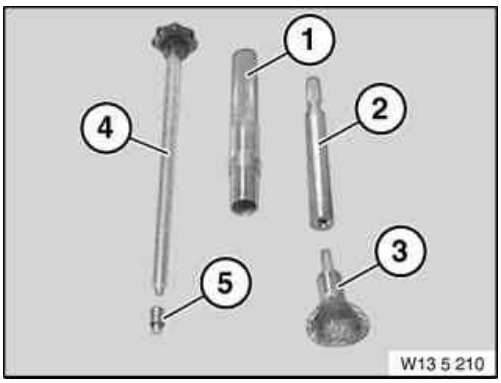
2 344 011 Tool

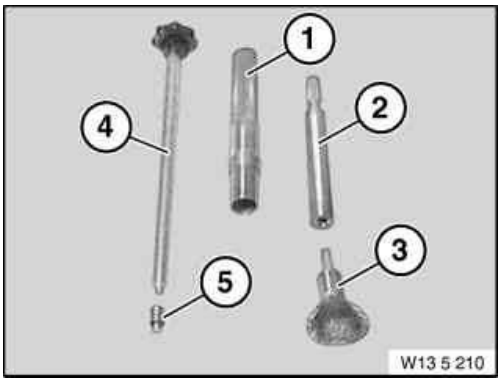
Common	Used in step 109
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common	Used in step 116
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 116
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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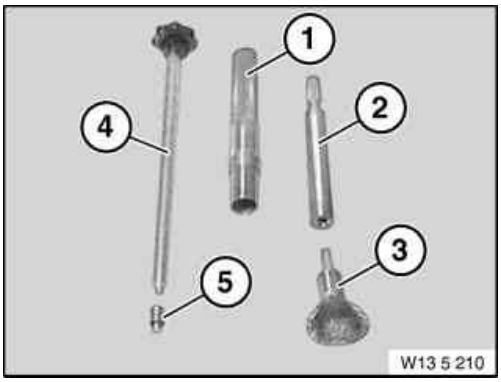
0 493 758 (13 5 210) Tool



Common

Used in step 116

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

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0 495 221 (36 1 323) Wheel stud

Common	Used in step 34
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 34
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 34
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud

Common	Used in step 34
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 34
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 34
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud

Common	Used in step 34
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 34
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Valve underprotrusion	Used in step 70
	0,8 (0,7 - 0,9) mm

Cylinder head flatness	Used in step 71
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 121
EGR controller	19 121
Troubleshooting on the exhaust turbocharger	84

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 134
61 12 ... Notes on intelligent battery sensor (IBS)	1 134
61 00 ... Notes for disconnecting and connecting battery	1 134

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Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	16 27 28 48 49 51 52 53 54
11 65 020 Turbocharger damage due to blocked oil supply lines	84
11 65 ... Test steps in the event of turbocharger damage	84
17 00 008 Draining and topping up coolant for high-temperature circuit	140
17 00 008 Draining and topping up coolant for high-temperature circuit	140
17 00 008 Draining and topping up coolant for high-temperature circuit	140
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	140
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	140
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	140

Operating materials	Used in step
2.0 Grease for wheel centring	109

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	76
Exhaust-gas recirculation cooler seal on exhaust manifold	121
Exhaust-gas recirculation cooler seal on intake plenum	121

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11 12 001 Replace the cylinder head cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

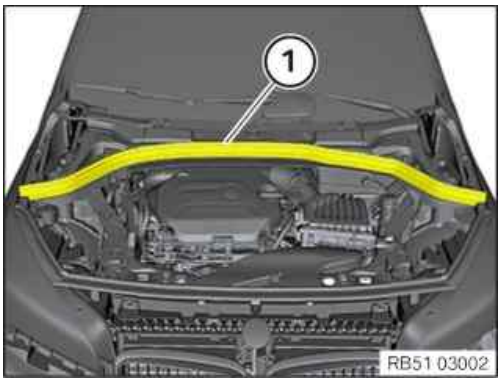
1 – Disconnecting all battery earth leads

- See additional information.

2 – Remove the seal for the rear bonnet

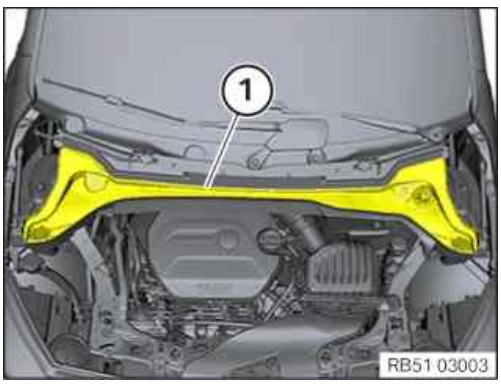
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

4 – Remove left and right wiper arm

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NOTICE

Description is for left component only. Procedure on the right side is identical.

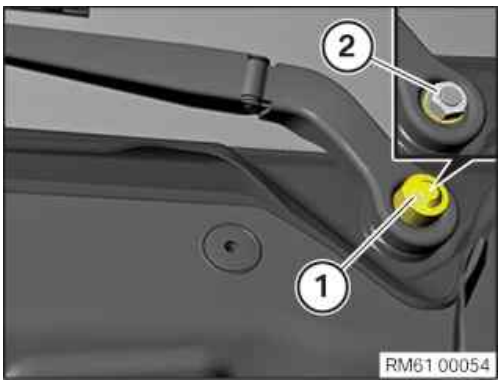
▶ **Remove the wiper arm**

RISK OF DAMAGE

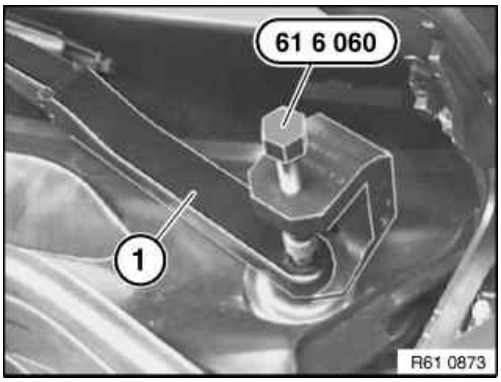
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

5 – Remove the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**

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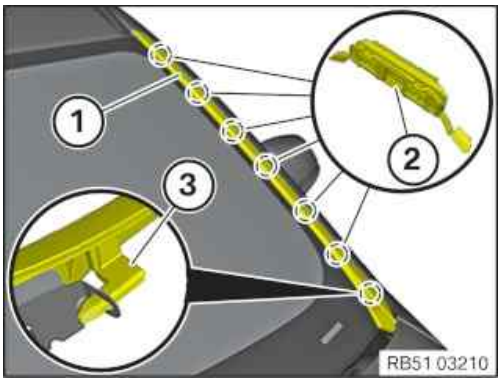
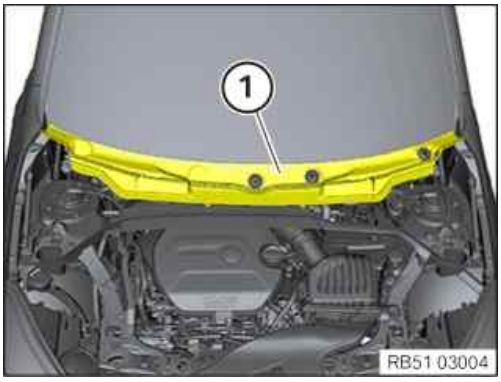


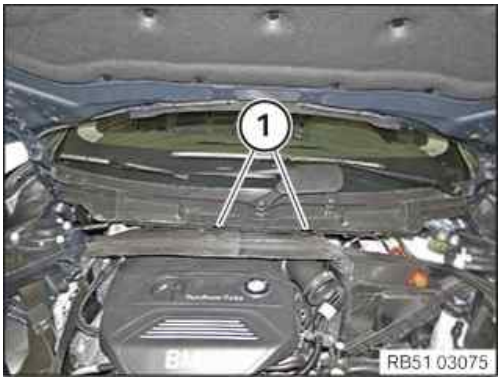
- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

6 – Remove the rear cowl panel cover

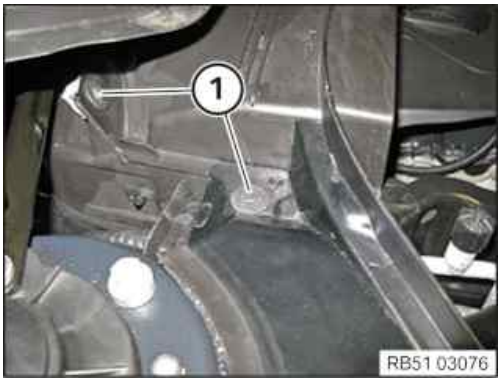


- Disengage and guide out the rear cowl panel cover (1) towards the top.

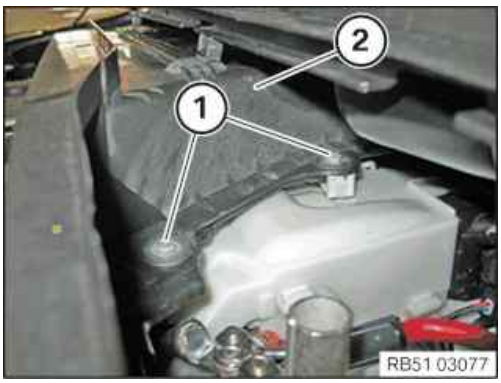
7 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

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8 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

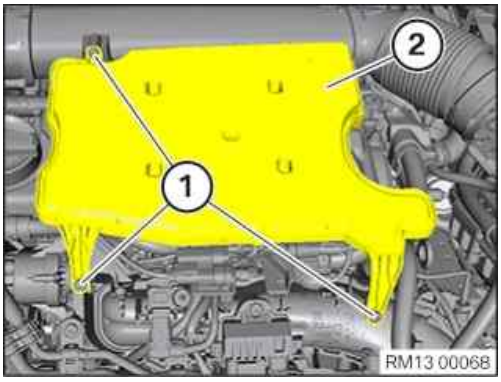
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

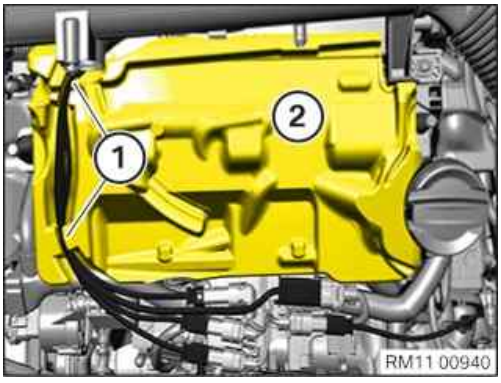
- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

10 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

11 – Remove the intake neck for intake silencer housing

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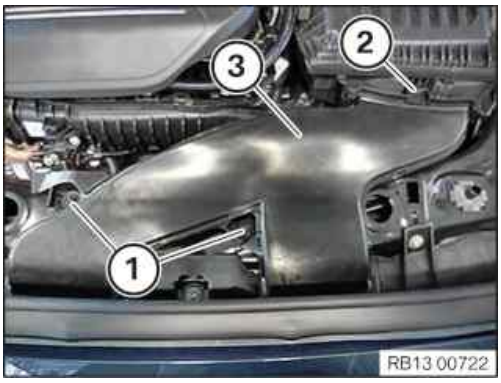
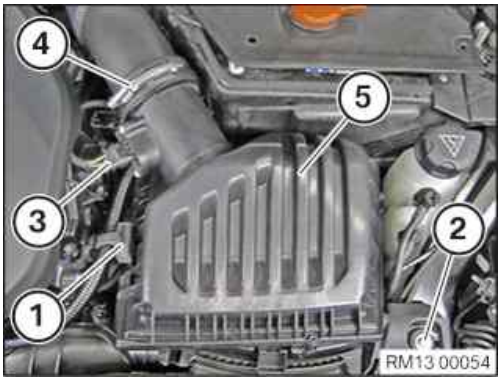


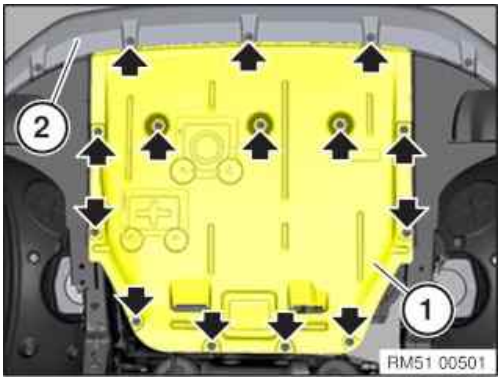
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

12 – Removing intake silencer housing



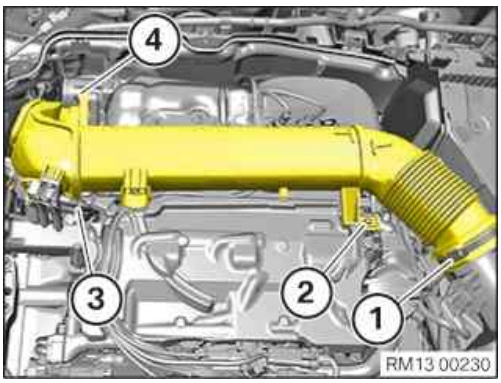
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

13 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

14 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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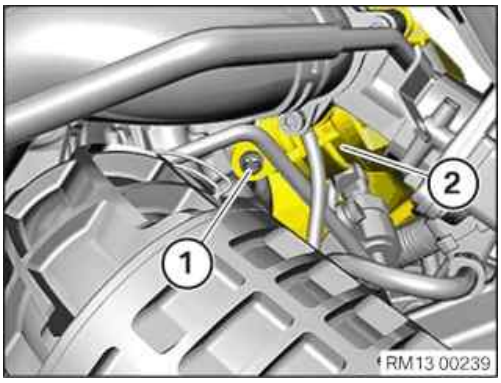
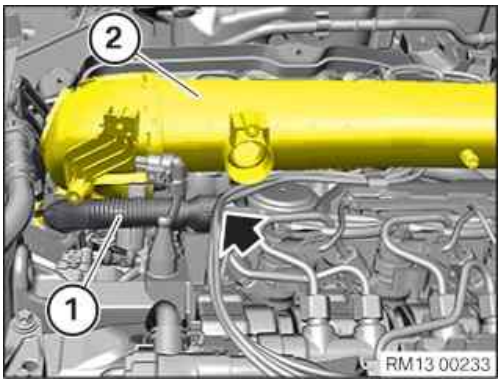


- Unscrew the screw (1) from the clean air pipe (2).

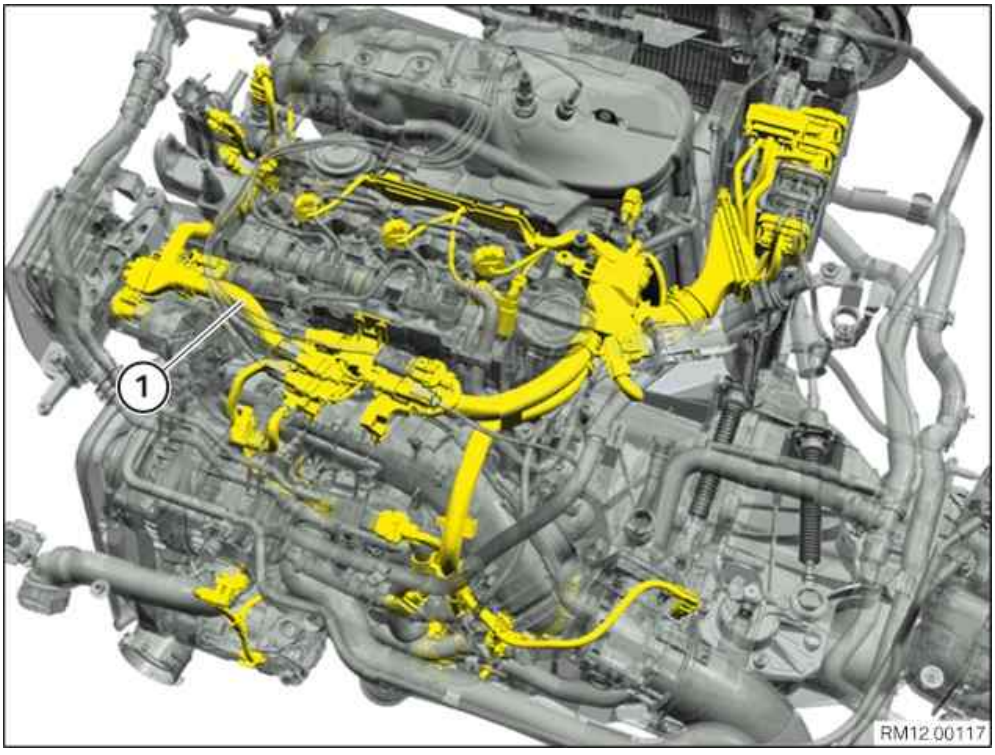


- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

15 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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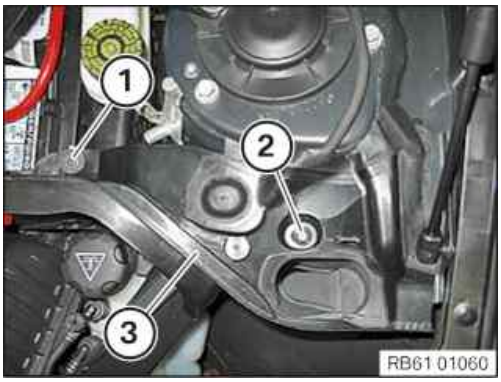
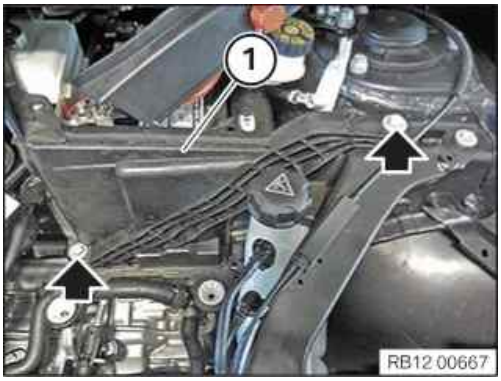
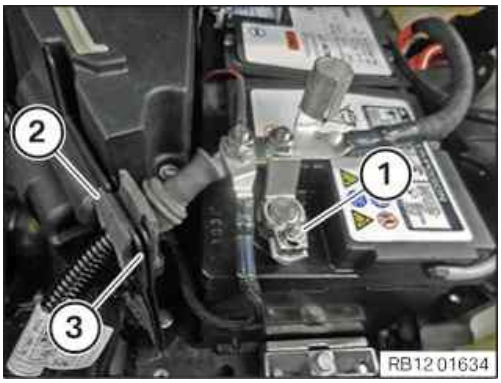


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

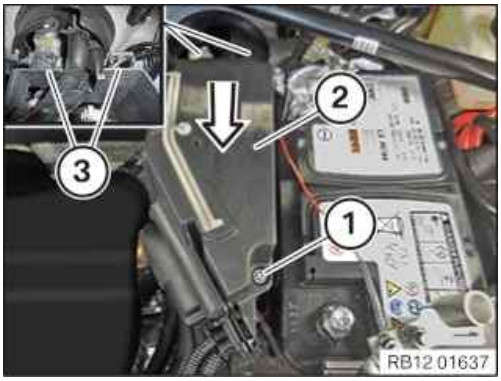
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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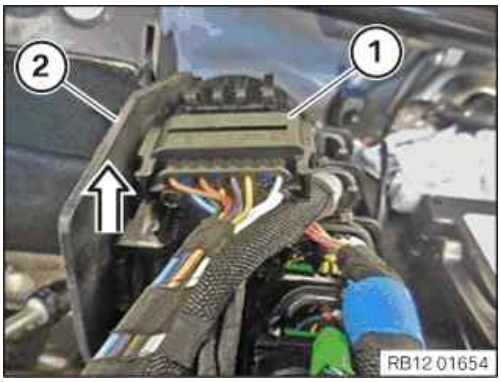
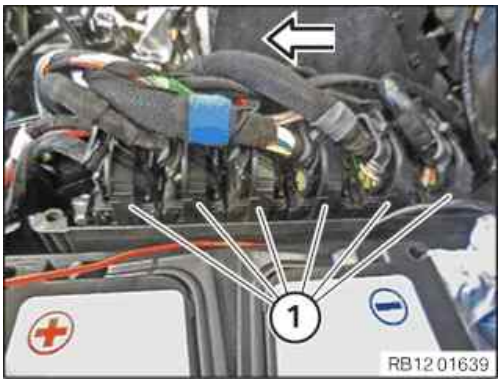
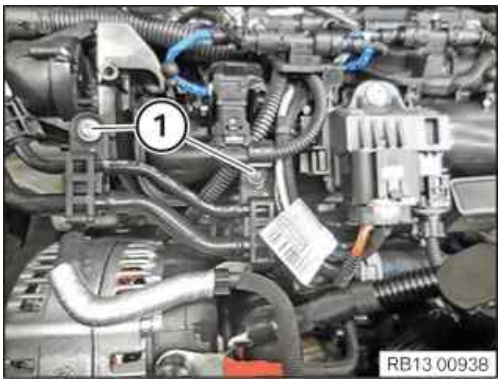


- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).

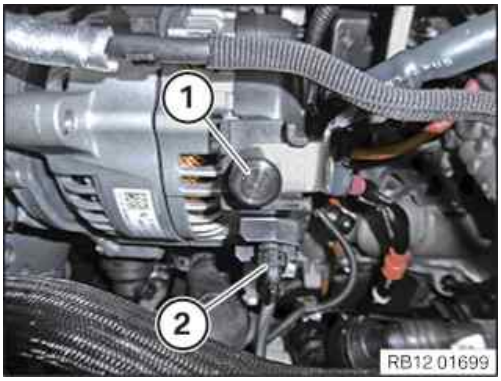


- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).



- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

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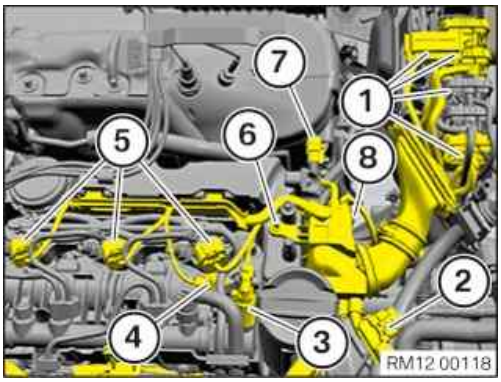
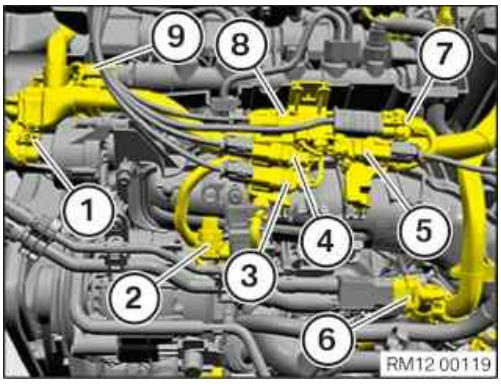
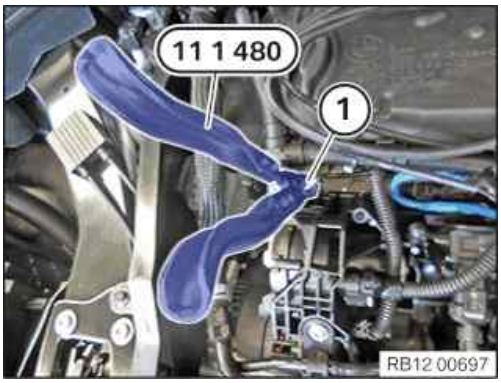


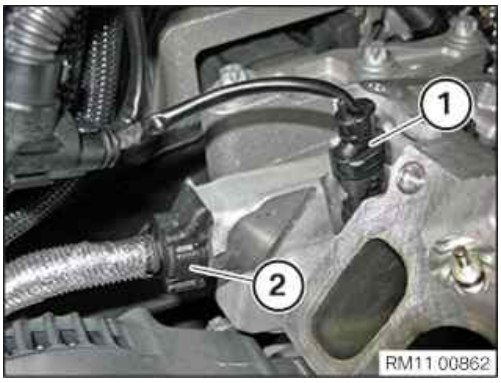
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.

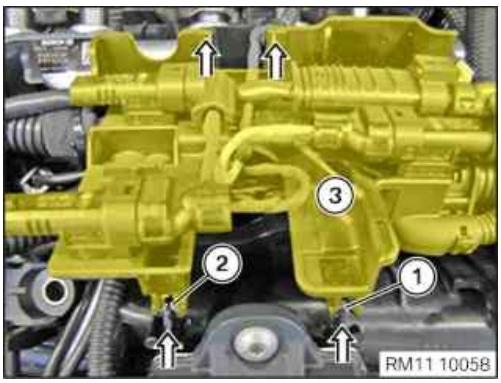


- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

16 – Removing the cable clips from the intake plenum



- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

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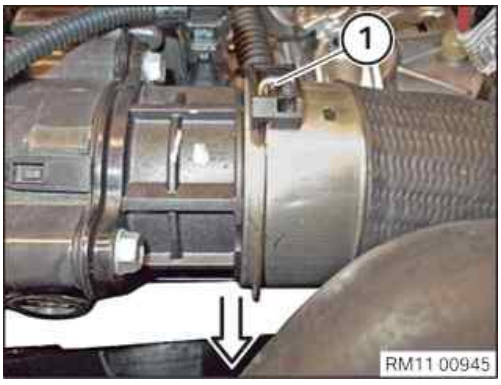
17 – Removing the intake plenum

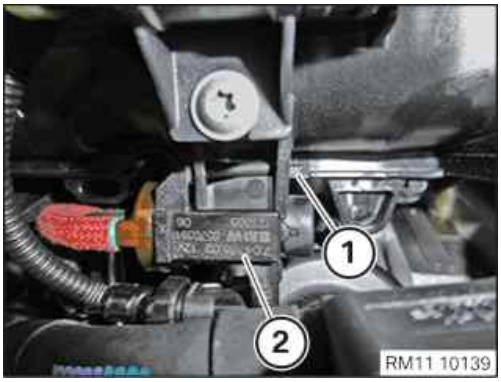
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

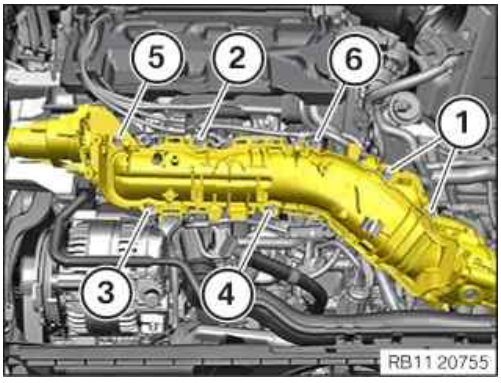
- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.

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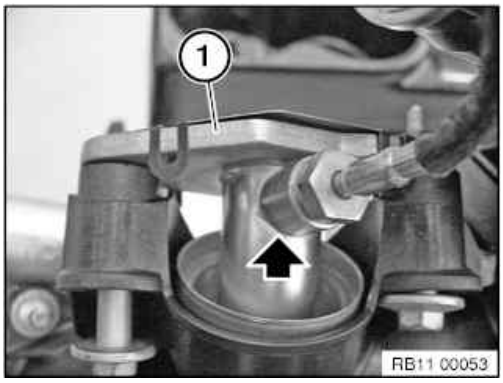

- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

18 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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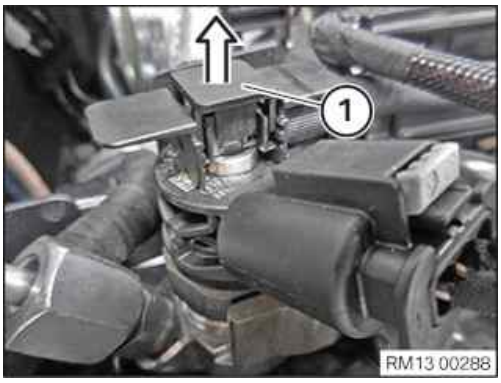

- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

19 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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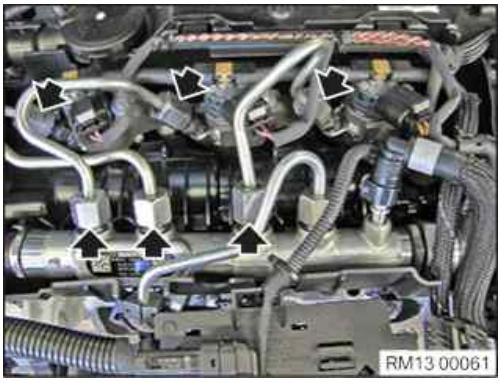
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

20 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

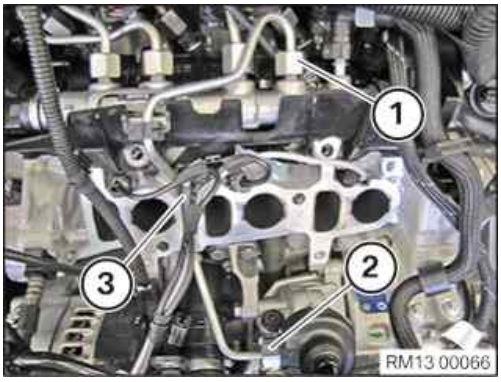
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

21 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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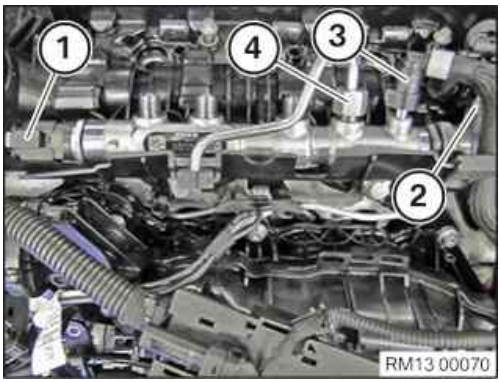
TECHNICAL INFORMATION

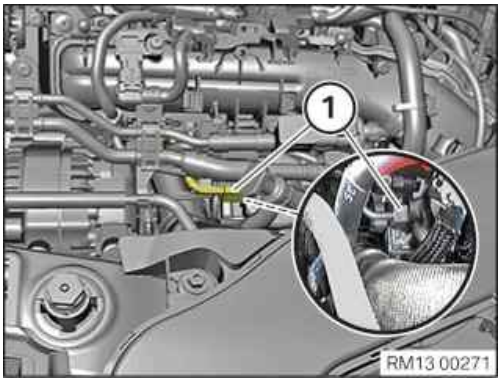
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

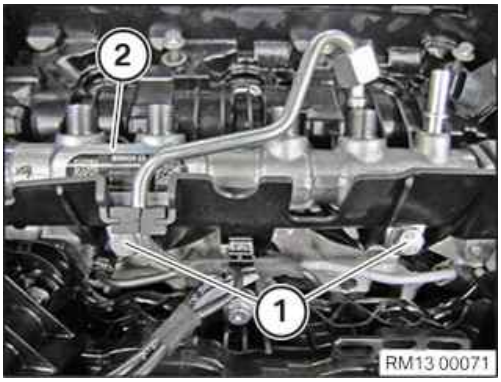
Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.



- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

22 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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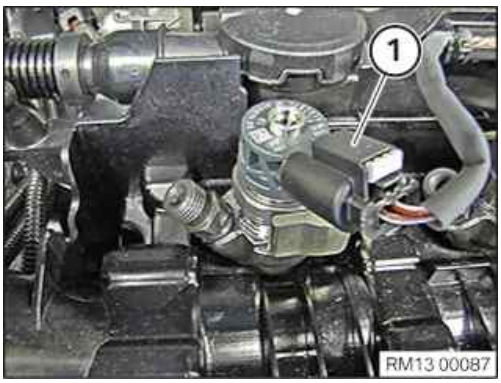
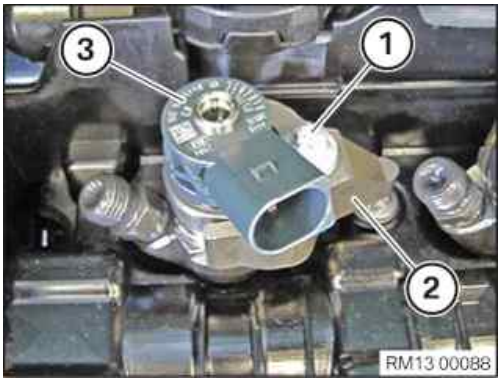
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

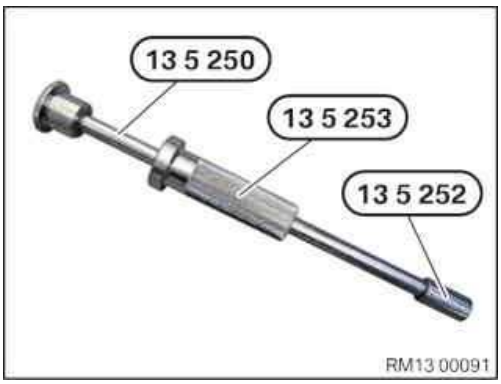
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

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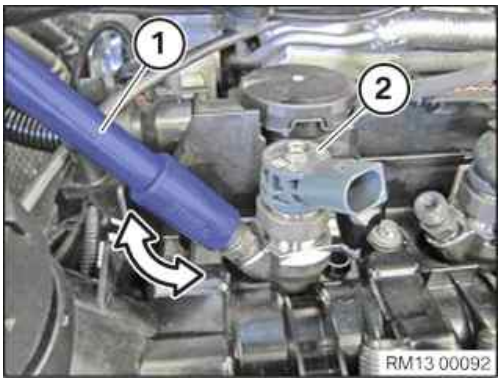


- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

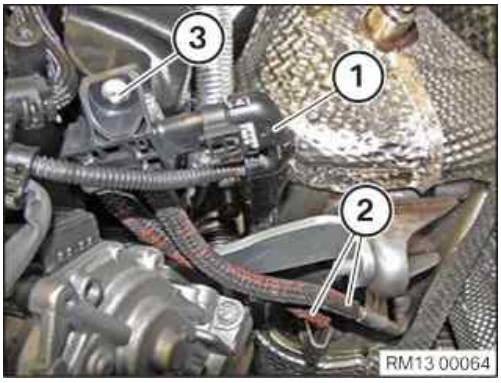
23 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

24 – Removing the cylinder head cover

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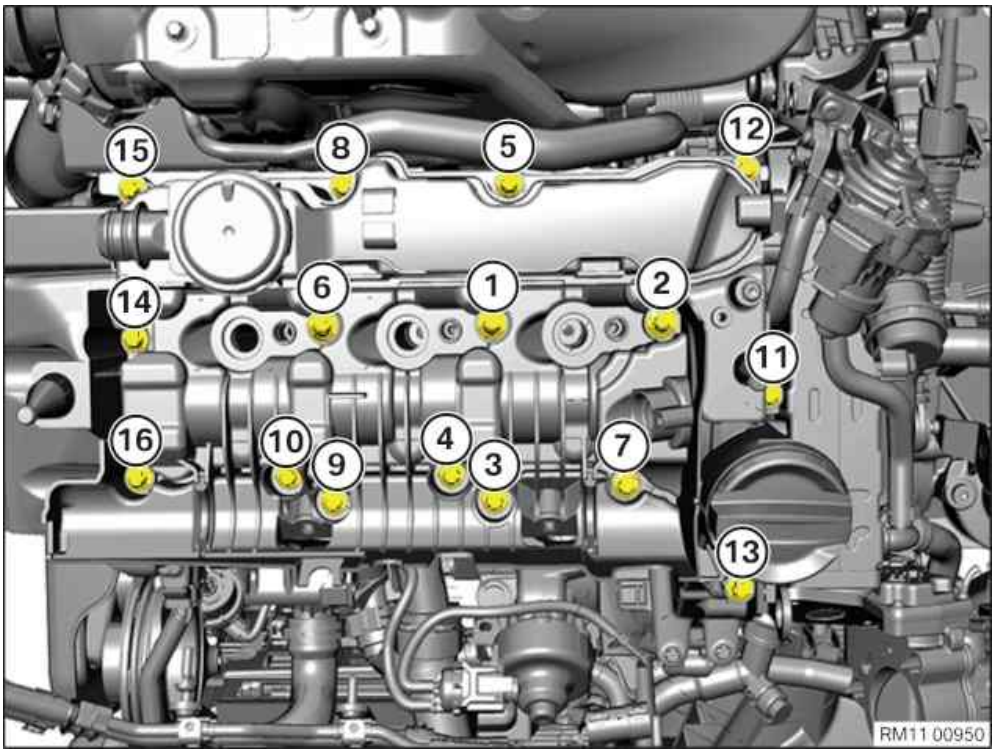
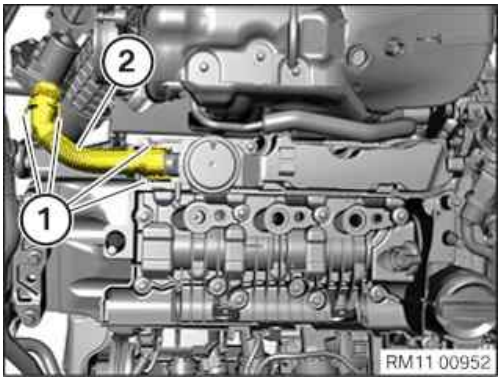
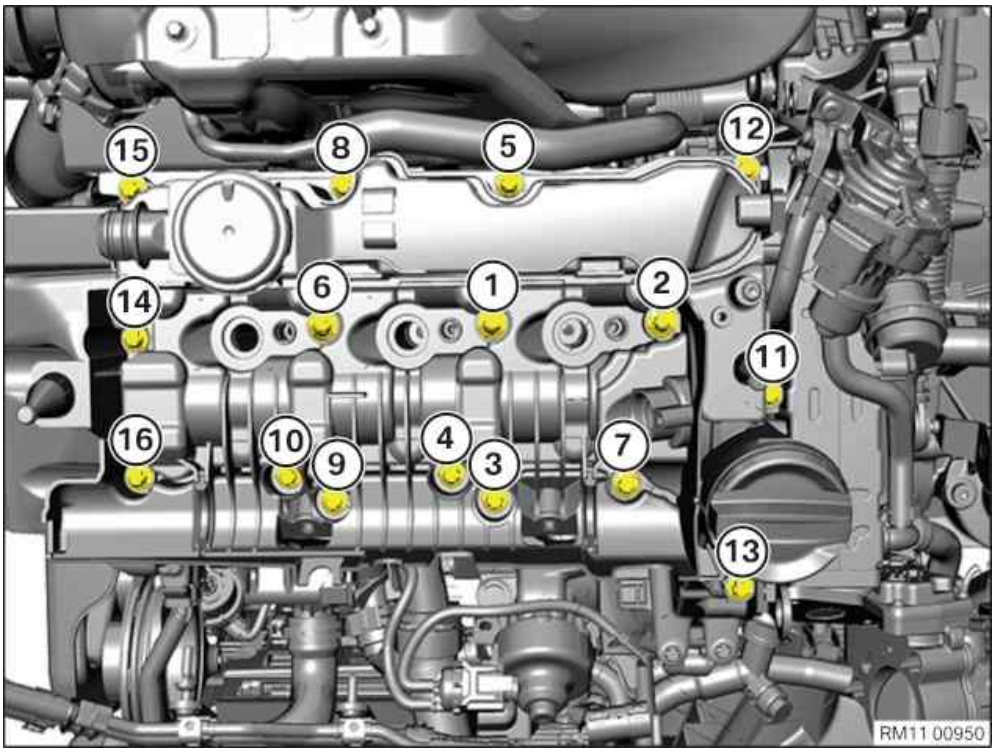
Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

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25 – Renewing the cylinder head cover

RISK OF DAMAGE

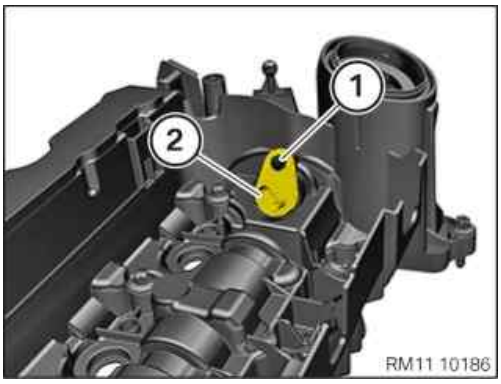
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

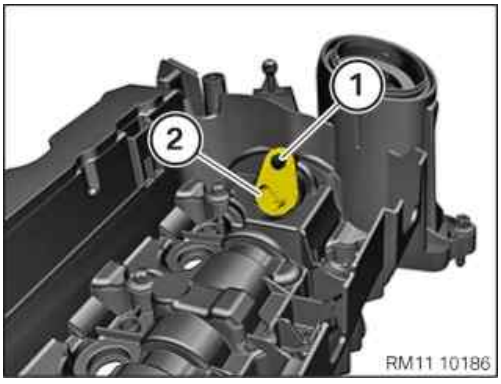
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screw (1).
- Feed out and remove the camshaft sensor (2).

- Check the sealing ring (1) for damage and renew where required.



- Guide in camshaft sensor (2) into the new cylinder head cover and install it.

  Parts: Cylinder head cover
- Tighten down screw (1).

Camshaft sensor to cylinder head cover

TS5x20		Tightening torque	4 Nm

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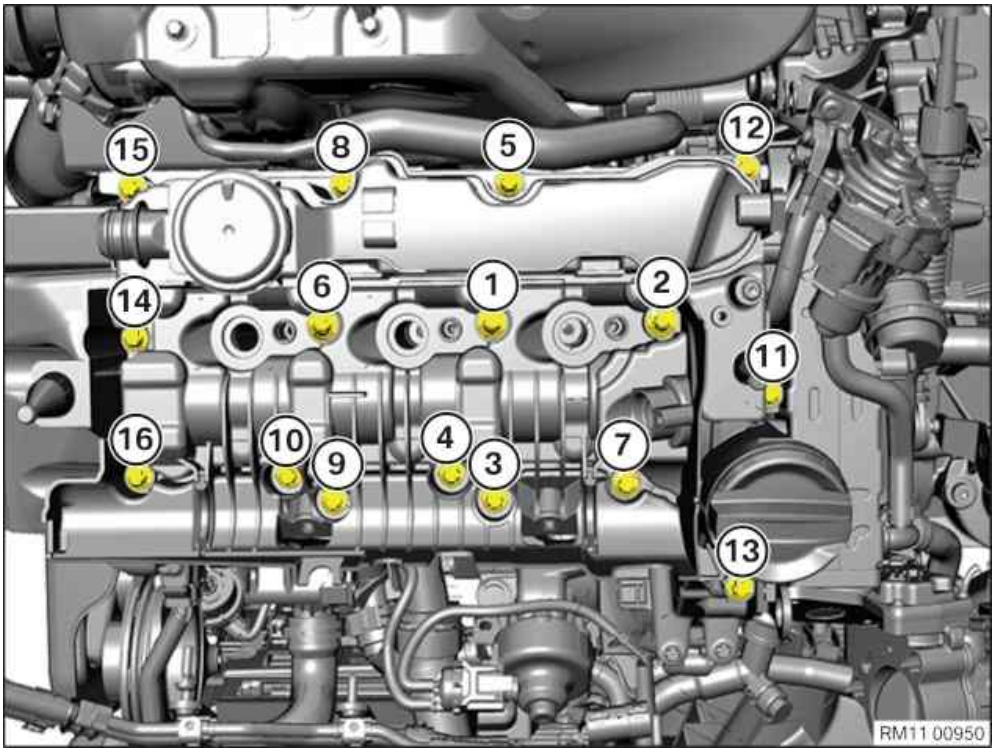
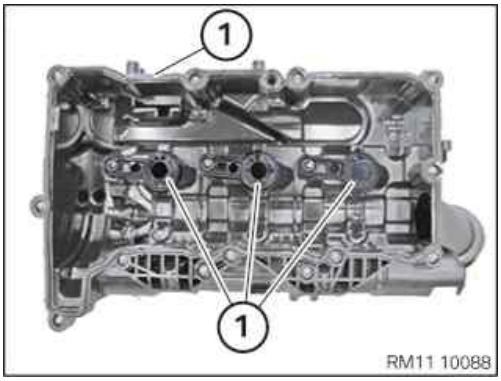
26 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

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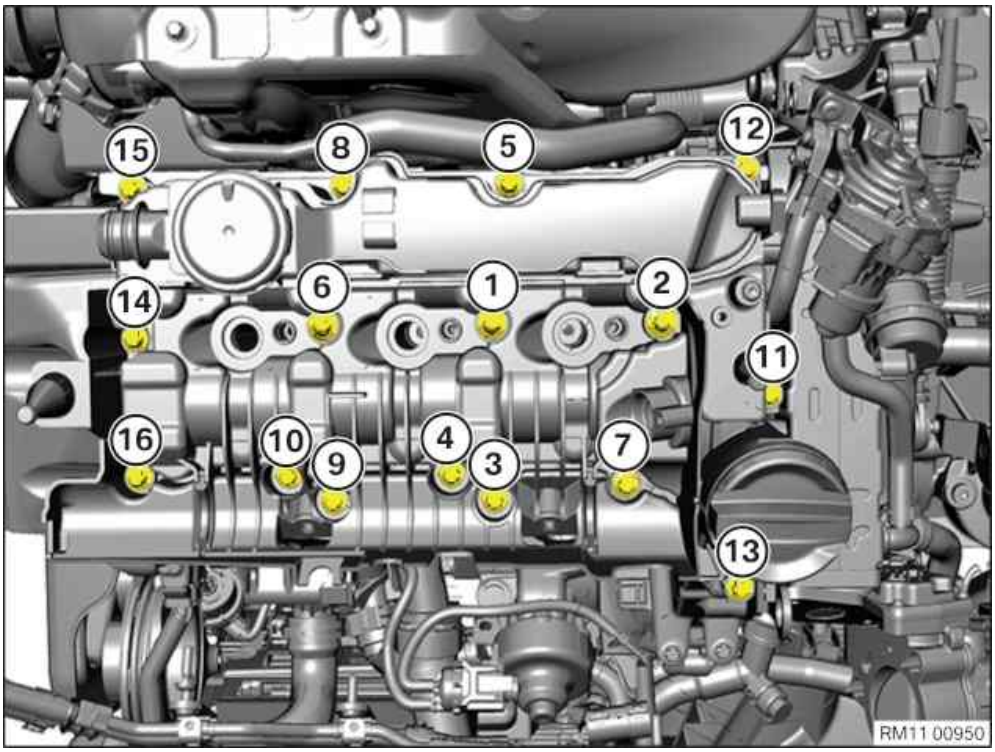
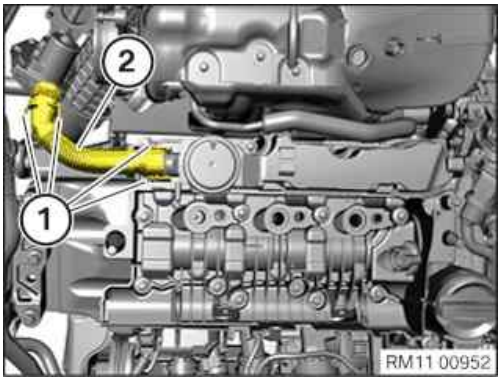


- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

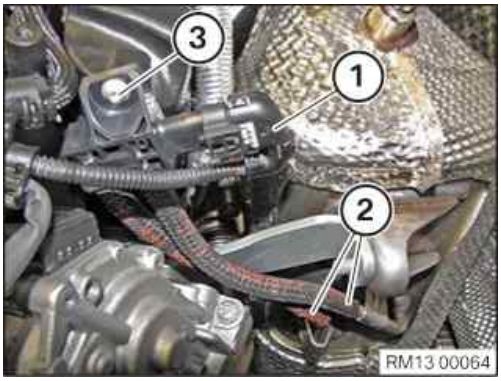
M6		Tightening torque.	8,5 Nm



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

27 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

28 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

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CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

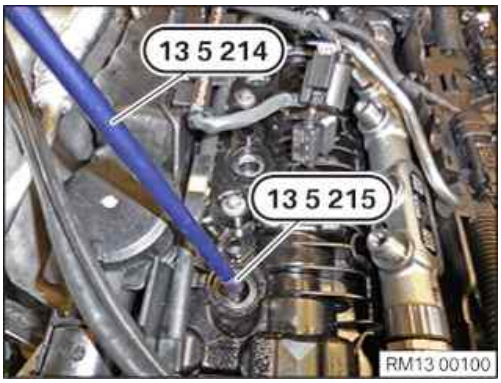
- Wear safety goggles.

RISK OF DAMAGE

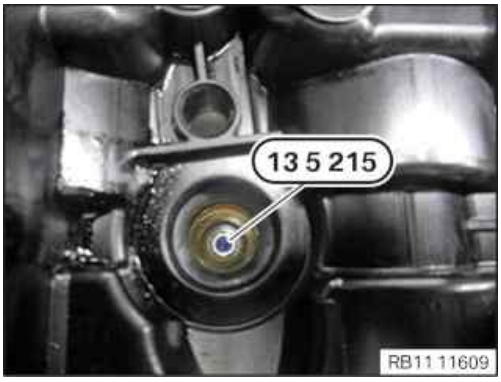
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

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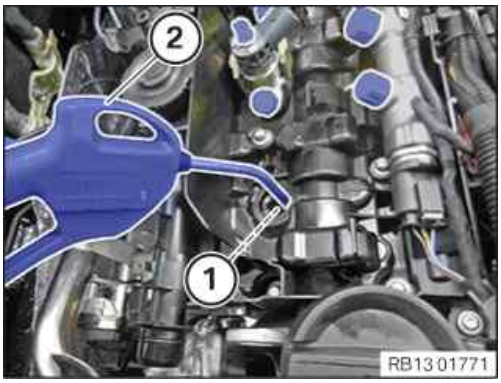
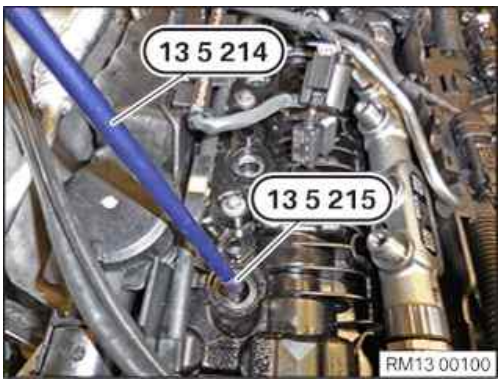
- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

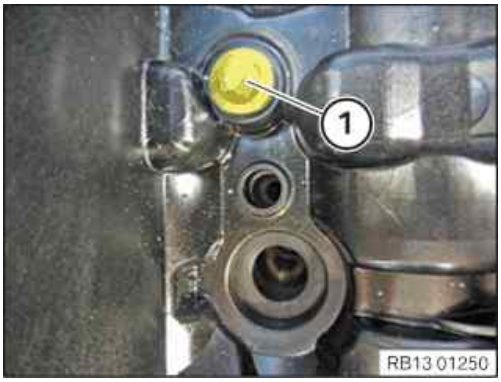
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

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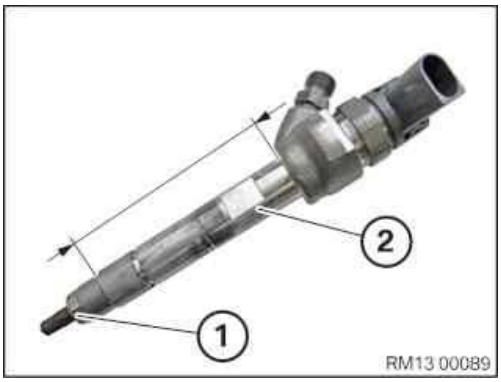
▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

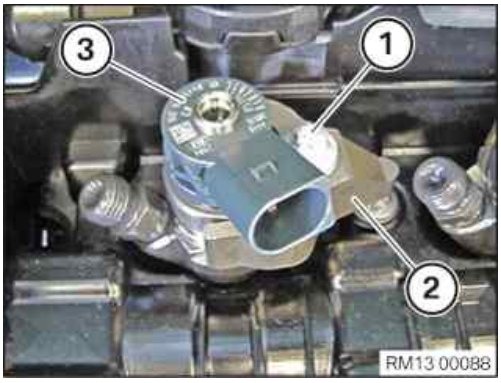


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

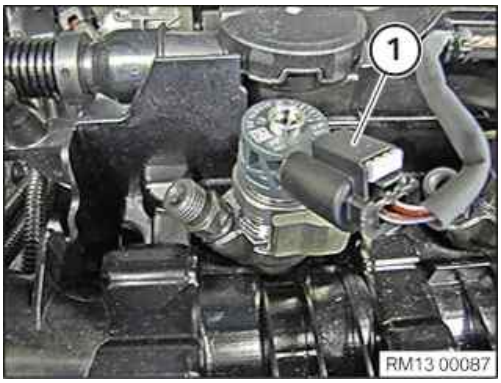
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

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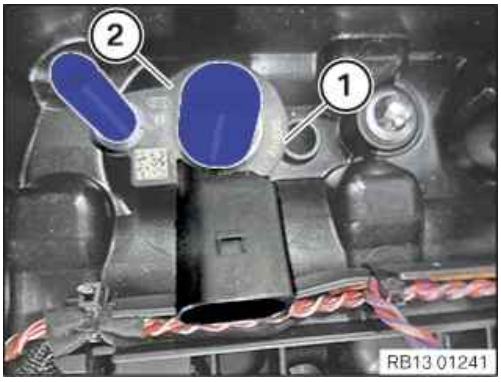
NOTICE

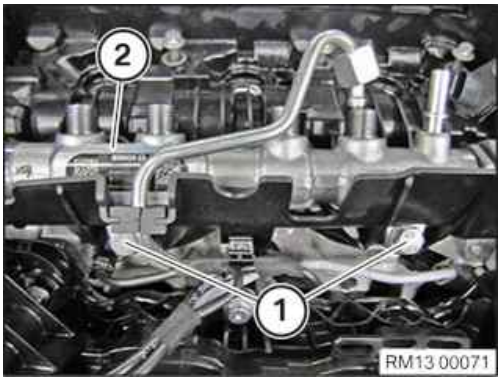
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

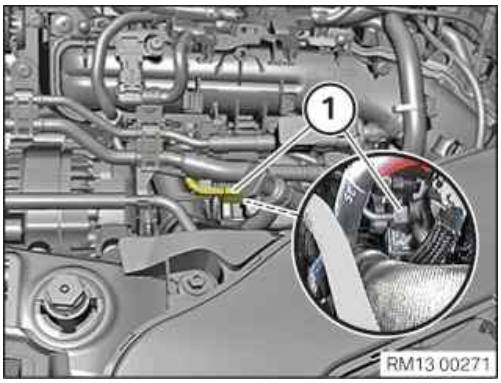
29 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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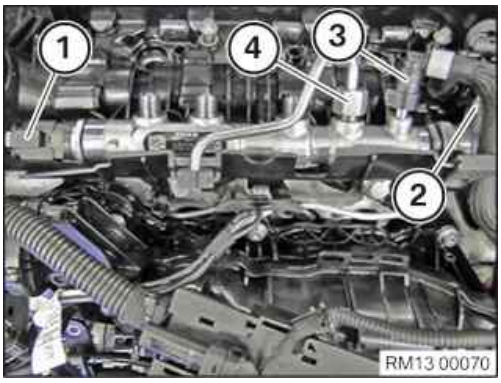

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

30 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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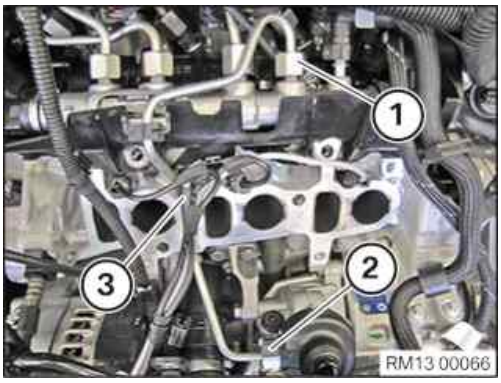

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

31 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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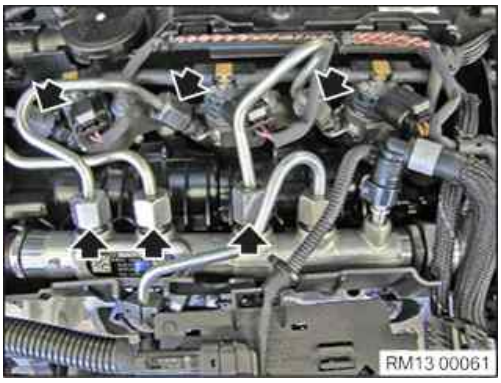


- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

32 – Connect the leakage oil line on the injector

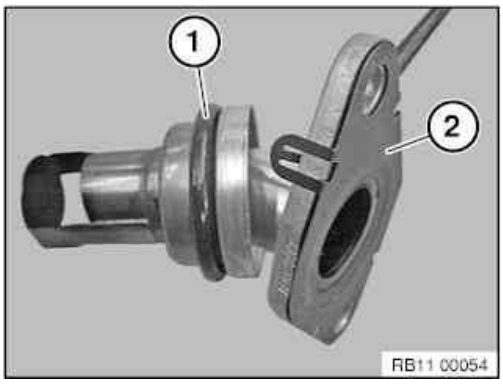
- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

33 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

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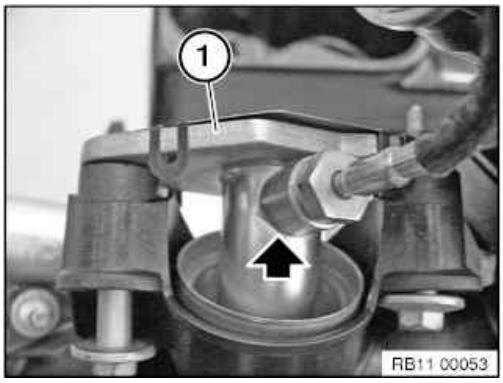
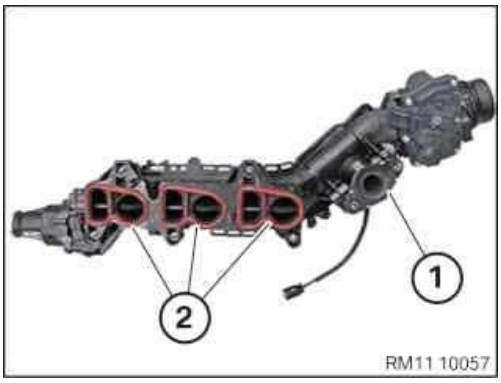
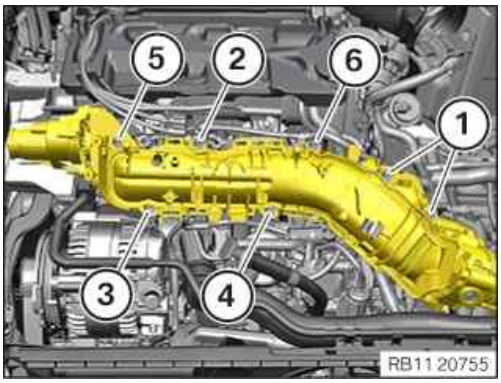


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

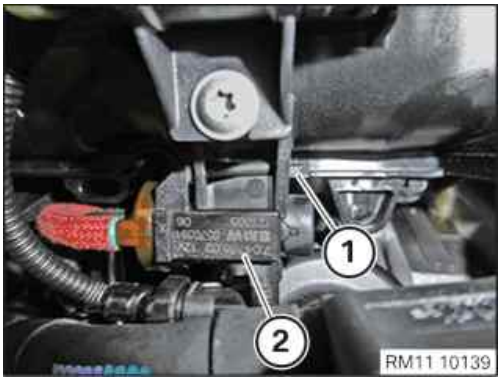
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



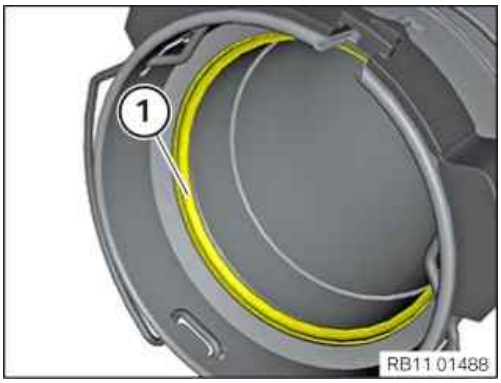
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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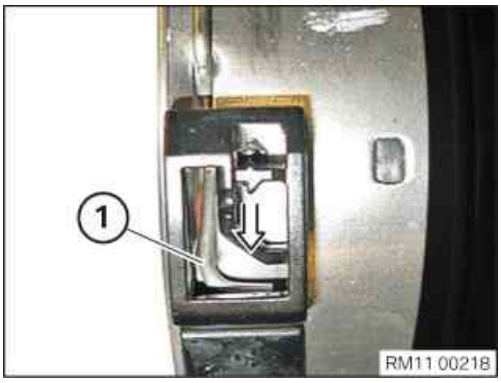
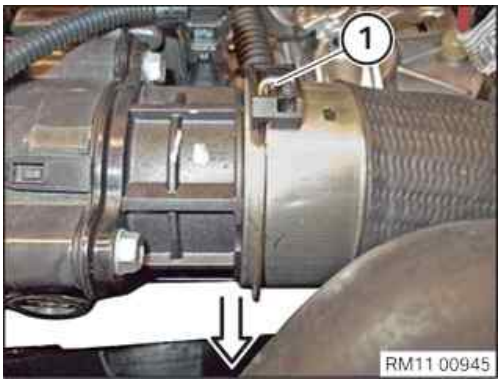
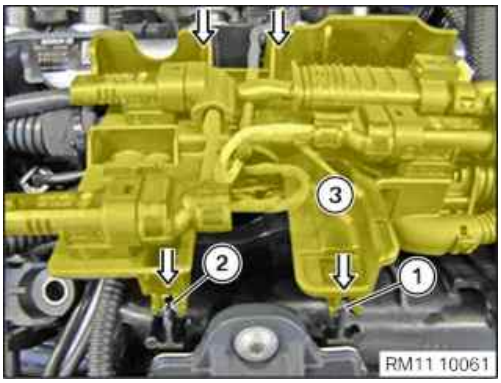


- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

34 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

35 – Fastening the wiring harness section for the intake plenum

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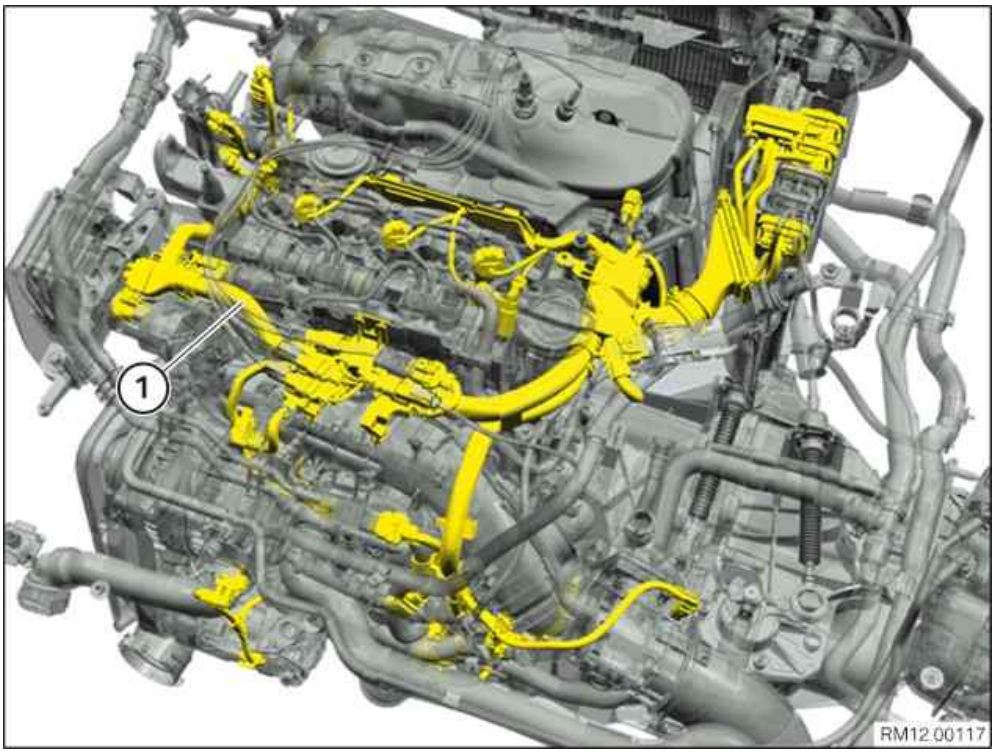
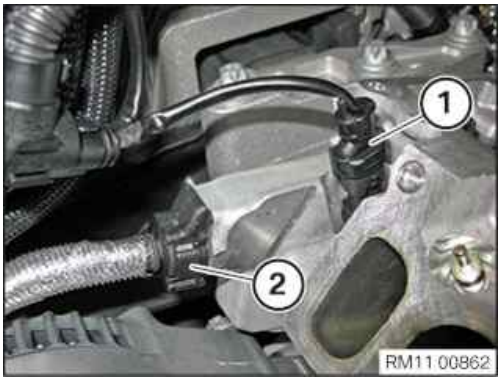
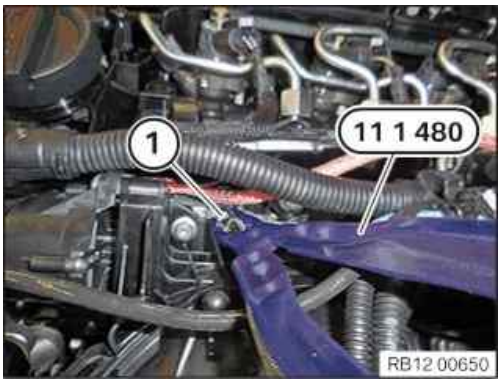
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

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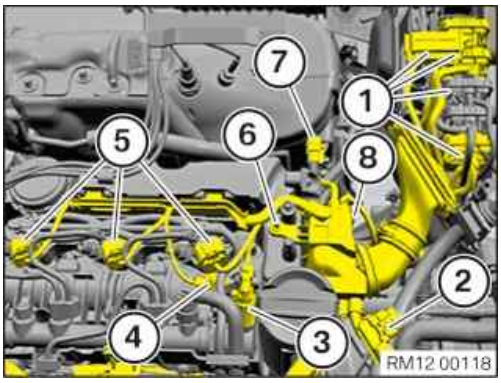
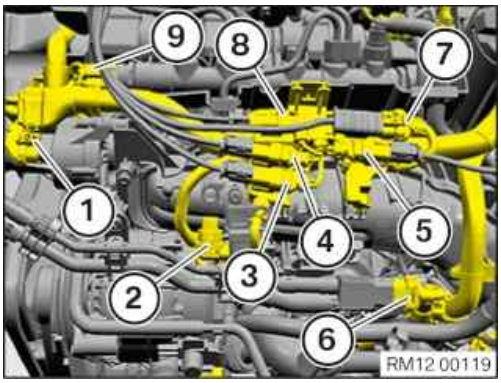


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

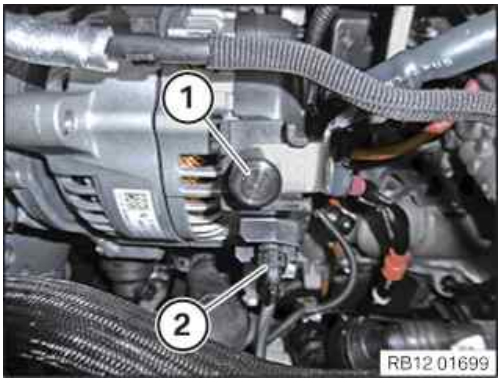
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

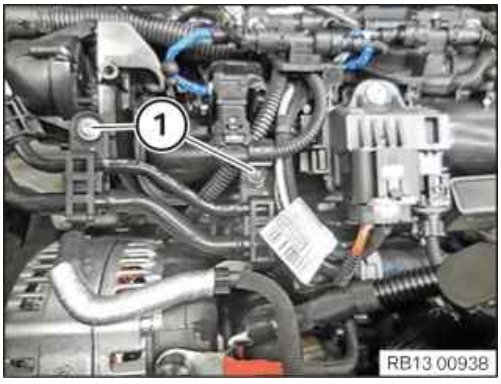


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm



- Position fuel lines.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

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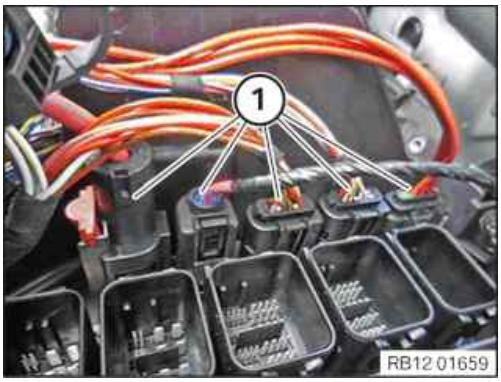
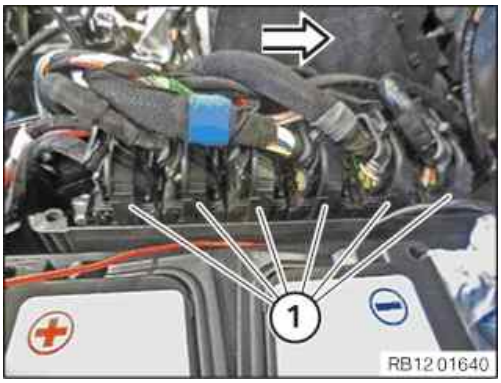
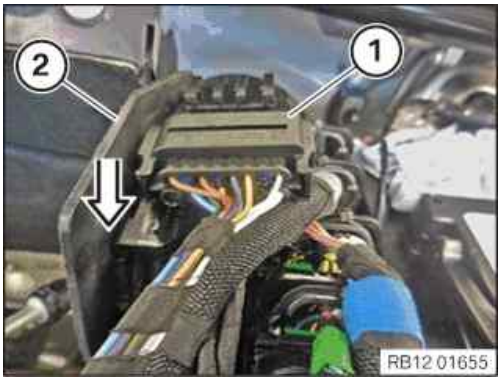


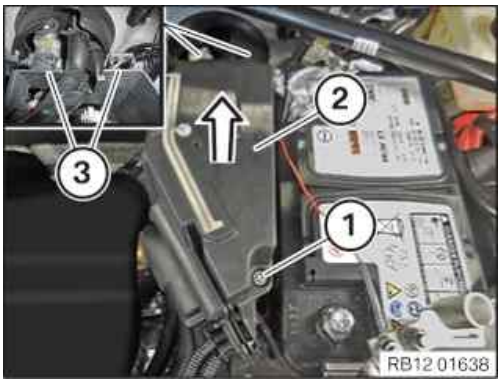
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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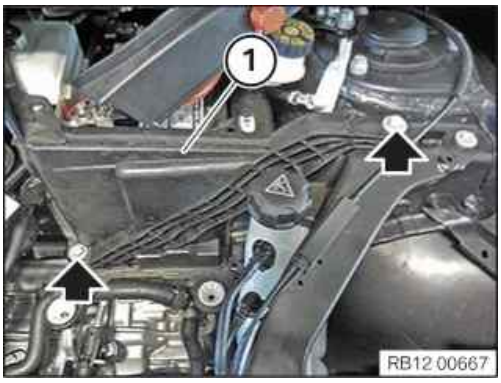


- Feed in and install tension strut (1).
- Tighten screws (arrows).

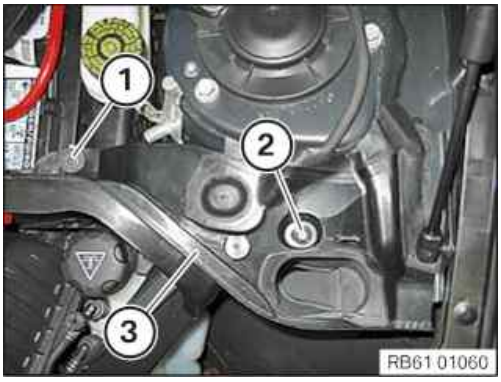
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

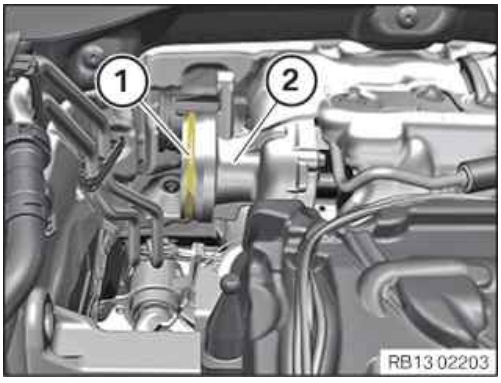


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

36 – Partially securing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.

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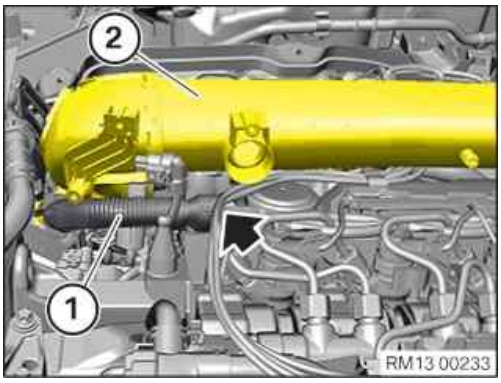
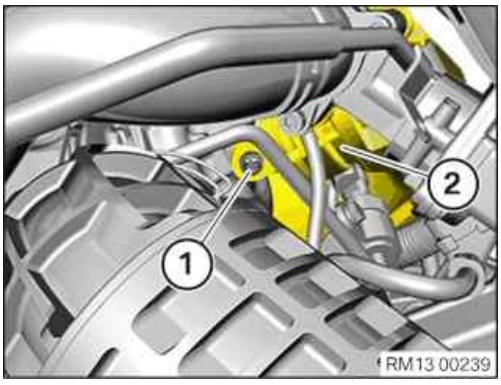


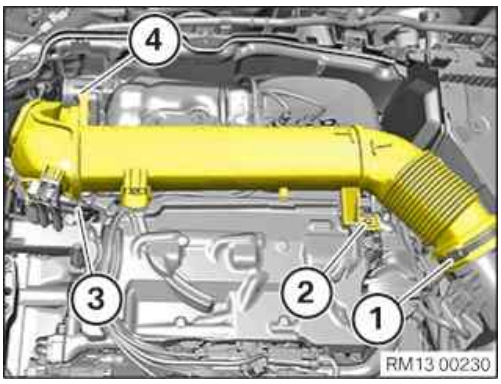
- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

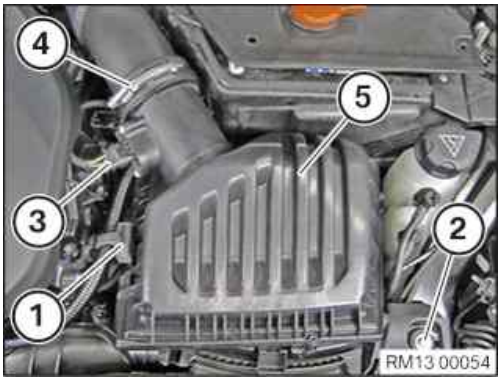
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

37 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

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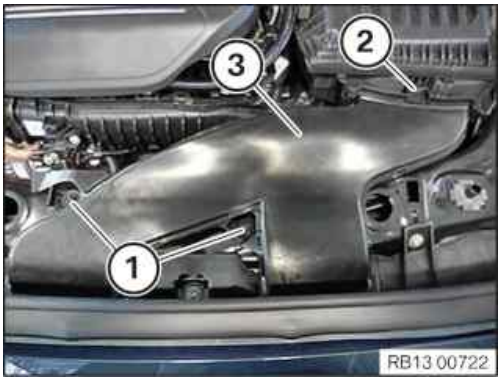
38 – Install the intake neck for the intake filter housing



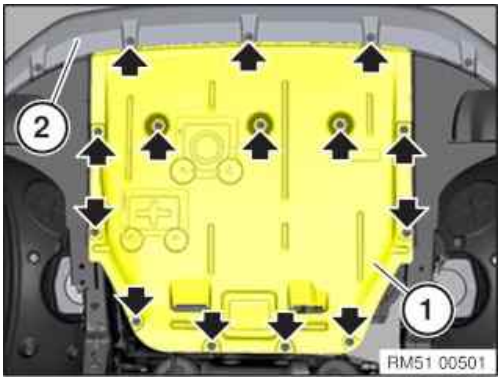
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

39 – Installing the front underbody protection

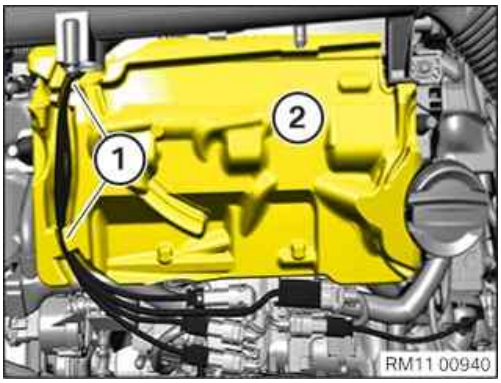


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

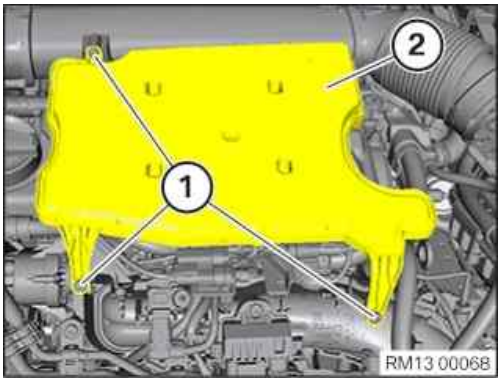
			3 Nm

40 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

41 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

42 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

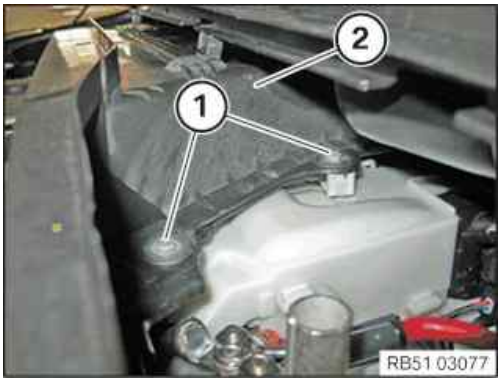
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

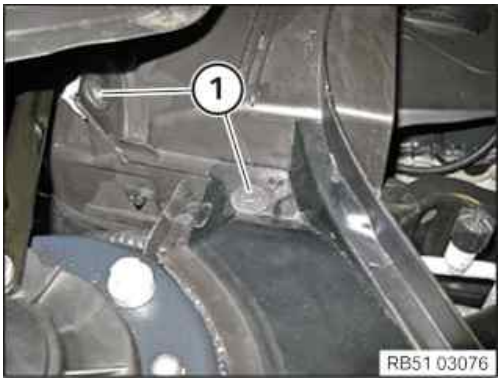
43 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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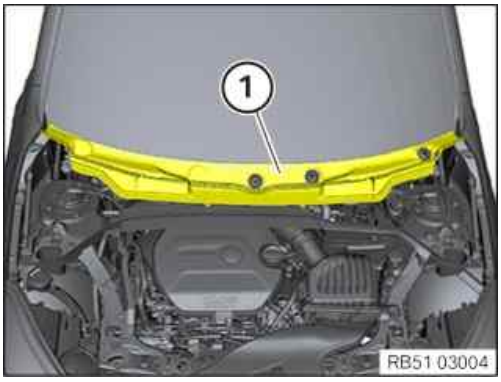
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

44 – Install the rear cowl panel cover



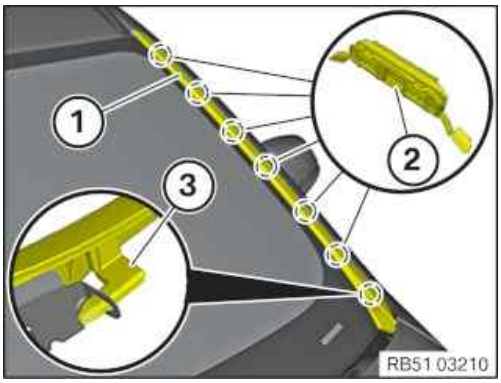
- Feed in and engage the rear cowl panel cover (1).

45 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

46 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the wiper arm**

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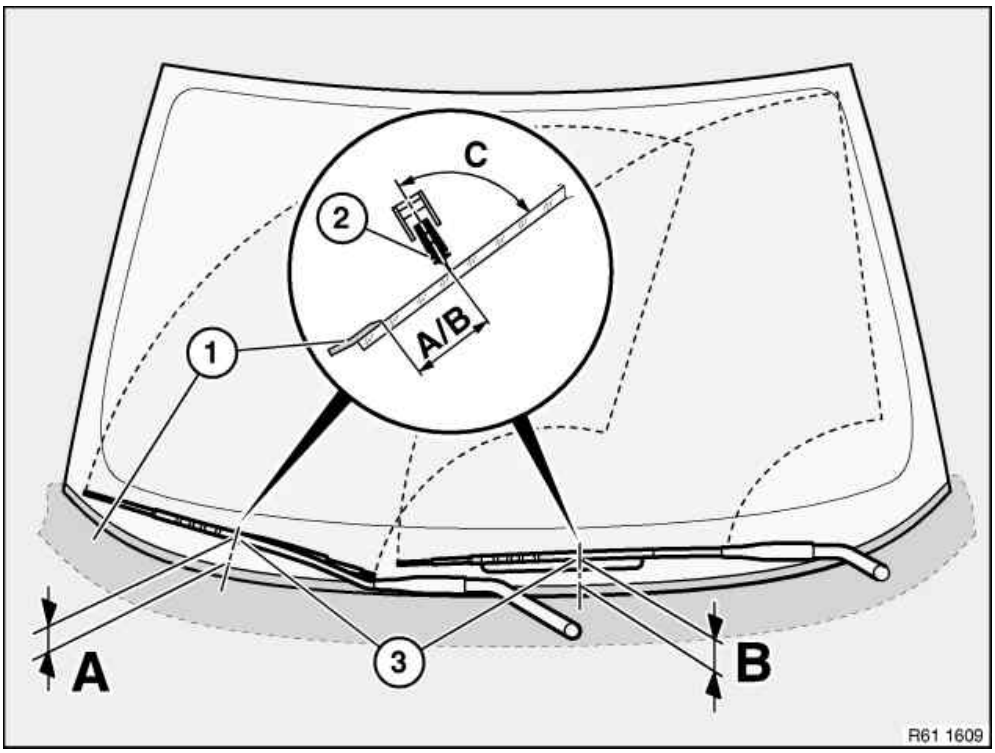
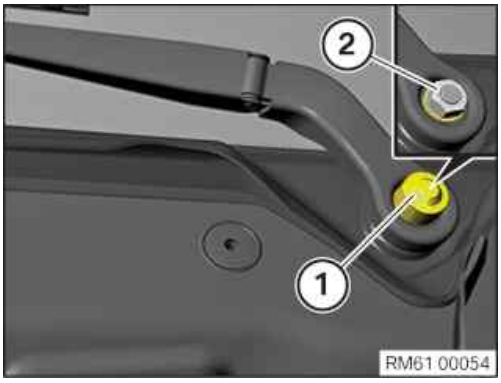
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

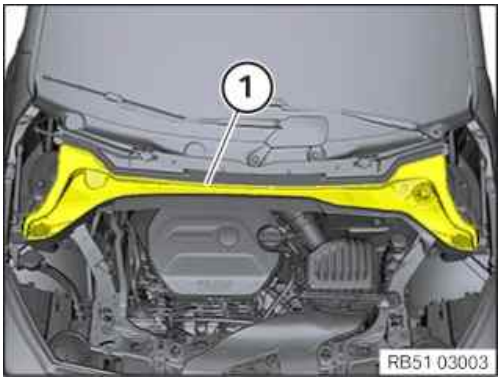
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

47 – Installing front cowl panel cover



- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

48 – Install the seal for the bonnet

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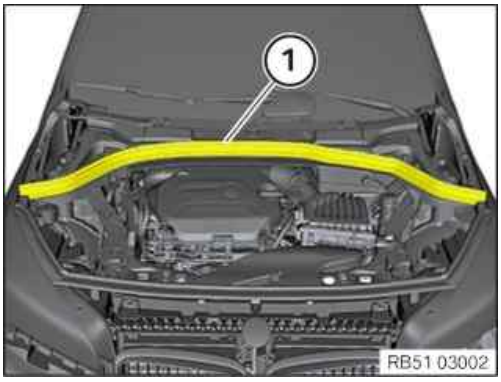
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

49 – Disconnecting all battery earth leads

- See additional information.

Additional Information

Overview of Tightening Torques

Camshaft sensor to cylinder head cover — Used in step 25

TS5x20		Tightening torque	4 Nm

Cylinder head cover to cylinder head — Used in step 26

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder — Used in step 27

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 27

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover — Used in step 28

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover — Used in step 28

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover — Used in step 29

Torx screw M8x25		Tightening torque	19 Nm

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High pressure line between high pressure pump and rail

Used in step 29 30

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 31

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 33

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover

Used in step 35

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 35

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 35

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 35

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 35

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 35

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 35

		Tightening torque	3 Nm

Battery cover

Used in step 35

Screw			2,8 Nm

Clean air pipe to exhaust turbocharger

Used in step 36

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover

Used in step 36

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 36 37

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge

Used in step 37

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 38

M6		Tightening torque	8 Nm

Underbody protection front

Used in step 39

			3 Nm

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Resonator to manifold and clean air pipe

Used in step 41

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top

Used in step 43

Screw		Tightening torque	3 Nm

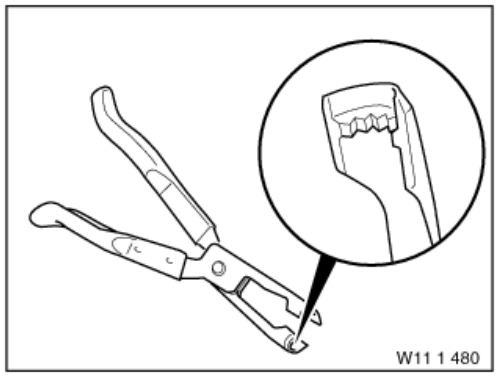
Windscreen wiper arm

Used in step 46

Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common Used in step 15

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common Used in step 19 20 21 29 30 31

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

2 413 106 Fastener

Common Used in step 19 20 30 31

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

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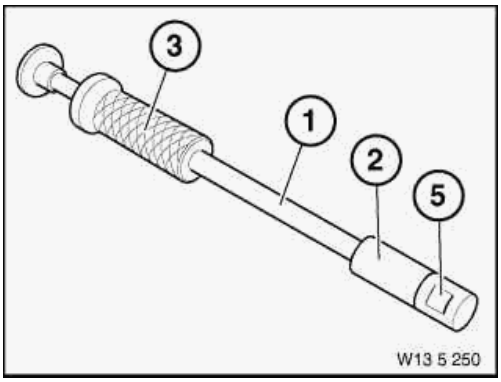
0 493 321 (13 5 250) Puller



Common Used in step 22

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common Used in step 22

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 22

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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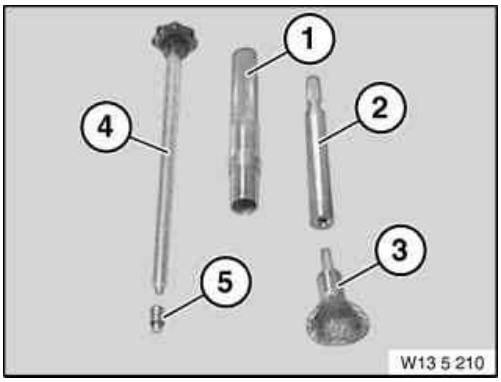
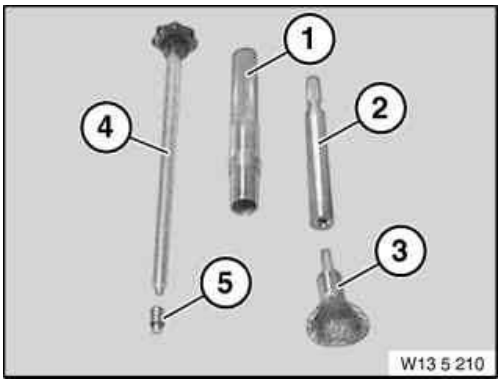
0 493 763 (13 5 215) Plug



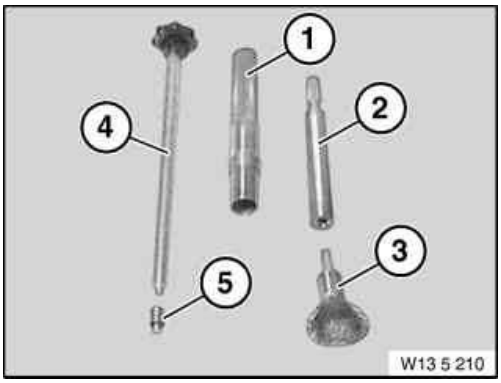
Common		Used in step 28
Usage	(Seal plug)	
Included in the tool or work	0 493 758	
Storage location		
Replaced by		
In connection with		
SI-Number		

0 493 762 (13 5 214) Rod



Common		Used in step 28
Usage	(Mounting rod) For the seal plug	
Included in the tool or work	0 493 758	
Storage location		
Replaced by		
In connection with		
SI-Number		

0 493 758 (13 5 210) Tool



Common		Used in step 28
Usage	(Cleaning set) For injector channels	
Included in the tool or work		
Storage location	B4	
Replaced by		
In connection with		
SI-Number	01 05 00 (574)	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Overview Technical Data

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Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 49
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 49
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
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61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 20 900 Disconnecting and connecting battery earth lead	1 49
61 35 ... Notes on ESD protection (Electro Static Discharge)	22 23 25

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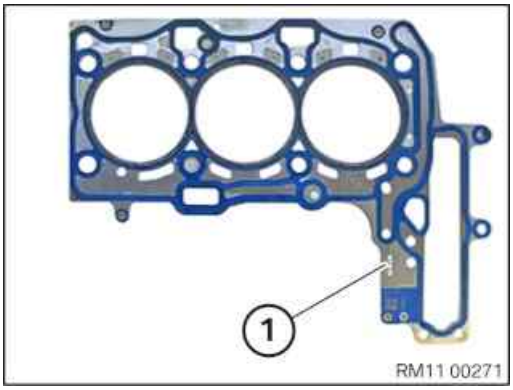
11 12 501 Replacing cylinder head gasket (B37C)

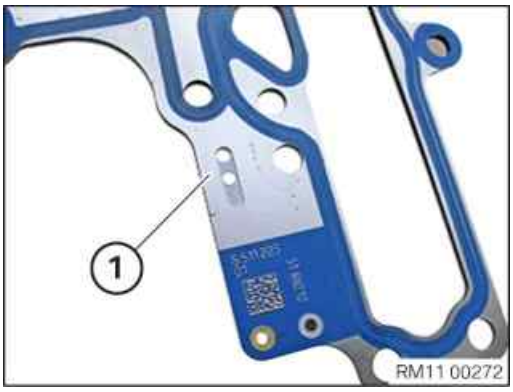
Necessary preliminary tasks:

- Remove cylinder head.



The cylinder head gasket is designed as a beaded metal gasket.

Note gasket thickness (1).



Highest piston protrusion at both measuring points of all 3 pistons determines thickness of cylinder head gasket.

Piston protrusion up to 0.42 mm

- Install 1 hole cylinder head gasket.

Piston protrusion >0.42 ... 0.53 mm

- Install 2 hole cylinder head gasket.

Piston protrusion over >0.53 ...0.68 mm

- Install 3 hole cylinder head gasket.

Concluding tasks:

- Install cylinder head.

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This documentation refers to special tools that were not yet available when going to press.

11 13 000 Remove and install, seal or replace oil sump

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

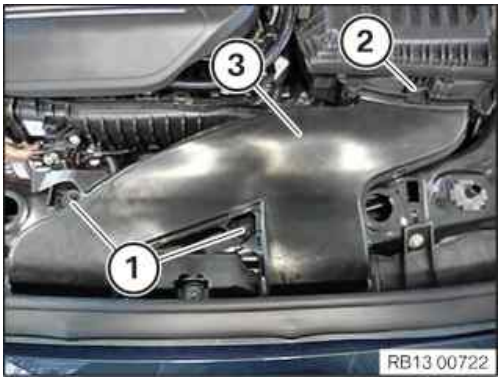
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

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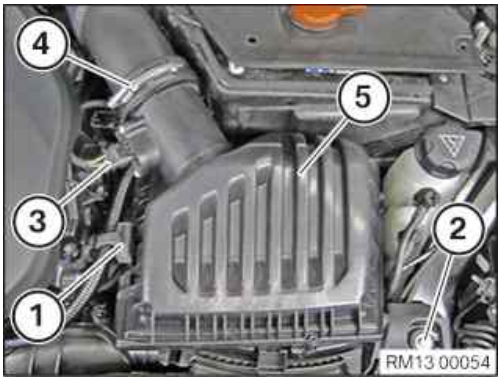
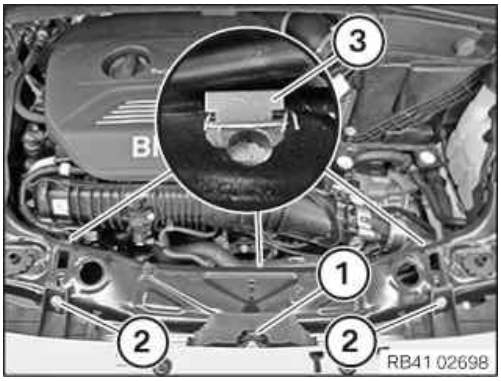
4 – Removing intake silencer housing

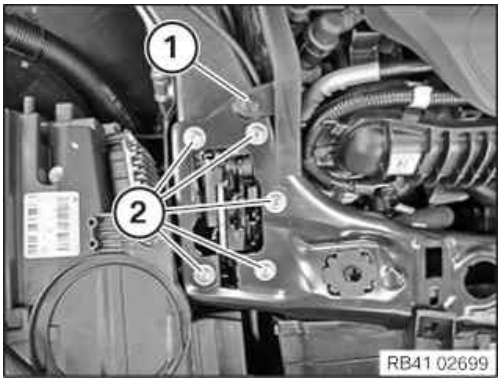


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

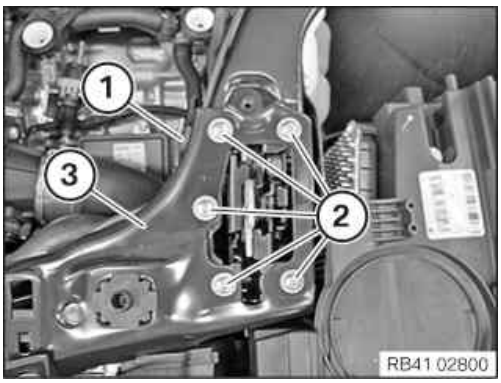
5 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

6 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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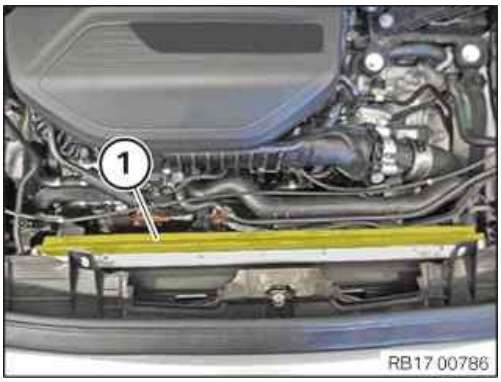
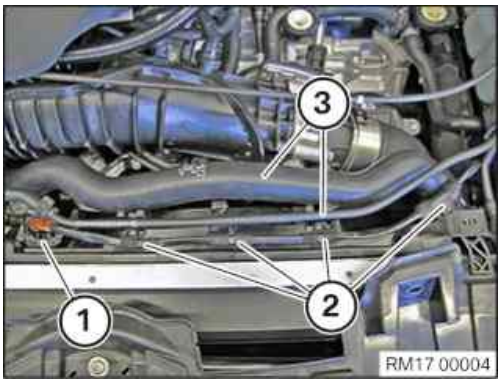
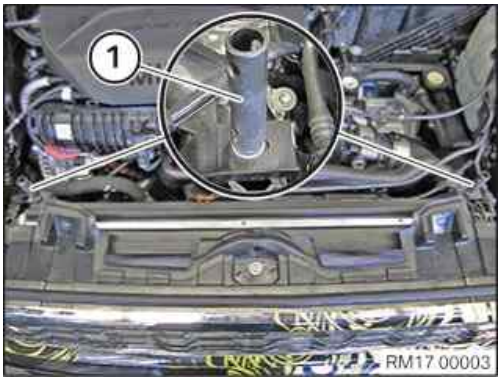


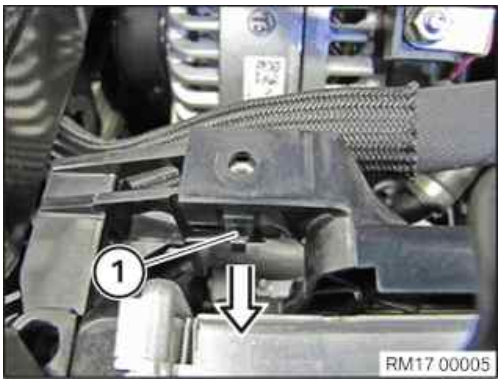
- Feed out and remove the sealing (1) from the radiator.



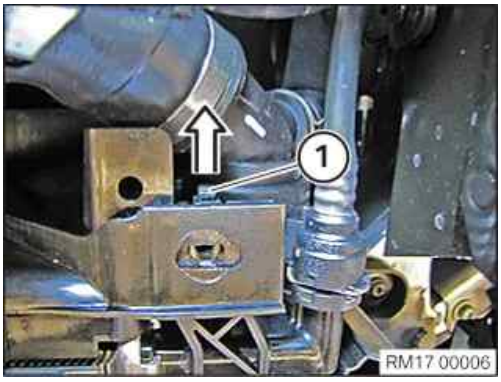
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

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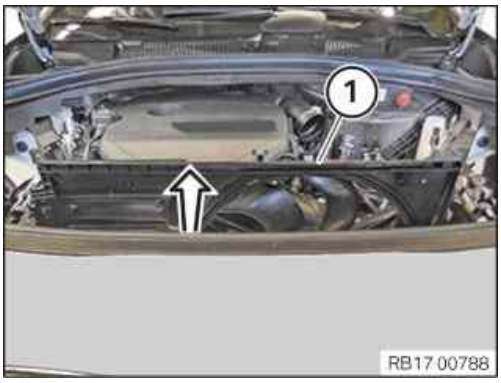
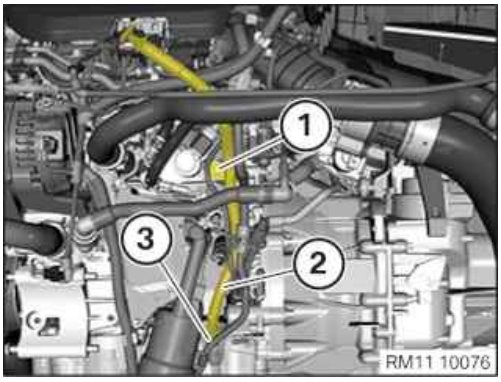


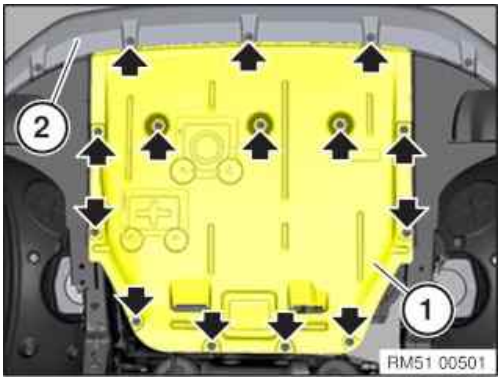
- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the guide tube for the oil dipstick



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

8 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

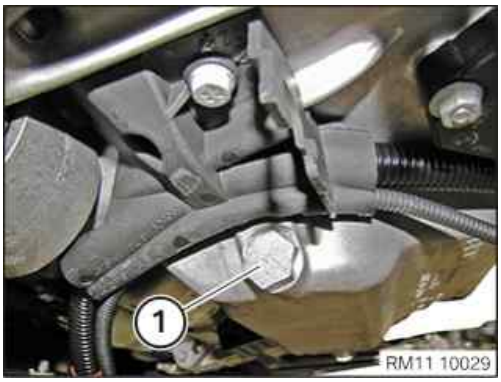
9 – Releasing the oil drain plug

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel.
Observe country-specific waste disposal regulations.

- Release oil drain plug (1).
- Drain engine oil.

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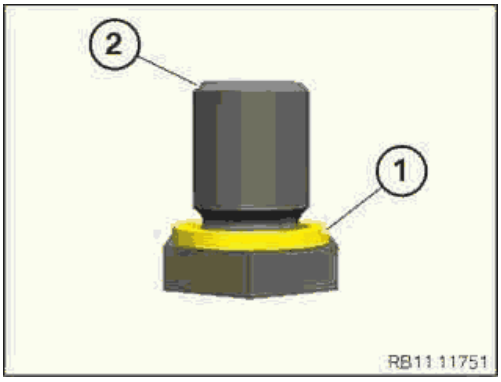
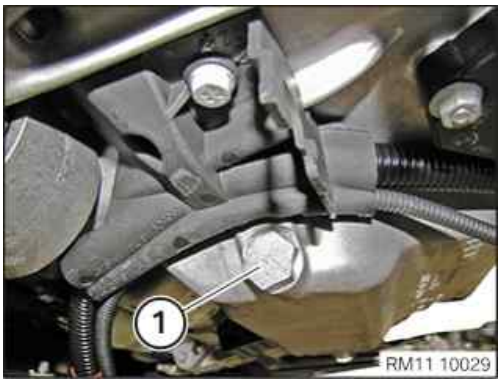
10 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring

- Guide in the sealing ring (1) on the oil drain plug (2) and install.



- Renew the sealing ring.

  Parts: Sealing ring

- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

11 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

12 – Removing the front right wheel arch cover

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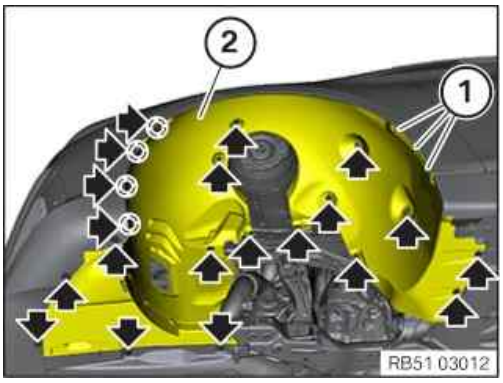
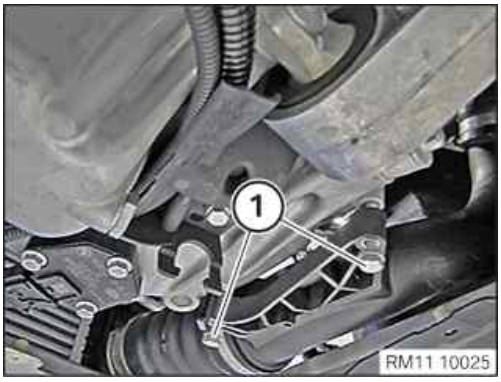


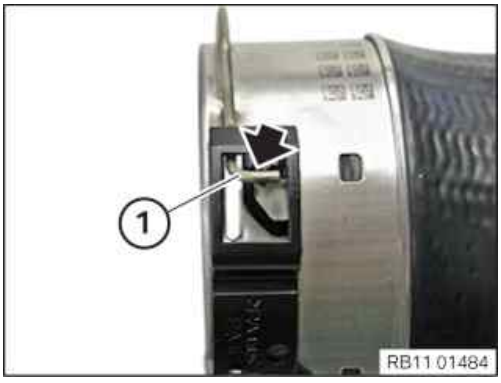
- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

13 – Remove right charge-air line

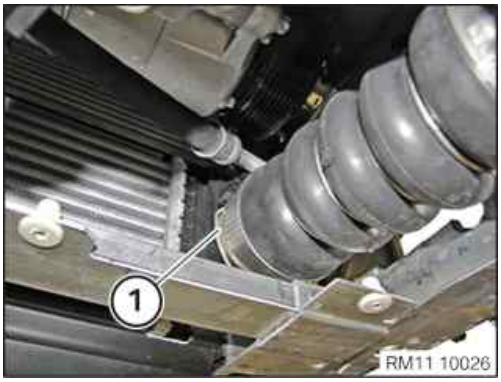


- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.



- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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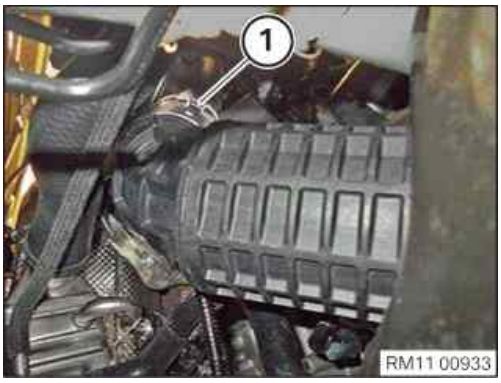


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

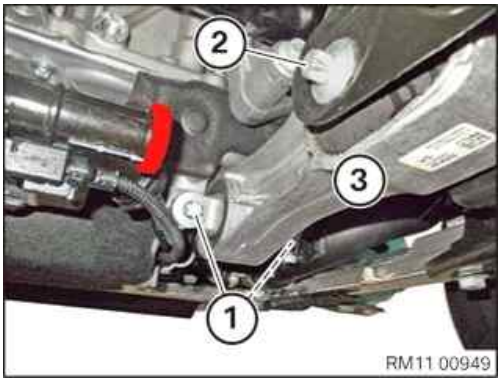
14 – Remove bracket with rubber mount

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.



- Support the engine with the jack at a suitable point.
- Loosen screws (1) and (2).
- Guide out and remove holder (3).

15 – Removing the acoustic cover of the oil sump

- Unlock connector (1) and pull off.
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

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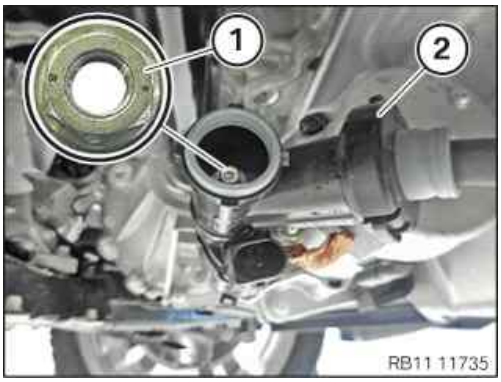
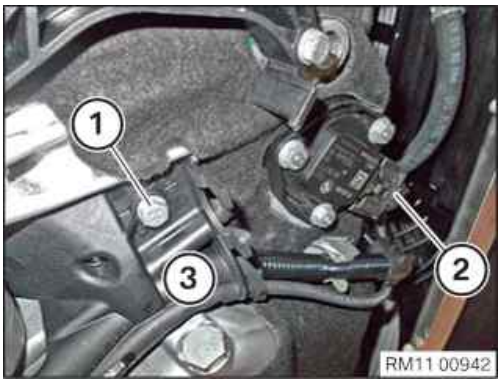
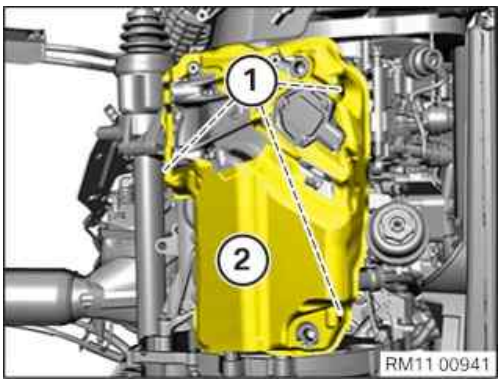


- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Unscrew the screw (1) on the wiring harness to the oil sump.
- Unlock and pull off connector (2) on the oil-level sensor.
- Place wiring harness (3) to one side.



- Remove the expanding rivets (1) on both sides of the acoustic cover.
- Feed out and remove the acoustic cover (2).

MAIN WORK

16 – Remove oil sump

- Loosen screws (1).
- Feed out starter motor and remove.

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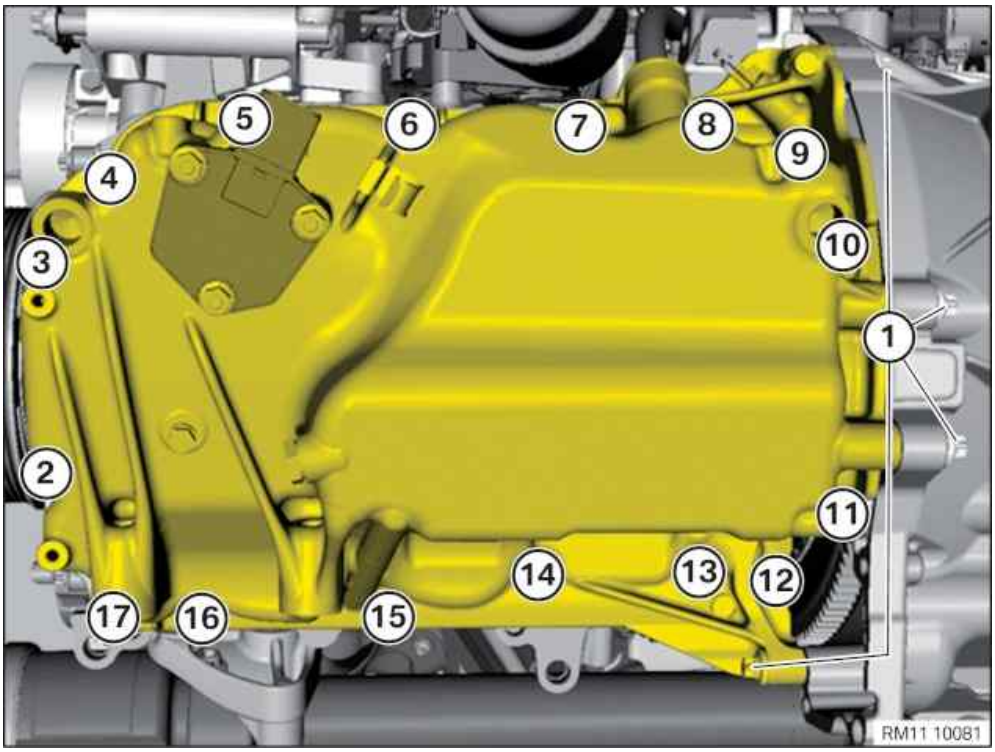
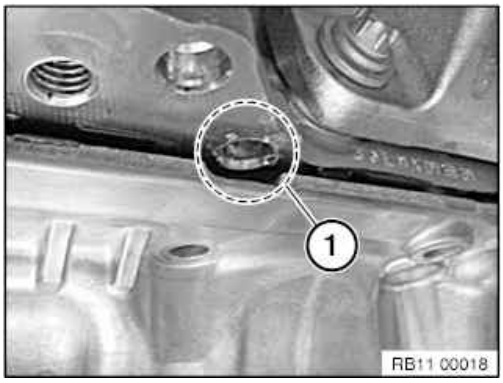
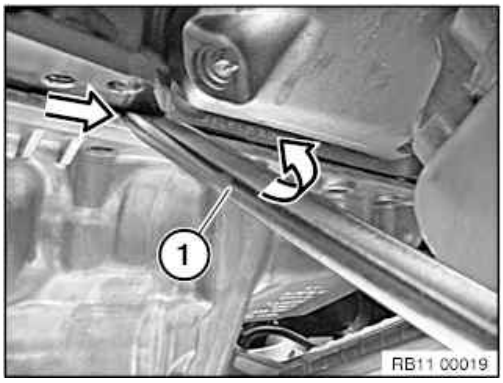


- Release transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

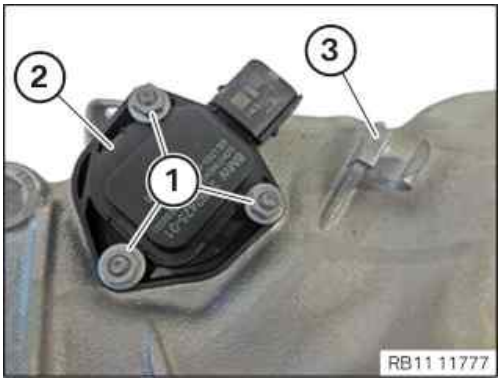


- Release the oil sump only in area (1).



- Release the oil sump carefully using a suitable mounting lever (1) at the appropriate position in the direction of the arrow.
- Secure the oil sump to prevent it from falling.

17 – Renew oil sump



- Loosen nuts (1).
- Remove the oil-level sensor (2).
- Feed out and remove the clamp (3).

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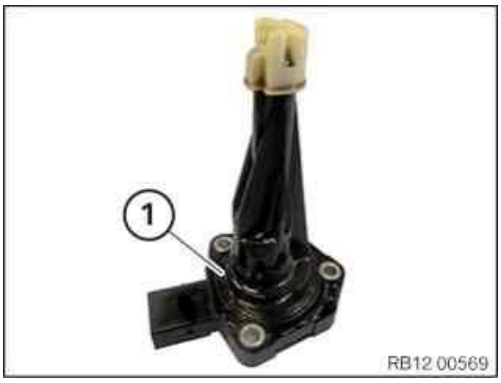
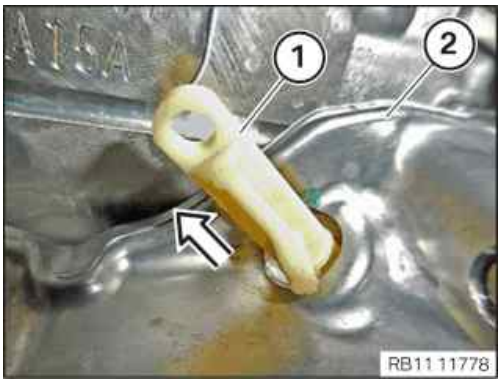
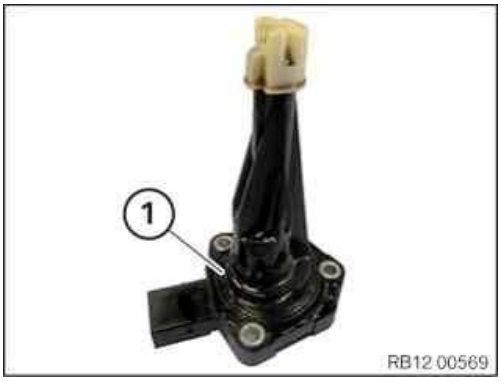


- Renew gasket (1).

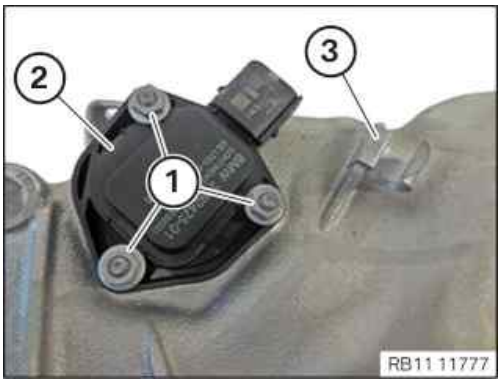
  Parts: Gasket



- Guide the seal plug (1) out of the oil sump (2) in the direction of the arrow and remove.



- Insert and install the new gasket (1).

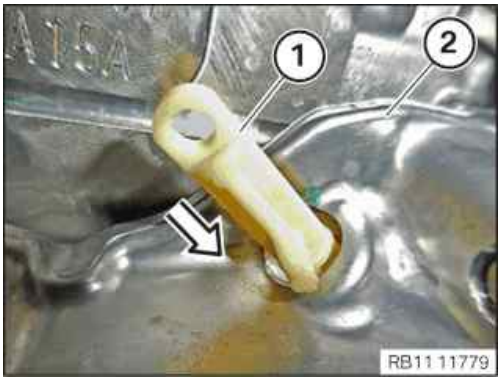


- Insert and install the oil-level sensor (2).
- Tighten nuts (1).

Oil level sensor to oil sump

M6		Jointing torque	2 Nm
		Tightening torque	8 Nm

- Secure clamp (3).



- Guide the seal plug (1) into the oil sump (2) in the direction of the arrow and install.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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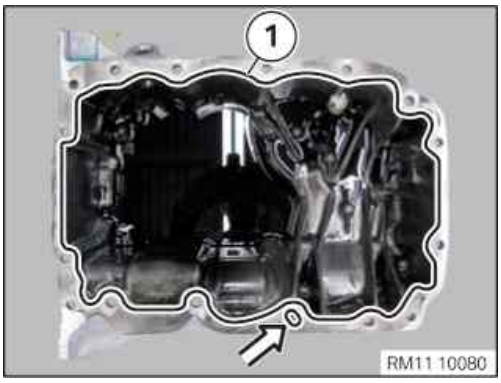


TECHNICAL INFORMATION

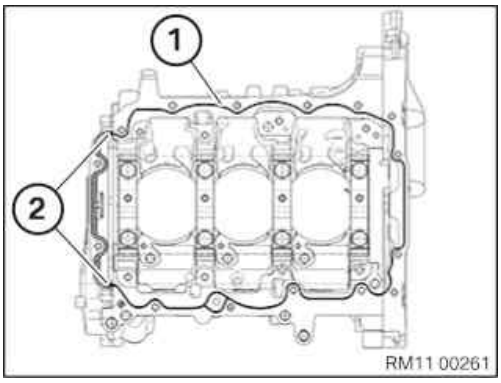
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

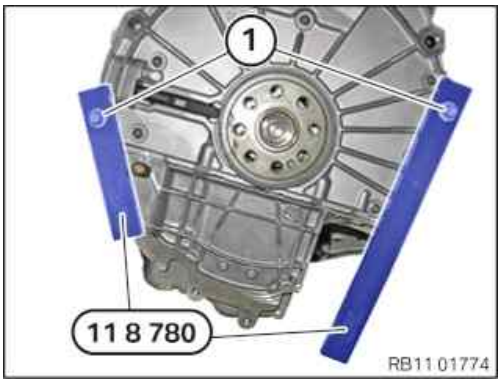
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.



TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.

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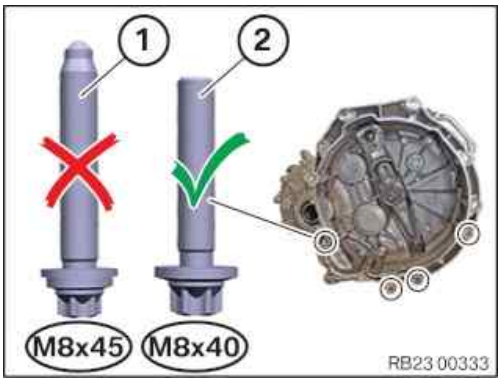


RISK OF DAMAGE

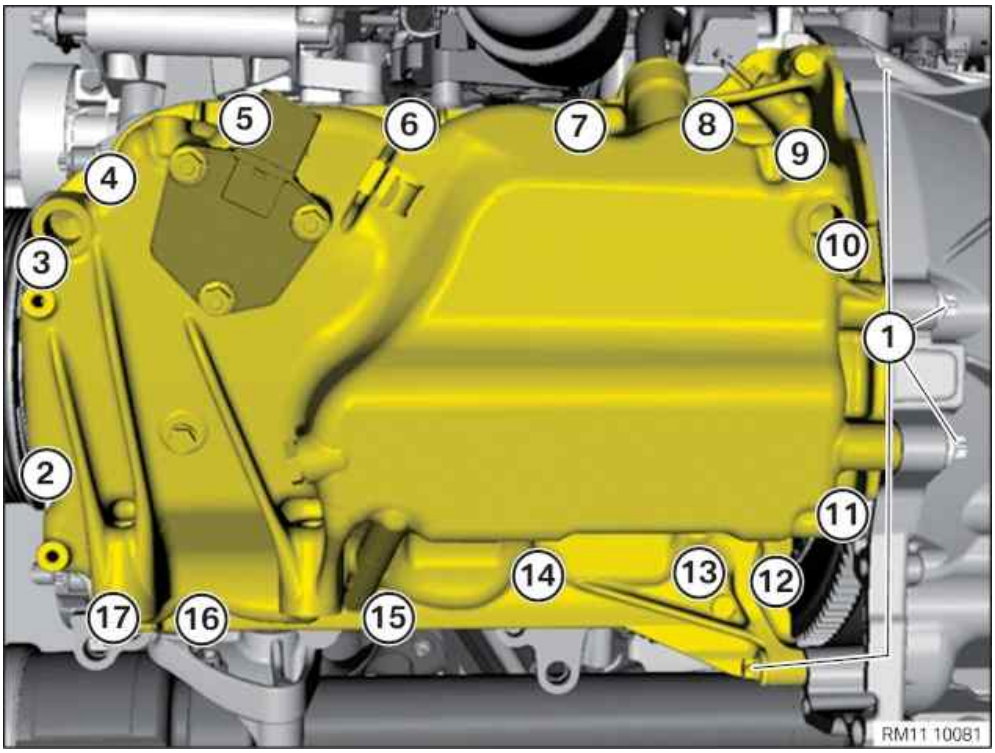
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Tighten screws (2) to (17) **hand-tight**, do **not** tighten fully.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws (2) to (17) on the oil sump.

Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten the transmission bolts (1) on the oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

POSTPROCESSES

19 – Installing the acoustic cover for the oil sump

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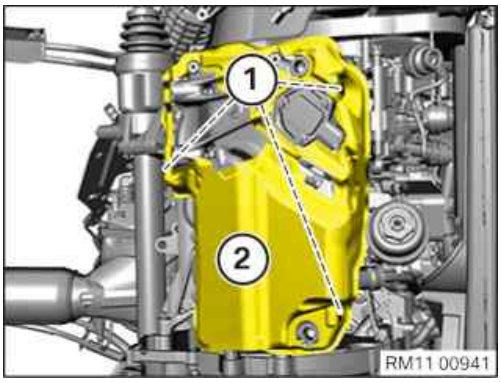
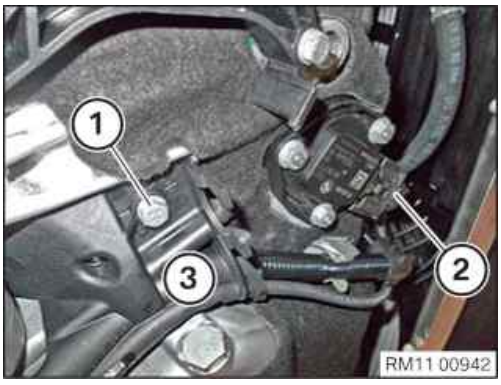


- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



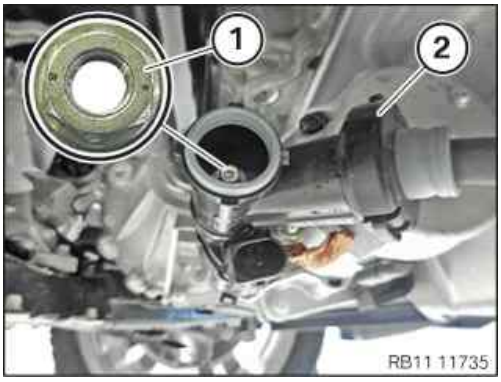
- Position wiring harness (3).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

- Connect and lock the connector (2) on the oil-level sensor.

  The connector must lock audibly.



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).

  The connector must engage audibly.

20 – Install the holder with the rubber mount

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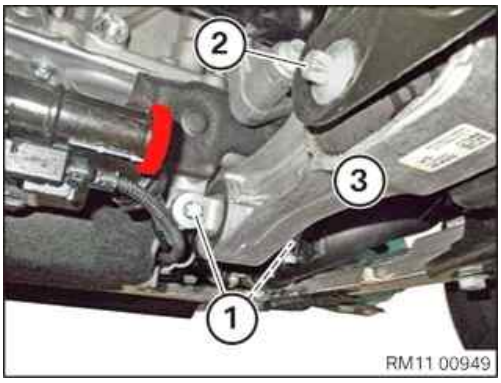


- Insert and install the holder (3).
- Tighten the screws (1) and (2) hand-tight.
- Release jack.
- Tighten down screw (2).

Holder to front axle support

M12		Tightening torque	100 Nm

- Tighten the screws (1).

Bracket to oil sump

M12		Tightening torque	100 Nm

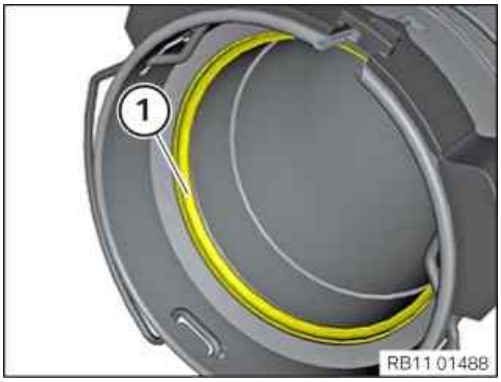
21 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

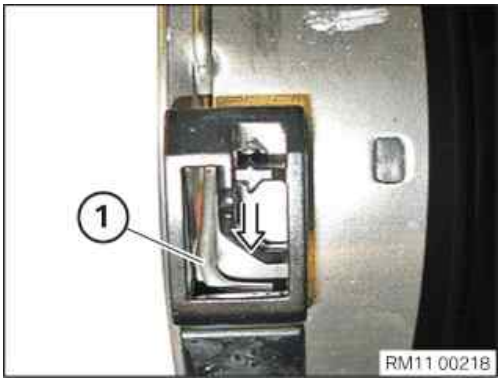
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

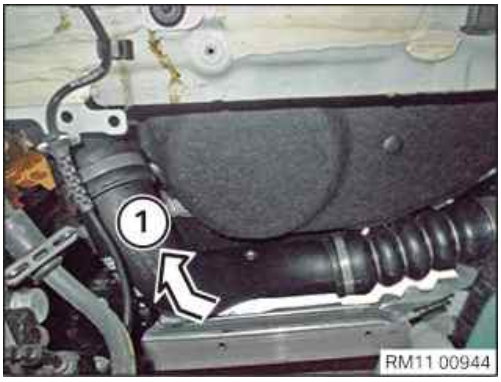


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.

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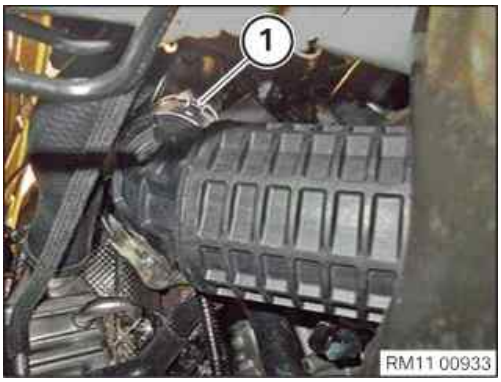
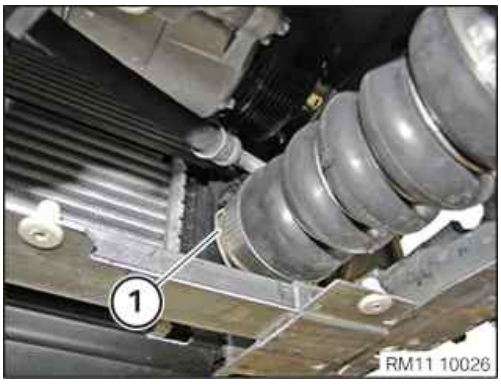


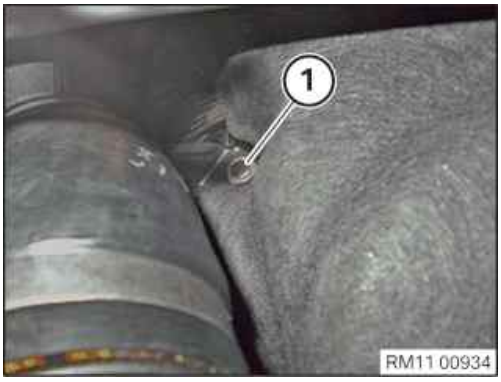
- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

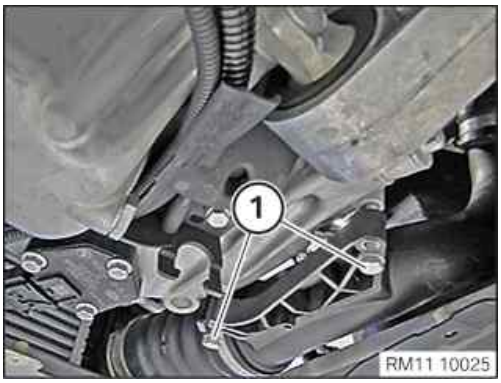
  The lock (1) must audibly engage.



- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

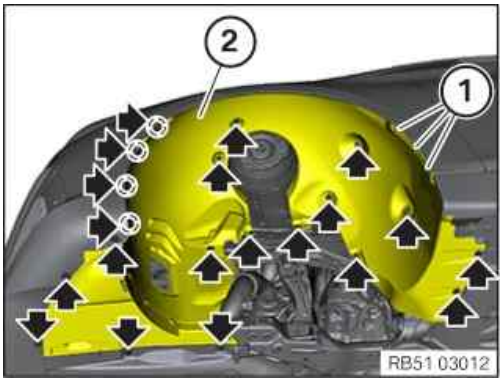


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

22 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

23 – Installing the front right wheel

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▶ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

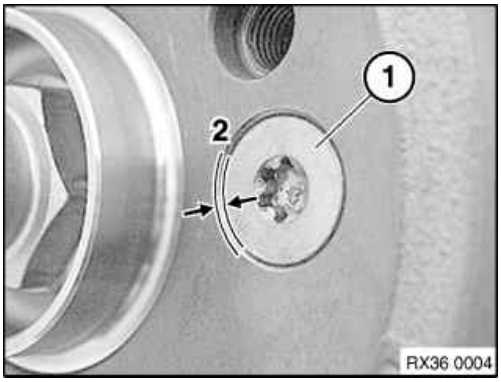
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

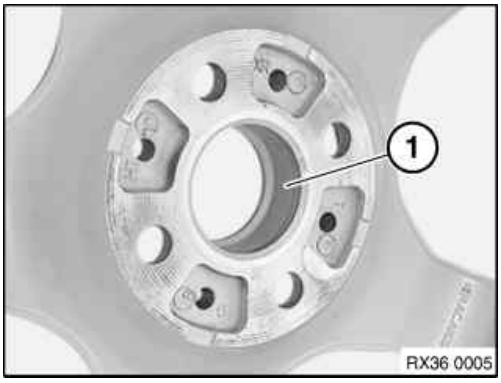


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

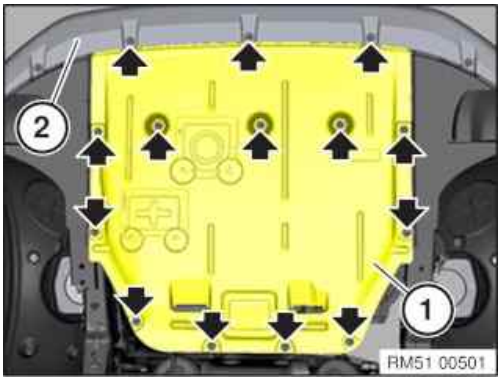
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

24 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

25 – Installing guide tube for oil dipstick

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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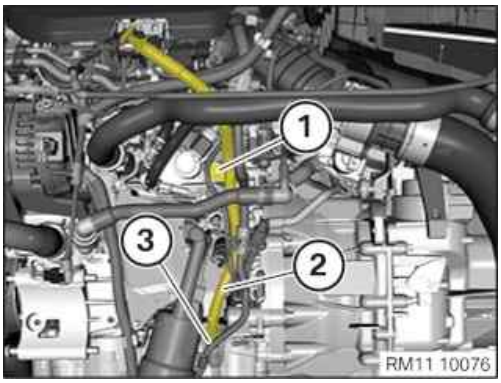
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and slide it into the oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

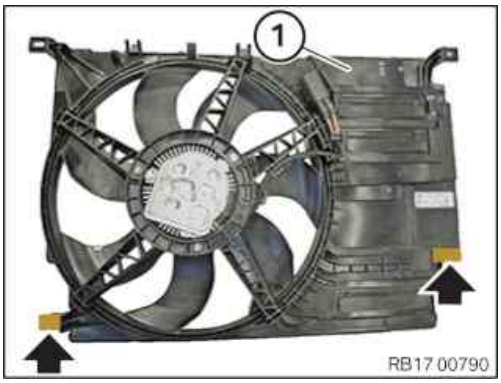
Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

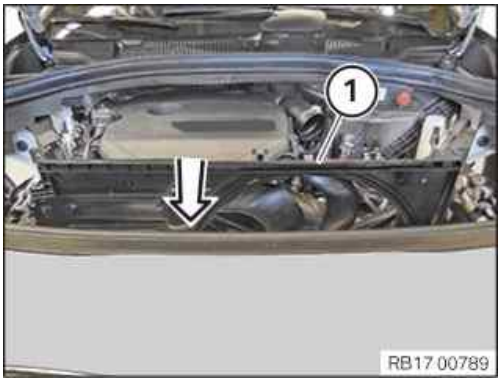
26 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.

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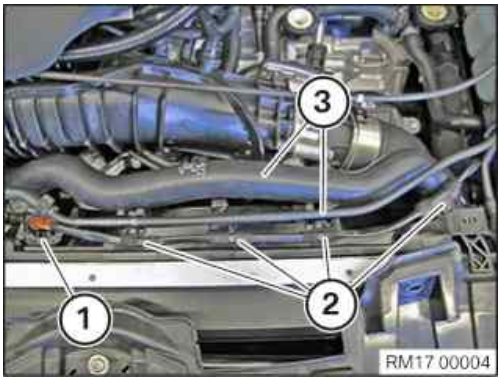
- Lock the left and right locks (arrows).

- Tighten the screws (1).

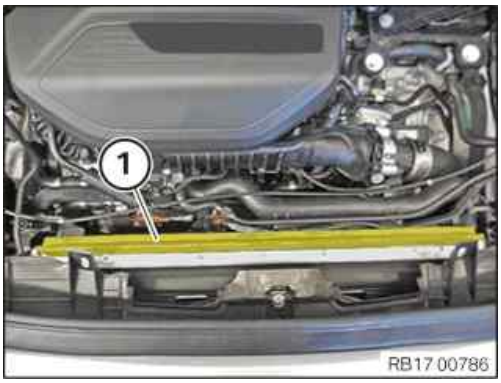
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



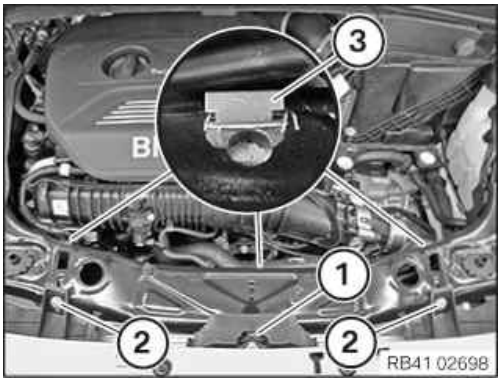
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



- Guide the sealing (1) on the radiator in and install it.

27 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

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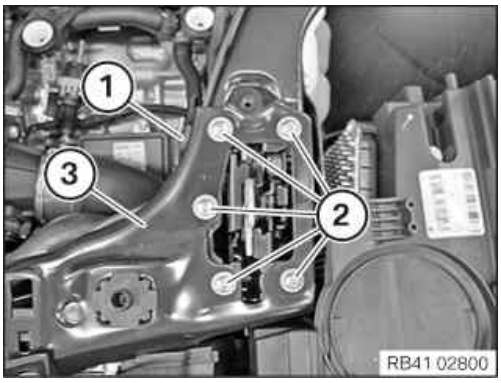
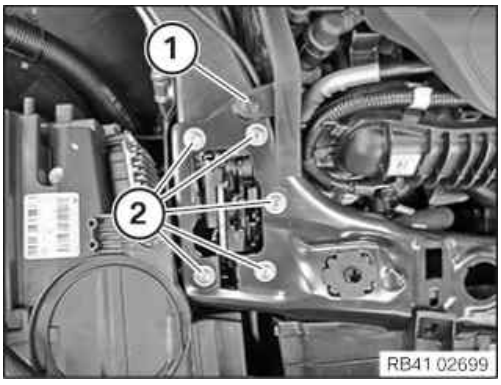


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



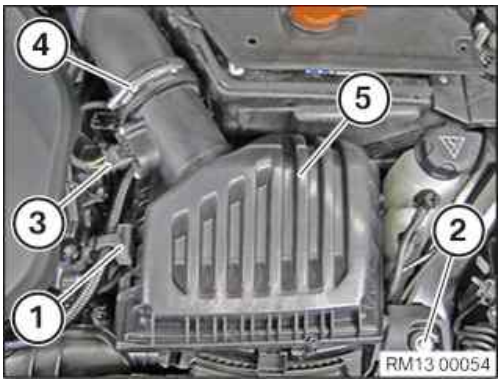
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

28 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

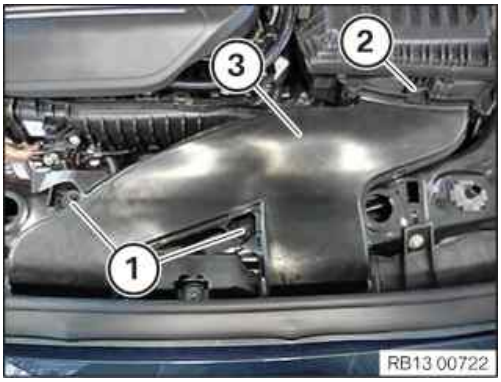
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

29 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

30 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

31 – Disconnecting all battery earth leads

- See additional information.

32 – Removing the oil filler cap

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- Open oil filler cap (1).

33 – Topping up the engine oil

RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

- Pour in engine oil.

Engine oilB37C15U1

Capacity of engine oil	4,8 l

Engine oil: Technically suitable engine oils for BMW Group engines

34 – Installing the oil filler cap

- Close oil filler cap (1).

35 – Check engine oil level

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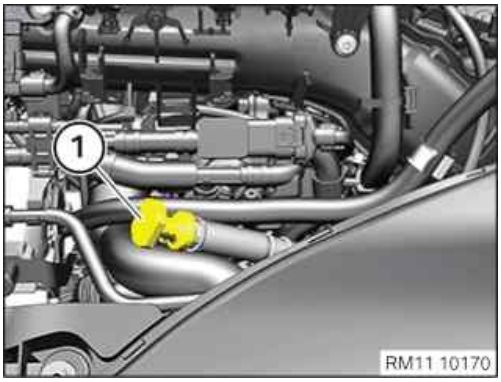
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

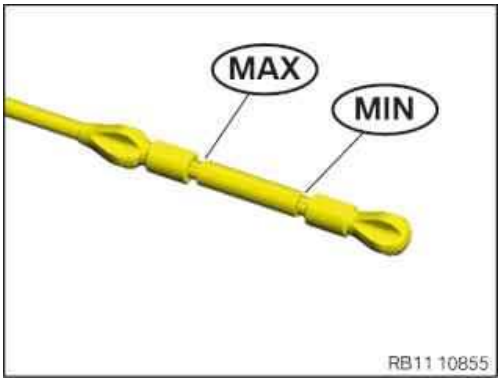


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump — Used in step 10

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

Oil level sensor to oil sump — Used in step 17

M6		Jointing torque	2 Nm
		Tightening torque	8 Nm

Oil sump to crankcase — Used in step 18

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

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Transmission to oil sump — Used in step 18

M8		Tightening torque	19 Nm

Starter motor to transmission — Used in step 18

M8x45		Tightening torque	19 Nm

Bracket to oil sump — Used in step 19

M6		Tightening torque	8 Nm

Battery positive lead to starter — Used in step 19

M8		Tightening torque	13,5 Nm

Holder to front axle support — Used in step 20

M12		Tightening torque	100 Nm

Bracket to oil sump — Used in step 20

M12		Tightening torque	100 Nm

Charge air line to crankcase — Used in step 21

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 21

M6		Tightening torque	8 Nm

Wheel arch cover — Used in step 22

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub — Used in step 23

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 23

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front — Used in step 24

			3 Nm

Guide tube for oil dipstick on engine — Used in step 25

M8x16		Tightening torque	19 Nm

Fan cowl on radiator — Used in step 26

M6X12		Tightening torque	6 Nm

Bracing strut to top cross connection — Used in step 27

M8		Tightening torque	25 Nm

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Air duct to deformation element/cross connection — Used in step 27

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 27

M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge — Used in step 28

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 28

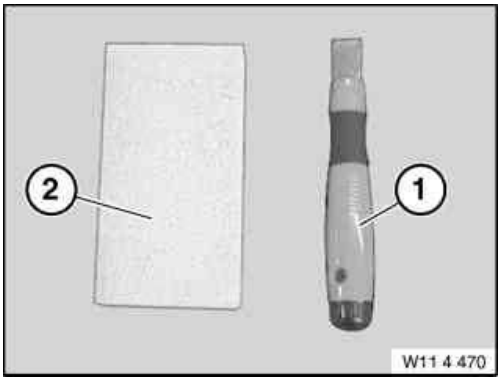
Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 29

M6		Tightening torque	8 Nm

Overview of Special Tools

0 495 102 (11 4 470) Tool



Common — Used in step 18

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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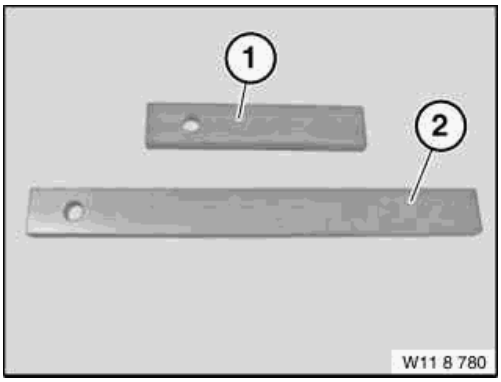
0 496 120 (11 8 780) Plate



Common Used in step 18

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 344 011 Tool

Common Used in step 23

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

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0 495 221 (36 1 323) Wheel stud

Common	Used in step 11
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 11
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 11
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 11
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud

Common	Used in step 11
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 11
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 11
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 11
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB37C15U1

Used in step 33

Capacity of engine oil	4,8 l

Engine oil: Technically suitable engine oils for BMW Group engines

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Links

Functional descriptions	Used in step
Oil supply	25

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	18

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 31
61 20 900 Disconnecting and connecting battery earth lead	1 31
61 20 900 Disconnecting and connecting battery earth lead	1 31
61 20 900 Disconnecting and connecting battery earth lead	1 31
61 20 900 Disconnecting and connecting battery earth lead	1 31
61 20 900 Disconnecting and connecting battery earth lead	1 31
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 31
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 31
61 20 900 Disconnecting and connecting battery earth lead	1 31
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 31
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 31
61 20 900 Disconnecting and connecting battery earth lead	1 31
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Operating materials	Used in step
2.0 Grease for wheel centring	23
3.0 Technically appropriate engine oils for BMW Group engines	33

Parts

Parts required

Designation	Used in step
Seal, guide tube for oil dipstick on oil sump	25

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11 13 000 Removing and installing, sealing or replacing oil sump (B37C)

Special tools required:

- 11 4 472
- 11 4 471
- 2 469 803
- 11 8 780

Necessary preliminary work:

- Remove underbody protection
- Remove guide tube for oil dipstick
- Drain off engine oil
- Remove starter motor
- Removing the holder

Caution!

Engines with surface sealant:

Application time of sealing bead **max.** 12 minutes.

Removal:

Release screws (1) from pressure pipe.

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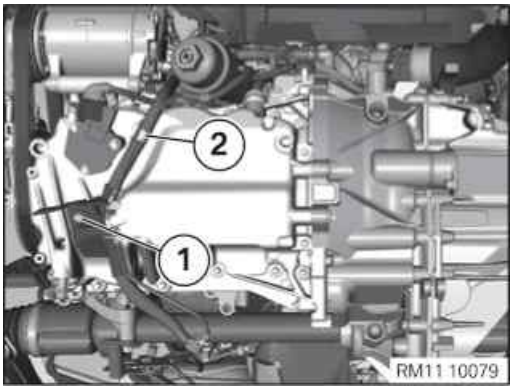
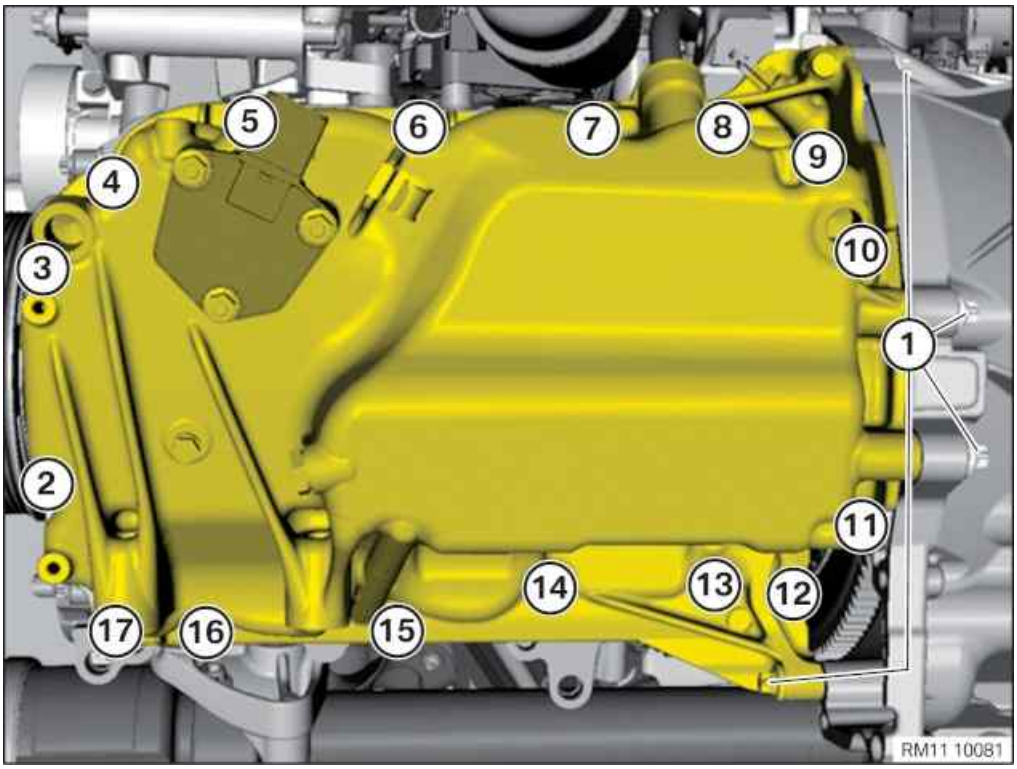
Unlock connector (1) and remove.



Release screw (1).
Release positive cable from clip (2).
Place wiring harness to one side.



Release screws (1) from transmission.
Release screws (2-17).

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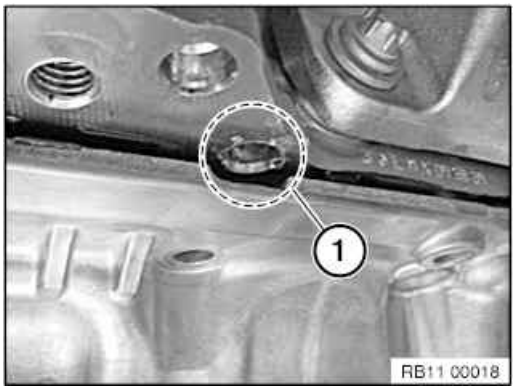
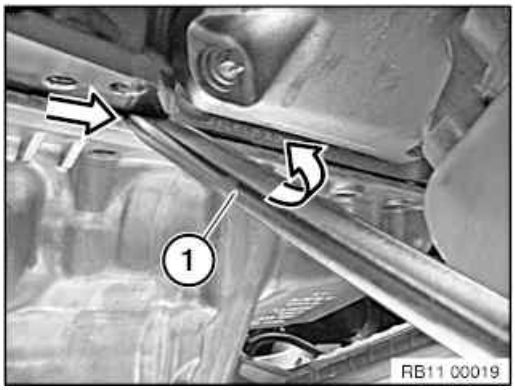


Engine with liquid sealing compound: Caution!

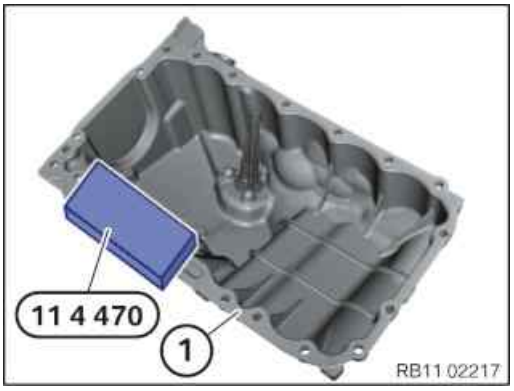
The oil sump can only be loosened in the areas (1) where an aperture is present in the oil sump.



Use a mounting lever (1) to release oil sump in direction of arrow at the correct location.

Preparation for installation:

Clean sealing residues from oil sump and crankcase.



Caution!

Do not use any metal-cutting tools (e.g. emery cloth).

Clean sealing surface (1) with special tool 11 4 472 and 11 4 472 of sealing residue.*Installation note:*
Clean sealing surface (1) with brake cleaner 3.3.

Sealing surface (1) must be free of oil, grease and cleaning agents.

Caution!

Do not use any metal-cutting tools (e.g. emery cloth).

Clean sealing surface (1) with special tool 11 4 471 and 11 4 472 of sealing residue.*Installation note:*
Clean sealing surface (1) with brake cleaner 3.3.

Sealing surface (1) must be free of oil, grease and cleaning agents.

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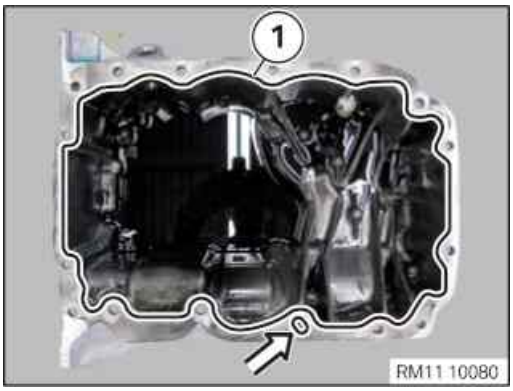
Keep special tool 2 469 803 ready.

Position sealing compound (1) on special tool 2 469 803 as shown.

Parts: Sealing compound 2.2



Applying sealing compound without replacing front bottom gear case cover:

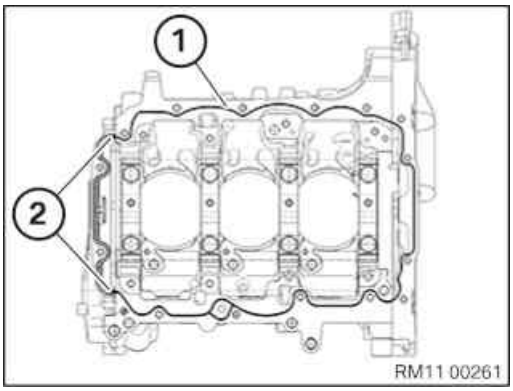
Apply sealing compound 2.2 in this area (1).

Make sure that the sealing bead runs along the inner edge.

The complete circumference of the oil return orifice (arrow) must be covered.

Installation note:
The oil sump must be installed approximately 10 minutes after application of the sealing compound.

Sealant height approximately 2 to 2.5 mm.



Applying sealing compound after replacing front bottom gear case cover:

Apply sealing compound 2.2 in this area (1).

Make sure that the sealing bead runs along the inner edge.

The complete circumference of the oil return orifice (arrow) must be covered.

Sealing bead (1) must overlap with the gasket of the gear case cover approx. 5 mm (2).

Installation note:
The oil sump must be installed approximately 10 minutes after application of the sealing compound.

Sealant height approximately 2 to 2.5 mm.

Installation:

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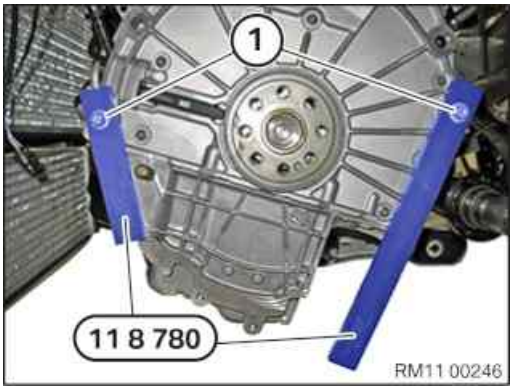


Installation note:
Special tool 11 8 780 is only necessary if the engine or the transmission is removed.

Position special tool 11 8 780 with transmission bolts (1) so that engine oil sump is exactly flush with engine block.

If necessary, renew fitting sleeves.

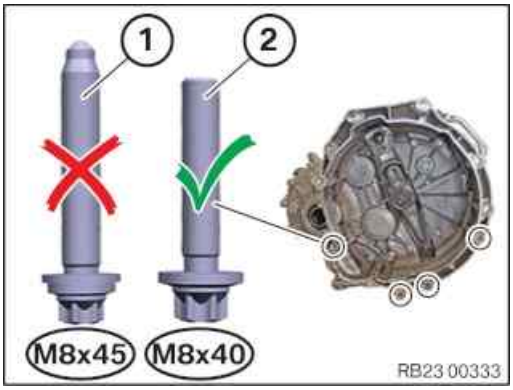
Caution!

Installing screws with an incorrect screw length may cause damage to the component.

Observe exact screw lengths.

Reinstall screws corresponding to the original screw length.

The oil sump may be damaged when using the incorrect screw length!



Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.

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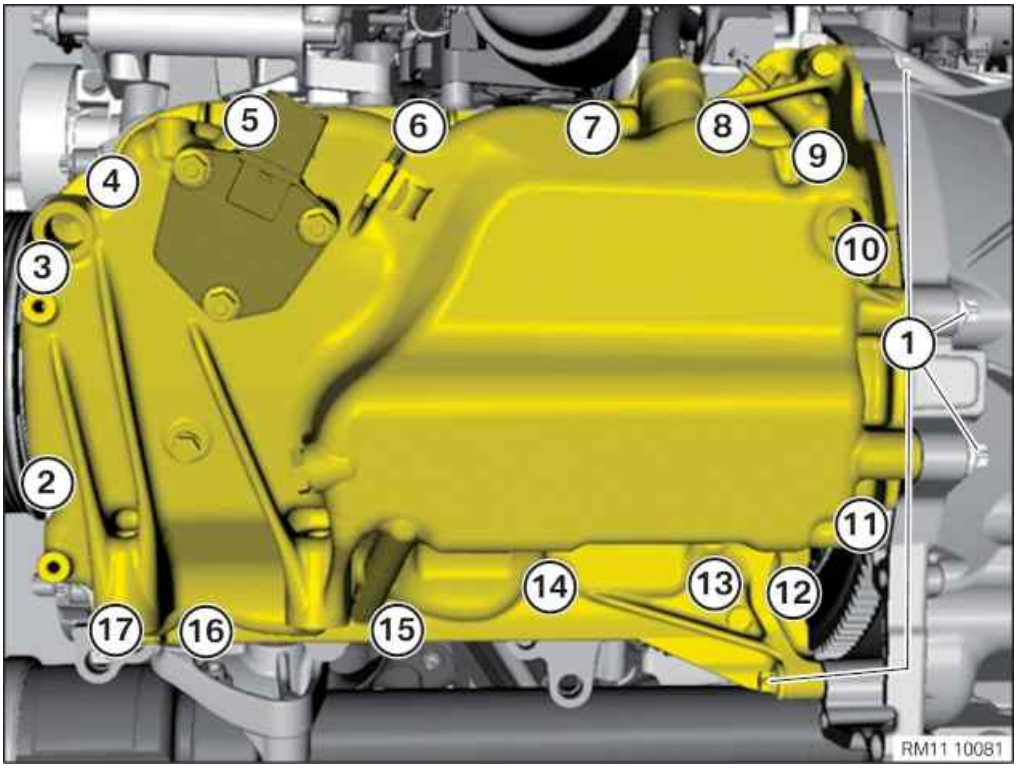


Installation note:
Tighten all screws (2-17) on oil sump with 5 Nm.

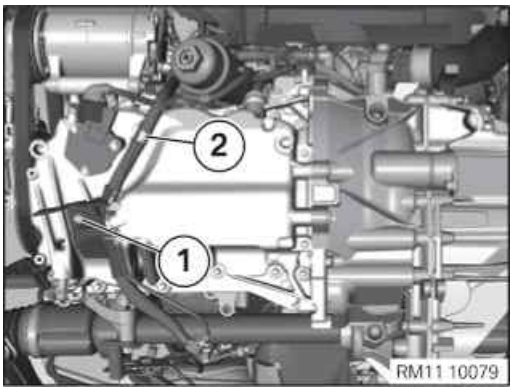
Join Torx screws (1) to 5 Nm.

Tighten down all screws on oil sump.

Tightening torque: 11 13 2AZ.

Tighten down Torx screws (1).

Tightening torque: 11 13 3AZ.



Tighten screw (1).

Tightening torque 12 52 4AZ.

Clip positive battery positive cable in clip (2).

Attach and lock connector (1).

Make sure the connector (1) engages audibly.

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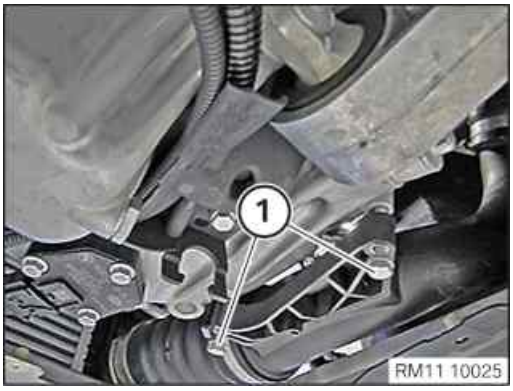

Tighten screws (1) of pressure pipe.

Required follow-up work:

- Install holder
- Install starter motor
- Install guide tube for oil dipstick
- Top up engine oil
- Install underbody protection

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This documentation refers to special tools that were not yet available when going to press.

11 14 200 Detaching and attaching/replacing timing case cover on front at bottom

TECHNICAL INFORMATION

When removing the timing case cover, this must be renewed.
It is not permitted to reuse a removed timing case cover.

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

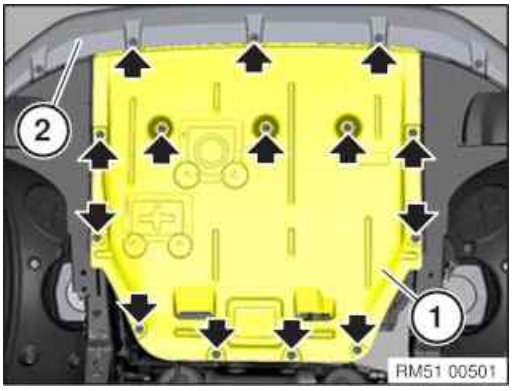
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

3 – Remove front right wheel

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TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

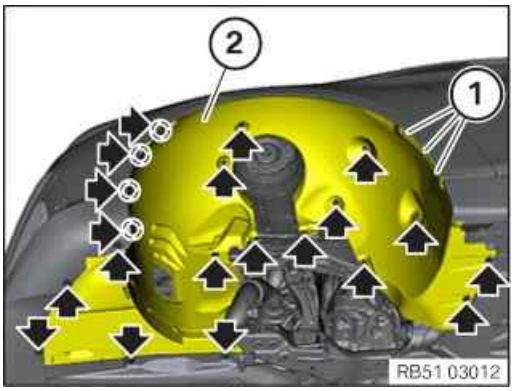
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

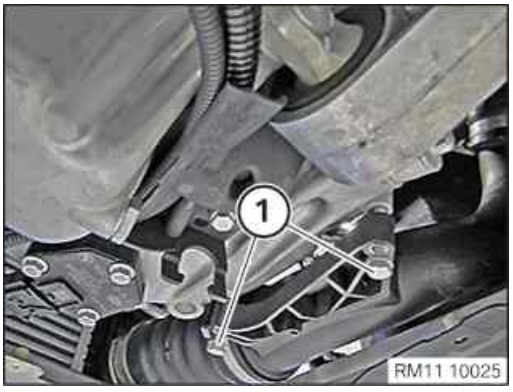
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

4 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

5 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.

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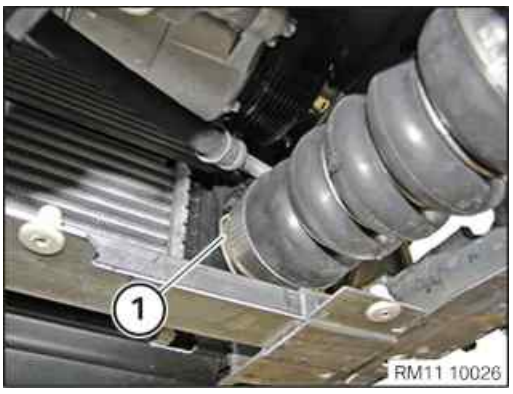
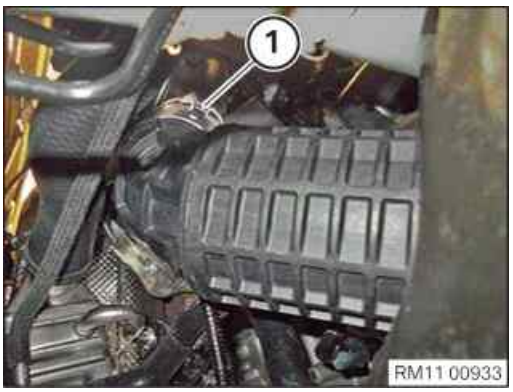
- Detach charge air duct screw connection (1) on crankcase.

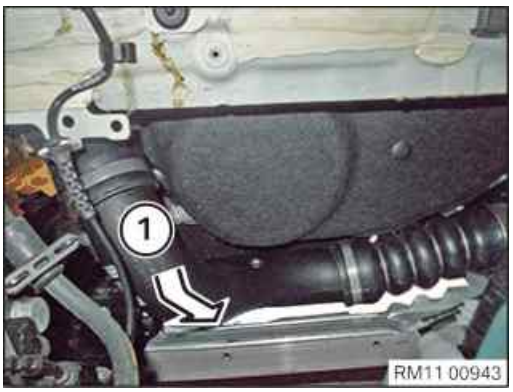
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

6 – Removing the acoustic cover for the engine at the front

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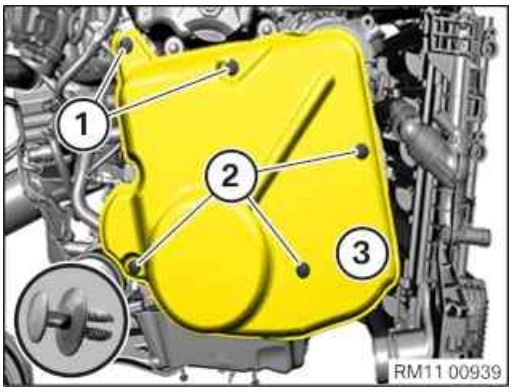

- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

7 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .

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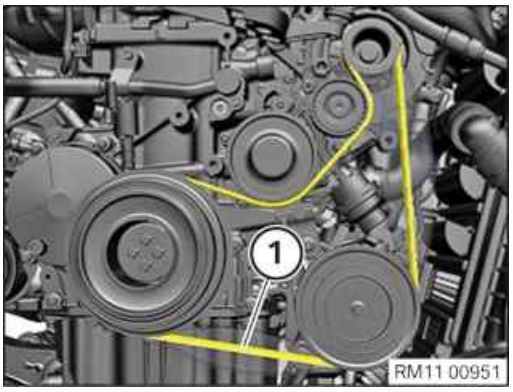
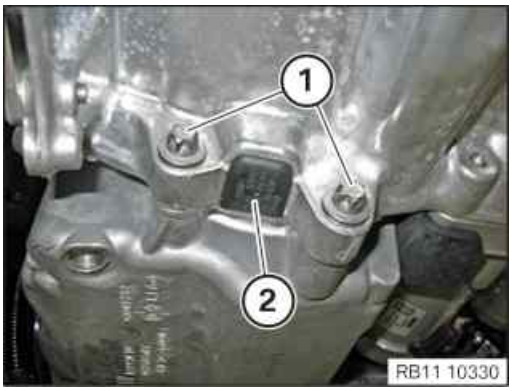
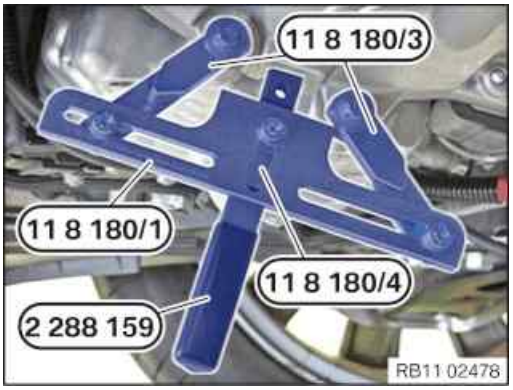


- Guide out the drive belt for the alternator (1) and remove it.

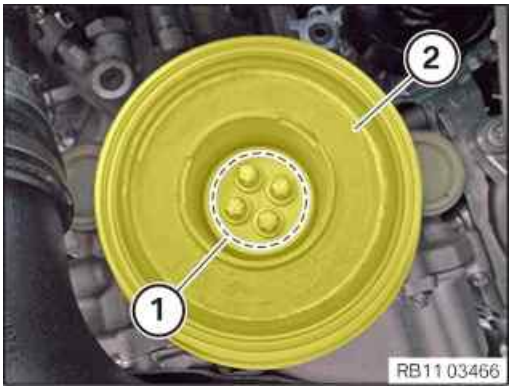
8 – Removing the vibration damper



- Release the transmission bolts (1).
- Remove the protective cap (2).



- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.



- Loosen screws in the area (1).
- Remove the vibration damper (2).

MAIN WORK

9 – Remove gear case cover

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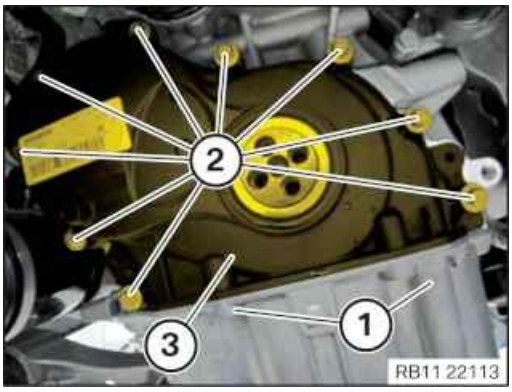


- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove timing case cover (3).

10 – Preparation for installation of the timing case cover

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

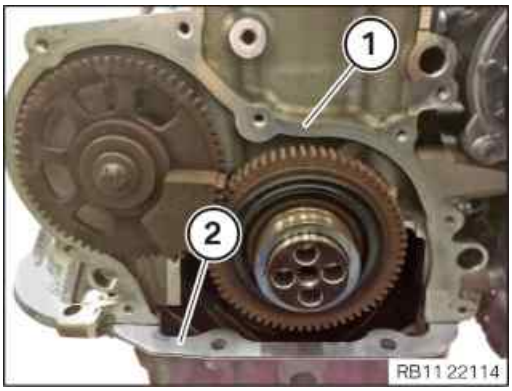
- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

When removing the timing case cover, this must be renewed.
It is not permitted to reuse a removed timing case cover.

- Renew timing case cover (1).

  Parts: Gear case cover



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surfaces (1) and (2)with the special tool **0 495 103 (11 4 471)** and the special tool **0 495 104 (11 4 472)**.
- Clean sealing surfaces (1) and (2) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

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- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

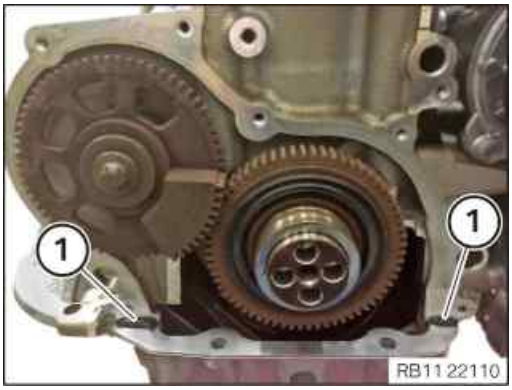
11 – Installing the timing case cover

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply sealing compound (1) approx. **5 mm** as shown.

  The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.

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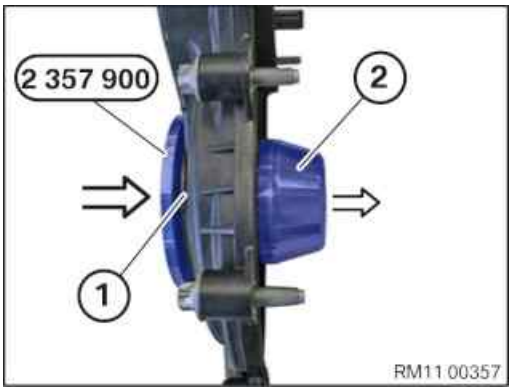
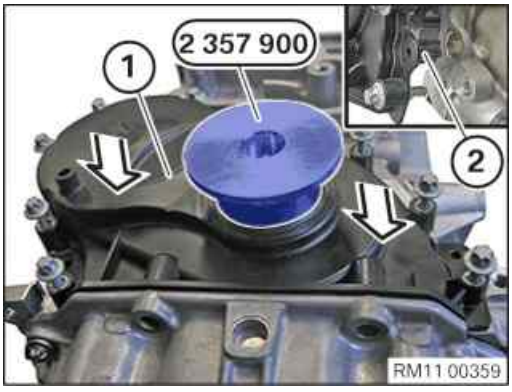
- Assemble special tool **2 357 900** as shown.
- Please note that no greases or lubricants may be used on the special tool **2 357 900**.



- Carefully slide the special tool **2 357 900** in the direction of the arrow through the sealing ring into the timing case cover (1).
- Make sure that the special tool **2 357 900** rests flat against the timing case cover (1).
- Remove the fitting aid (2).

- Connect special tool **2 357 900** to the timing case cover (1) on the hub of the crankshaft (2).



- Feed in and install timing case cover (1) in the direction of the arrow.
- Ensure the guide pins (2) are fitted correctly.
- Tighten screws hand-tight.
- Remove special tool **2 357 900**.

- Make sure that the air guide (1) faces out.

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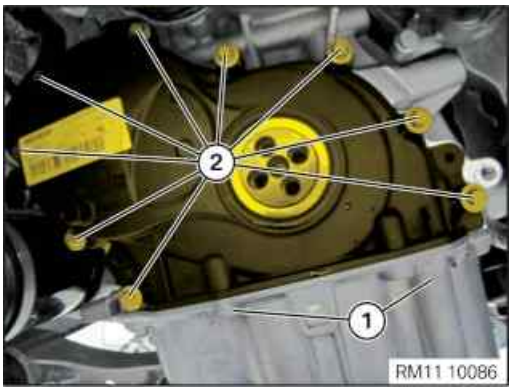


- Hand-tighten the bolts (1).
- Tighten the screws (2) in a crosswise sequence with a tightening torque.

Timing case cover, front, to crankcase

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

- Tighten the screws (1).

Oil sump to crankcase

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

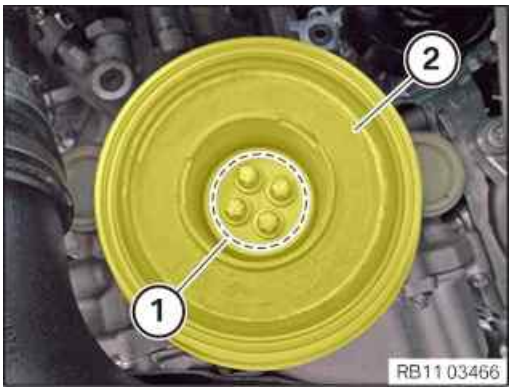
- Tighten the screws (2) in a crosswise sequence with an angle of rotation.

Timing case cover, front, to crankcase

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

POSTPROCESSES

12 – Installing the vibration damper

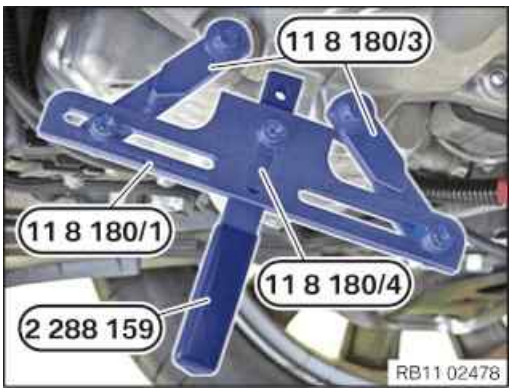


- Position vibration damper (2).
- Renew screws (1).

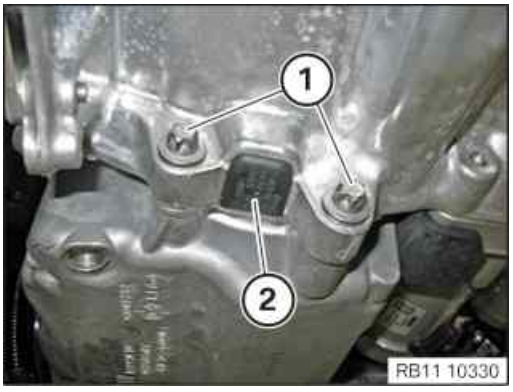
  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

Vibration damper with belt pulley to crankshaft

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.



- Tighten transmission screws (1).

Transmission to oil sump

M8			19 Nm

- Install protective cap (2).

13 – Installing the drive belt for alternator

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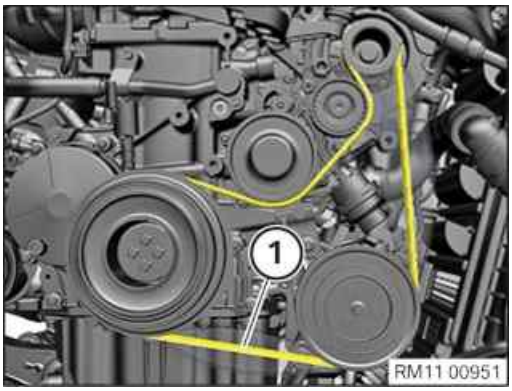
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

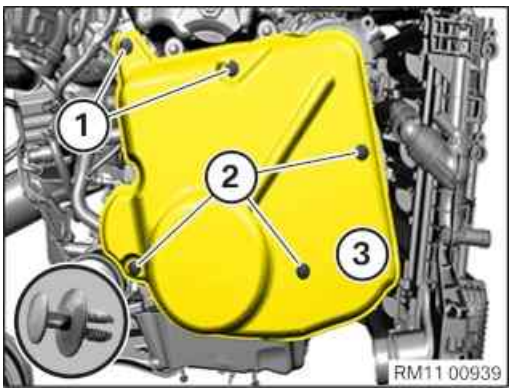
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

14 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

15 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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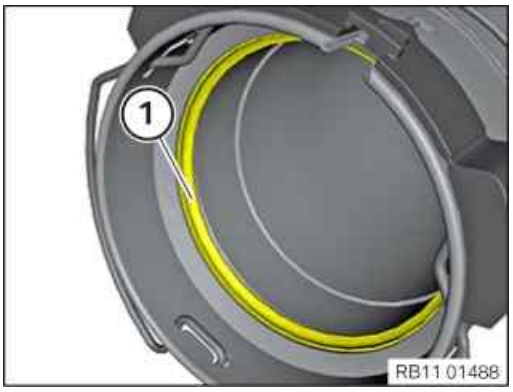
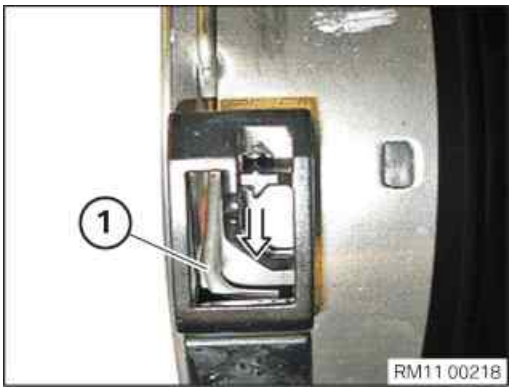
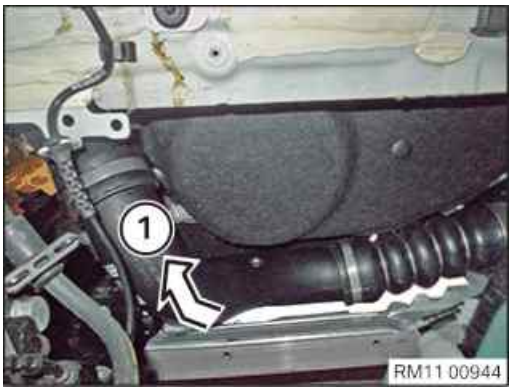


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

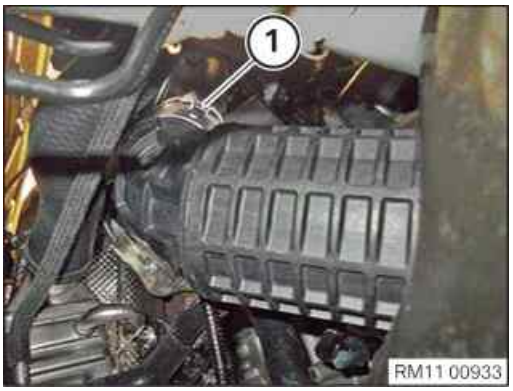
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

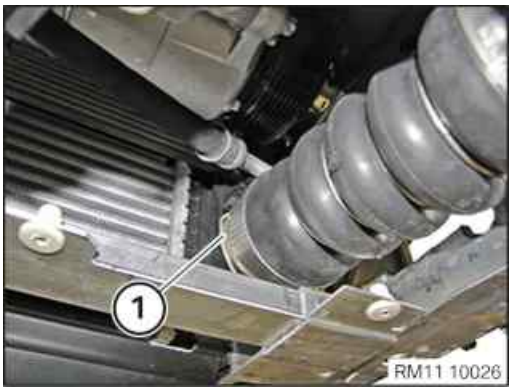


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

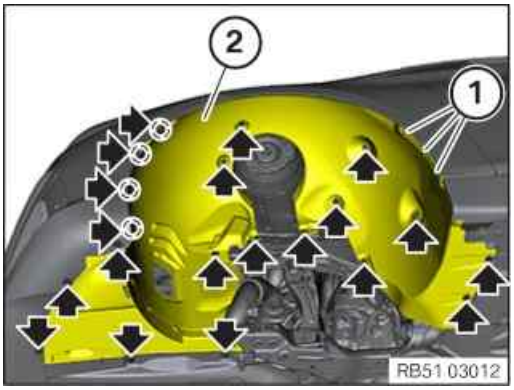
M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

16 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

17 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

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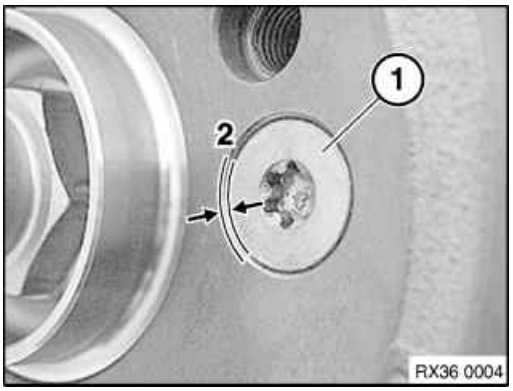
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

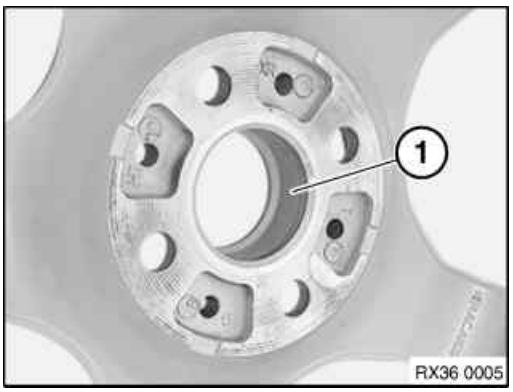


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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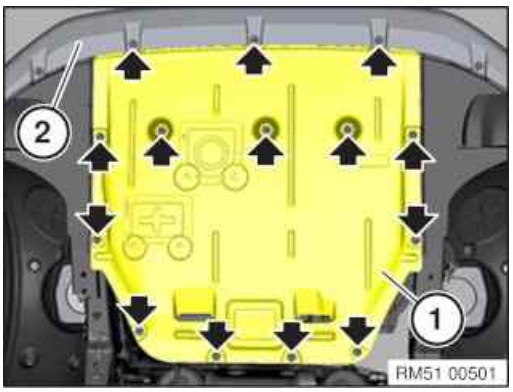
18 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

19 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Timing case cover, front, to crankcase — Used in step 11

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

Oil sump to crankcase — Used in step 11

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Vibration damper with belt pulley to crankshaft — Used in step 12

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °

Transmission to oil sump — Used in step 12

M8			19 Nm

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Charge air line to crankcase — Used in step 15

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 15

M6		Tightening torque	8 Nm

Wheel arch cover — Used in step 16

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub — Used in step 17

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 17

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front — Used in step 18

			3 Nm

Overview of Special Tools

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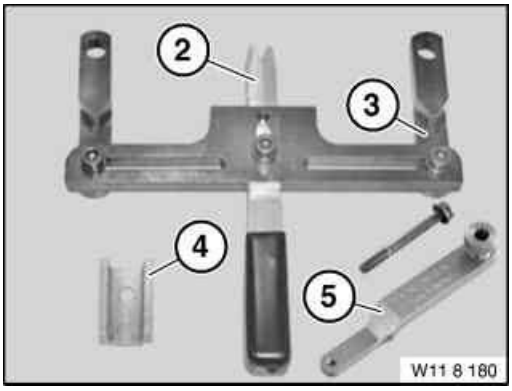
0 493 587 (11 8 180) Holder



Common

Used in step 8 12

Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

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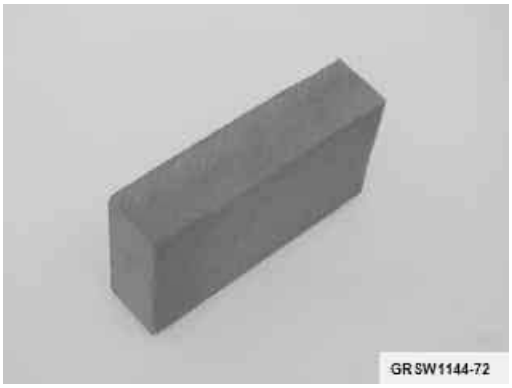
0 495 103 (11 4 471) Scraper

Common	Used in step 10
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 10
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

2 357 900 Fitting aid

Common	Used in step 11
Usage	For installation of the front radial shaft seal incl. lid.
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

2 344 011 Tool

Common	Used in step 17
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

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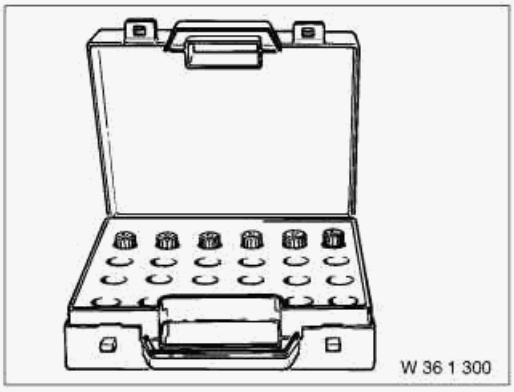
0 495 221 (36 1 323) Wheel stud



Common	Used in step 3
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 3
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 3
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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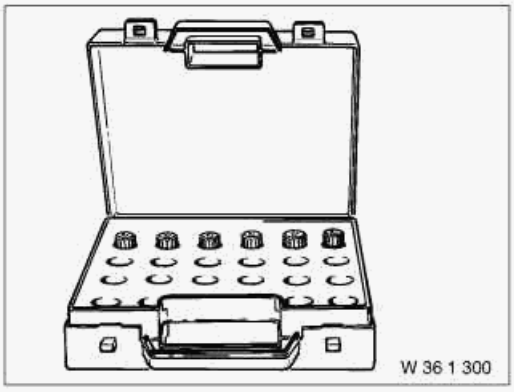
0 495 226 (36 1 328) Wheel stud



Common	Used in step 3
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 3
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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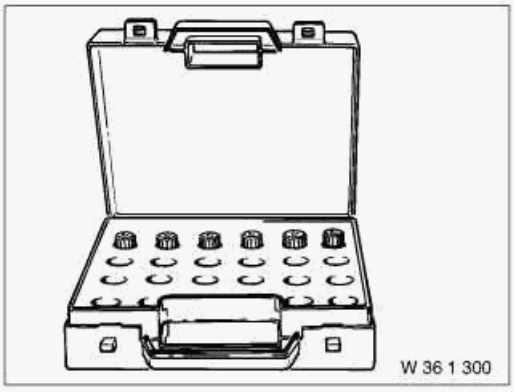
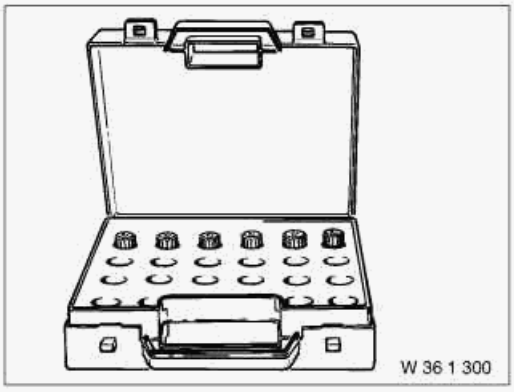
0 495 228 (36 1 331) Wheel stud



Common	Used in step 3
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 3
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 3
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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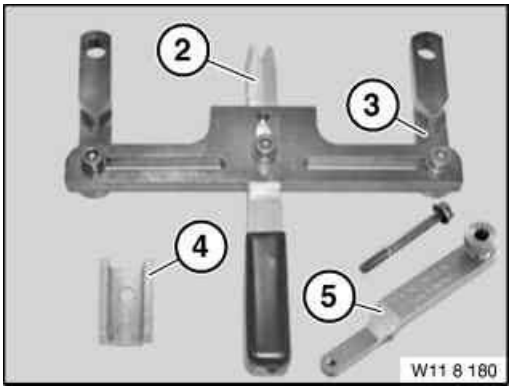
0 494 434 (11 8 183) Basic body



Common	Used in step 8 12
Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	10 11

Operating materials	Used in step
2.0 Grease for wheel centring	17

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11 14 200 Detaching and attaching/replacing timing case cover on front at bottom (B37C)

Special tools required:

- 11 4 471
- 11 4 472
- 2 469 803
- 2 357 900

Caution!

When removing the timing case cover, renewing the timing case cover is **essential**.

Reuse of the timing case cover is **not** permitted.

Caution!

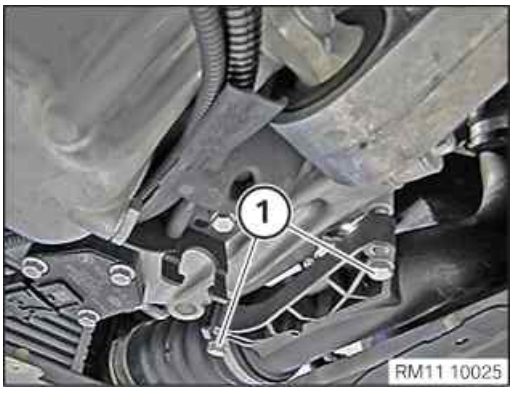
Engines with surface sealant:

Application time of sealing compound maximum 12 min.

Necessary preliminary work:

- Remove underbody protection
- Remove vibration damper.
- Remove belt tensioner for alternator.

Removal:



Loosen screws (1).

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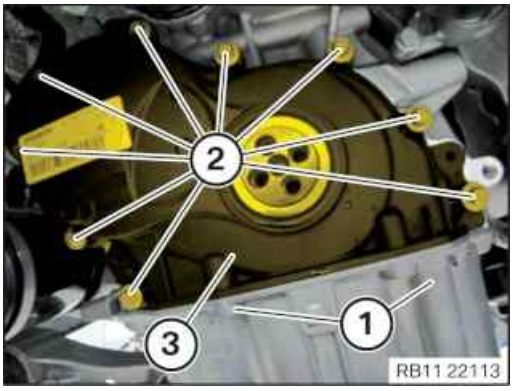


Release screws (1).

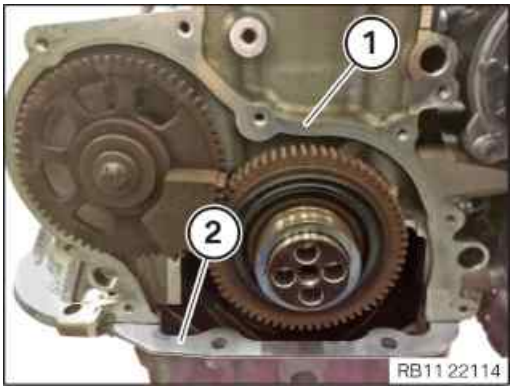
Unfasten screws (2).

Remove gear case cover (3).

Preparation for installation:

Renew timing case cover (1) **without fail**.

Parts: Gear case cover



Caution!

Do not use any metal-cutting tools (e.g. abrasive cloth) for cleaning the sealing surfaces.

Clean sealing surfaces (1) and (2) with special tool 11 4 471 and 11 4 472 of sealing residue.*Installation note:*
Clean sealing surfaces (1) and (2) with brake cleaner 3.3.

Sealing surfaces (1) and (2) **must be free** of oil, grease and cleaning agents.

Keep special tool 2 469 803 ready.

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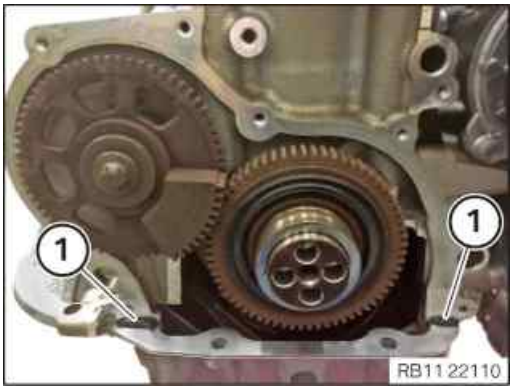
Position sealing compound (1) on special tool 2 469 803 as shown.

Parts: Sealing compound 2.2

Installation:



Caution!

Application time of sealing compound **maximum** 12 min.

Sealing compound height approximately 2 - 2.5 mm.

Apply sealing bead (1) approx. 5 mm as shown.

Assemble special tool 2 357 900 as shown.

Caution!

Do not use engine oil or lubricant.

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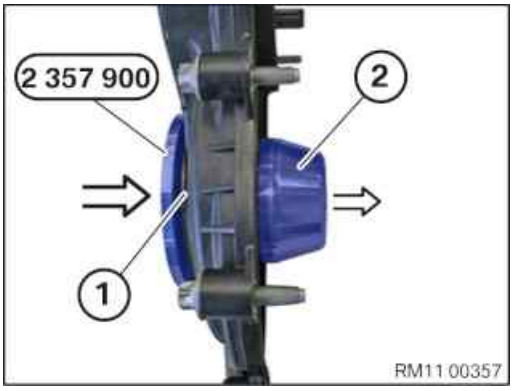
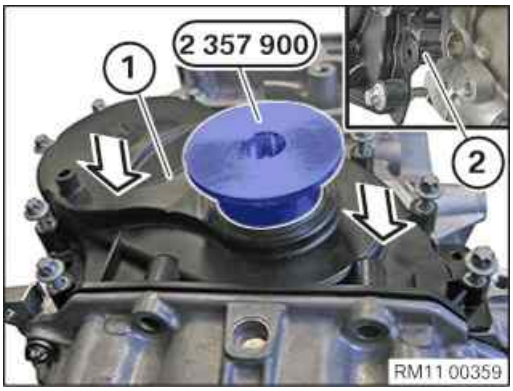


Caution!
Special tool must be resting on timing case cover (1).

Carefully push special tool 2 357 900 through sealing ring into timing case cover and abut.

Remove fitting aid (2).

Fit special tool 2 357 900 with timing case cover (1) on crankshaft hub (2).



Note:
Pay attention to both guide pins (2).

Mount timing case cover (1) on crankcase in direction of arrow.

Abut screws.

Note:
Dust lip (1) must be facing outwards.

Remove special tool 2 357 900 .

Check installation position of dust lip (1).

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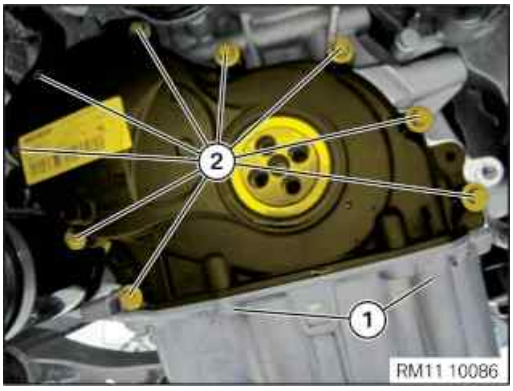
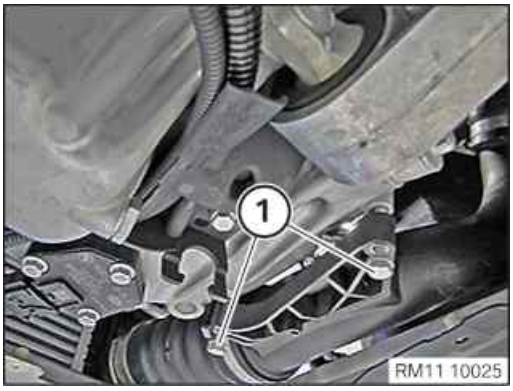


Abut screws (2) crosswise.
Abut screws (1).
Tighten the screws (2) crosswise.
Tightening torque 11 14 3AZ.
Tighten screws (1).
Tightening torque: 11 13 2AZ.



Tighten down screws (1).
Tightening torque: 11 00 2AZ.

Required follow-up work:

- Install belt tensioner for alternator.
- Install vibration damper.
- Install underbody protection.

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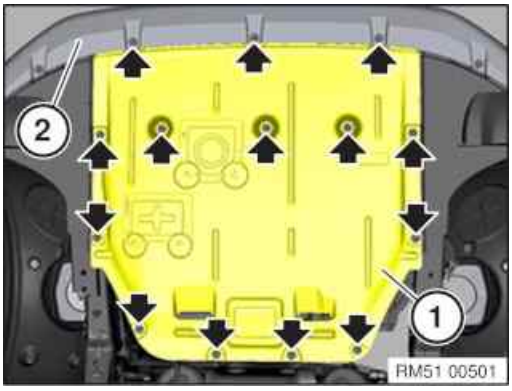
11 14 295 Remove and install / replace the acoustic cover for the oil sump

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

- See additional information.

2 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

3 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

4 – Removing the front right wheel arch cover

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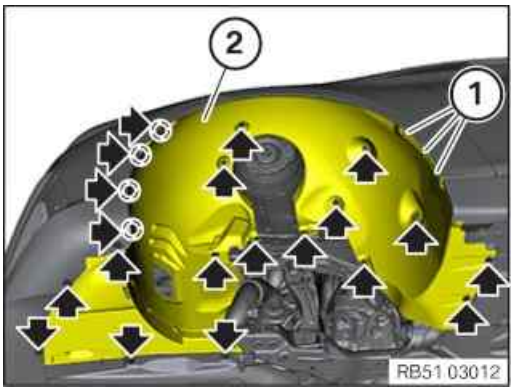
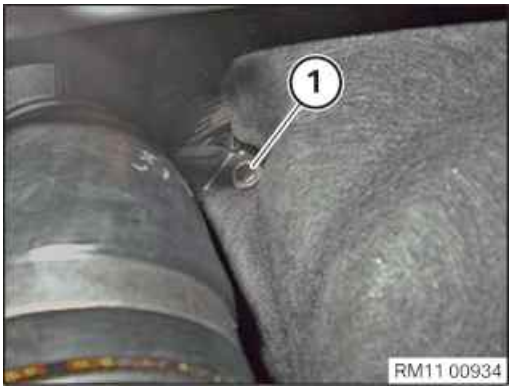


- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

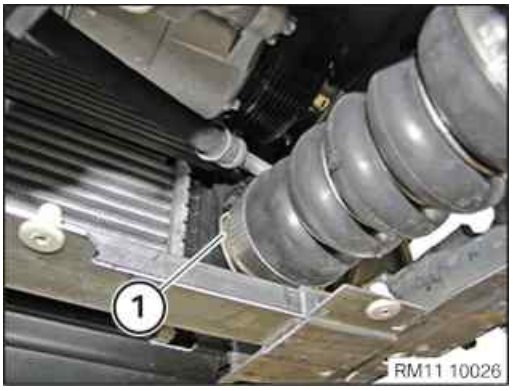
5 – Remove right charge-air line

- Release charge air duct screws (1) on oil sump.



- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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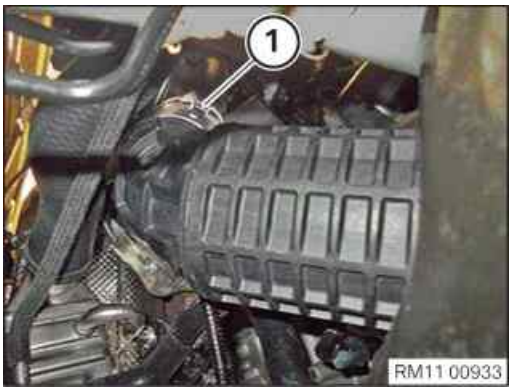
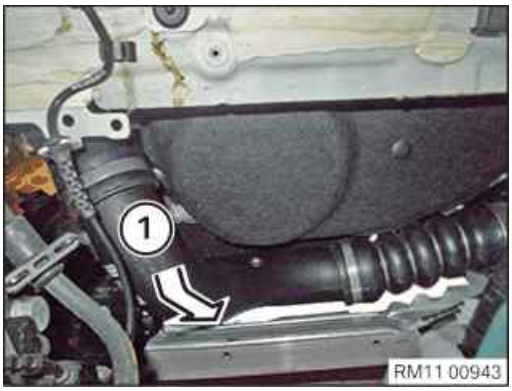


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

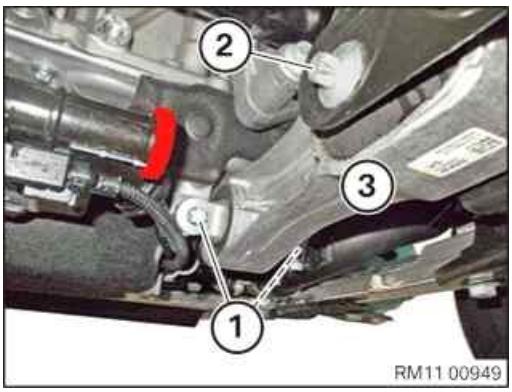
6 – Remove bracket with rubber mount

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.



- Support the engine with the jack at a suitable point.
- Loosen screws (1) and (2).
- Guide out and remove holder (3).

MAIN WORK

7 – Removing the acoustic cover of the oil sump

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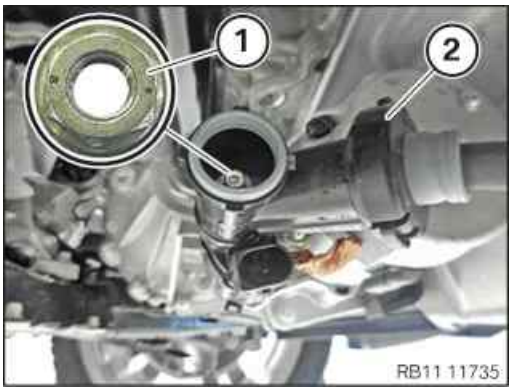
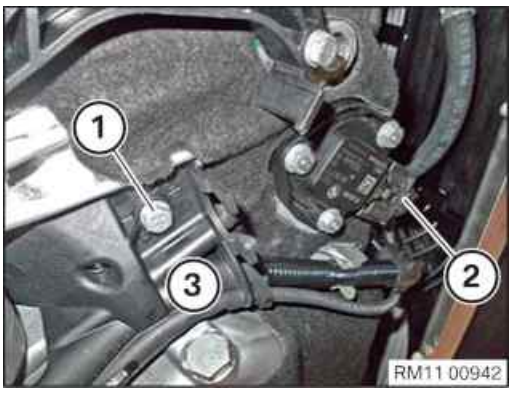
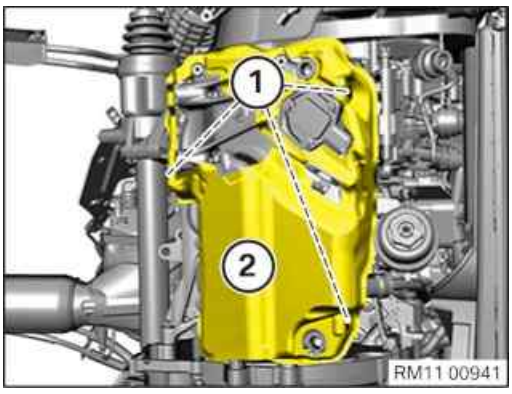
- Unlock connector (1) and pull off.
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

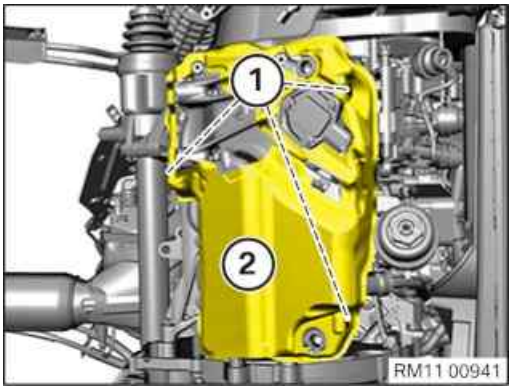


- Unscrew the screw (1) on the wiring harness to the oil sump.
- Unlock and pull off connector (2) on the oil-level sensor.
- Place wiring harness (3) to one side.



- Remove the expanding rivets (1) on both sides of the acoustic cover.
- Feed out and remove the acoustic cover (2).

8 – Installing the acoustic cover for the oil sump



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

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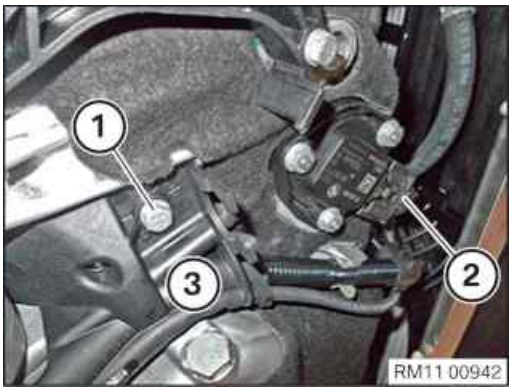


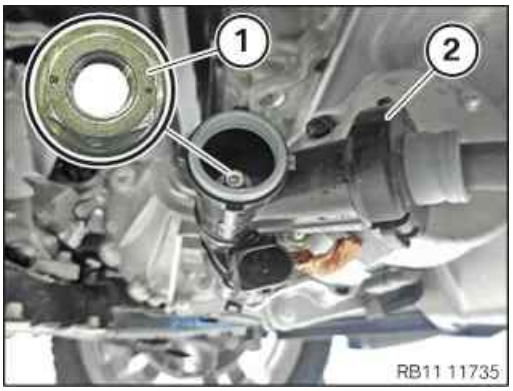
- Position wiring harness (3).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

- Connect and lock the connector (2) on the oil-level sensor.

  The connector must lock audibly.



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

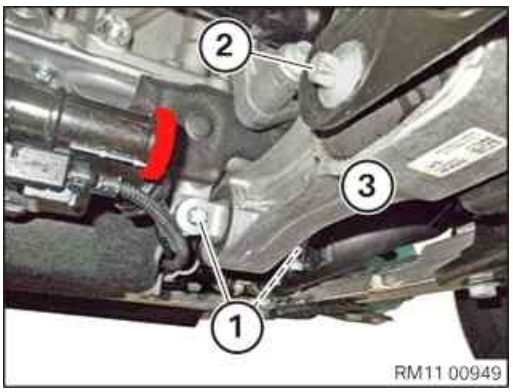
M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).

  The connector must engage audibly.

POSTPROCESSES

9 – Install the holder with the rubber mount



- Insert and install the holder (3).
- Tighten the screws (1) and (2) hand-tight.
- Release jack.
- Tighten down screw (2).

Holder to front axle support

M12		Tightening torque	100 Nm

- Tighten the screws (1).

Bracket to oil sump

M12		Tightening torque	100 Nm

10 – Install right charge air duct

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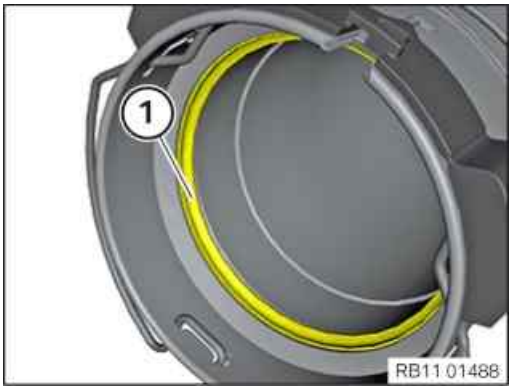
RISK OF DAMAGE

Damage to the exhaust turbocharger.

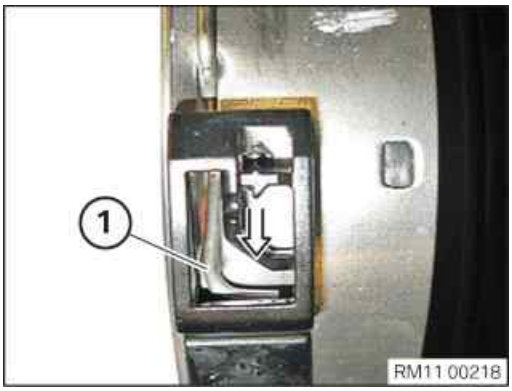
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

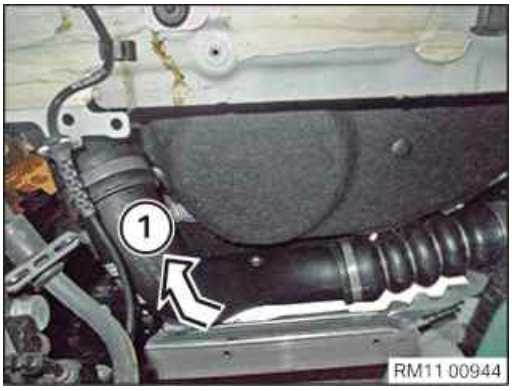


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

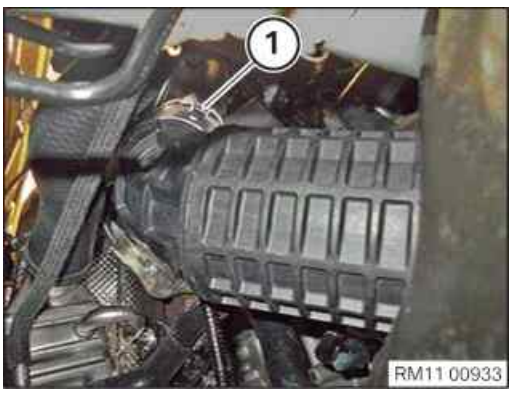
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.

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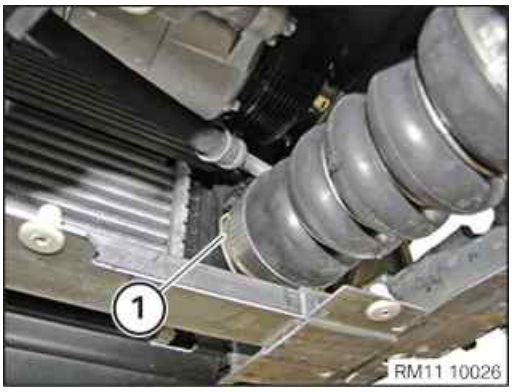


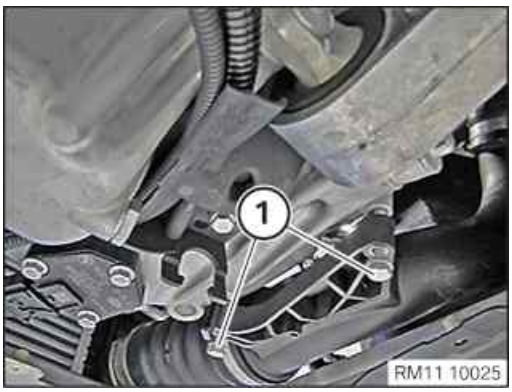
- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

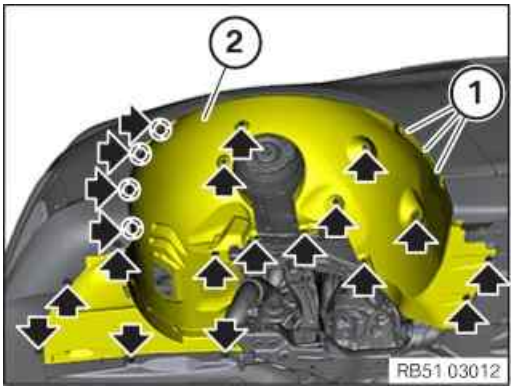


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

11 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

12 – Installing the front right wheel

▶ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

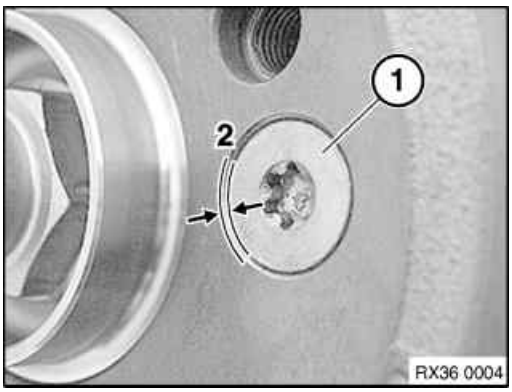
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

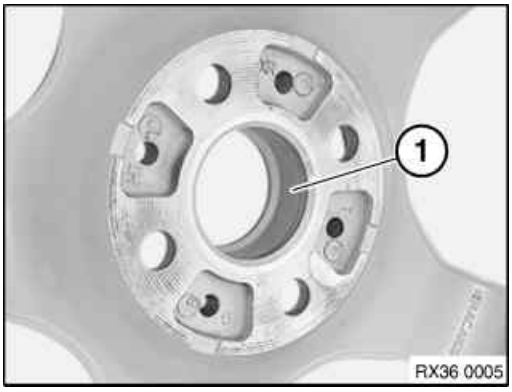


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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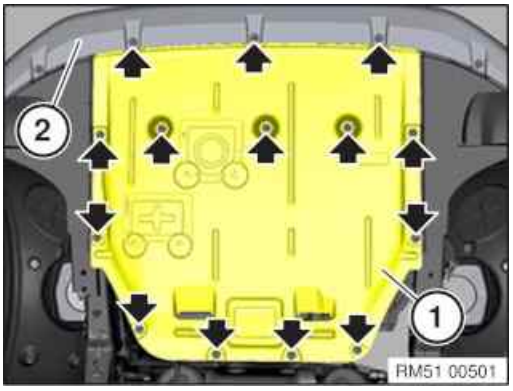
13 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

14 – Disconnecting all battery earth leads

- See additional information.

Additional Information

Overview of Tightening Torques

Bracket to oil sump			Used in step 8
M6		Tightening torque	8 Nm

Battery positive lead to starter			Used in step 8
M8		Tightening torque	13,5 Nm

Holder to front axle support			Used in step 9
M12		Tightening torque	100 Nm

Bracket to oil sump			Used in step 9
M12		Tightening torque	100 Nm

Charge air line to crankcase			Used in step 10
M6x25		Tightening torque	5 Nm

Charge air duct to oil sump			Used in step 10
M6		Tightening torque	8 Nm

Wheel arch cover			Used in step 11
Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub			Used in step 12
M8	Renew screw.		16 Nm

Wheel bolts			Used in step 12
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front			Used in step 13
			3 Nm

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Overview of Special Tools

2 344 011 Tool

Common	Used in step 12
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

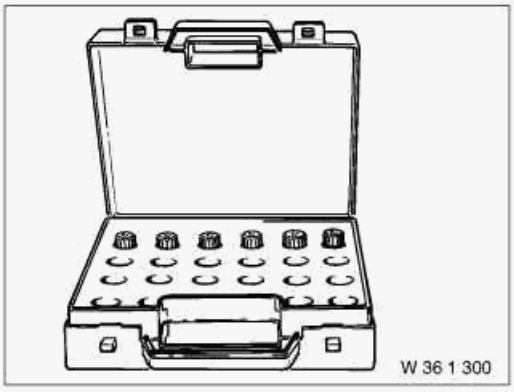
0 495 221 (36 1 323) Wheel stud

Common	Used in step 3
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 3
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud



Common	Used in step 3
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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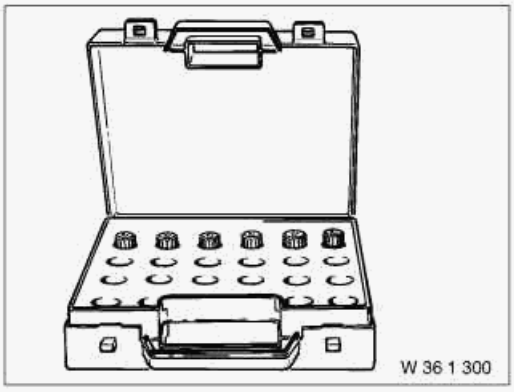
0 495 226 (36 1 328) Wheel stud



Common	Used in step 3
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 3
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 3
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 3
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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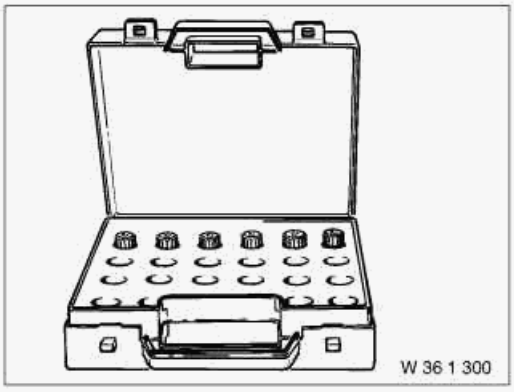
0 495 230 (36 1 333) Wheel stud



Common	Used in step 3
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 14
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 14
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
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61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14

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61 20 900 Disconnecting and connecting battery earth lead	1 14
61 20 900 Disconnecting and connecting battery earth lead	1 14

Operating materials	Used in step
2.0 Grease for wheel centring	12

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11 14 110 Removing and installing, sealing/replacing rear timing case cover (B37C)

Special tools required:

- 11 4 470
- 11 8 815
- 11 8 811
- 11 8 812
- 11 8 813
- 11 8 814
- 11 8 810

Important!

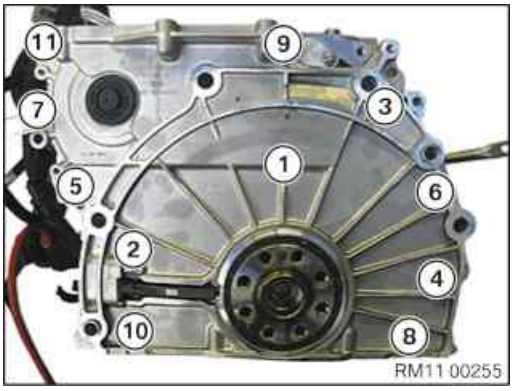
Engines with surface sealant:

Application time of sealing compound max. 12 minutes.

Necessary preliminary tasks:

- Remove engine with gearbox.
- Mount engine on assembly stand.
- Remove flywheel.
- Remove cylinder head.
- Removing oil sump.

REMOVAL:



Release screws in the sequence **11 to 1**.

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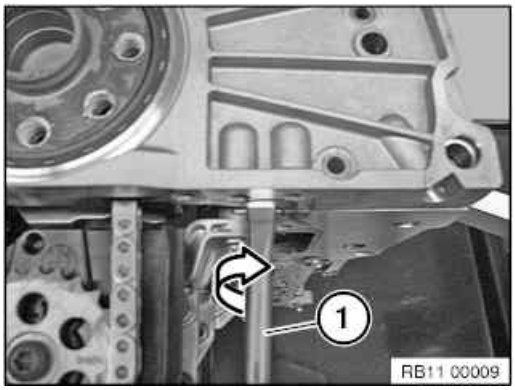
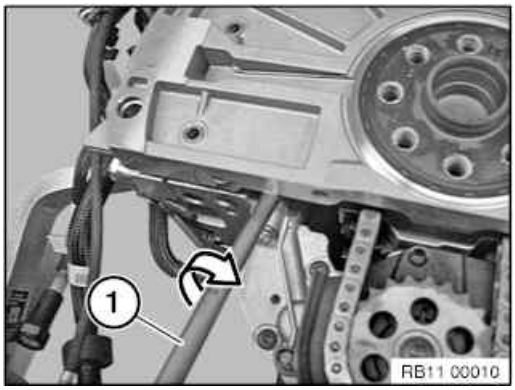
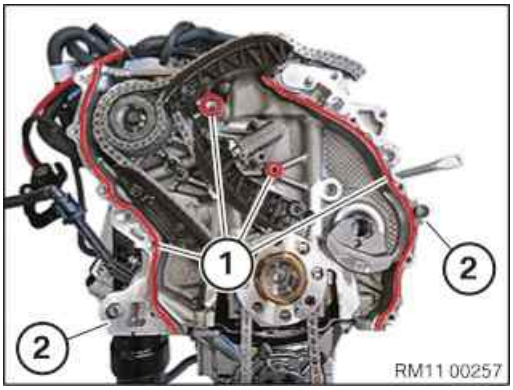


Loosen gear case cover with a screwdriver (1) in direction of arrow.



Loosen gear case cover with a screwdriver (1) in direction of arrow.

Remove gear case cover.



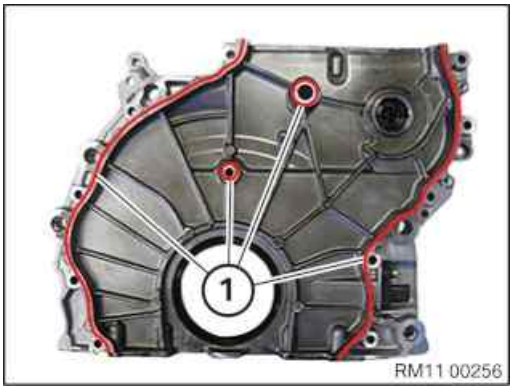
Important!

Do not use any metal-cutting tools (e.g. emery cloth).

Remove gasket remnants from the crankcase with special tool 11 4 470 .

Check that fitting sleeves (2) are correctly fitted, replace if necessary.

INSTALLATION:



When replacing the rear timing case cover:

Installation note:

Application time of sealing bead (1) max. 12 min.

Thickness of sealing bead: **1.5 to 2.0 mm**.

Apply sealing bead (1) at the positions indicated (see graphic) on the inside of the timing case cover.

Parts:

Sealing bead (1): sealant 2.2.

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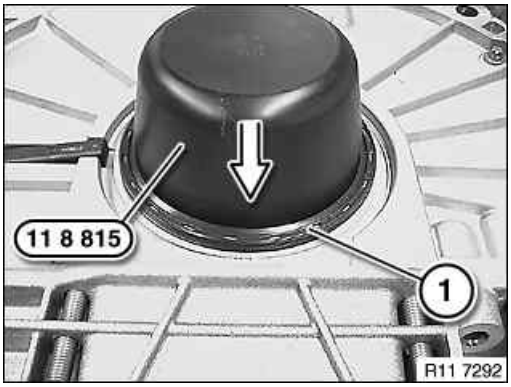
Important!

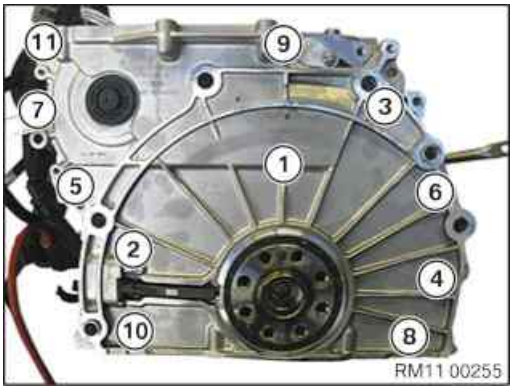
The radial shaft seal must be installed dry.

Do not use engine oil or lubricant.



Preassemble special tool 11 8 815 on crankshaft.

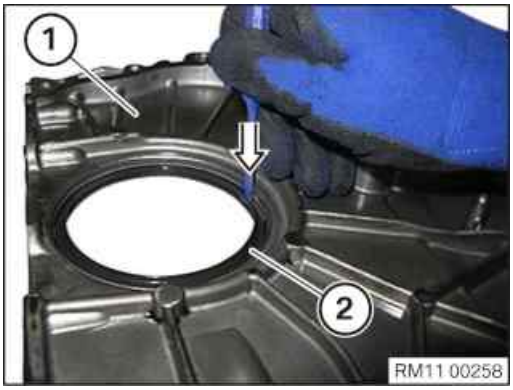
Mount the timing case cover with radial shaft seal (1).



Insert bolts.

Tighten bolts in the sequence **1 to 11**.

Tightening torque: 11 14 1AZ.

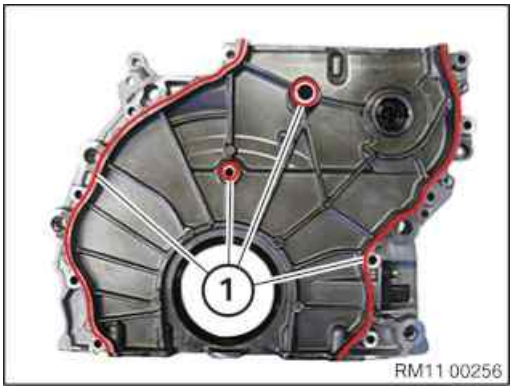


When reinstalling the timing case cover:

Support the timing case cover (1) from below.

Place punch inside in the radial shaft seal (2).

Drive radial shaft seal (2) outwards.



Installation note:
Application time of sealing bead (1) max. 12 minutes.

Thickness of sealing bead **1.5 to 2.0 mm**.

Important!
Do not use any metal-cutting tools (e.g. emery cloth).

Remove gasket remnants from the timing case cover using special tool 11 4 470 .

Apply sealing bead (1) at the positions indicated (see graphic) on the inside of the timing case cover.

Parts:

Sealing bead (1): sealant 2.2.

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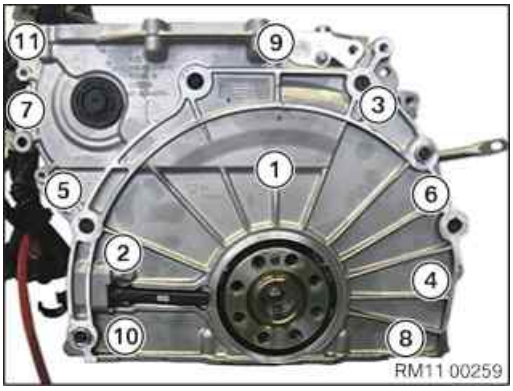
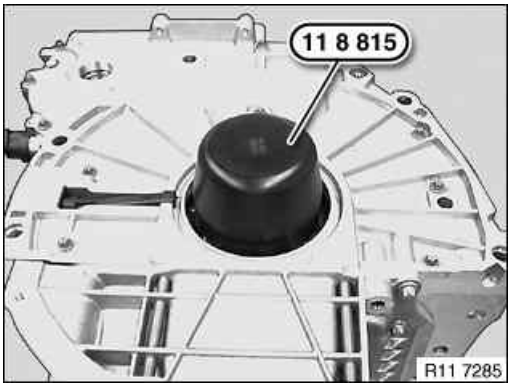


Mount timing case cover without radial shaft seal.

Insert bolts.

Tighten bolts in the sequence **1 to 11**.

Tightening torque: 11 14 1AZ.

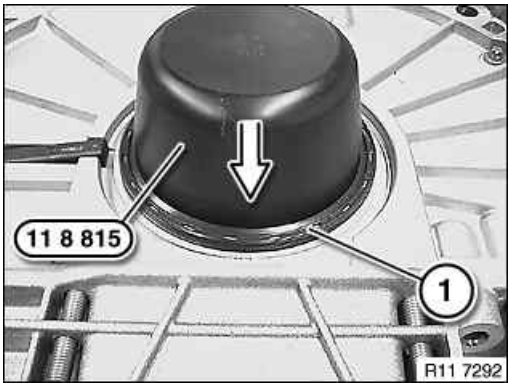


Position special tool 11 8 815 on crankshaft.*Note:*
Graphic shows: N47 D20.

Important!

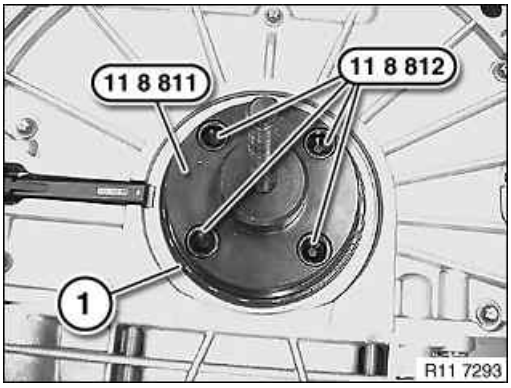
The radial shaft seal must be installed dry.

Do not use engine oil or lubricant.



Use special tool 11 8 815 to fit the radial shaft seal (1) in the direction of the arrow up to the timing case cover and position.

Remove special tool 11 8 815 .



Fasten special tool 11 8 811 with special tool 11 8 812 on the crankshaft.

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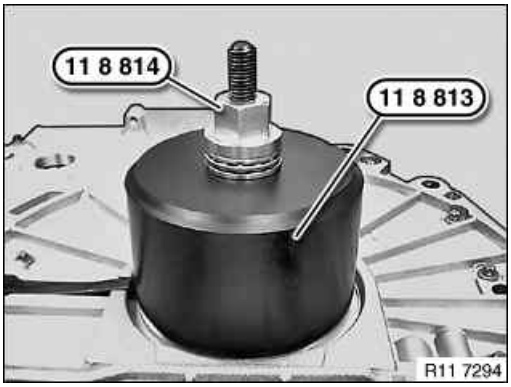
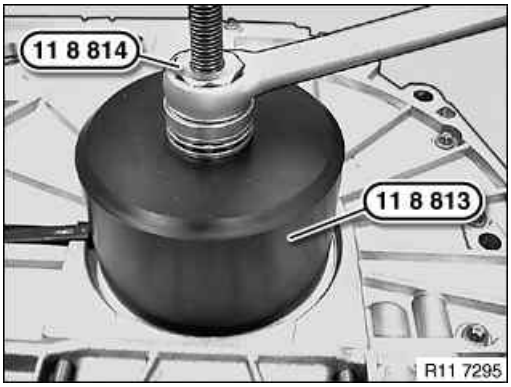


Slide on special tool 11 8 813 .
Screw down special tool 11 8 814 .



Press in radial shaft seal with special tool 11 8 813 .
Screw in special tool 11 8 813 up to gear case cover.

Remove all special tools 11 8 810 .

Concluding tasks:

- Install oil sump.
- Install cylinder head.
- Install flywheel.
- Remove engine from assembly stand.
- Install engine with transmission.

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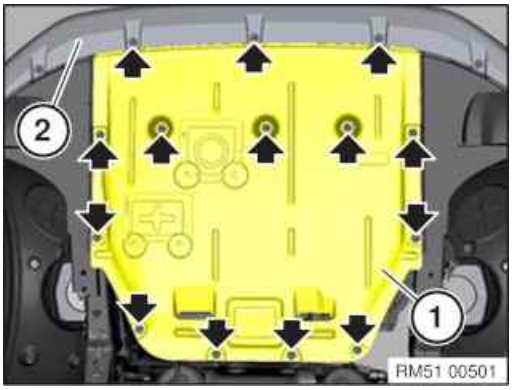
11 14 290 Removing and installing/renewing front engine acoustic cover

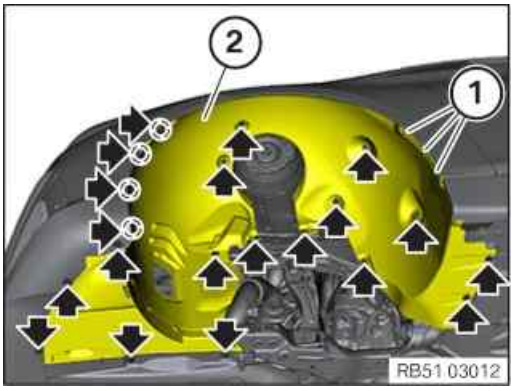
PRELIMINARY WORK

1 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

2 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

3 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

4 – Remove right charge-air line

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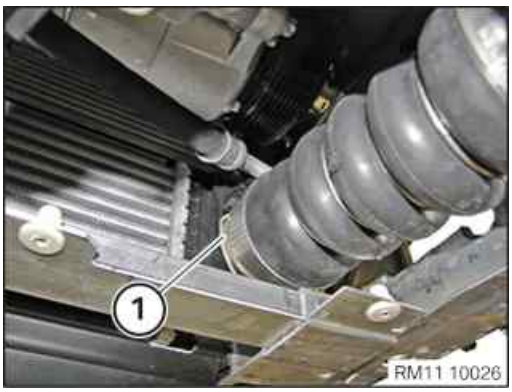
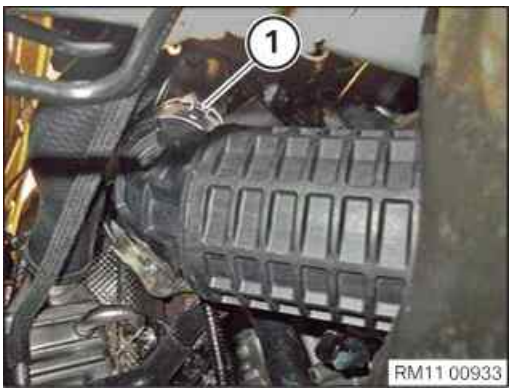
- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

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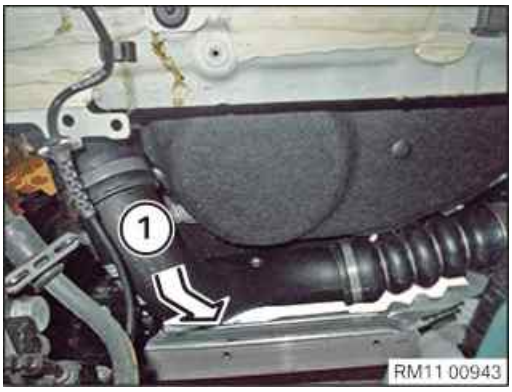
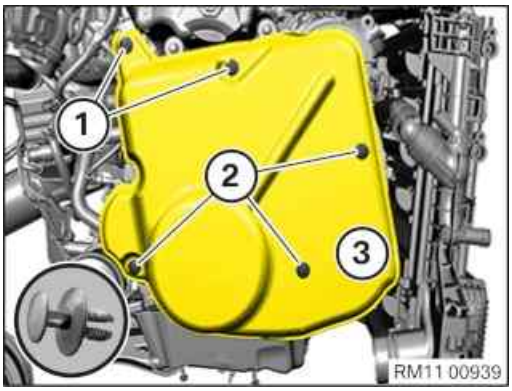


- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

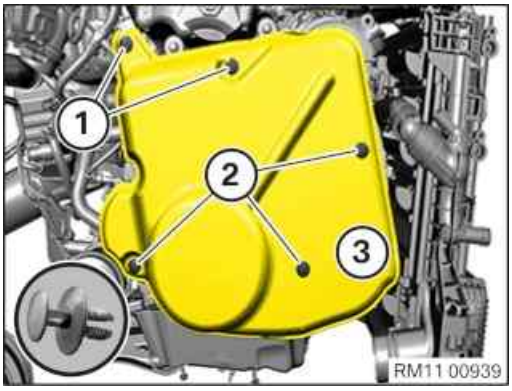
MAIN WORK

5 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

6 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

POSTPROCESSES

7 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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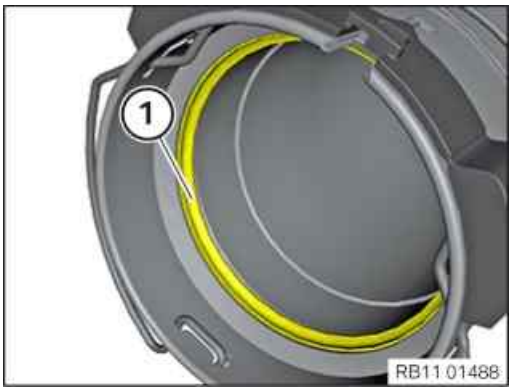
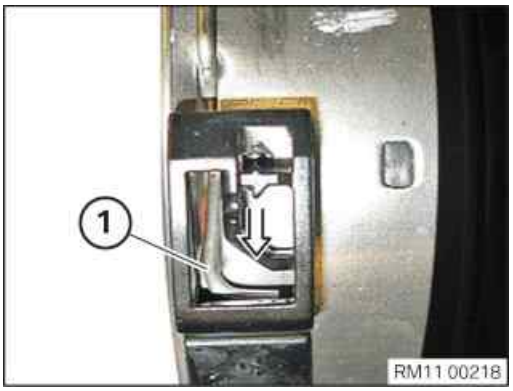
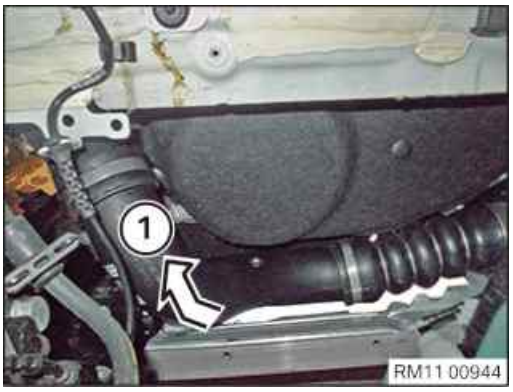


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

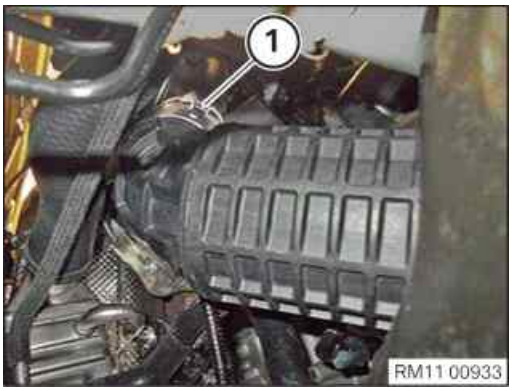
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

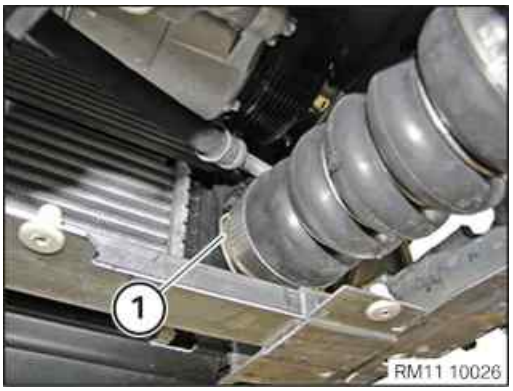


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

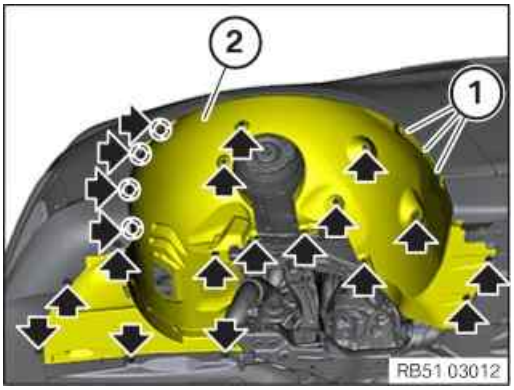
M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

8 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

9 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

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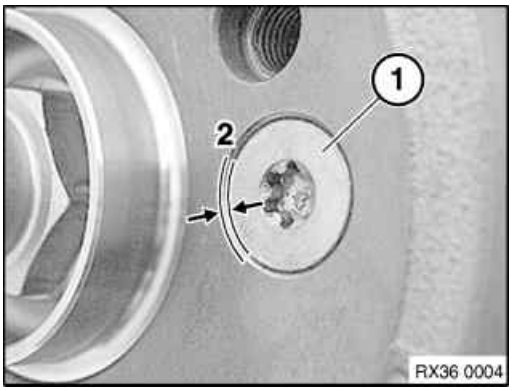
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

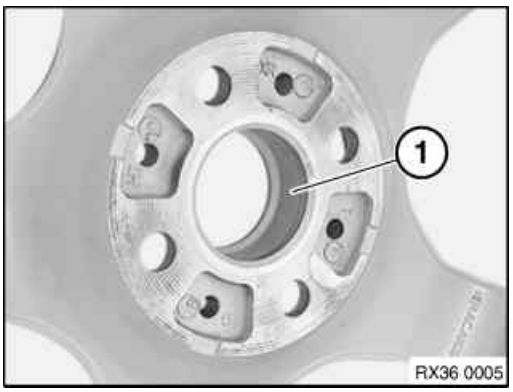


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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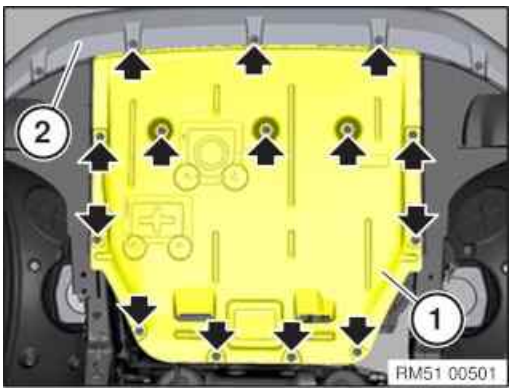
10 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

Additional Information

Overview of Tightening Torques

Charge air line to crankcase — Used in step 7

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 7

M6		Tightening torque	8 Nm

Wheel arch cover — Used in step 8

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub — Used in step 9

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 9

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front — Used in step 10

			3 Nm

Overview of Special Tools

2 344 011 Tool

Common — Used in step 9

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

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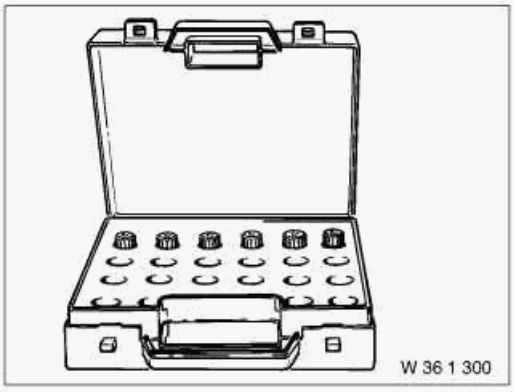
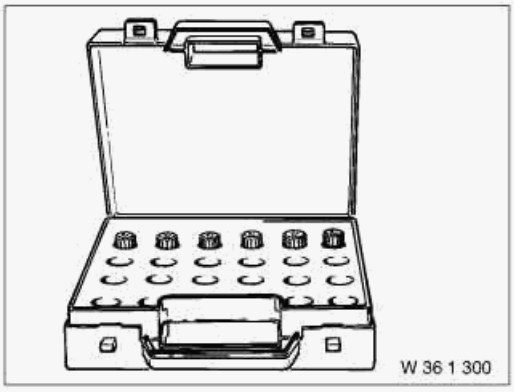
0 495 221 (36 1 323) Wheel stud



Common	Used in step 3
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 3
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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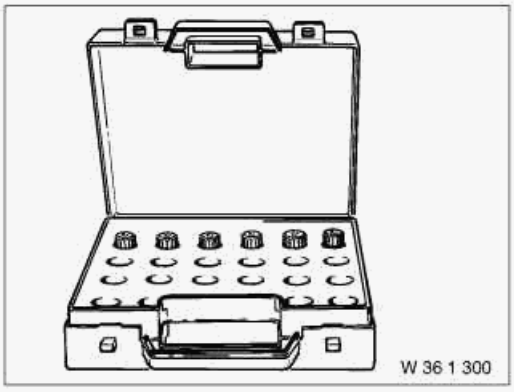
0 495 225 (36 1 327) Wheel stud



Common	Used in step 3
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 3
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 3
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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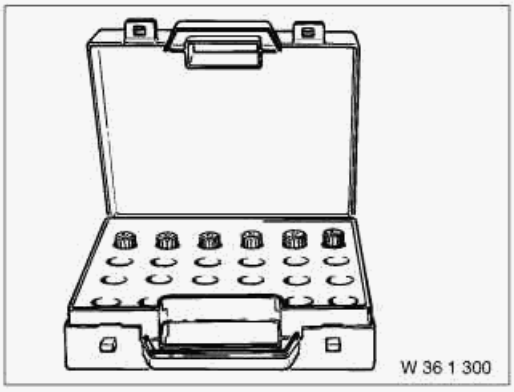
0 495 228 (36 1 331) Wheel stud



Common	Used in step 3
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 3
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 3
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	9

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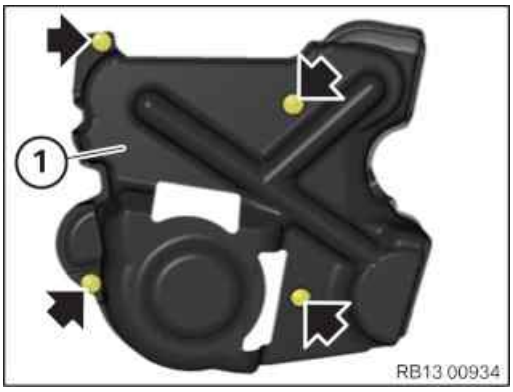
11 14 290 Removing and installing/replacing front acoustic engine cover (B37)

Necessary preliminary tasks:

- Remove acoustic cover
- Remove front underbody protection.
- Right charge air line. **(Loosen only)**

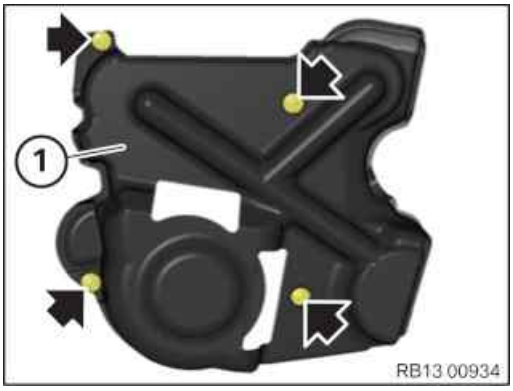
Removal:



Unlock and loosen clamp along the arrows.

Disengage acoustic cover (1) towards the bottom and remove.

Installation:



Feed in acoustic cover (1) and install.

Connect and lock clamps along the arrows.

Required reworking:

- Install the acoustic cover.
- Install front underbody protection.
- Install right charge air line.

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This documentation refers to special tools that were not yet available when going to press.

11 14 110 Removing and installing/sealing or replacing bottom timing case cover

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator

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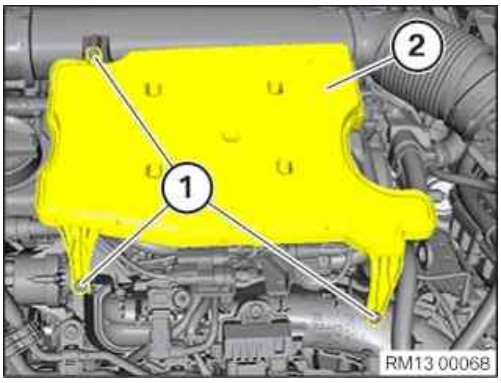
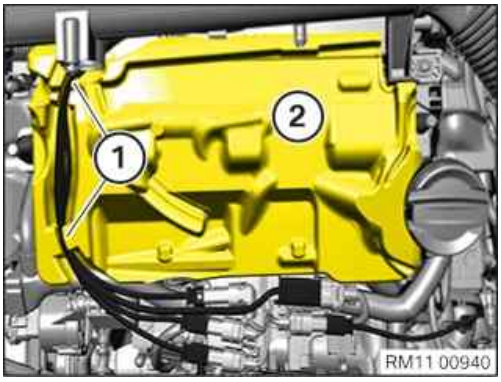


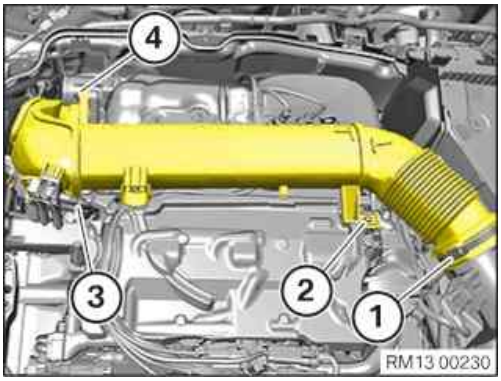
- Loosen screws (1).
- Guide out and remove the resonator (2).

4 – Remove the acoustic cover for the injectors

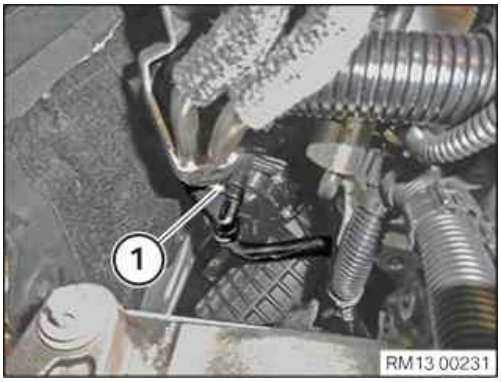


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

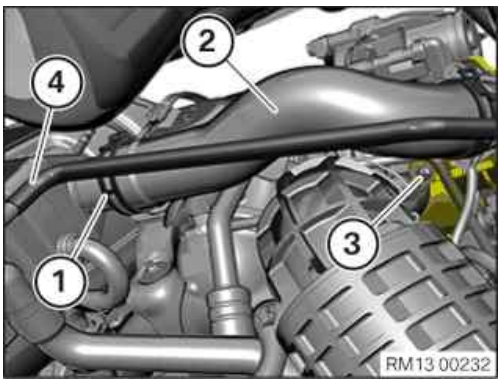
5 – Removing clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.

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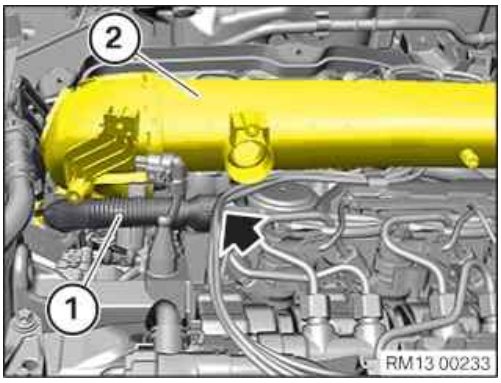
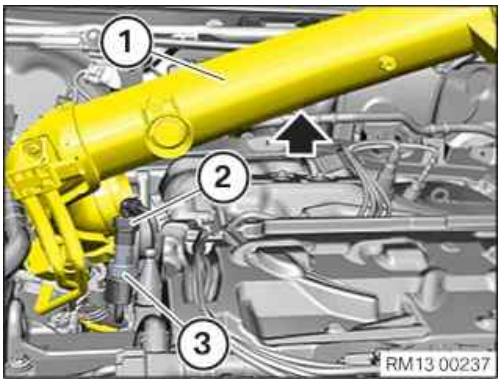


- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).



- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

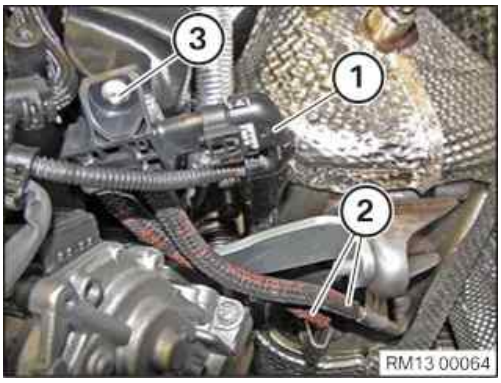
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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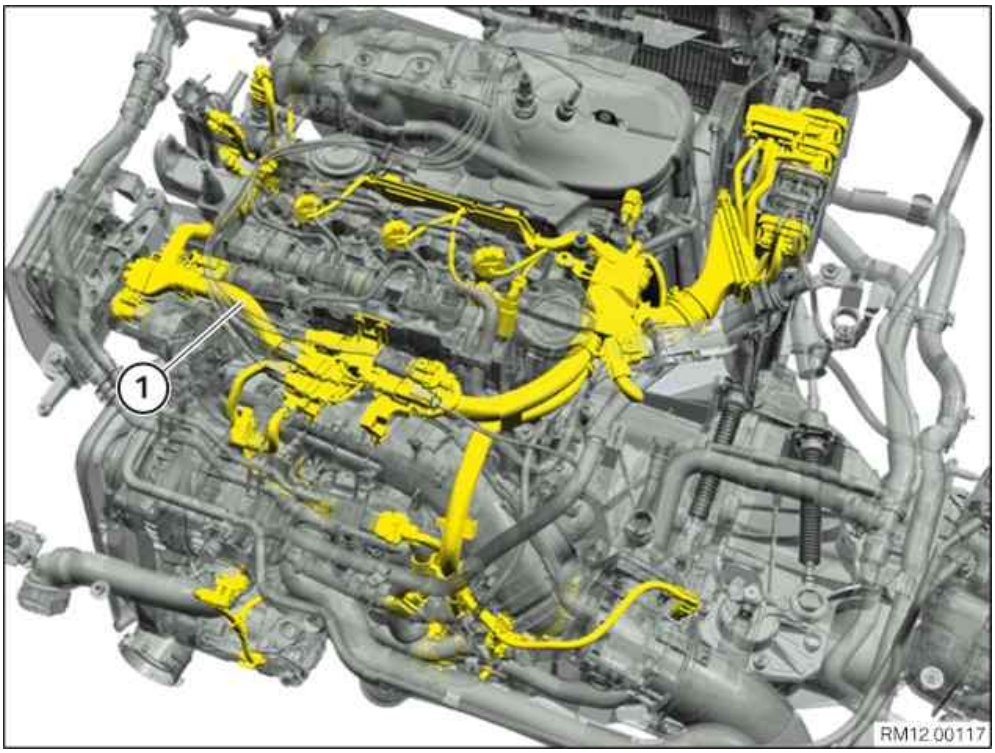
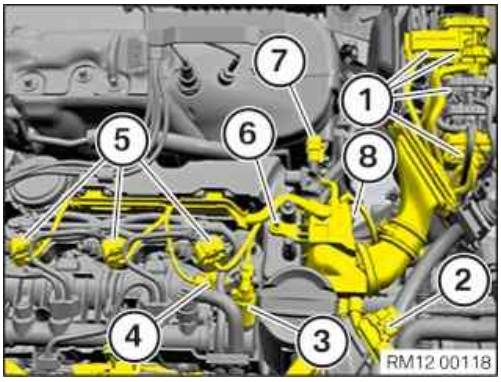
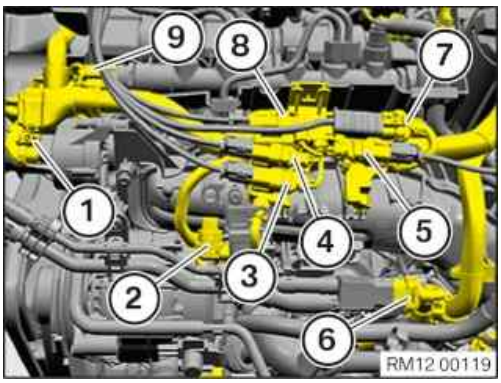
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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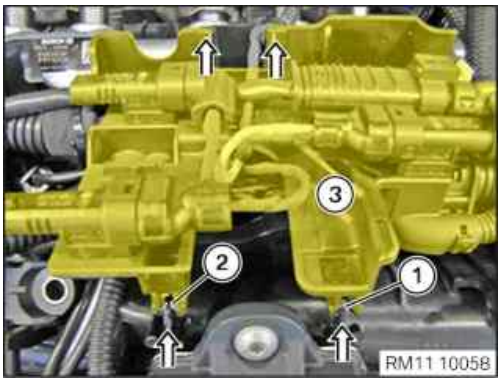
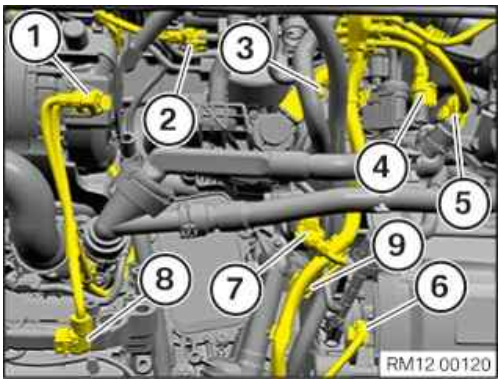
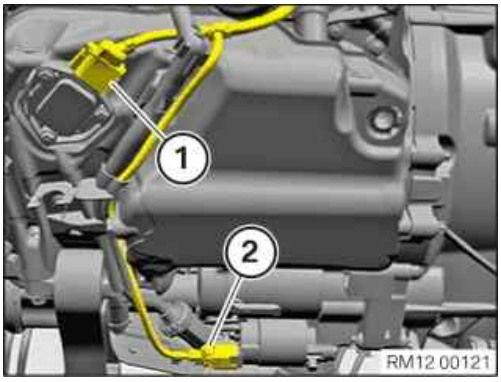


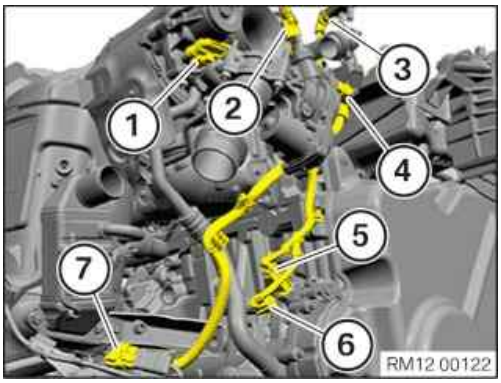
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



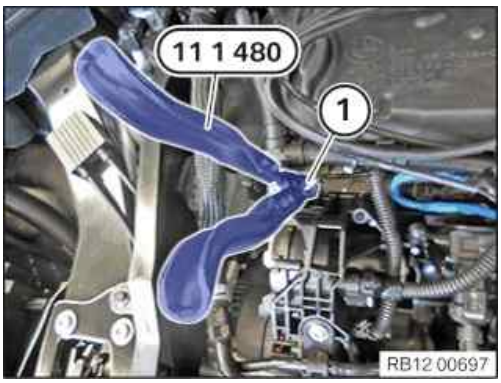
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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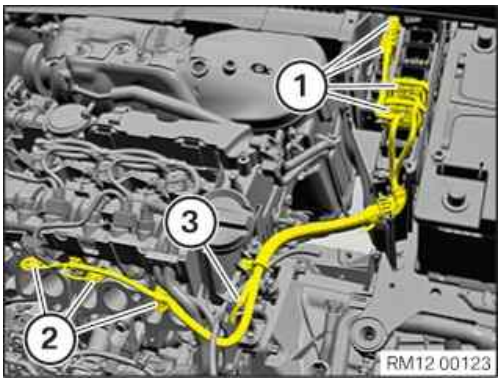


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

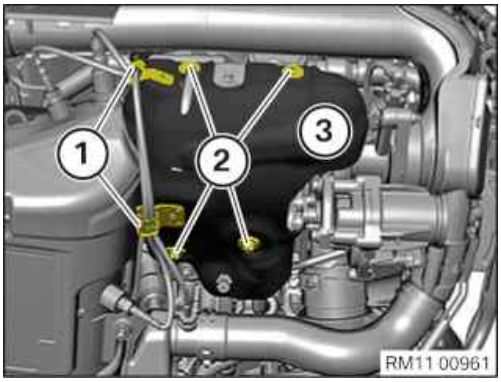
▶ Removing heat shield from top exhaust turbocharger

WARNING

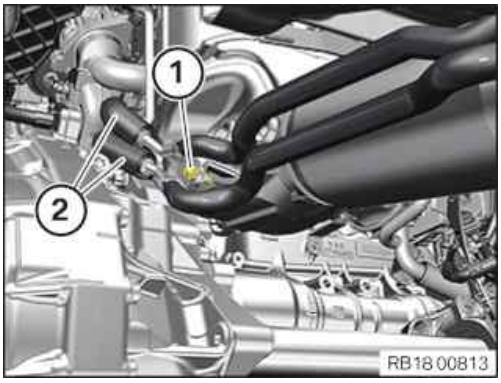
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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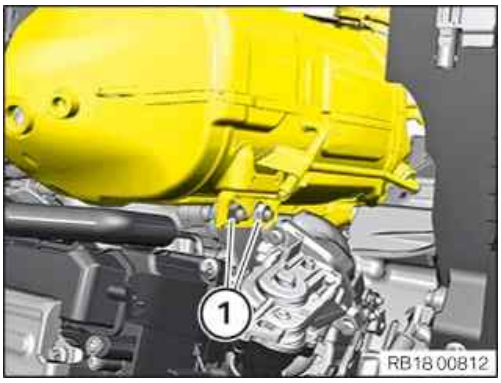
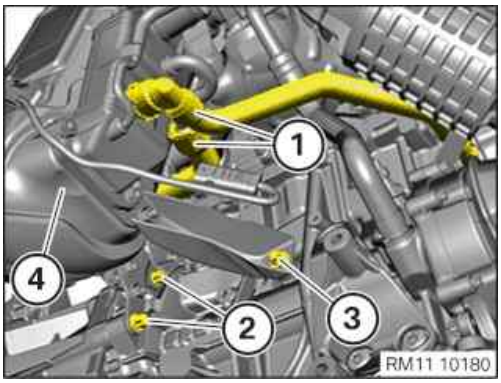


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

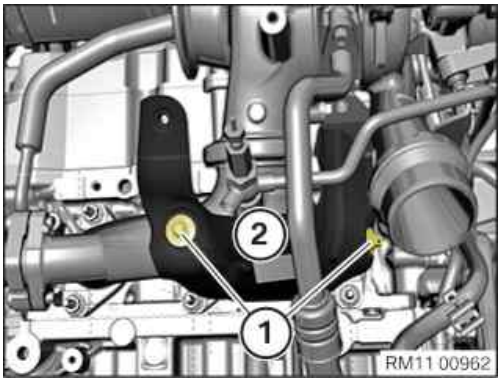
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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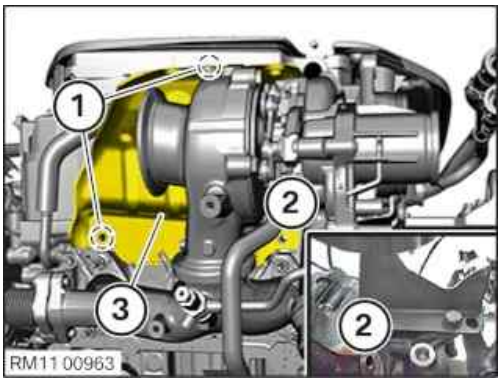


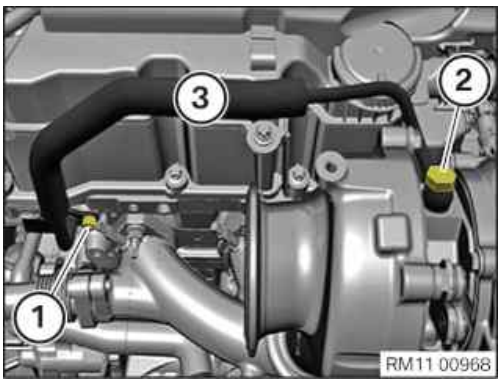
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

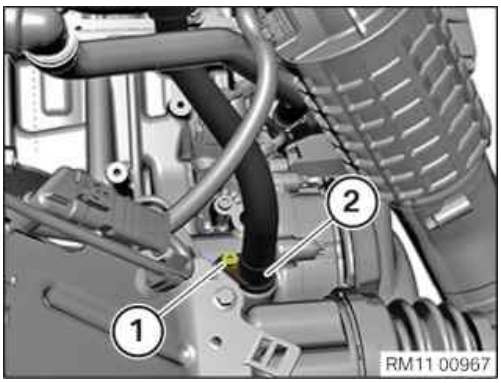
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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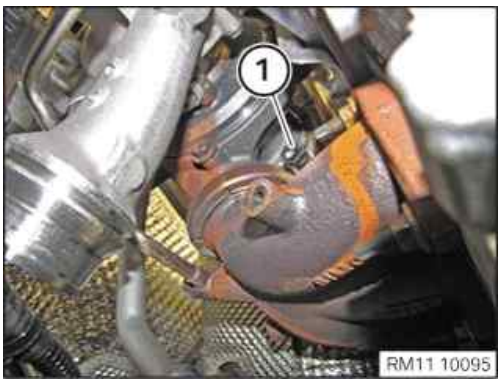
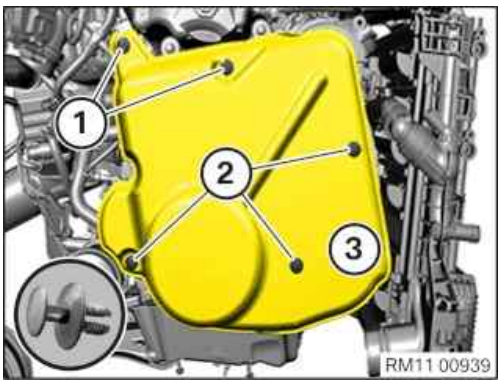
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

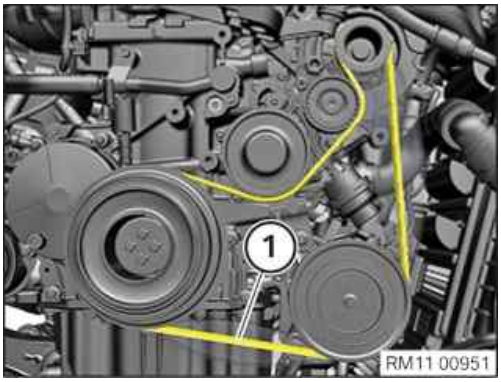
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

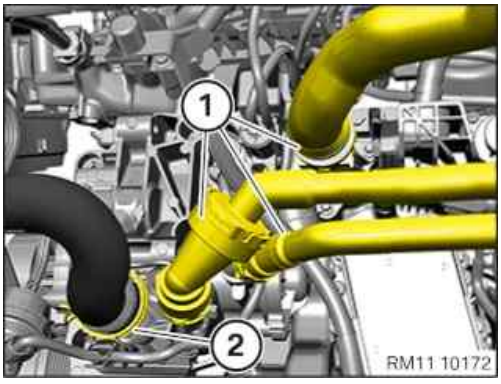
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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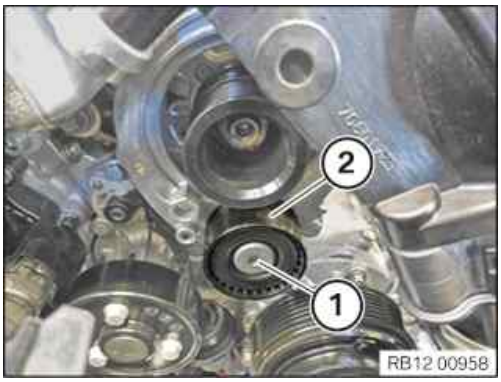
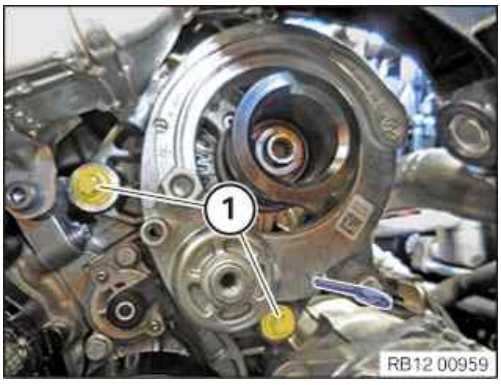
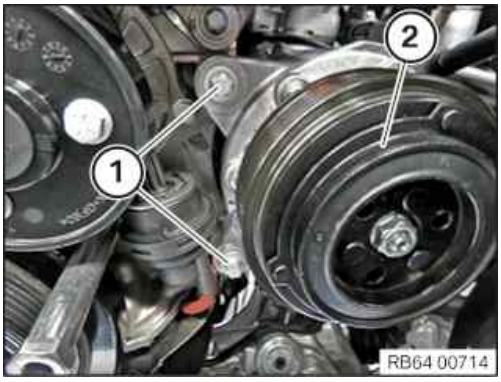


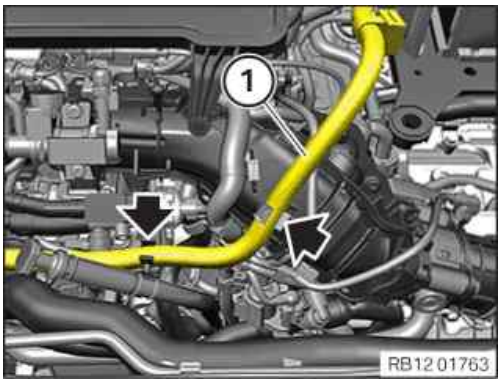
- Loosen screw (1).
- Remove the deflecting element (2).



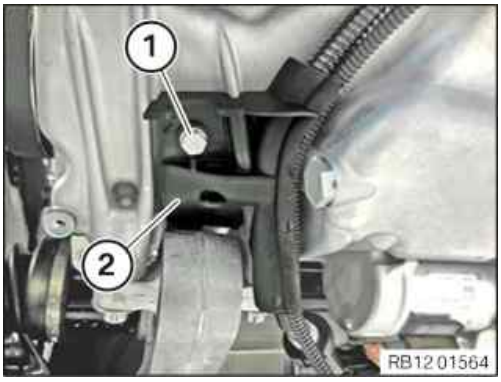
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

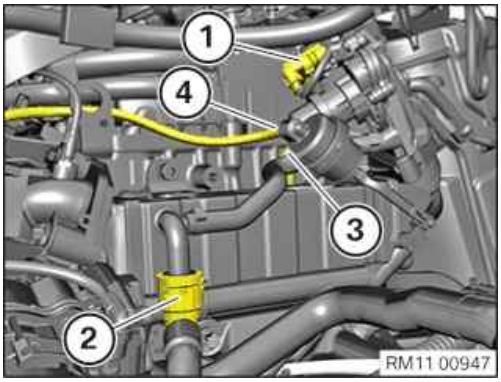
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

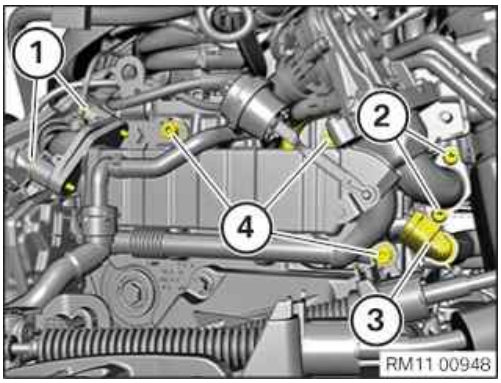
- Perform all work only on components that have cooled down.



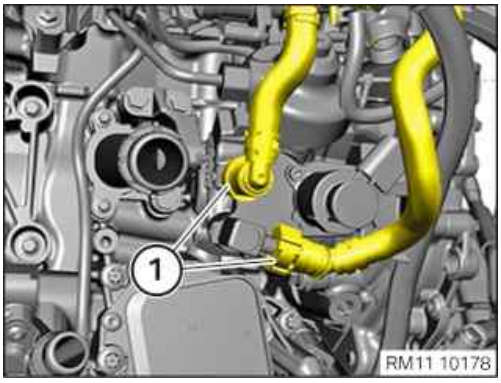
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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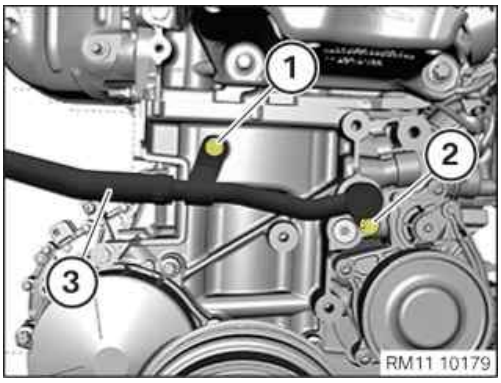


- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Detach the engine from the manual gearbox

Prerequisite

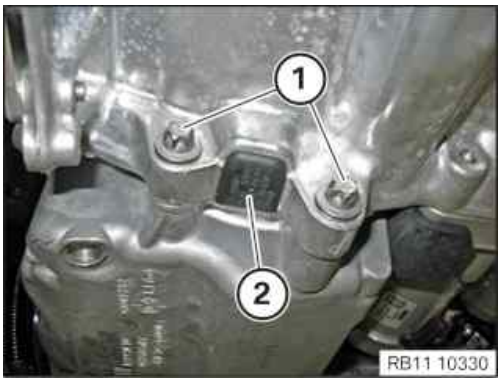
Engine has been removed.

CAUTION

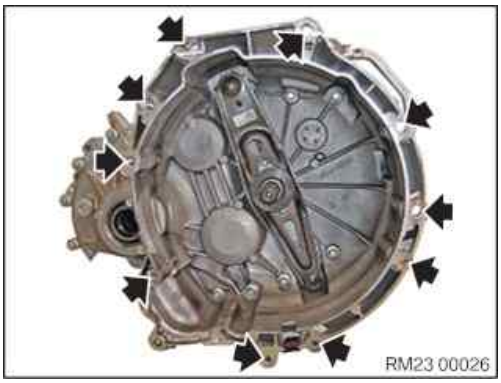
Heavy component.

Heavy components can lead to injury or damage.

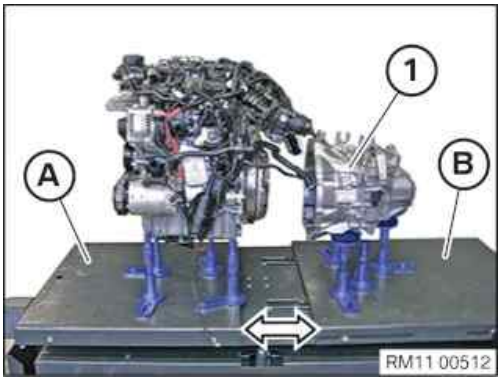
- Remove and install heavy components with the aid of another person/other persons.



- Loosen screws (1).
- Remove protective cap (2).



- Remove screws (arrows).



- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.

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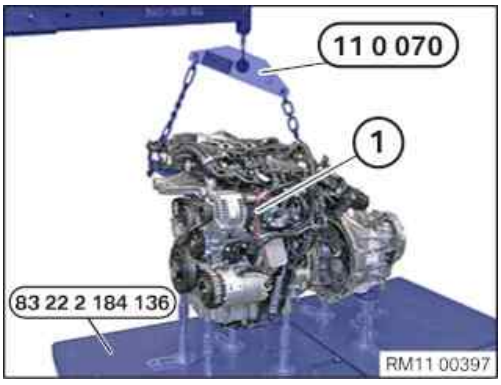
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool **0 490 579 (11 0 070)** and lift engine (1) off lifting table.

9 – Mount engine on assembly stand

CAUTION

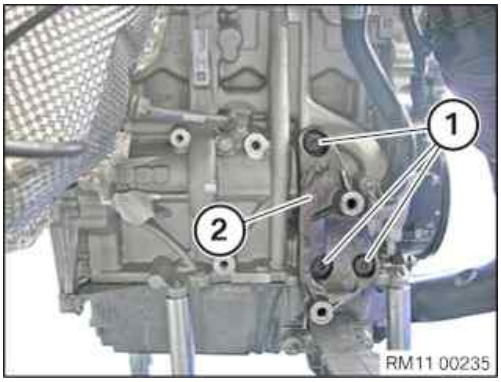
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

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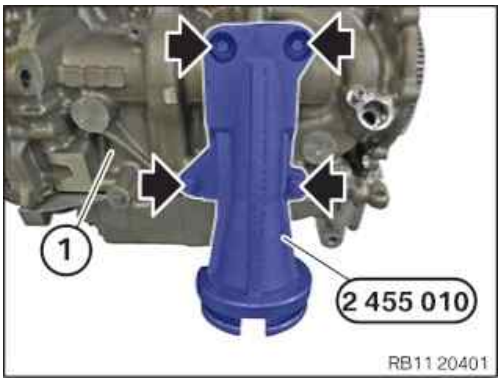
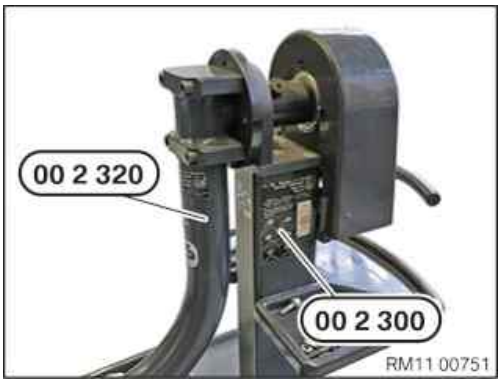


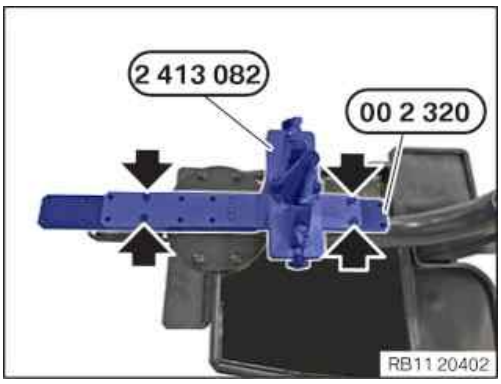
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.

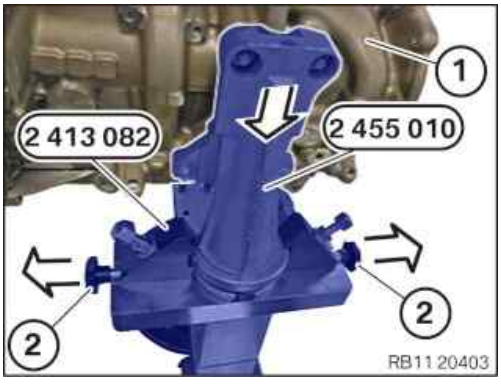


- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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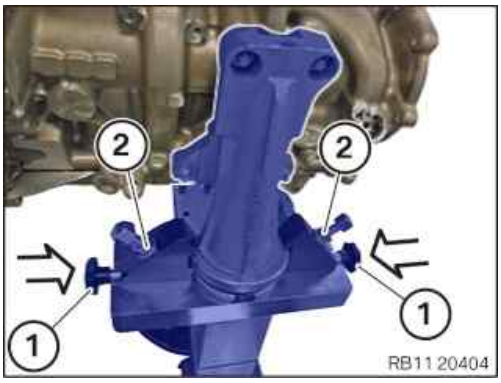


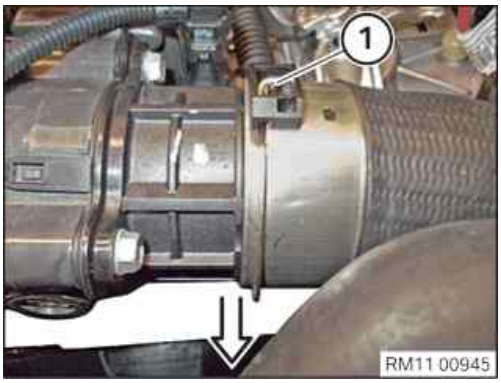
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

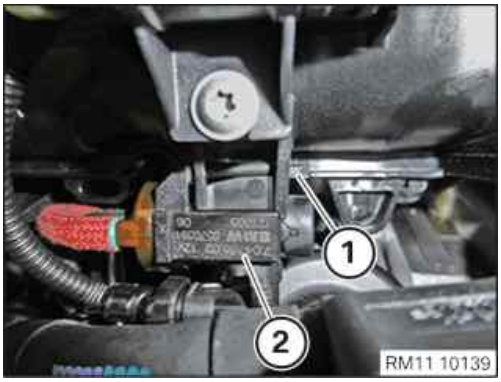
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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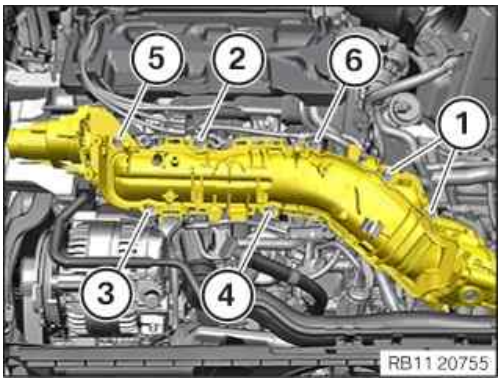
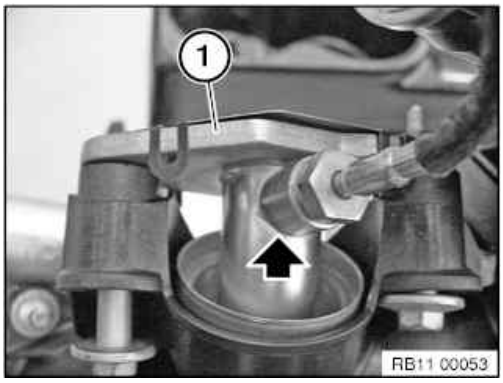


- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

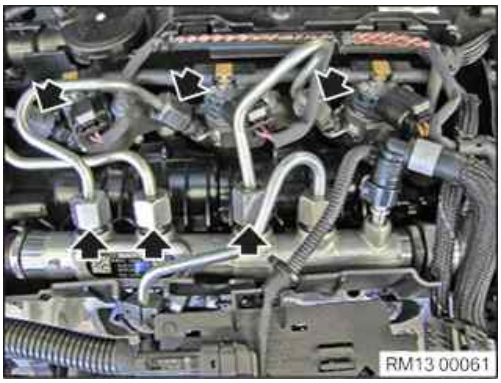
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

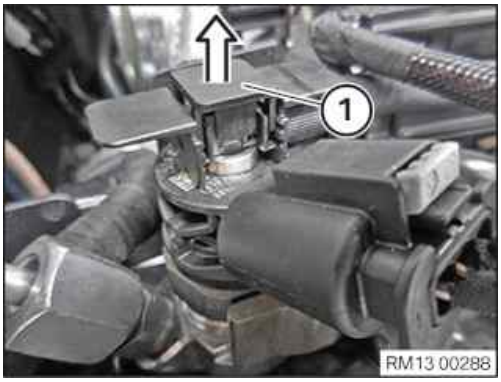
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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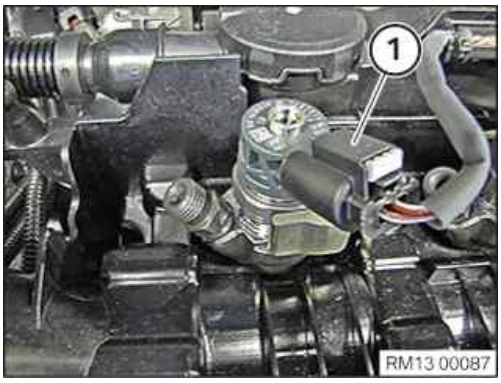
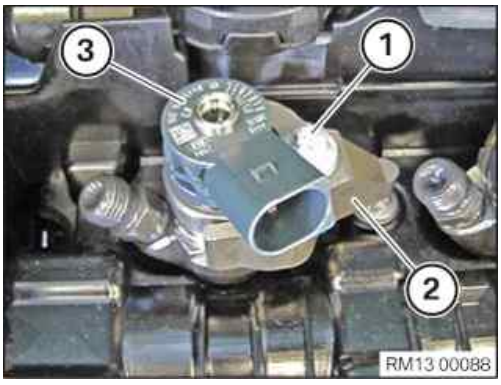


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

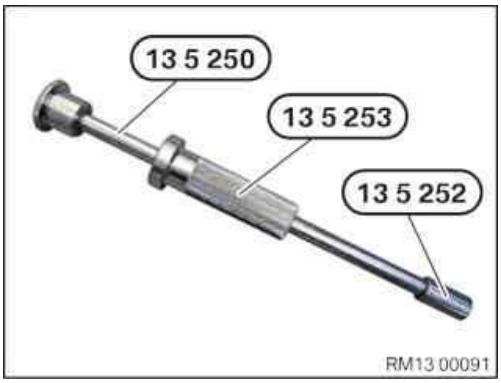
▶ **Loosen stuck injectors**

RISK OF DAMAGE

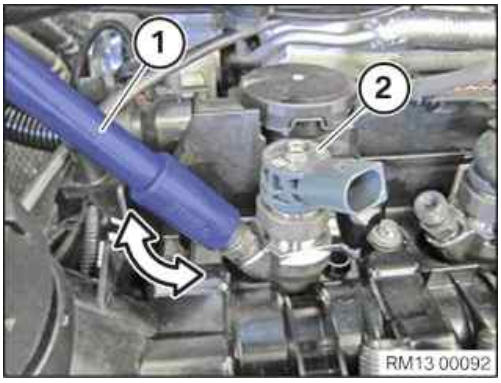
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

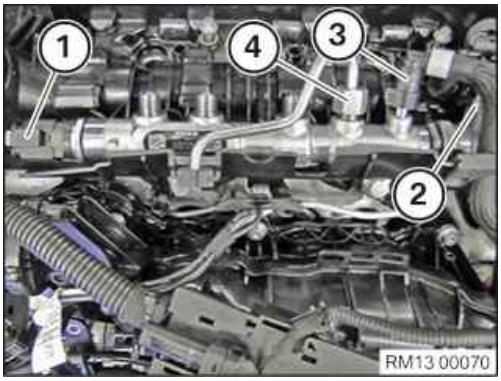
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

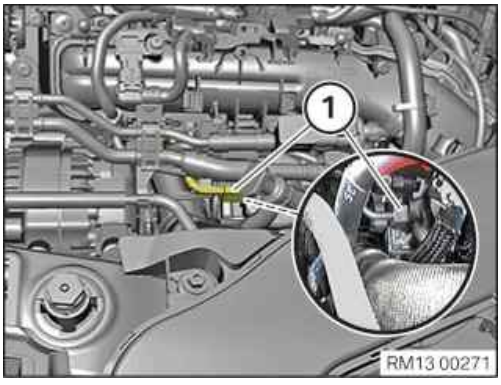
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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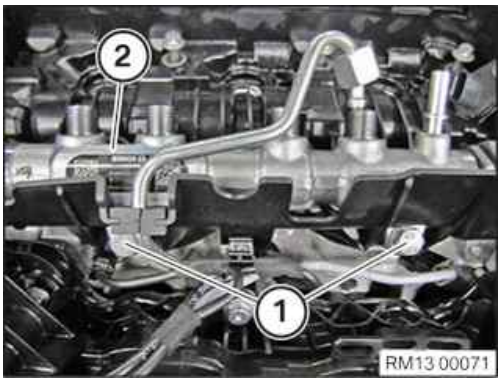
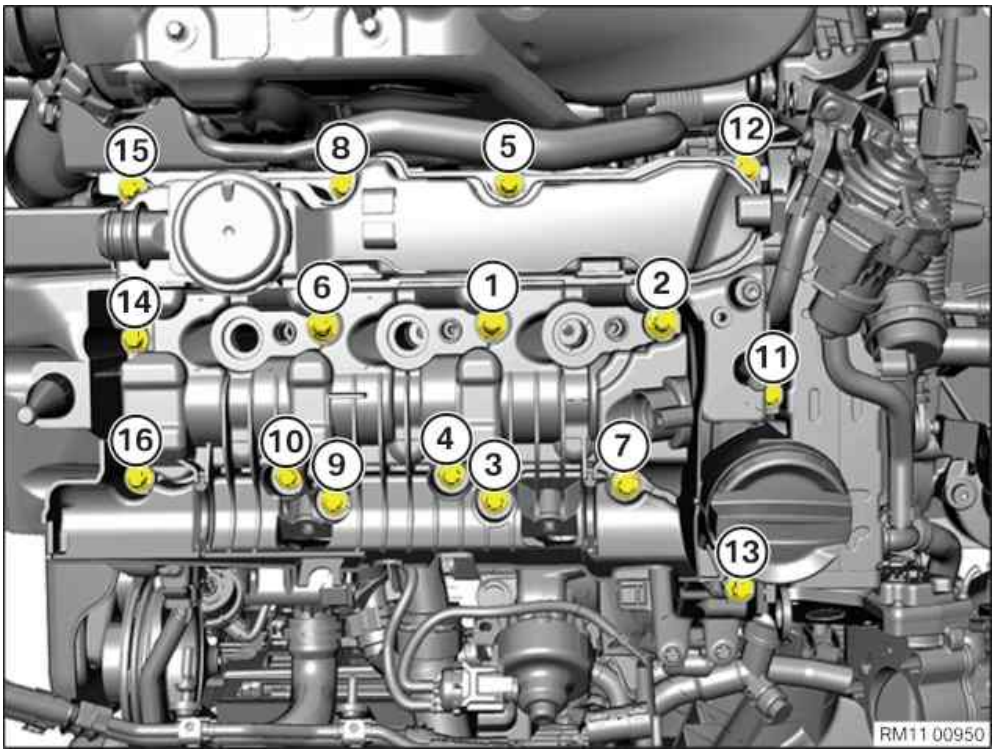


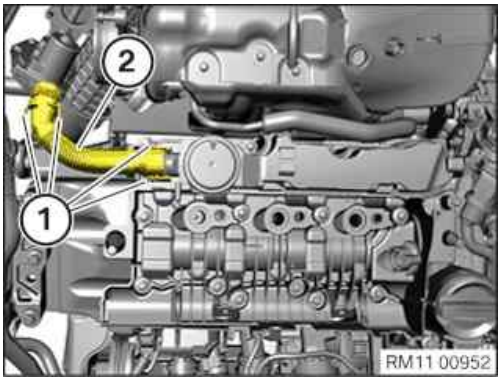
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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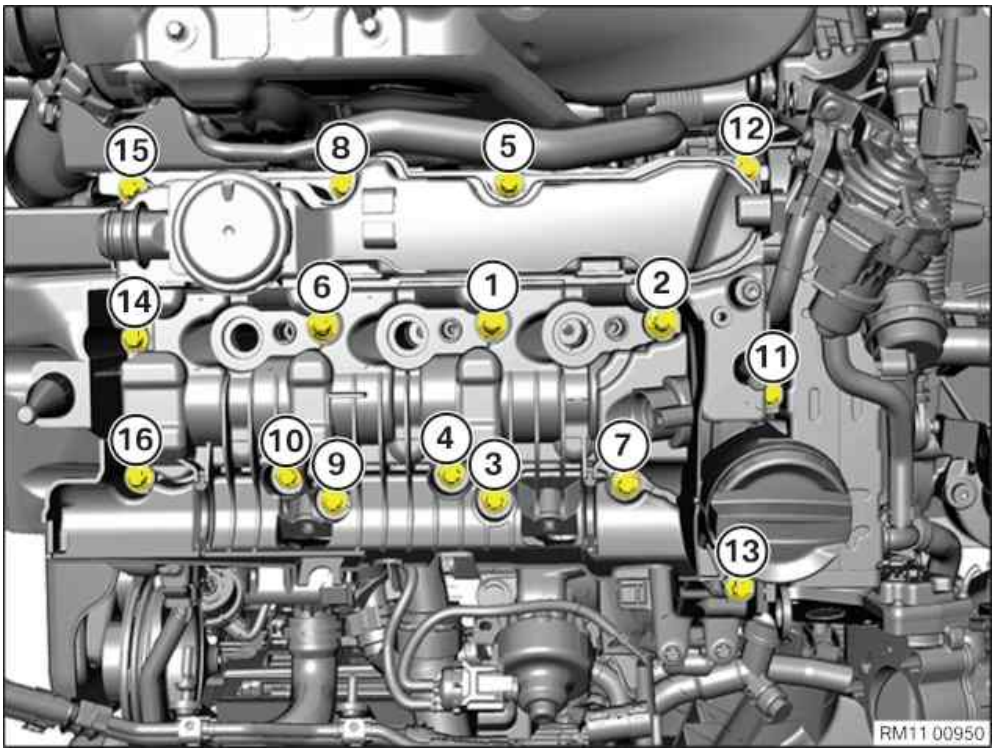

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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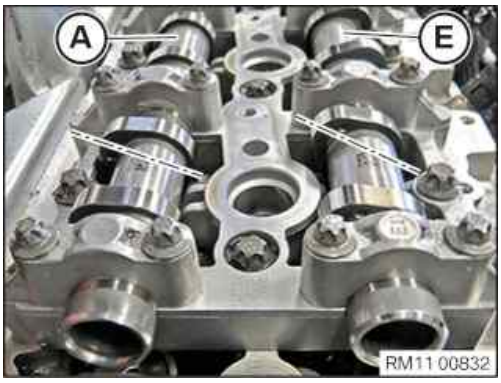
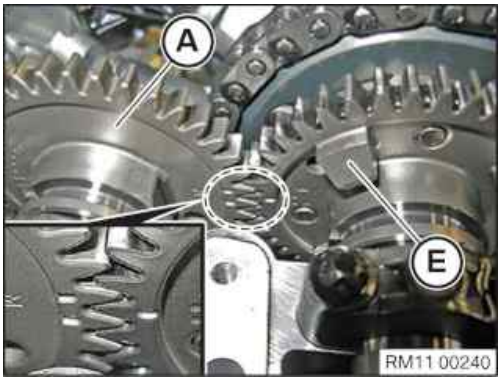


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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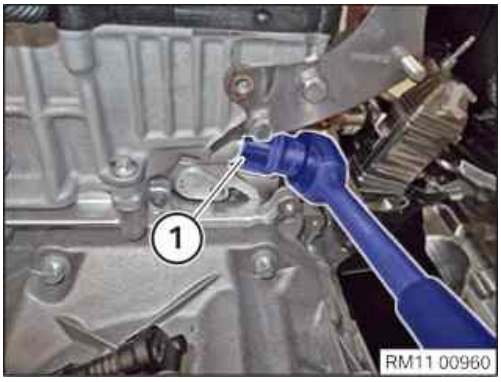
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

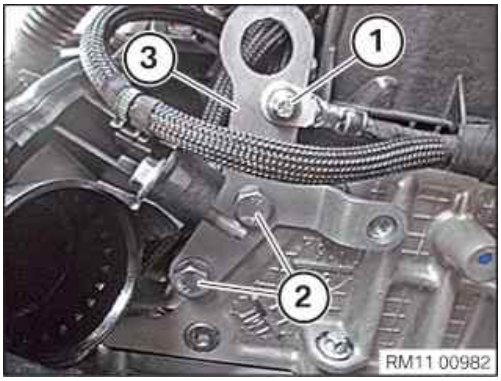


TECHNICAL INFORMATION

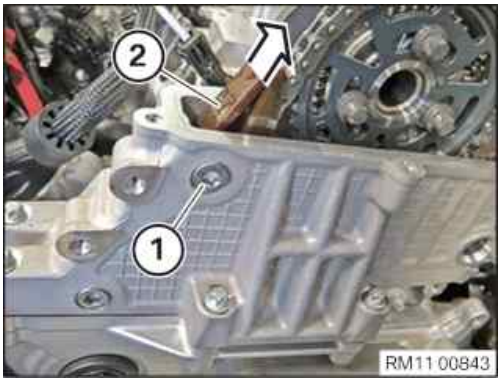
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

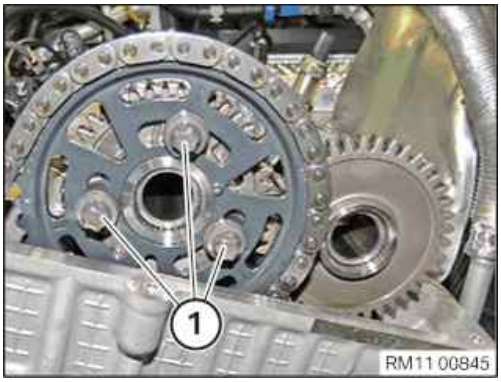


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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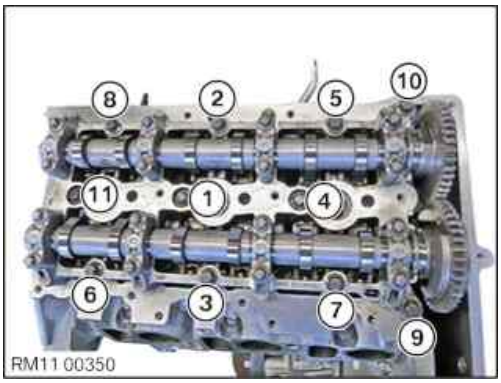
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

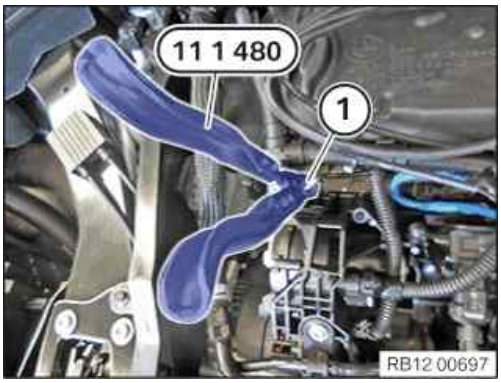
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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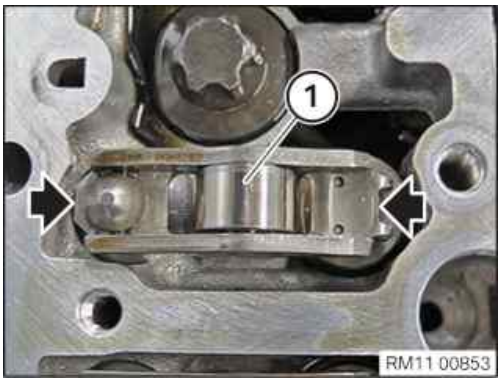


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

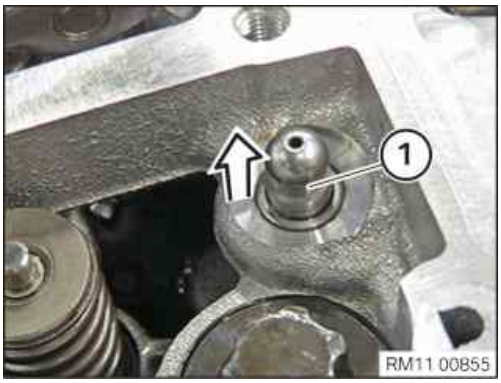
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

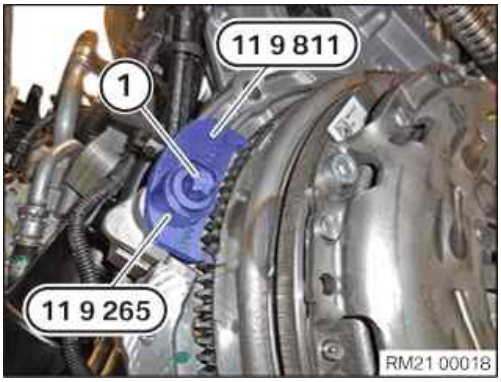
24 – Remove clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.

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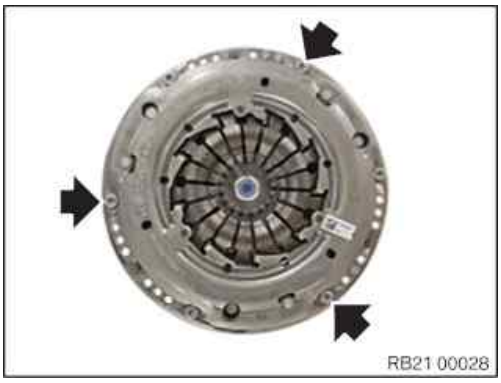
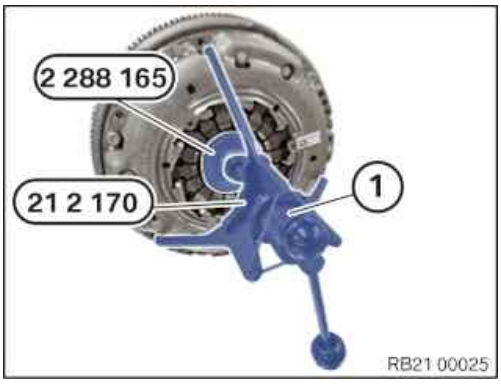
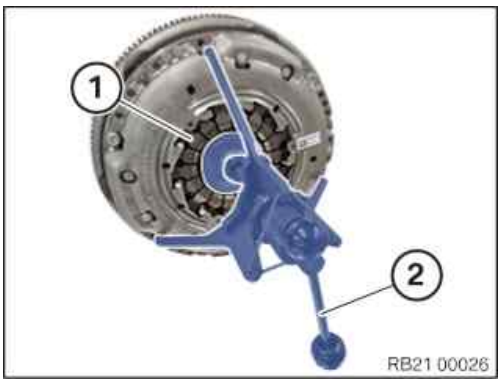


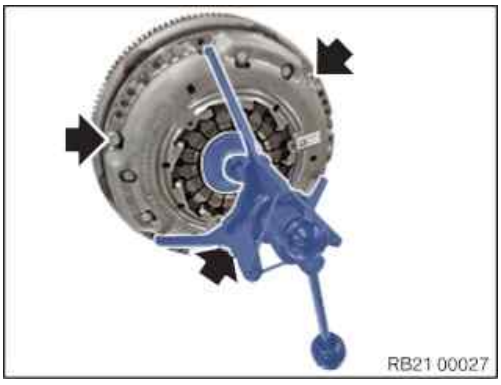
- Detach 3 screws to attach special tool **0 493 839 (21 2 170)** and **2 288 165**.



- Position special tool **0 493 839 (21 2 170)** and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

25 – Removing flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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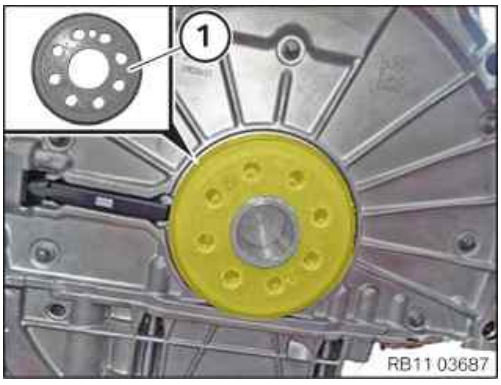
- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.



RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

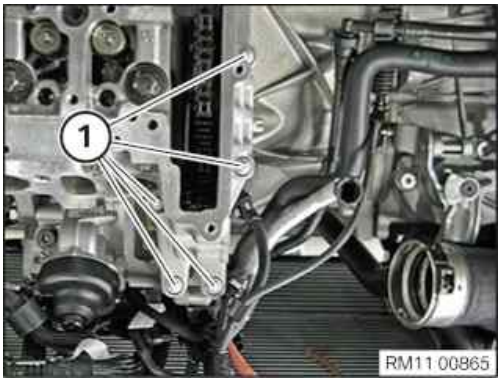
MAIN WORK

26 – Remove rear timing case cover

Prerequisite

Transmission is removed.

- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).

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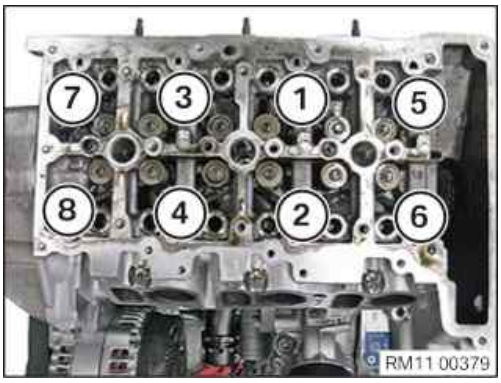
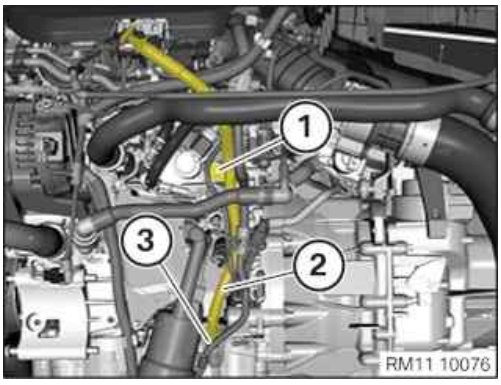
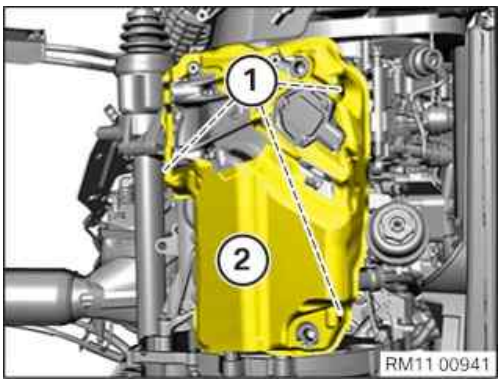


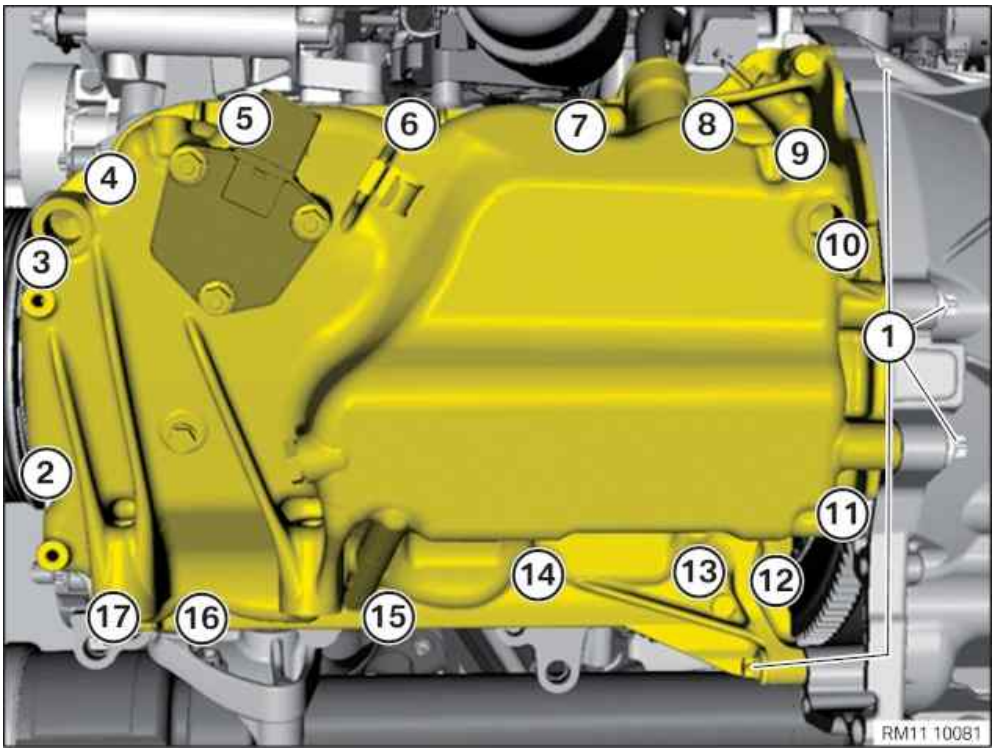
- Loosen the cylinder head bolts in the sequence from (8) to (1).



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- If required, remove sealing ring (3) from oil sump.



- Remove the expanding rivet (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).



- Tighten the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

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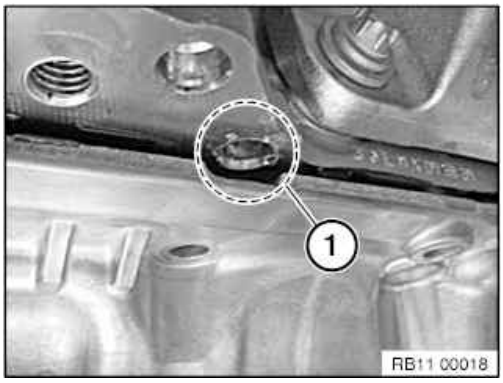
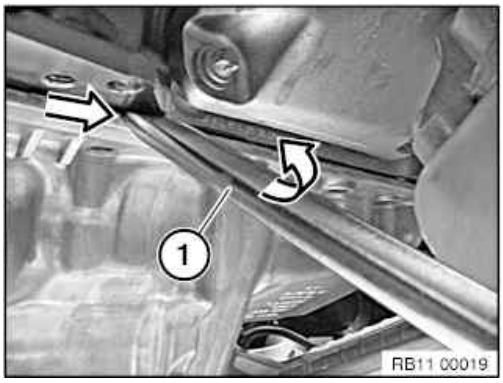
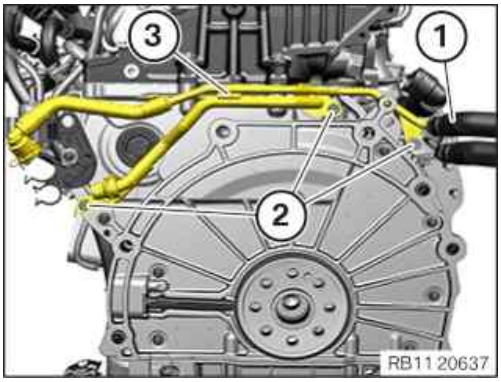


- Release oil sump only in area (1).

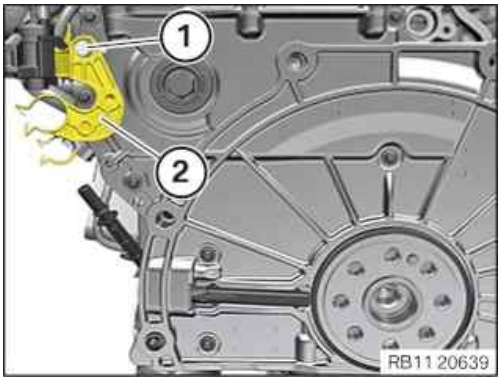


- Release the oil sump using a suitable mounting lever (1) carefully at the position intended for that.
- If required, secure the oil sump against falling.

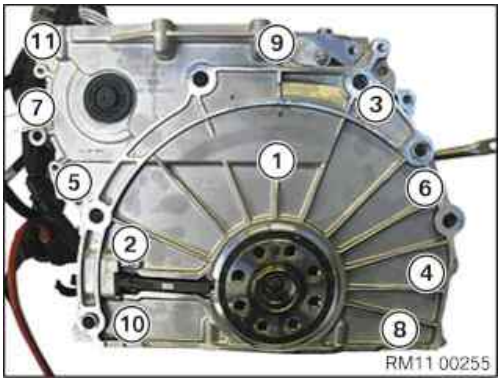
► **If installed: Remove coolant line of the SCR metering module**



- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).

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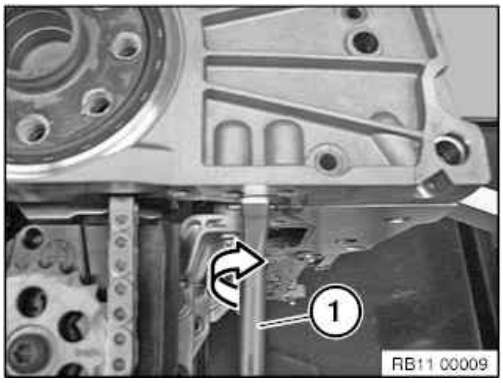
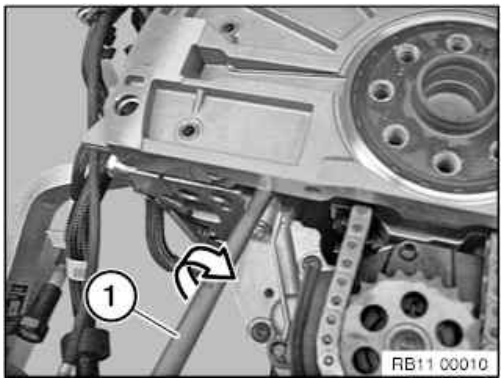


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

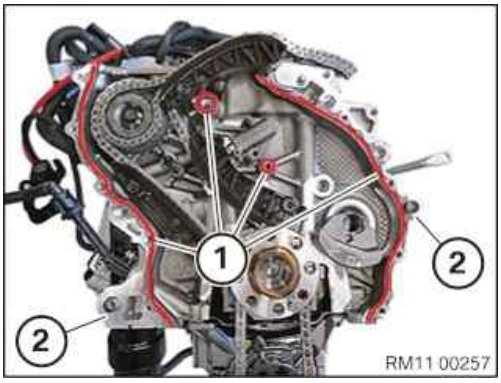


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

27 – Install the rear timing case cover

Prerequisite

Transmission is removed.



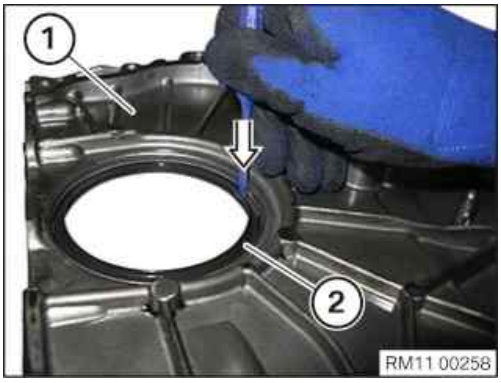
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.

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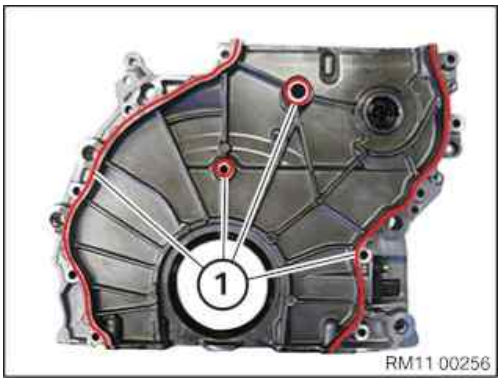
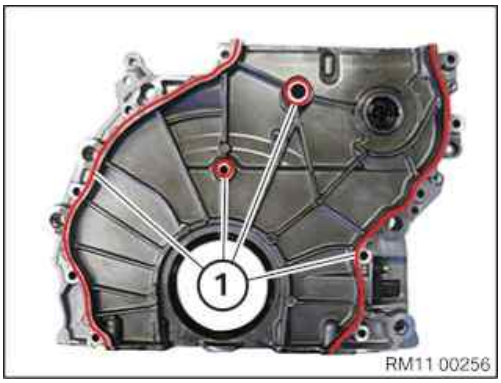


- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

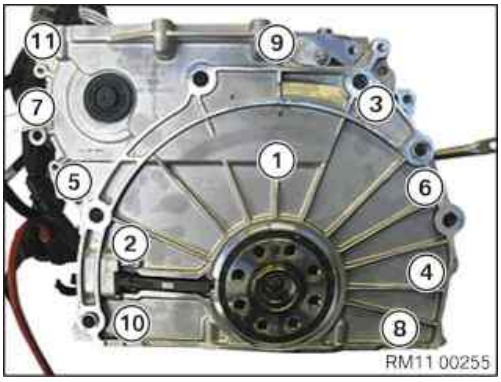


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

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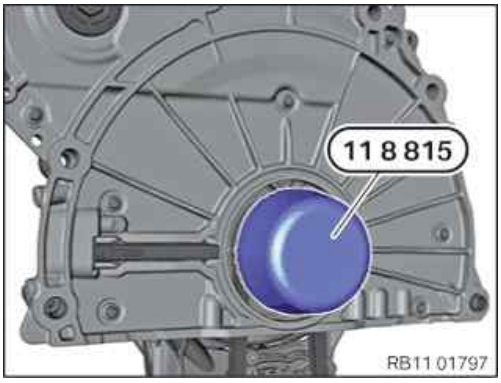
RISK OF DAMAGE

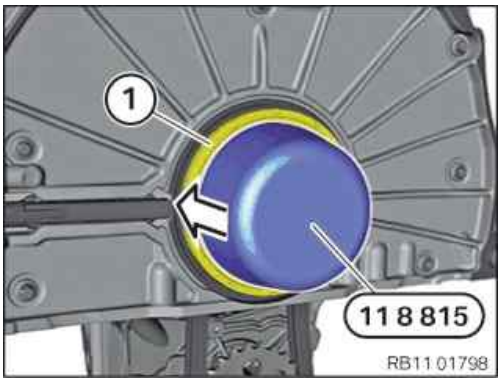
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

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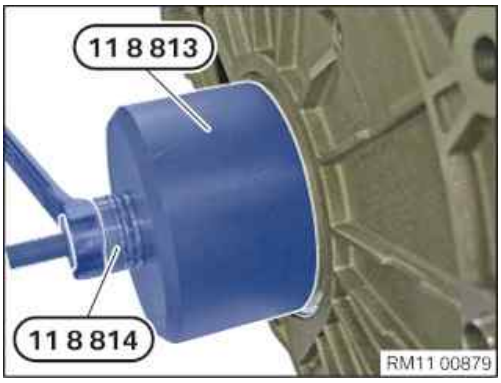
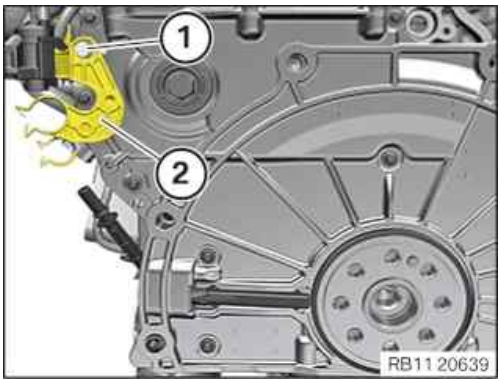
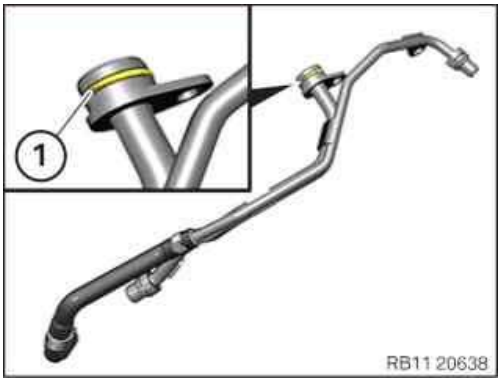


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



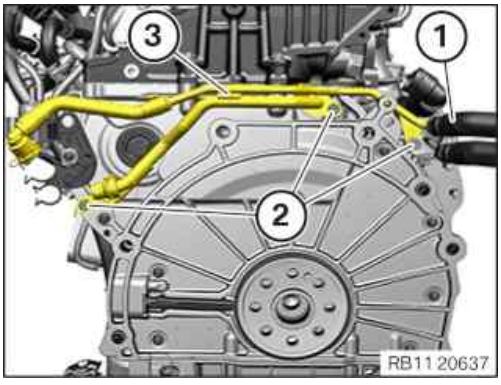
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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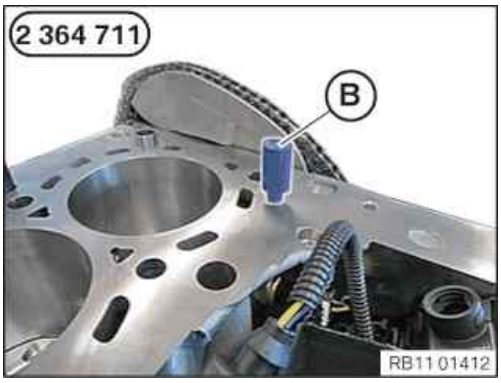


- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

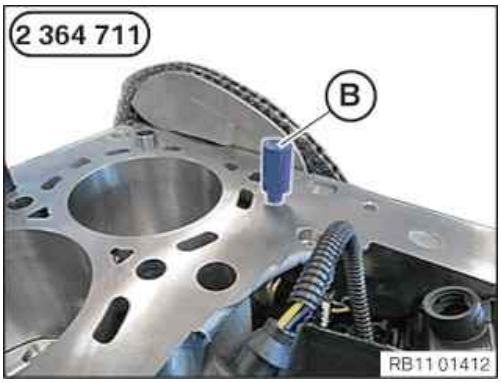
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

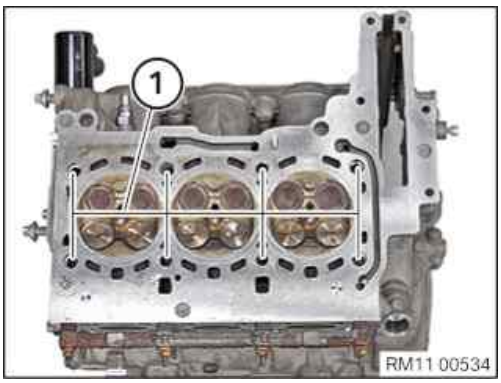
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ Renewing the cylinder head gasket



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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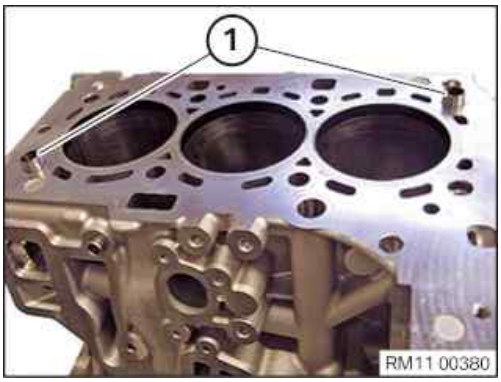
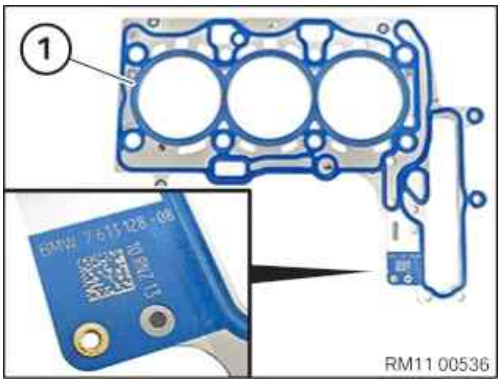
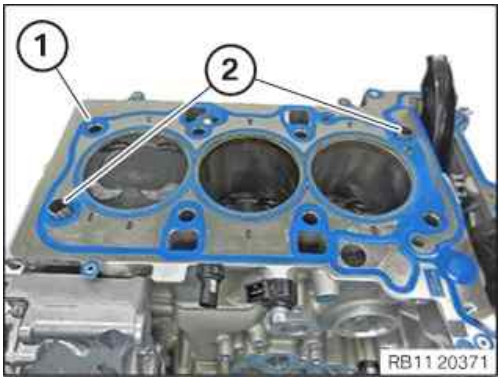


- Check the fitting sleeves (1) for secure fit and damage.

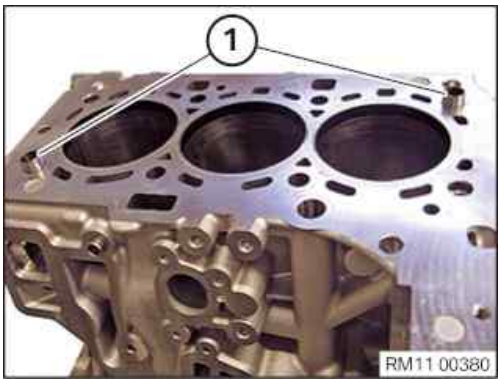


- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.

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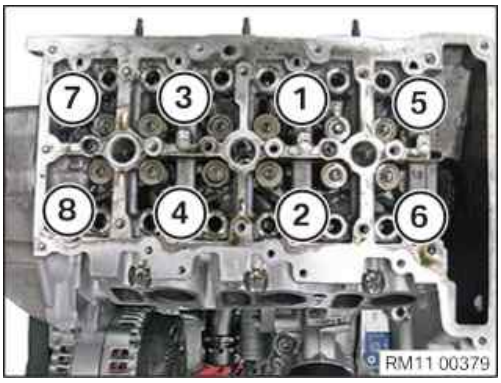


- Fit new cylinder head screws.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

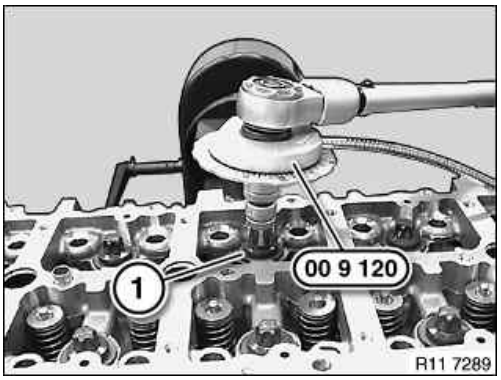
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

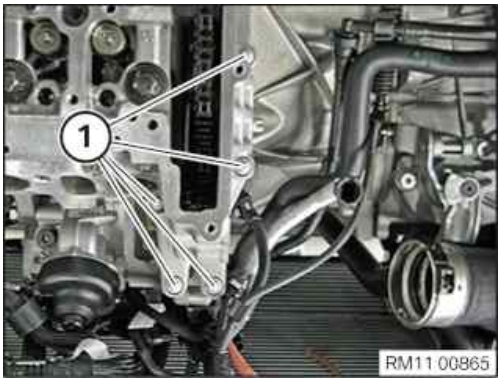
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolts in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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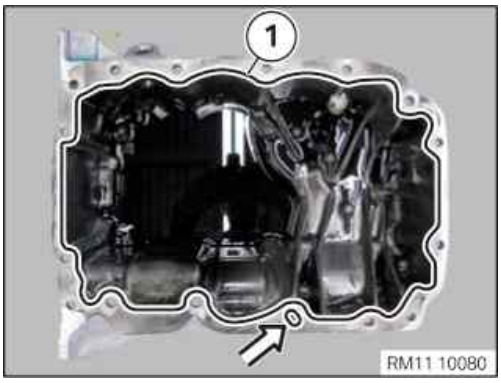


TECHNICAL INFORMATION

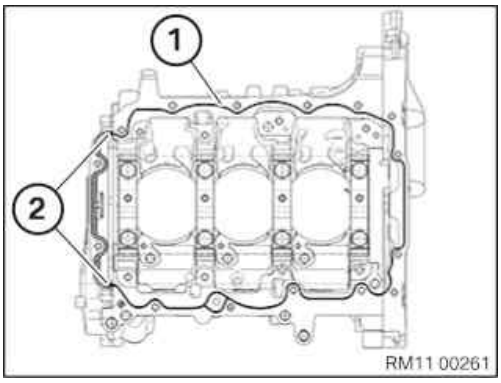
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

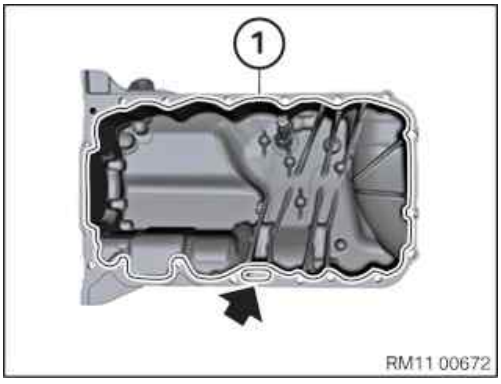
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

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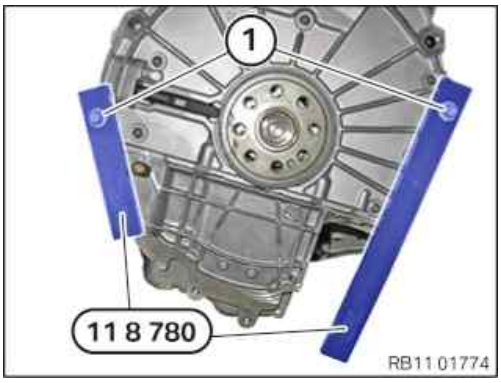
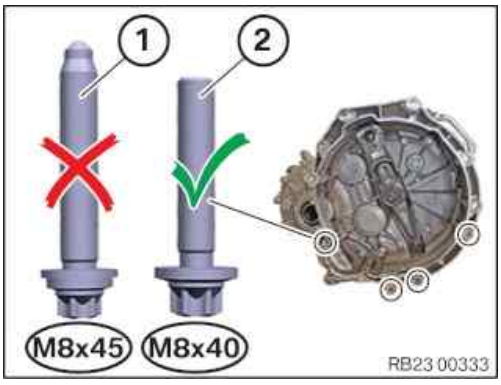


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

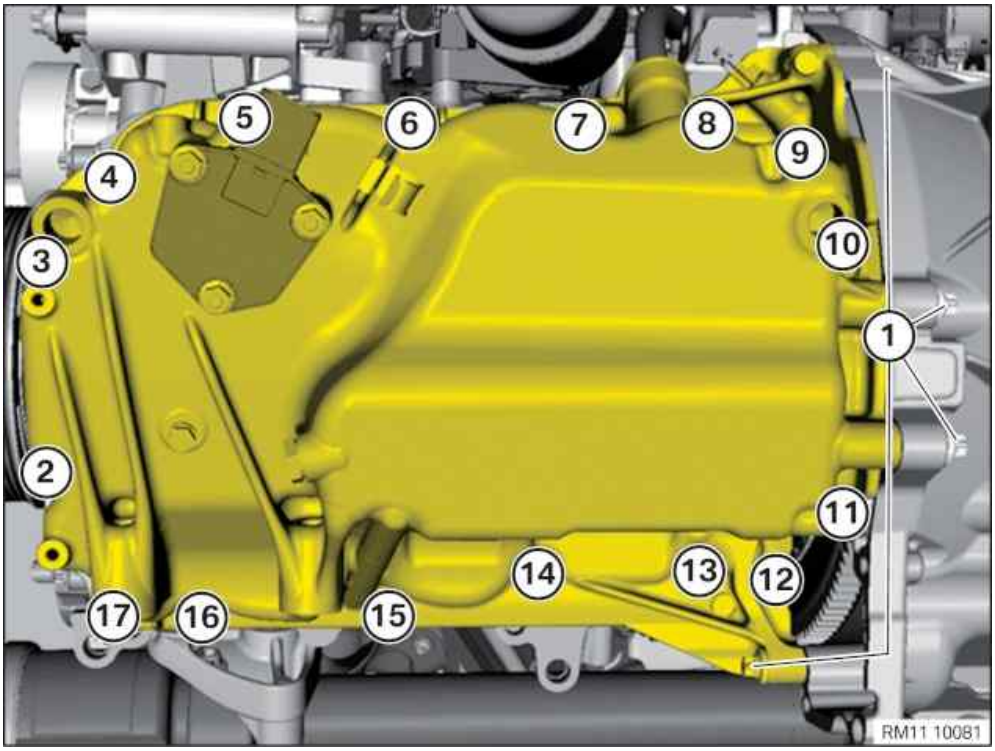
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Hand tighten the screws of oil sump (2) to (17) , but do **not** tighten completely yet.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

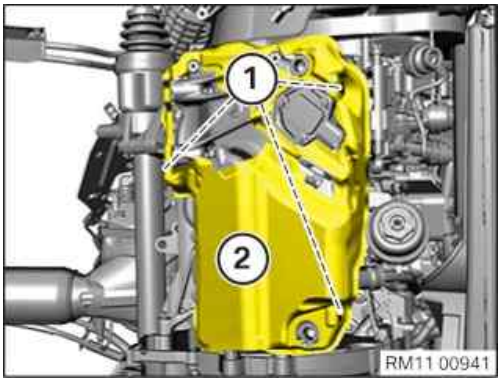
Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

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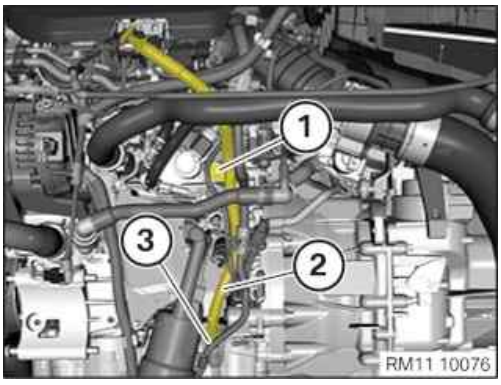
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

POSTPROCESSES

28 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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TECHNICAL INFORMATION

Clean all threads with a screw tap.

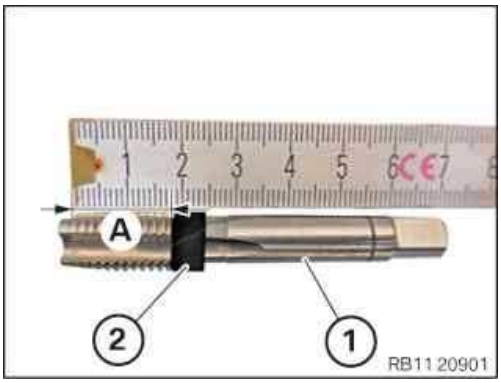
- Clean all screw threads (1).

- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

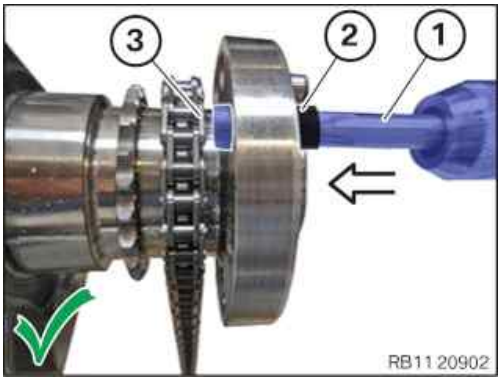
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

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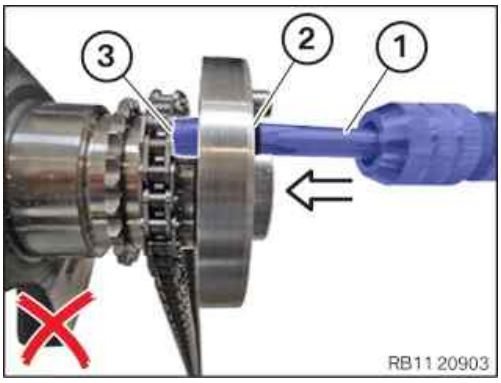
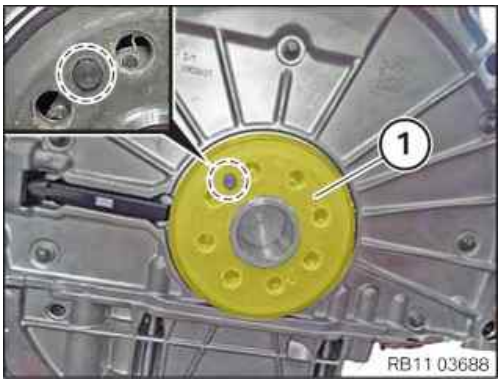


TECHNICAL INFORMATION

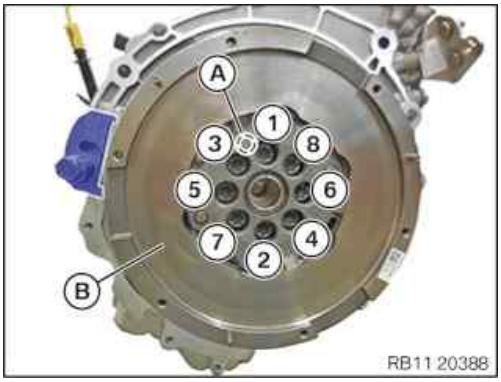
- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.



- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm

- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

29 – Install clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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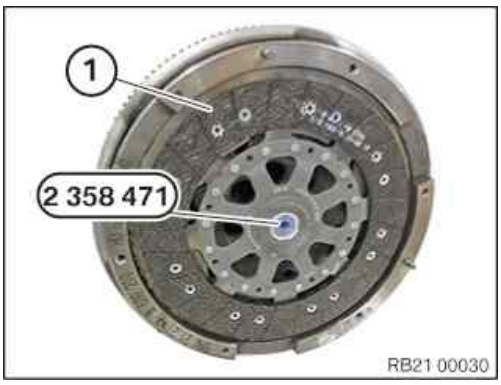
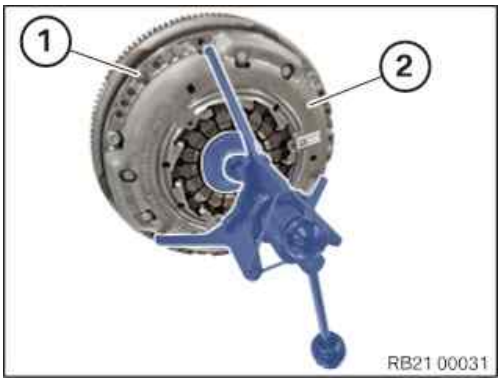
TECHNICAL INFORMATION

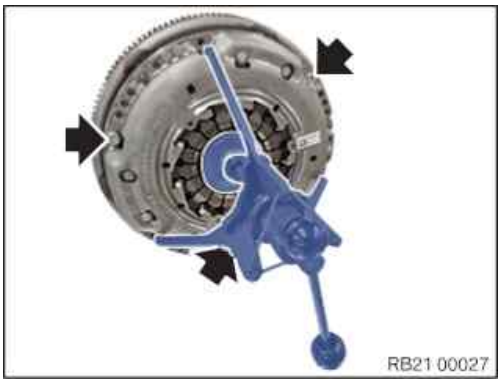
Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.



- Centre the clutch disc (1) using special tool **2 358 471**.



- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

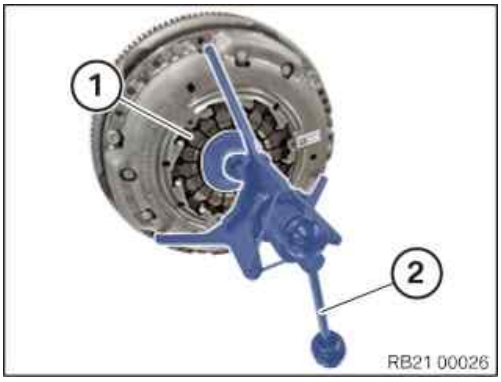


- Renew the bolts (arrows).

  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.

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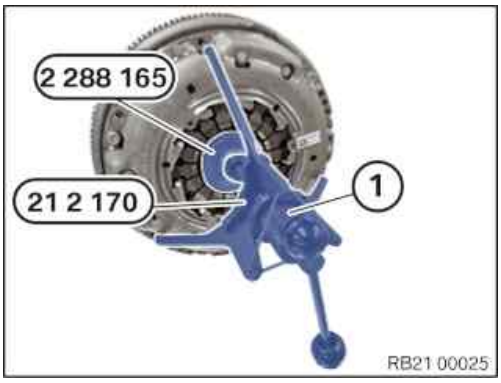
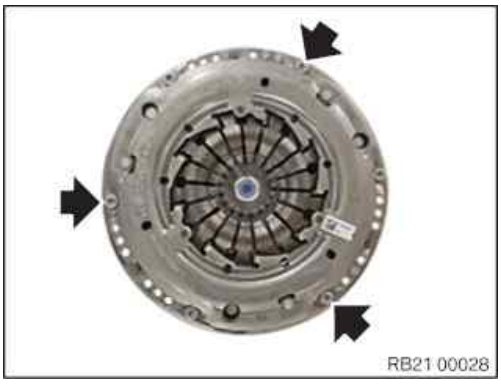


- Unscrew the knurled screw (1) and remove the special tool **0 493 839 (21 2 170)** with **2 288 165** from the clutch.



- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

- Withdraw special tool **2 358 471** from clutch disc with aid of accompanying screw.

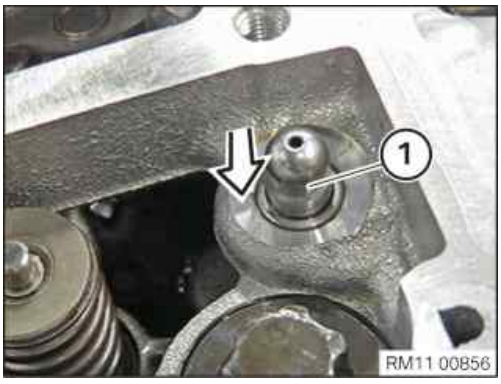
30 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

31 – Install the roller cam followers

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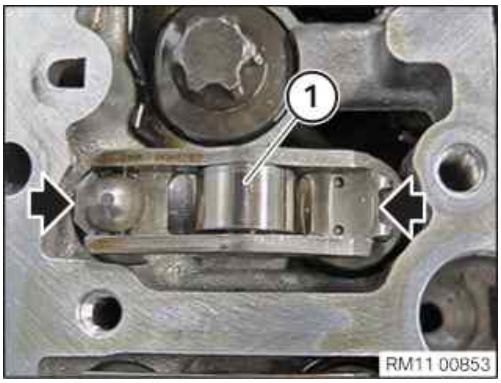
TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

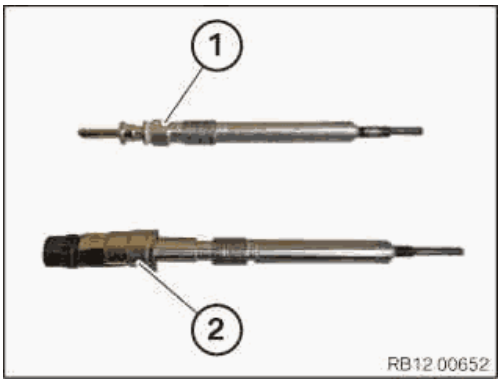


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

32 – Install glow elements

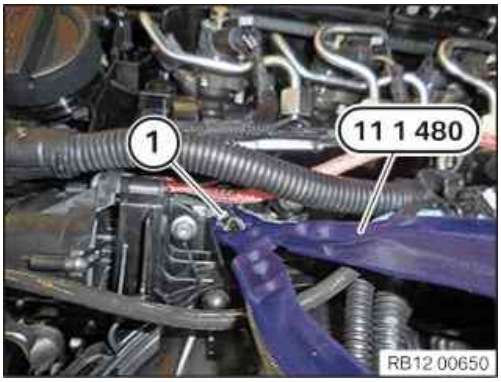


- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

33 – Installing the camshaft support

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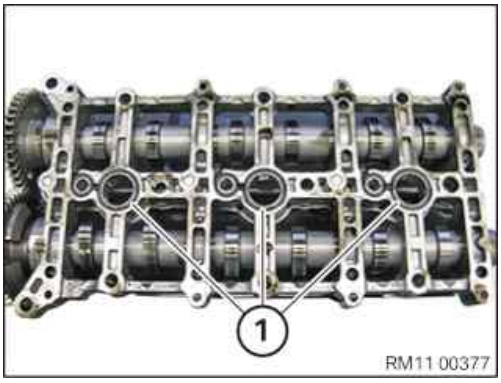
RISK OF DAMAGE

Damage of the engine and mounted parts.

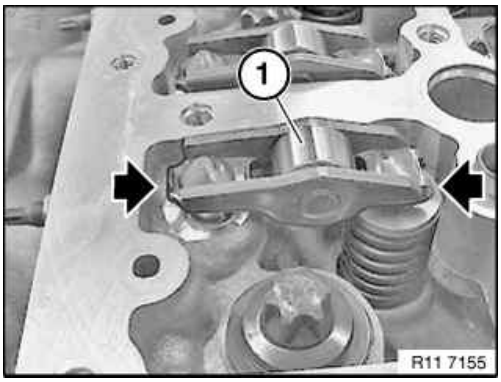
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

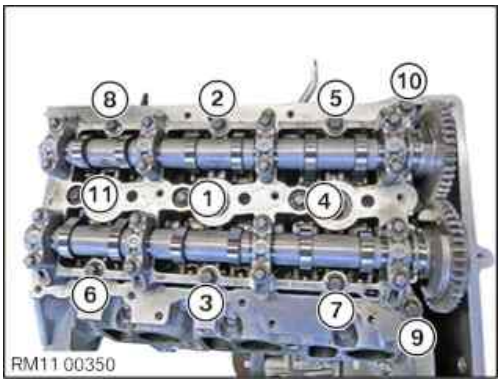


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

34 – Adjusting the timing of the camshafts

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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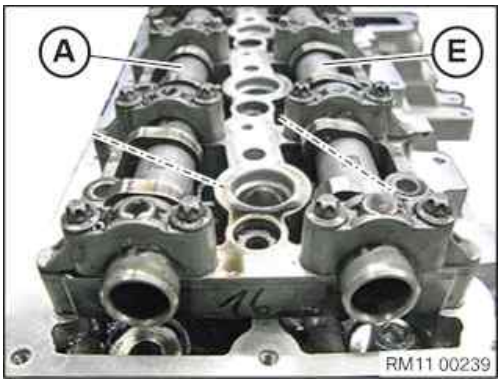
- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

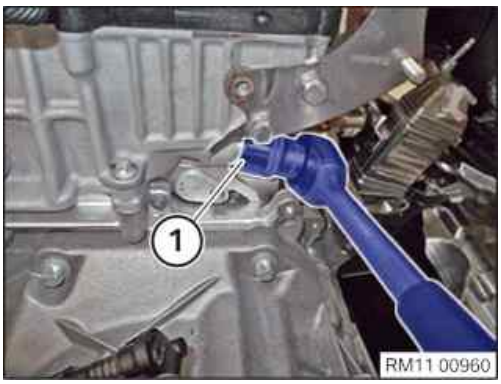
▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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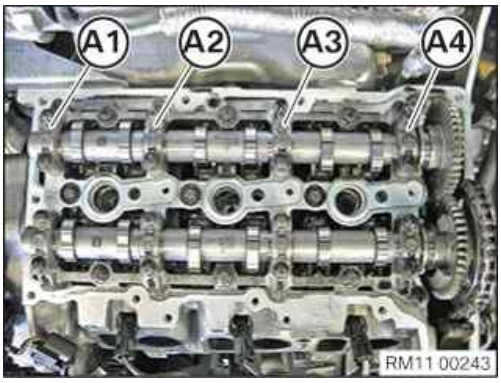
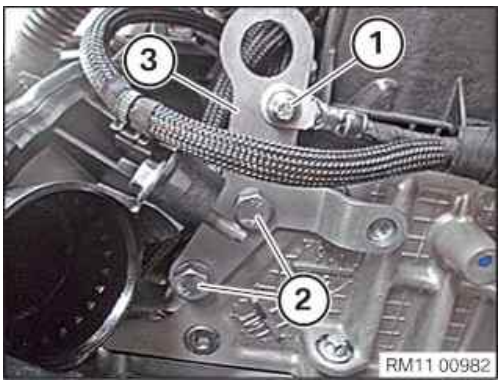


TECHNICAL INFORMATION

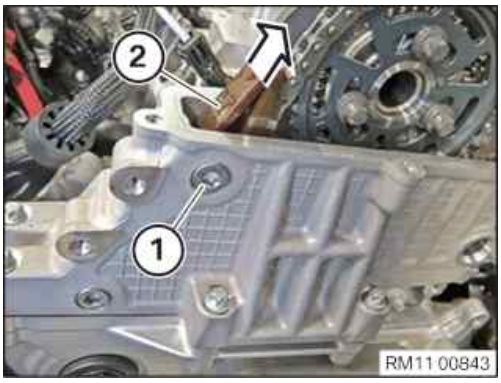
The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▸ Remove the timing chain guide rail

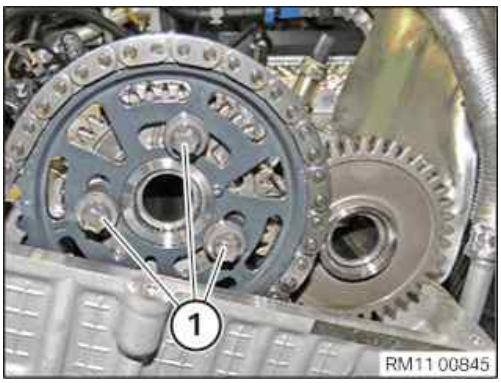


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▸ Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▸ Installing exhaust camshaft

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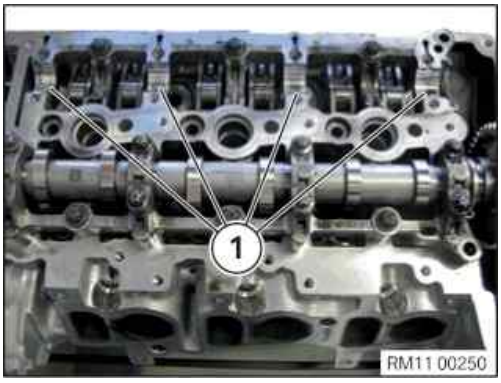
RISK OF DAMAGE

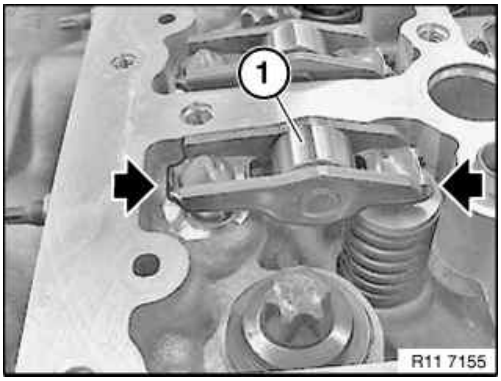
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

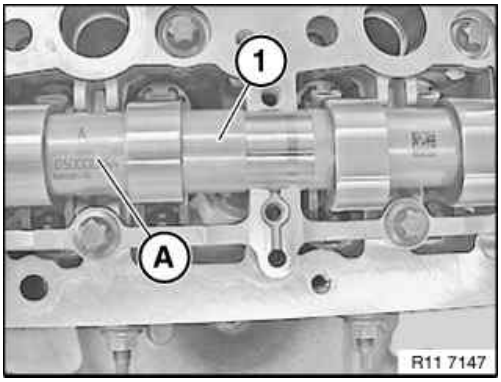
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



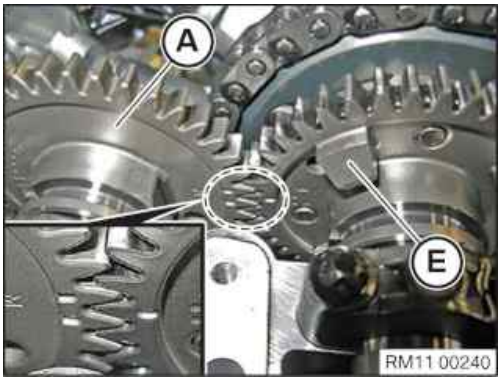
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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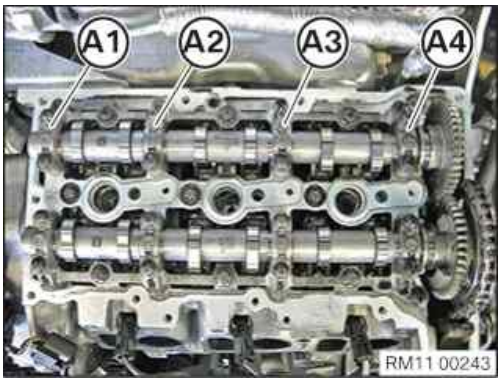


- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

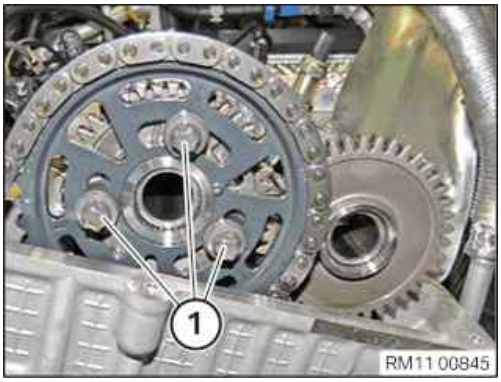
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

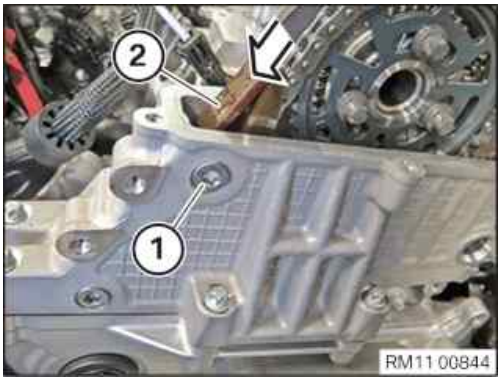
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



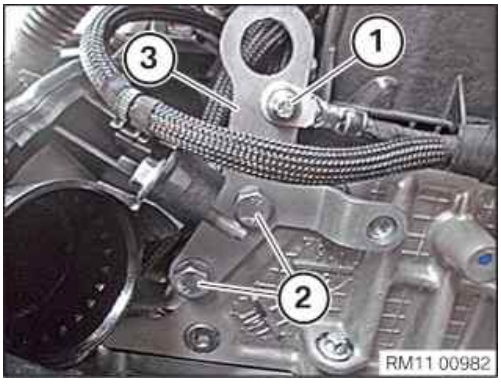
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

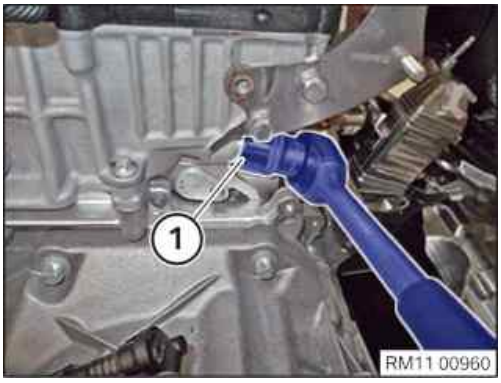
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

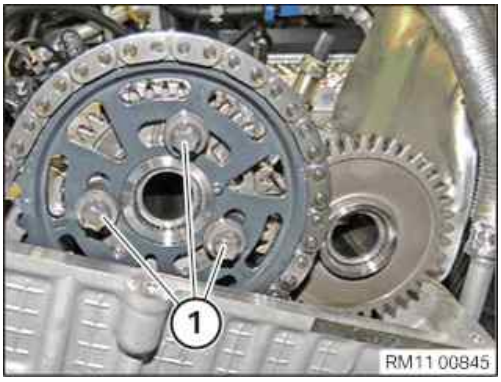


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

35 – Remove special tool to disconnect the crank shaft

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- Remove special tool **2 288 380**.

36 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

37 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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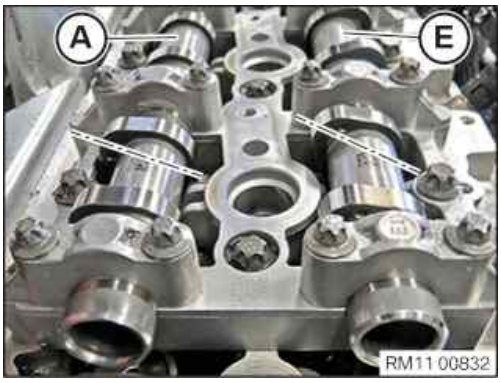
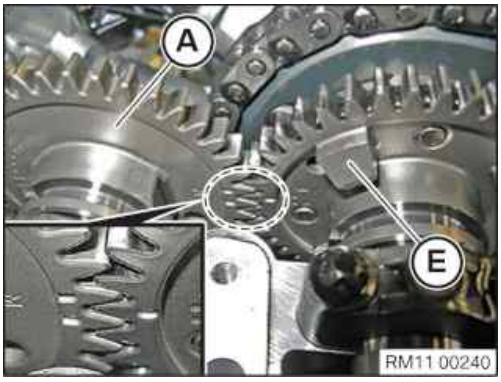


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

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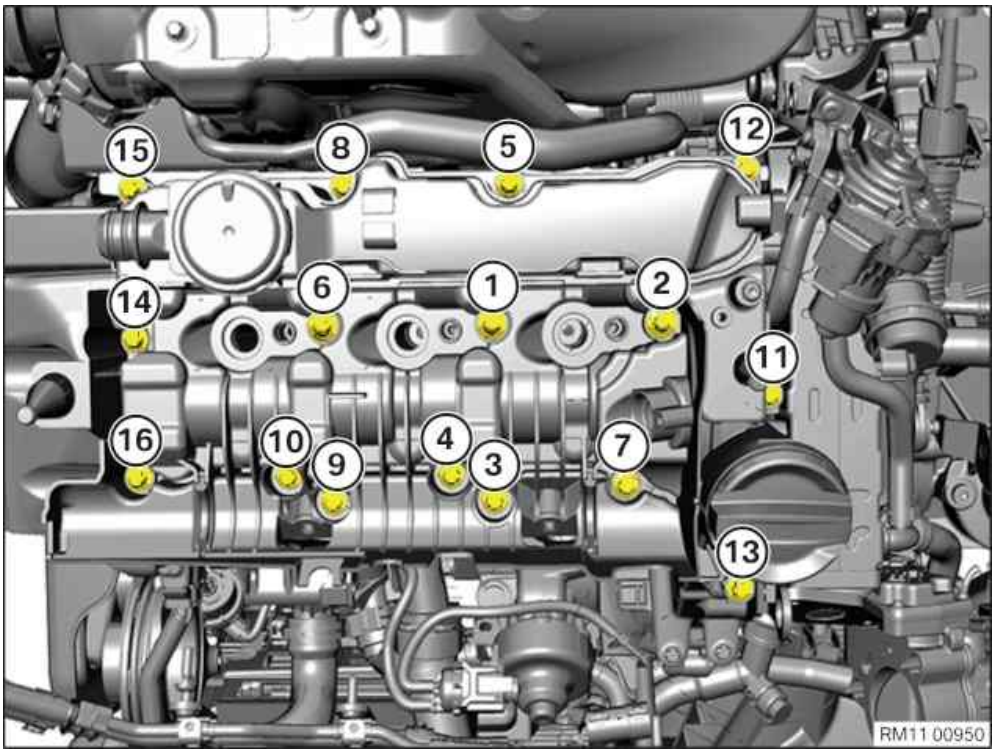
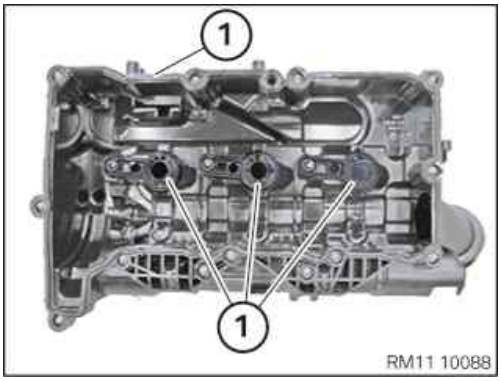
Overview: Screw connection of the cylinder head cover

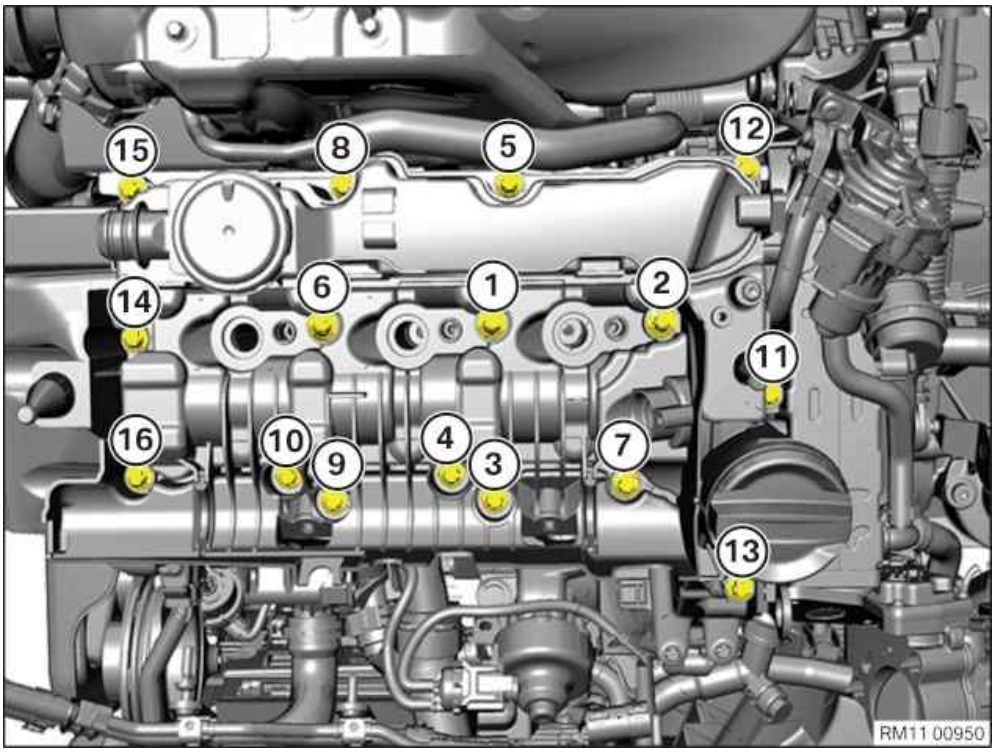


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nm

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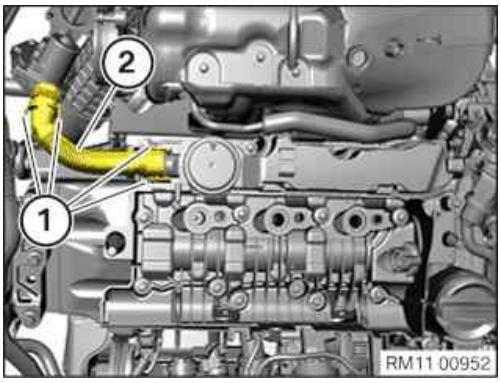


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

39 – Installing injectors of injection system

▶ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

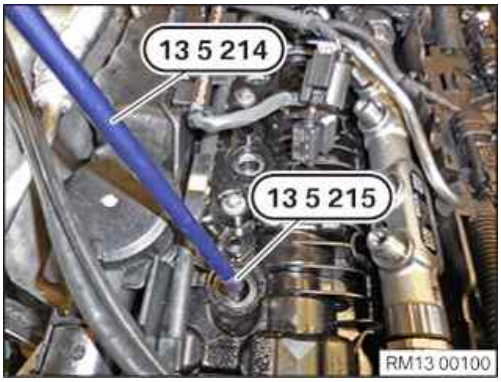
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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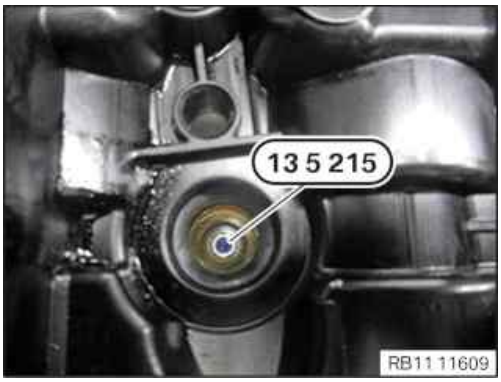
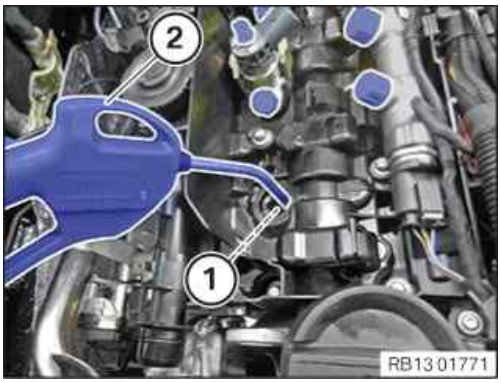


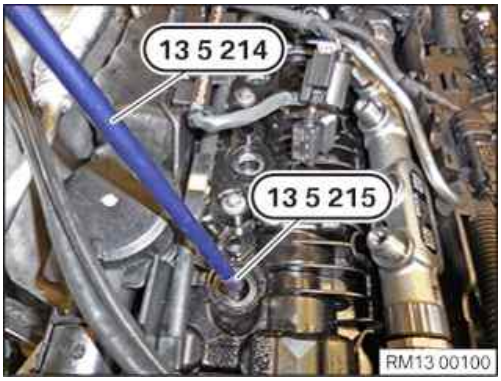
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

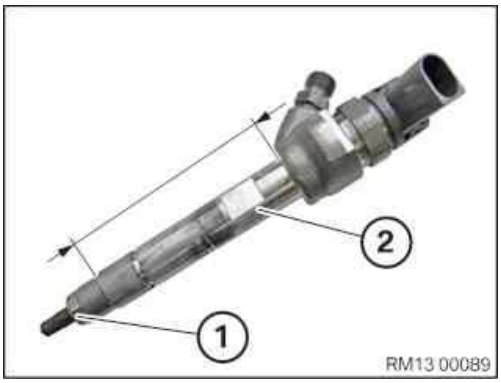
▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

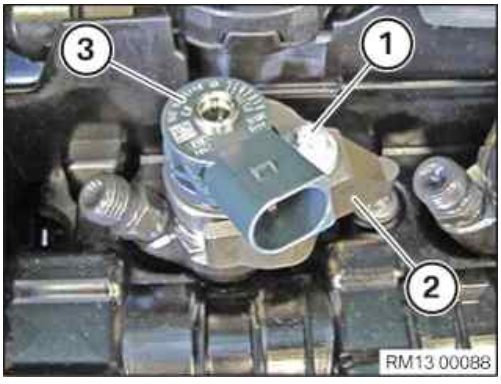


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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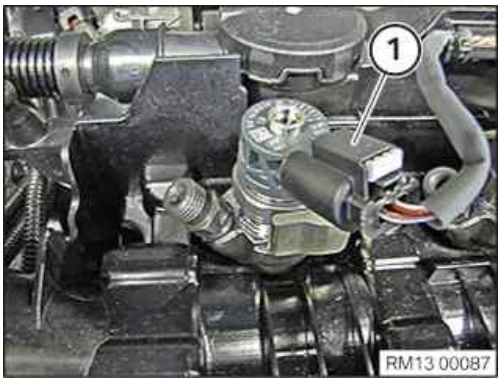


- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

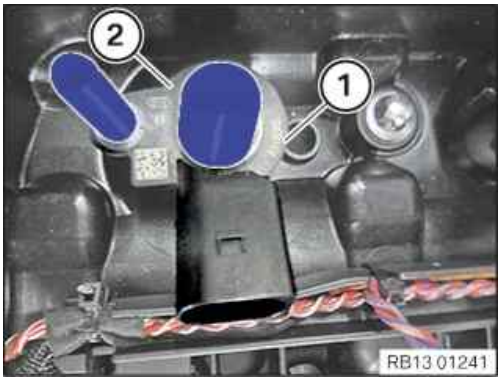
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

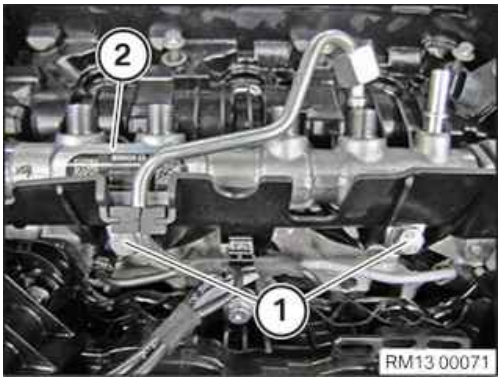
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

40 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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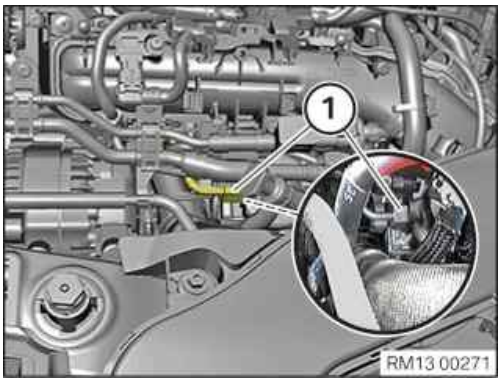


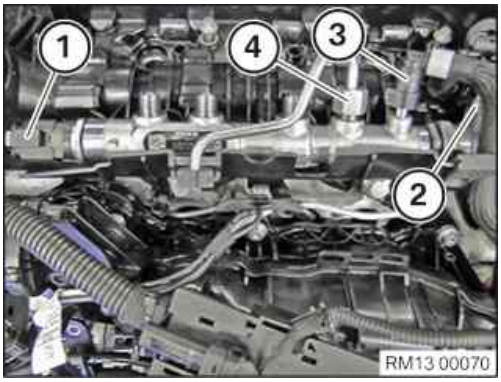
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

41 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

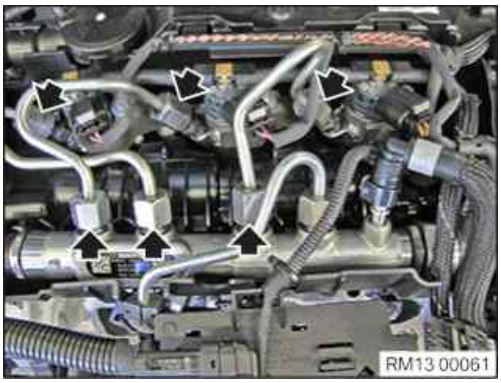
42 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

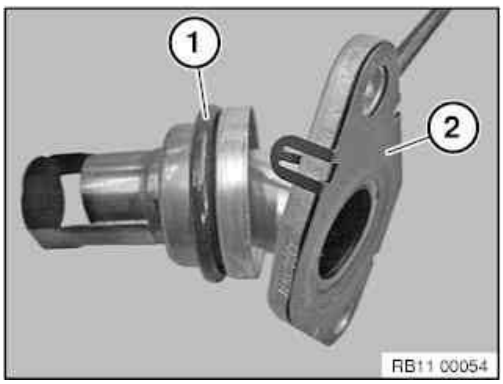
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

43 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

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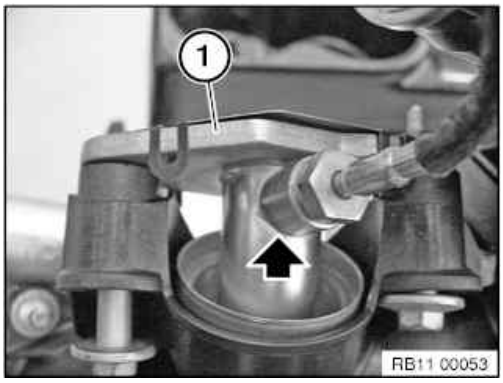
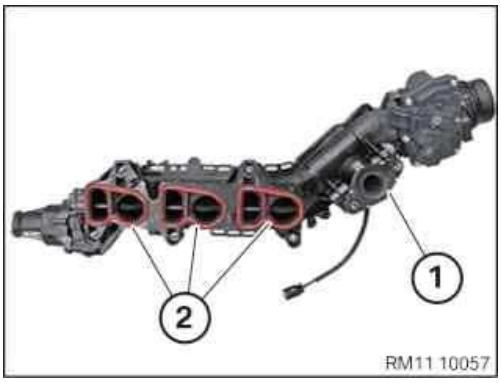
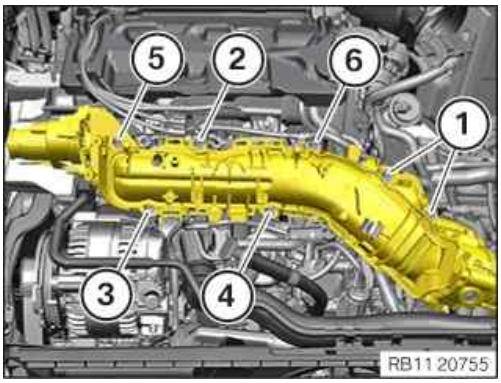


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

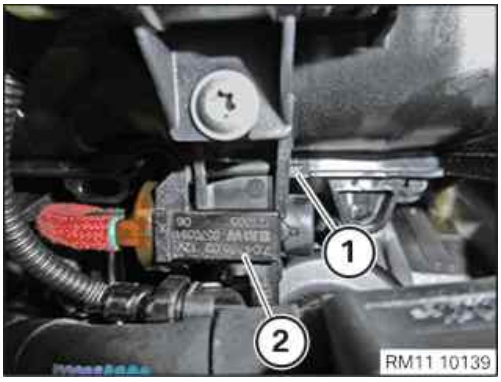
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



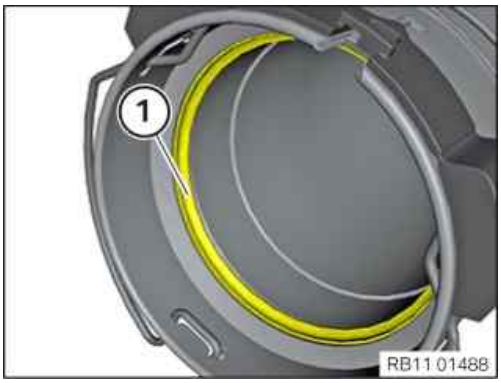
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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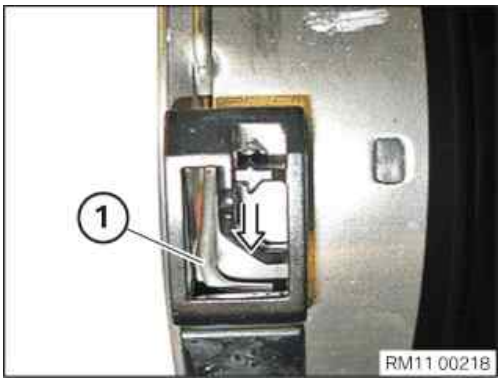
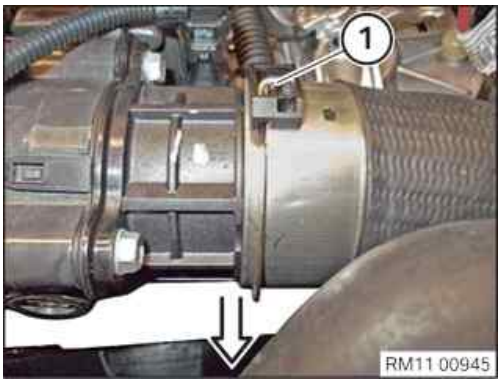


- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

44 – Remove the engine from the assembly stand

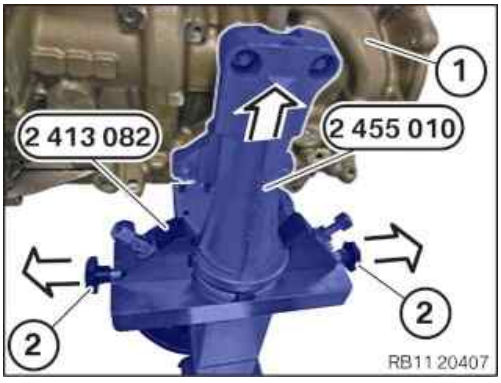
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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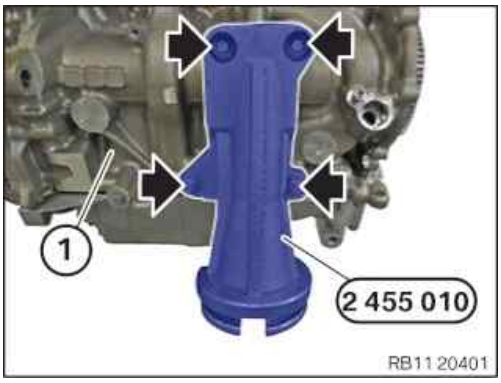
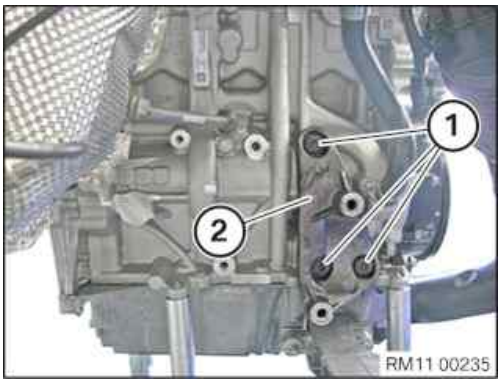


- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

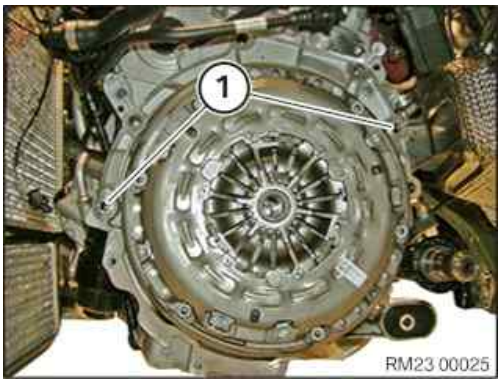
Holder to crankcase

M10		Tightening torque	38 Nm

45 – Mounting engine on manual gearbox

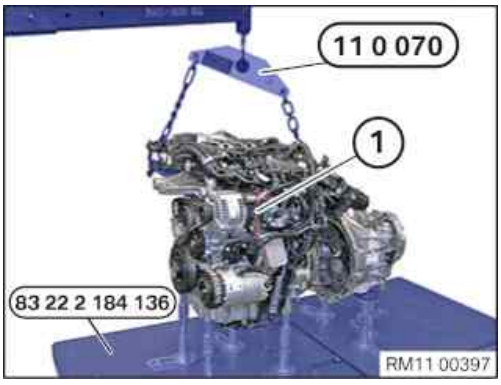
Prerequisite

Engine has been removed.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.



- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.

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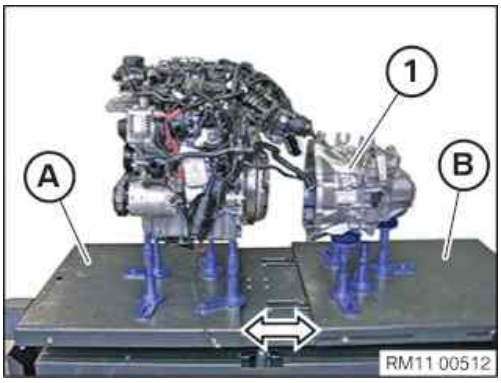
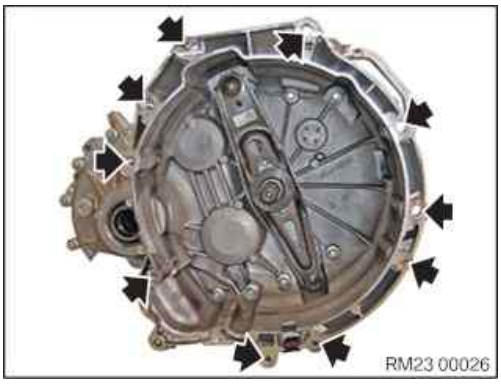


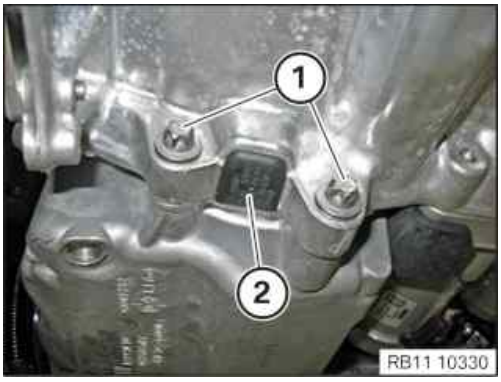
- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Tighten the screws (1).

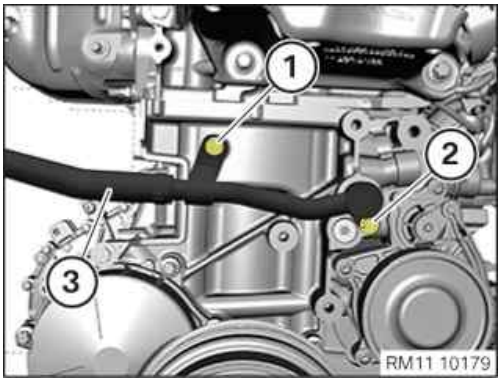
Transmission to oil sump

M8		Tightening torque	19 Nm

- Install the protective cap (2).

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

46 – Attaching assemblies (on lifting table)



- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm

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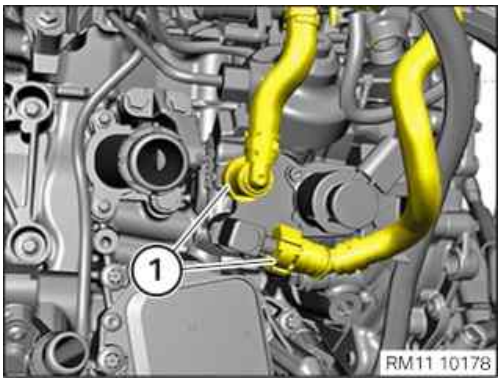


- Connect and lock fuel lines (1).

  The locks must engage audibly.

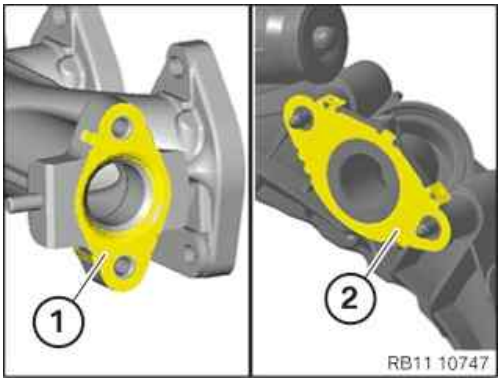
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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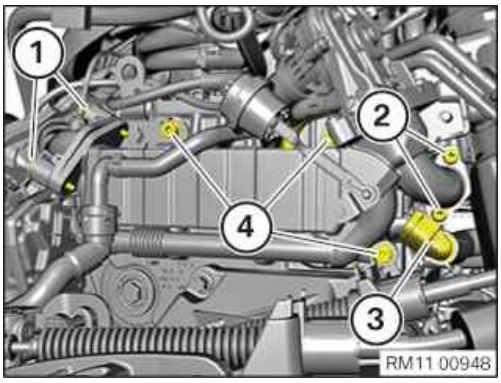


- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

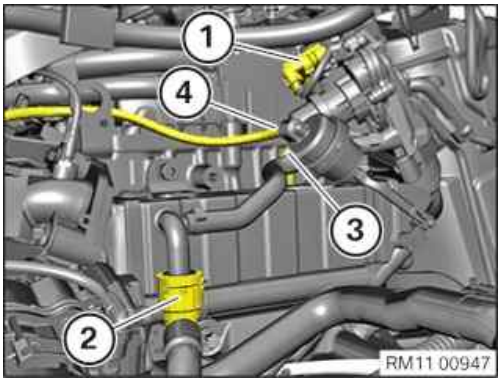
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

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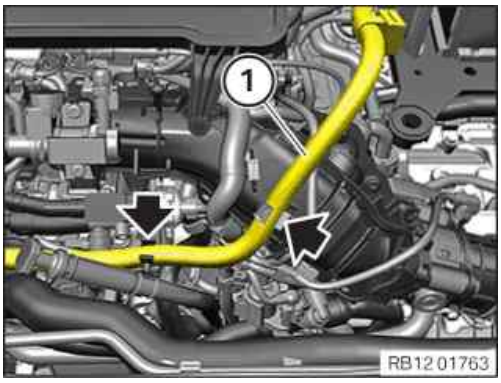


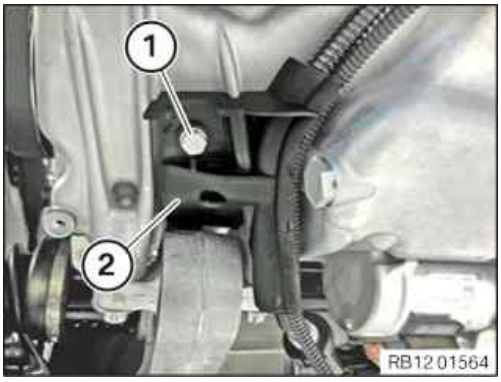
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

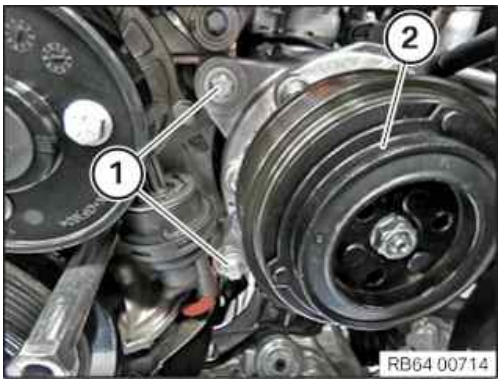
- Insert the positive battery cable (1) into the clamps (arrows).
- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

- Tighten the screws (1).

- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

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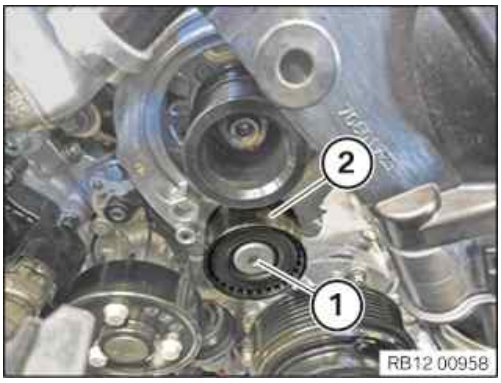
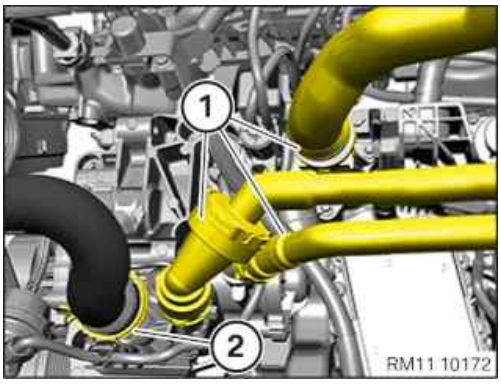


- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

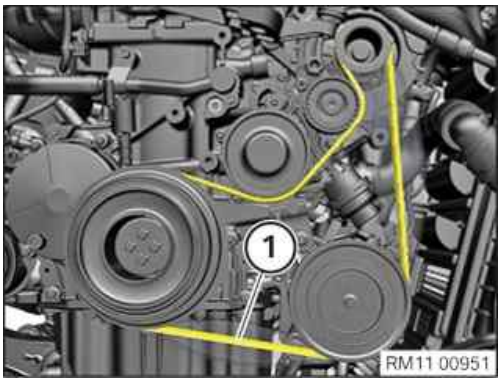
▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ Install the acoustic cover for the engine at the front

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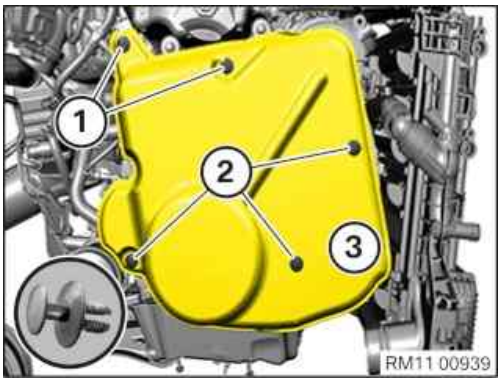
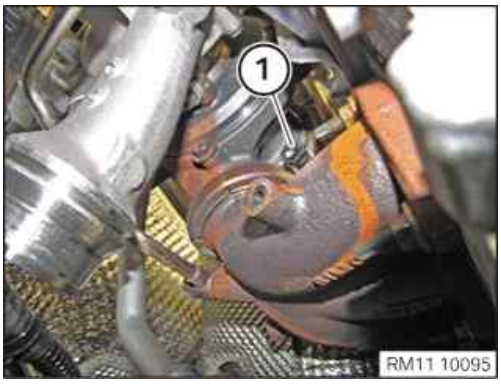


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

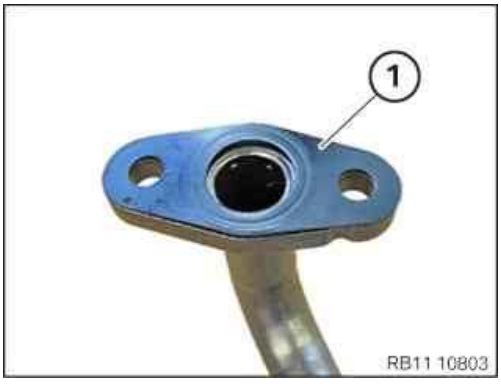
▸ **Installing the oil return line for the exhaust turbocharger**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

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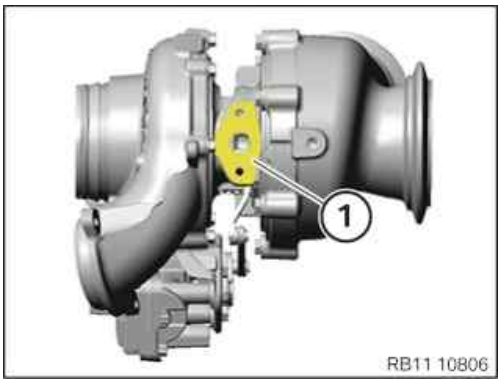
- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

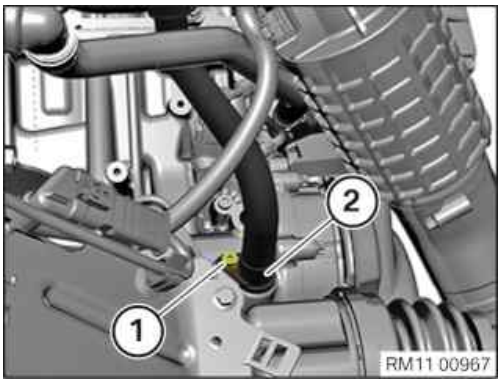
- Do not use any metal-cutting tools.

- Clean sealing surface.

- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm



- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

▸ **Install the oil feed line for the exhaust turbocharger**

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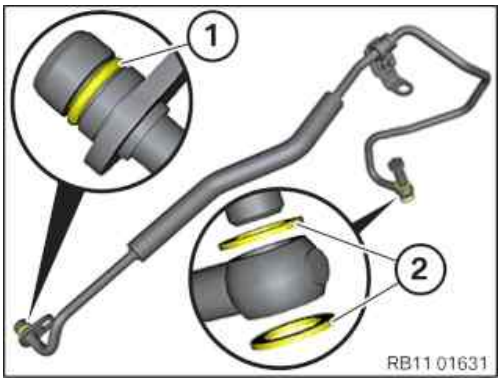
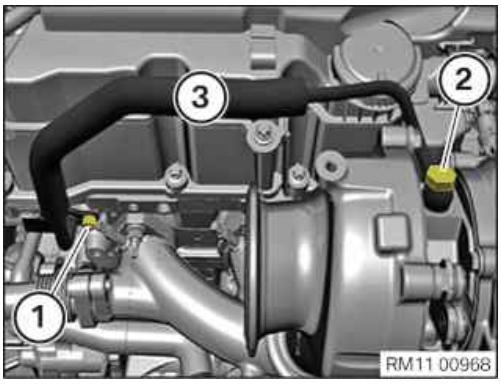


- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

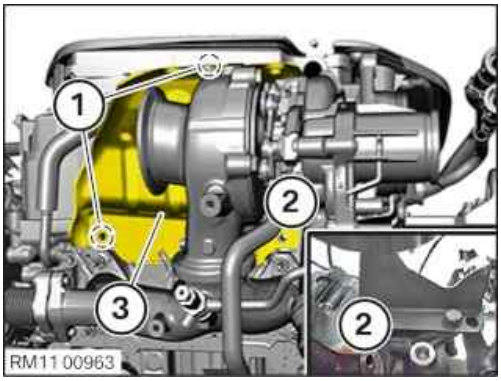
▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

▸ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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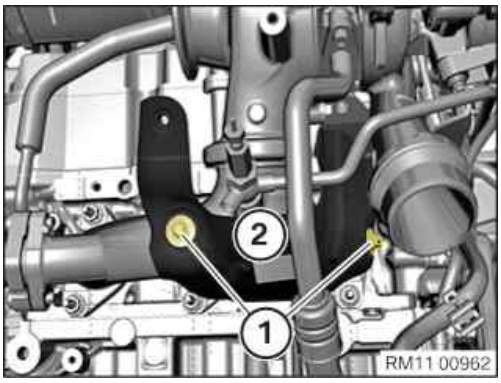


- Feed in and install the heat shield (2).
- Tighten the screws (1).

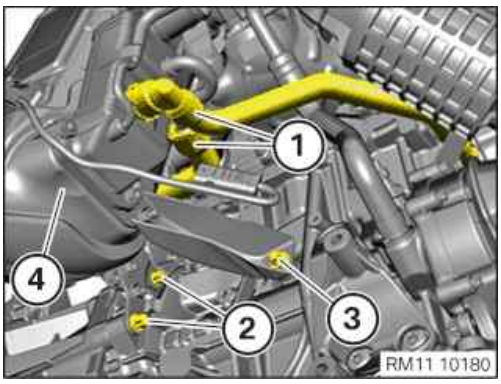
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

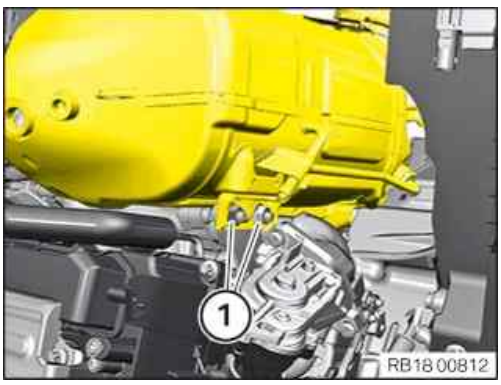
M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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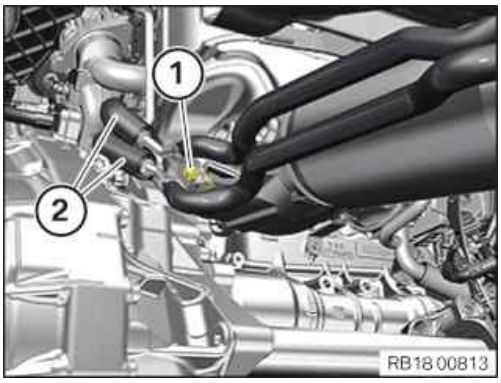


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

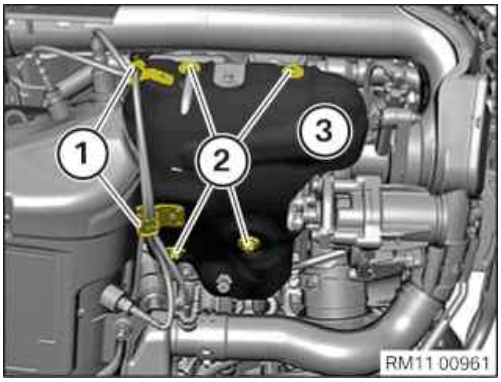
▶ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



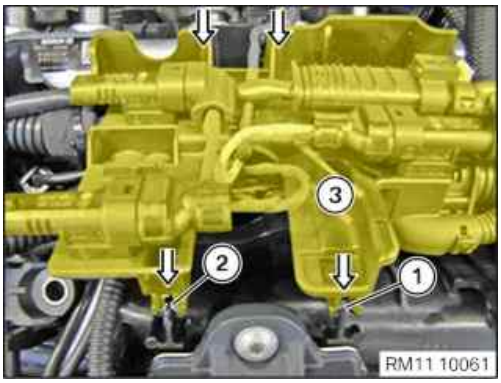
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

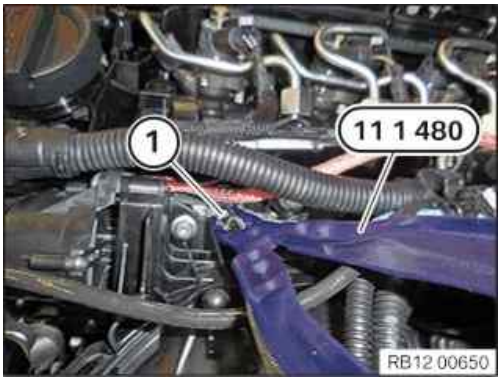
Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▶ **Installing the cable clip for the intake plenum**



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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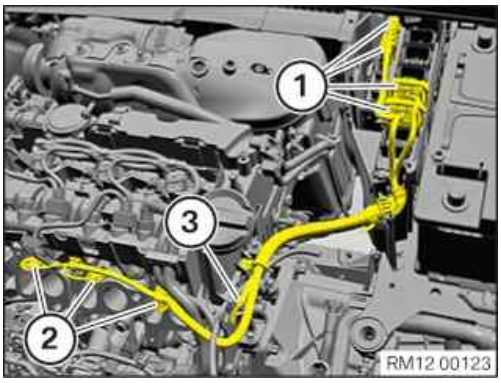
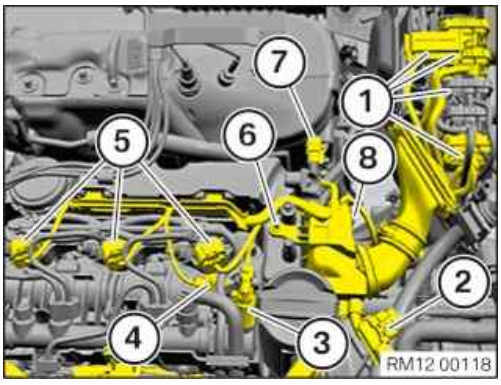


- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

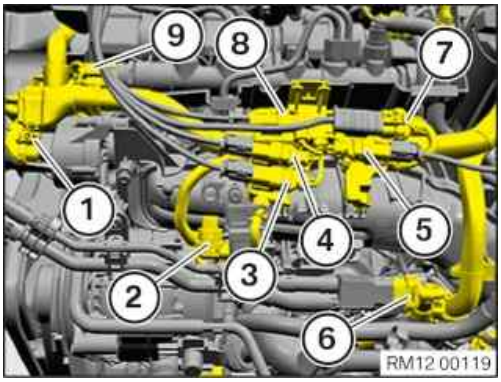


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

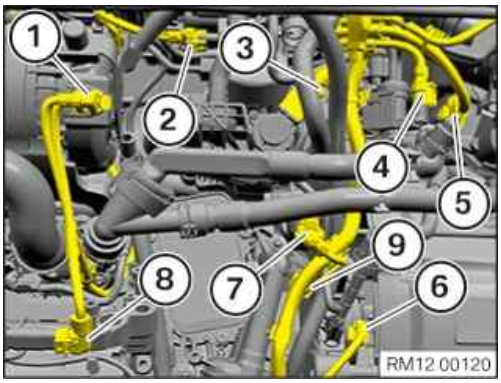
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.

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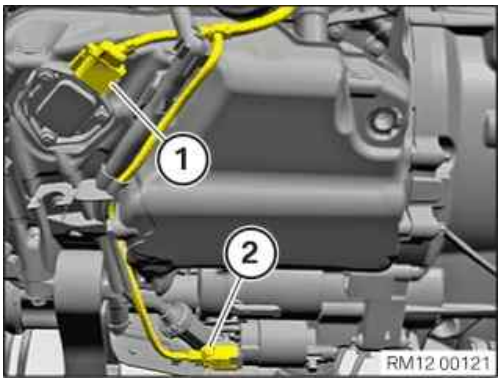
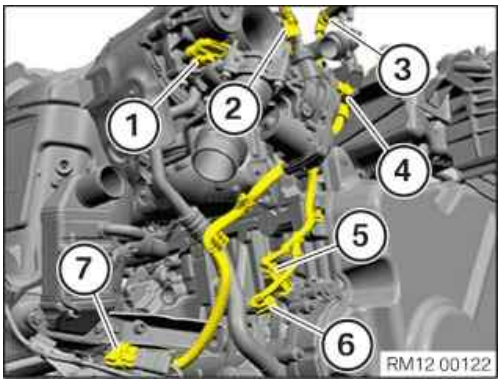
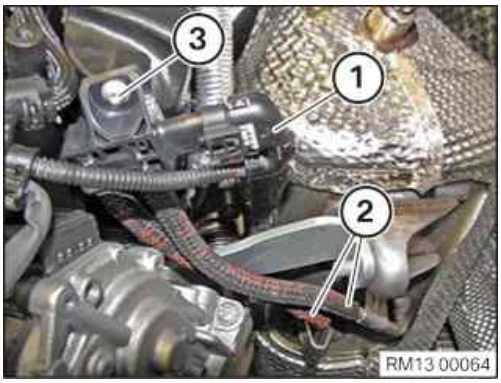


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

47 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

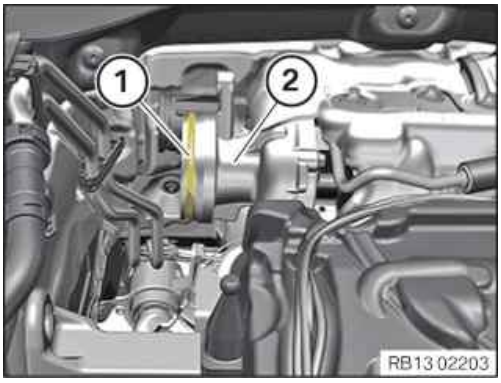
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

48 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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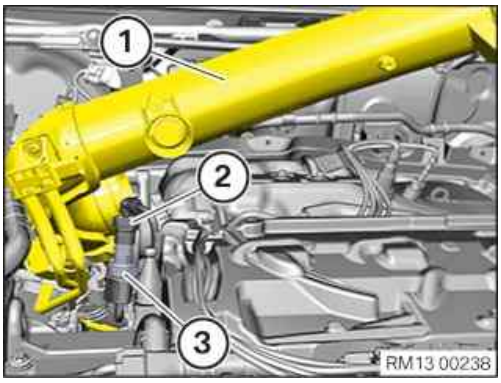


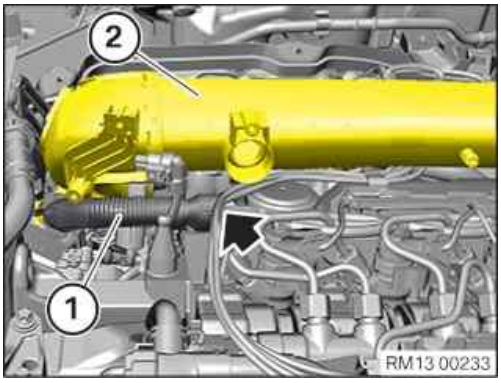
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

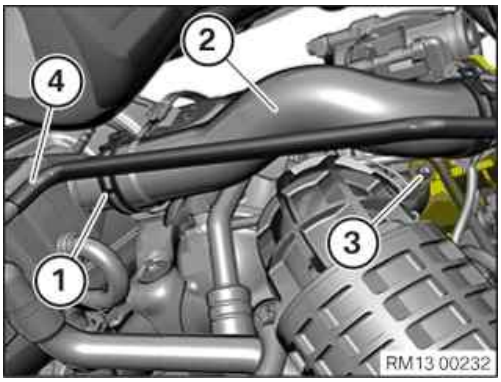
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

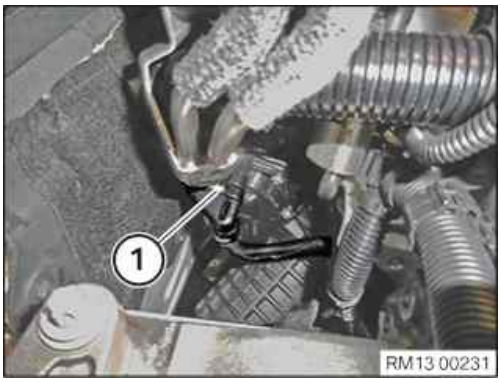
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.

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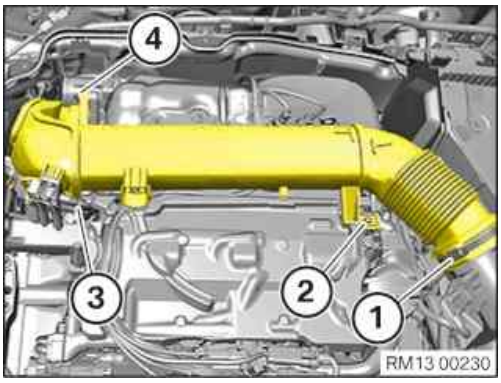


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

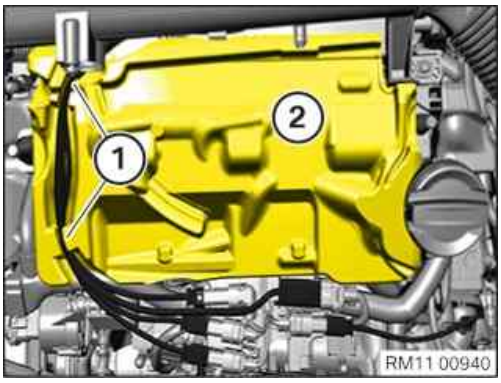
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

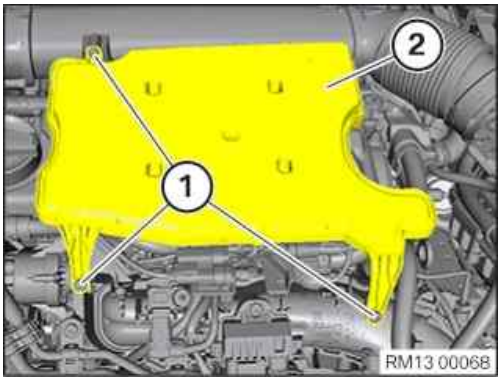
Clamp		Tightening torque	3 Nm

49 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

50 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

51 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

52 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 8

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 9

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 9

M14x35		Tightening torque	160 Nm

Rear timing case cover to crankcase

Used in step 27

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover

Used in step 27

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 27

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 27

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 27

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 27 45

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 27

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 28

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel

Used in step 29

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Glow elements to cylinder head

Used in step 32

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 33

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 34

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 34

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 34

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 34 46

M6			8 Nm

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Chain tensioner piston to cylinder head

Used in step 34

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 34

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 38

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 39

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 39

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 40

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 40

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 42

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 43

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 44 46

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 45 46

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 46

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 46

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 46

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 46

M8x20		Tightening torque	19 Nm

Bracket to oil sump

Used in step 46

M6		Tightening torque	8 Nm

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Air conditioning compressor in component carrier — Used in step 46

M10		Tightening torque	38 Nm

Alternator to component carrier — Used in step 46

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner — Used in step 46

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold — Used in step 46

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase — Used in step 46

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger — Used in step 46

M6x12		Tightening torque	8 Nm

Oil return line to crankcase — Used in step 46

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head — Used in step 46

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger — Used in step 46

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger — Used in step 46

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 46

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder — Used in step 46

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 46

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter — Used in step 46

Torx bolt BM6x16		Tightening torque	8 Nm

Ground cable to cylinder head — Used in step 46

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 46

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 47

Screw		Tightening torque	4 Nm

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Clamp for the pressure hose on the differential pressure sensor — Used in step 47 48

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor — Used in step 48

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 48

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 48

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 48

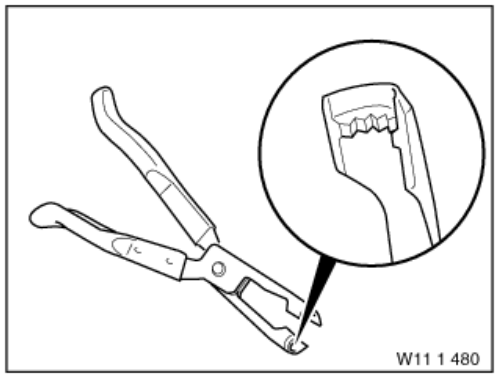
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 50

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder

Common — Used in step 8 45

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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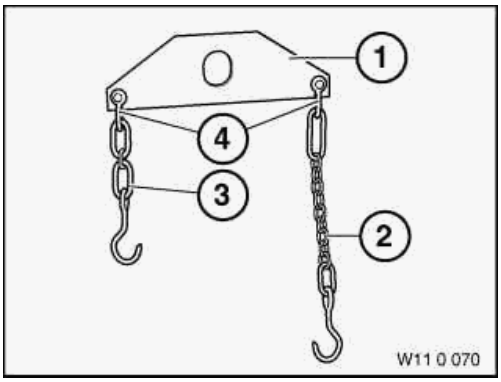
0 490 579 (11 0 070) Lifting gear



Common

Used in step 8 9 44 45

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

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2 455 010 Engine support

Common Used in step 9 44

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 9

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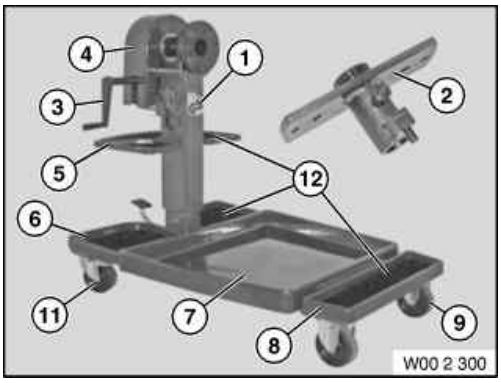

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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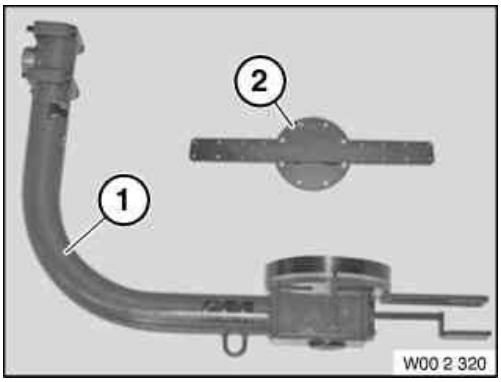
0 495 196 (00 2 320) Support arm



Common

Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common

Used in step 11 14 40 42

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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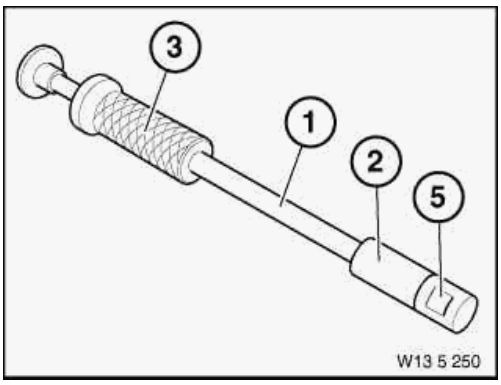
2 413 106 Fastener

Common

Used in step 11 42

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common

Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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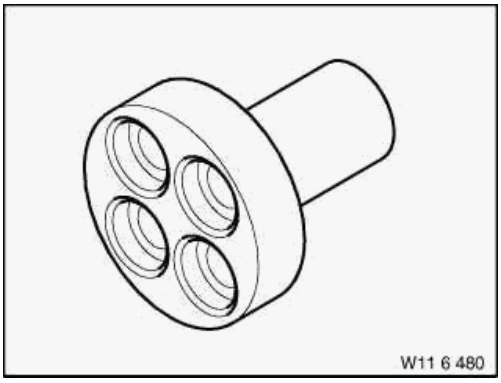
0 493 339 (13 5 252) Bush

Common	Used in step 13
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common	Used in step 13
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 16 34 37
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 288 380 Locating stud

Common Used in step 16 34 35 37

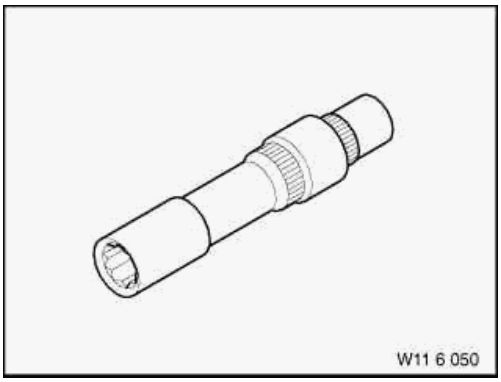
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common Used in step 16 34 36 37

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 21 32

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

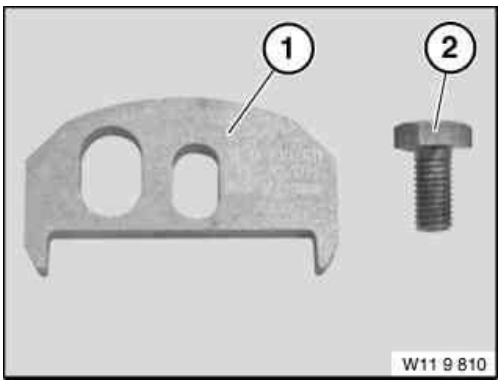
Common Used in step 22 23 34

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 171 (11 9 811) Holder



Common Used in step 24 25 28

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

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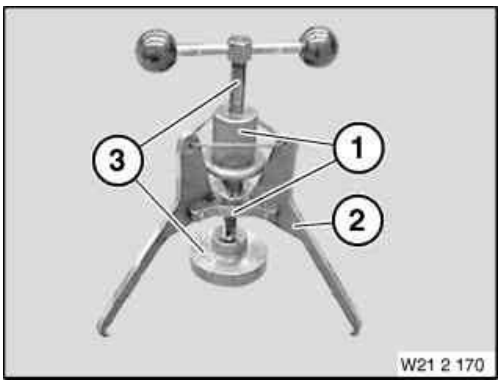
0 494 793 (11 9 265) Bush

Common Used in step 24 25 28

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

0 493 839 (21 2 170) Device



Common Used in step 24 29

Usage	(tensioning device) For resetting adjusting ring and installing self-adjusting clutch on flywheel without tension.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 00 (622)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 558 (21 2 171)		**Basic body** (Basic body) Basic body with adjusting spindle Deletion, only available via tool set	
2	0 494 559 (21 2 172)		**Claw** (Clamping claw (1 piece)) Available as part of complete tool set 0493839 only.	
3	0 494 560 (21 2 173)		**Spindle** (Pressure spindle with washer) Available as part of complete tool set 0493839 only.	

2 288 165 Synchronising key

Common Used in step 24 29

Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

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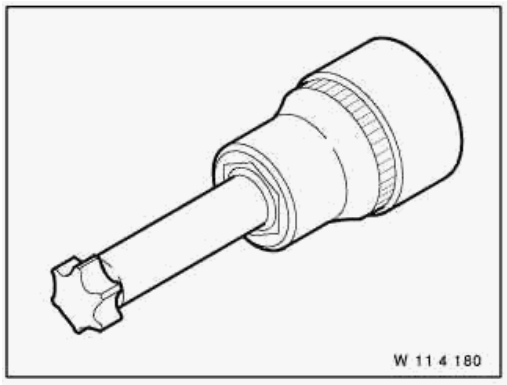
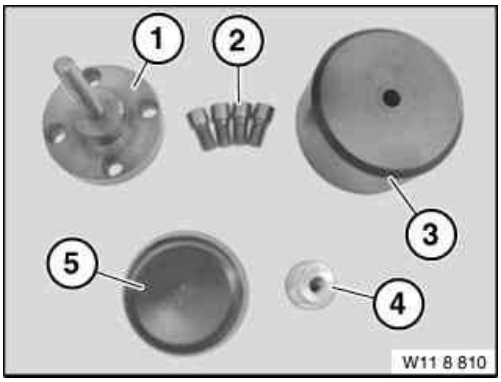
0 491 018 (11 4 180) Socket WAF 46



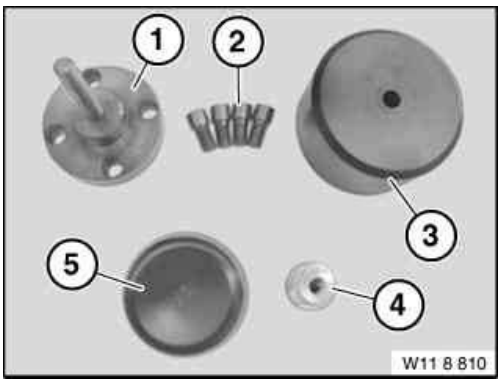
Common	Used in step 25 28
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

0 496 137 (11 8 815) Holding sleeve



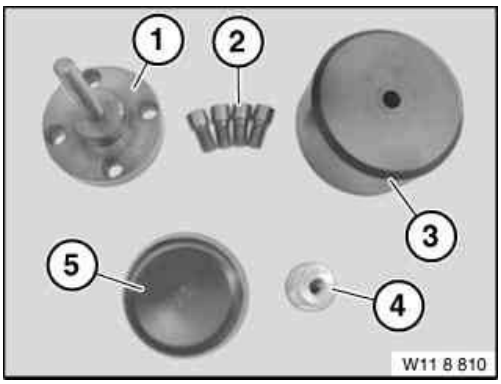
Common	Used in step 27
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body



Common	Used in step 27
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 27
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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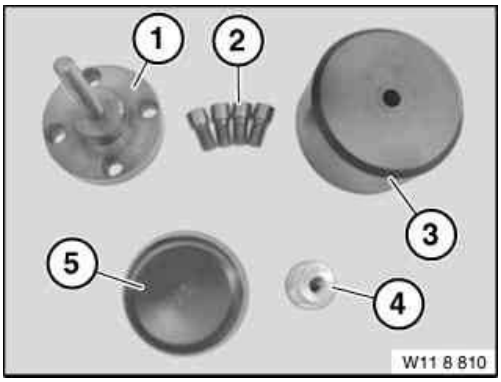
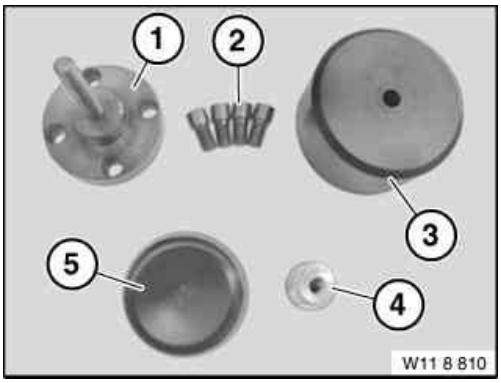
0 496 135 (11 8 813) Holding sleeve



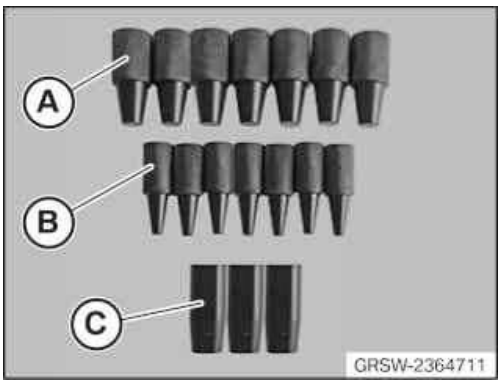
Common	Used in step 27
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut



Common	Used in step 27
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common	Used in step 27
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common	Used in step 27
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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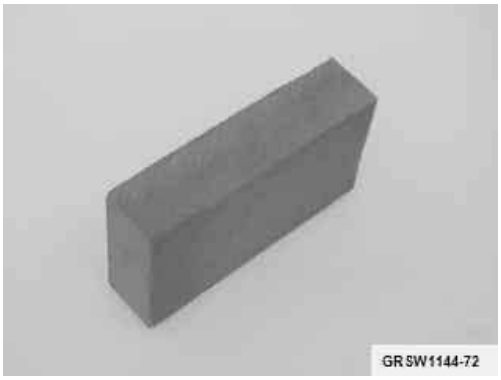
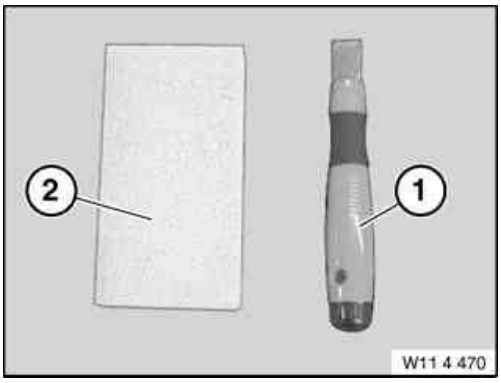
0 495 104 (11 4 472) Extractor



Common Used in step 27

Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 102 (11 4 470) Tool



Common Used in step 27

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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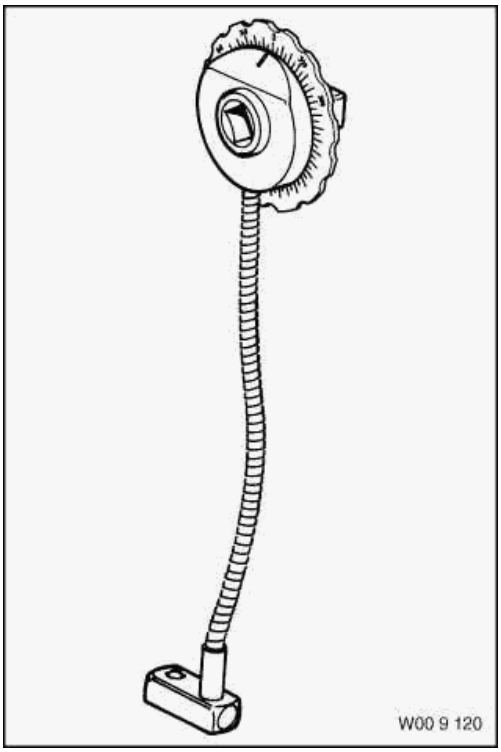
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 27

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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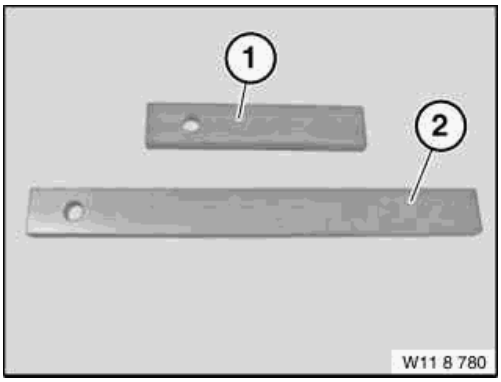
0 496 120 (11 8 780) Plate



Common Used in step 27

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set

Common Used in step 28

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

2 358 471 Clutch tool

Common Used in step 29

Usage	For installation of coupling drive plate.. (Getrag transmission) . Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A55
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

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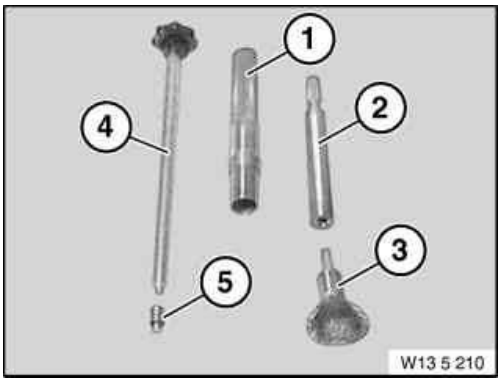
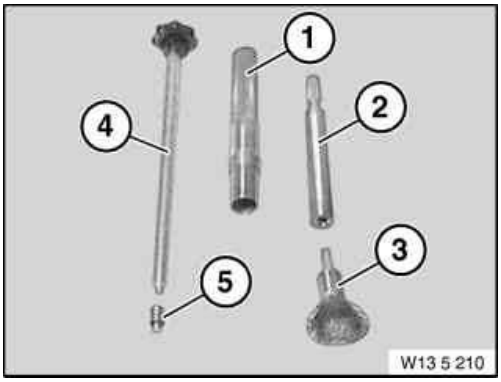
0 493 763 (13 5 215) Plug



Common Used in step 39

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common Used in step 39

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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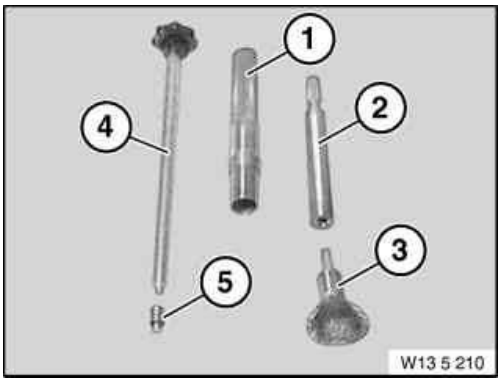
0 493 758 (13 5 210) Tool

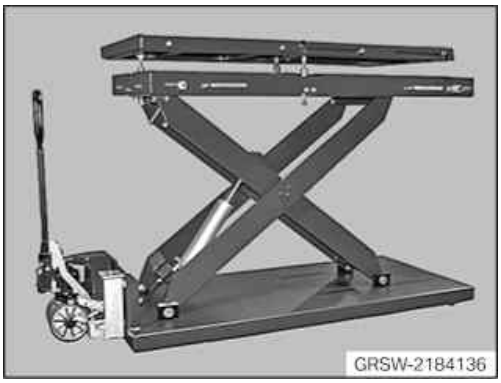


Common		Used in step 39
Usage	(Cleaning set) For injector channels	
Included in the tool or work		
Storage location	B4	
Replaced by		
In connection with		
SI-Number	01 05 00 (574)	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common		Used in step 45
Usage	Table lift MHT 1200	
Included in the tool or work		
Storage location		
Replaced by		
In connection with		
SI-Number	06 01 10 (649)	

Replacement tools:

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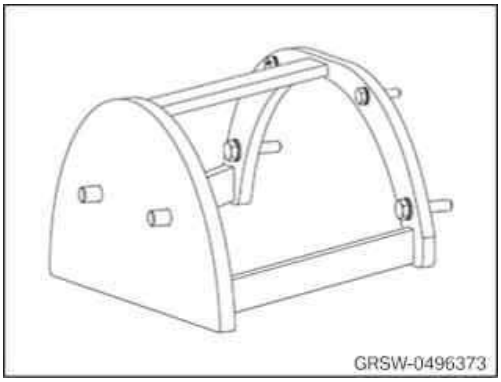
2 299 563 Adapter

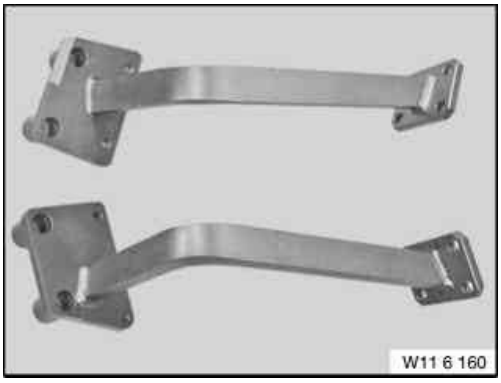
Common	Used in step 9
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 373 (11 5 420) Plate



Common	Used in step 9
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 9
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 28
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 46
EGR controller	7 46

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	27

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52

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11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
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11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
31 10 001 Completely removing and installing front axle with engine and transmission	1 52
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
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11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Removing and installing the engine (manual gearbox)	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine	1 52
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11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine \PREMIUM	1 52
11 00 050 Removing and installing/replacing engine (N63)	1 52
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 52
11 00 050 Remove and install engine	1 52
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21 27
61 35 ... Notes on ESD protection (Electro Static Discharge)	27

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	34
Exhaust-gas recirculation cooler seal on exhaust manifold	46
Exhaust-gas recirculation cooler seal on intake plenum	46

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This documentation refers to special tools that were not yet available when going to press.

11 14 110 Removing and installing/sealing or replacing bottom timing case cover

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator

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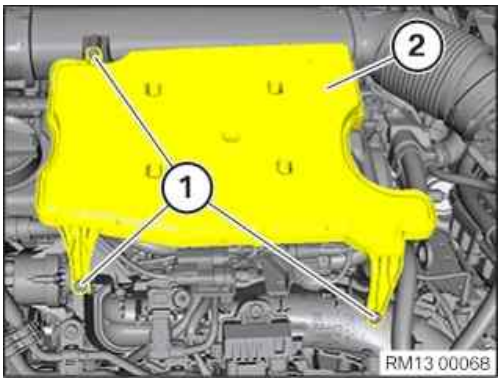
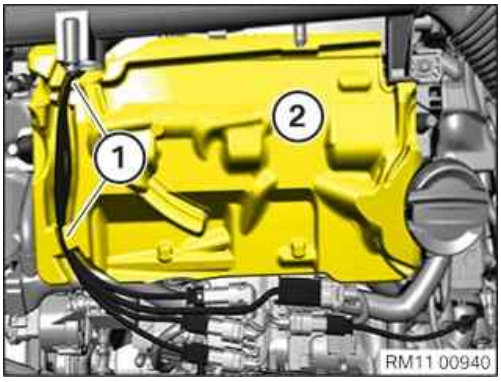


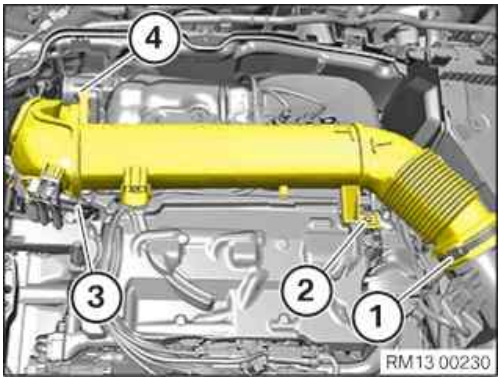
- Loosen screws (1).
- Guide out and remove the resonator (2).

4 – Remove the acoustic cover for the injectors

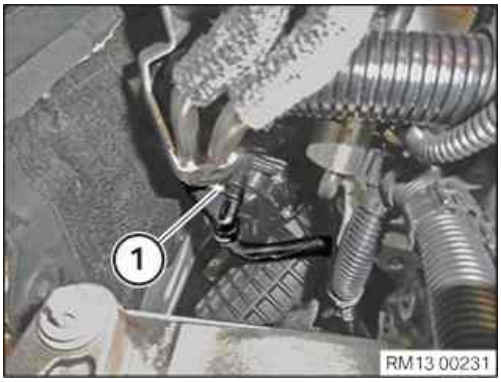


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

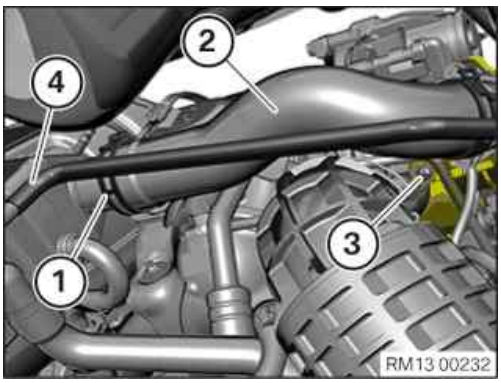
5 – Removing clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.

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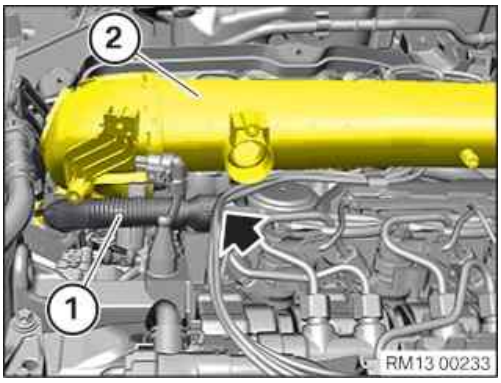
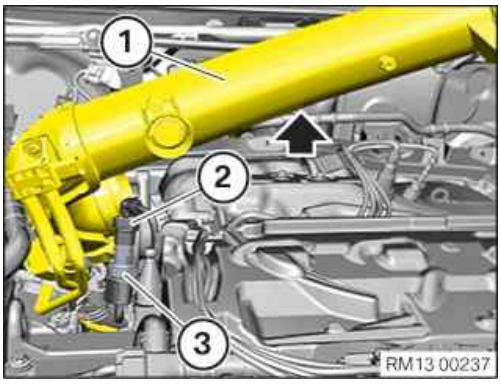


- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).



- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

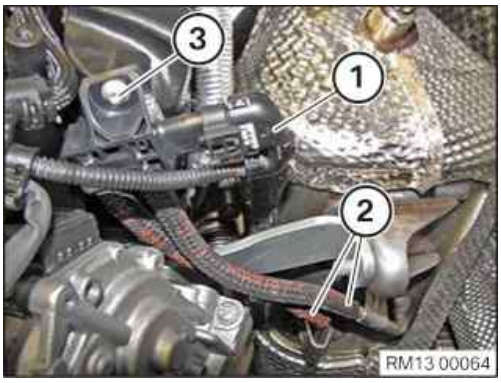
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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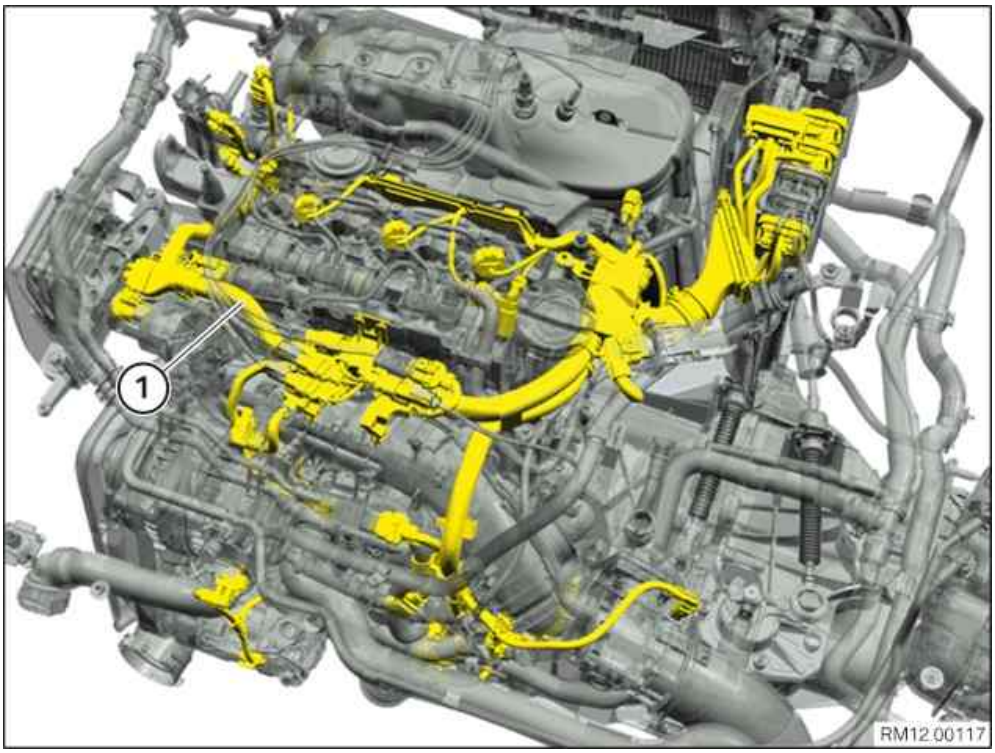
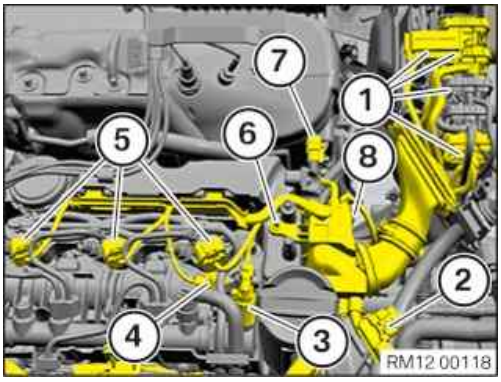
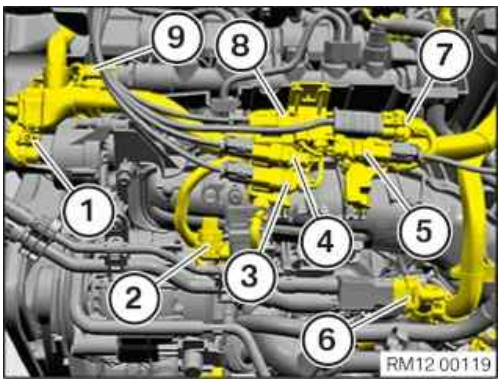
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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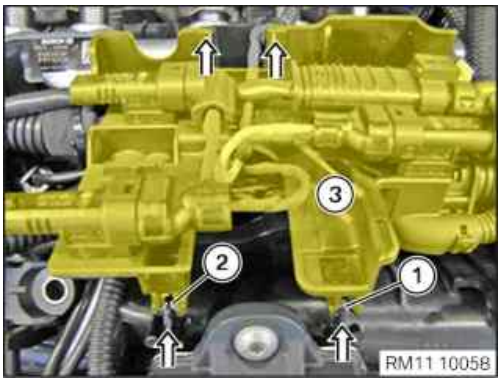
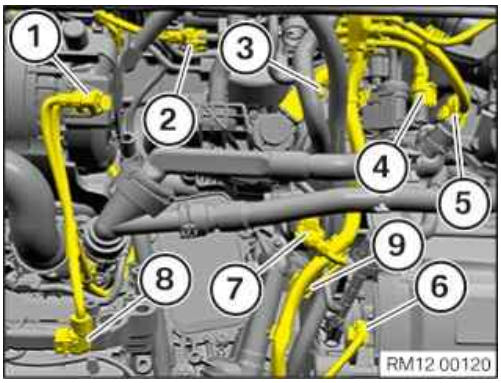
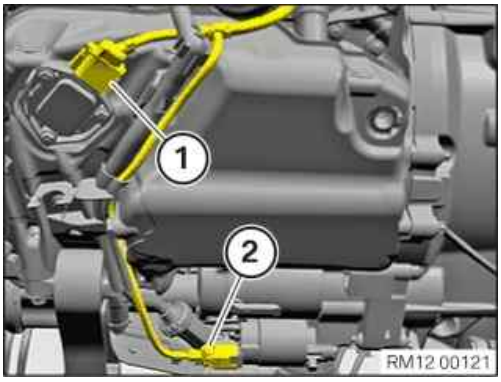


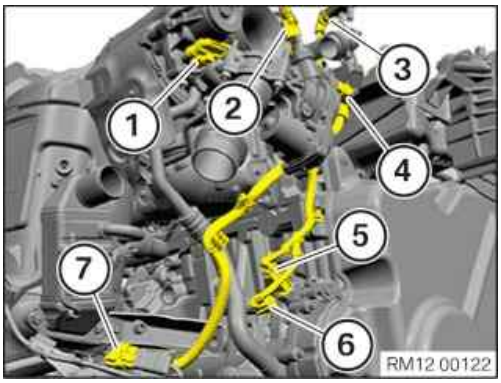
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



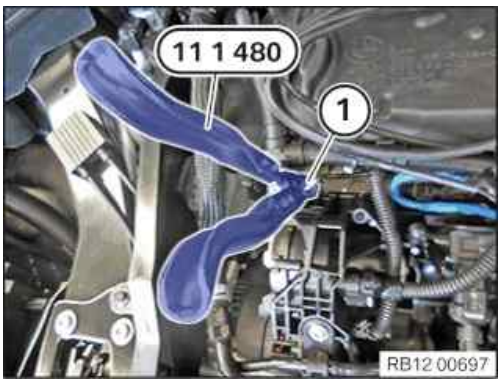
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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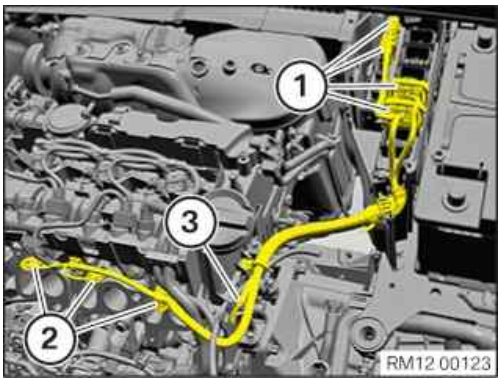


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

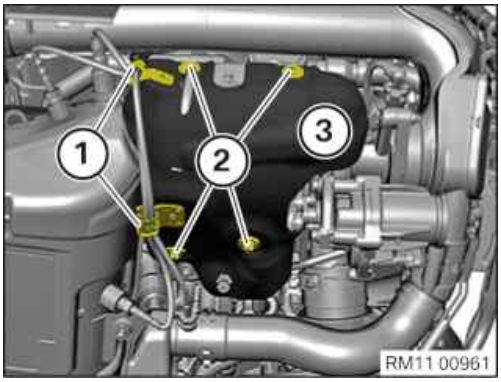
▶ Removing heat shield from top exhaust turbocharger

WARNING

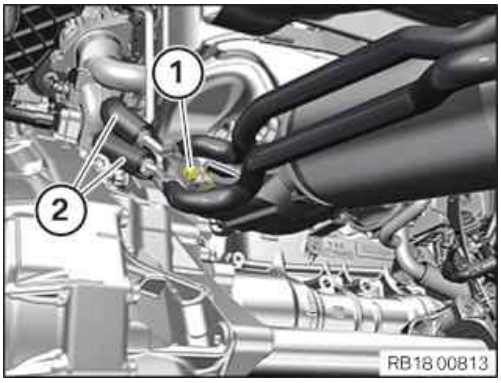
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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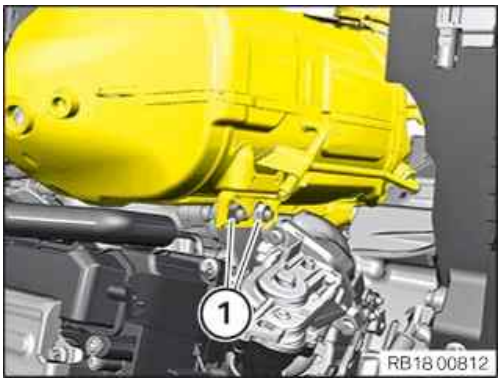
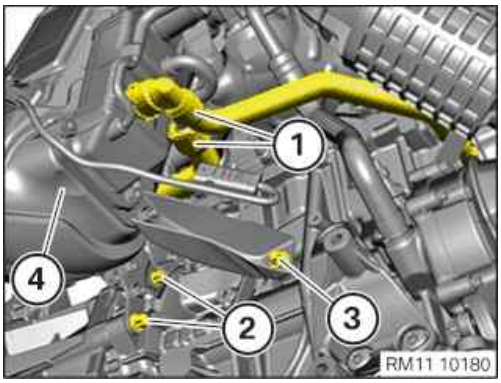


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

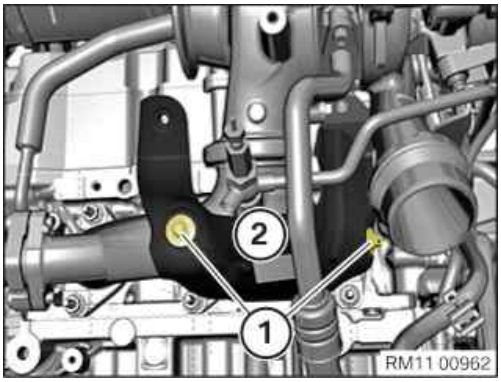
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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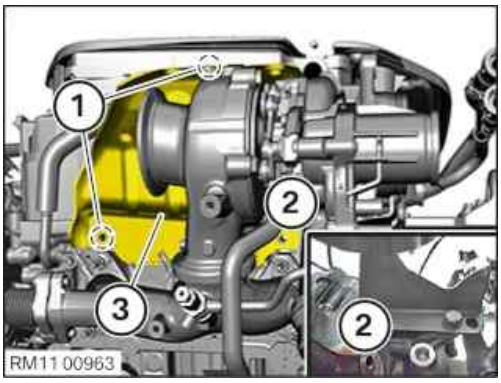


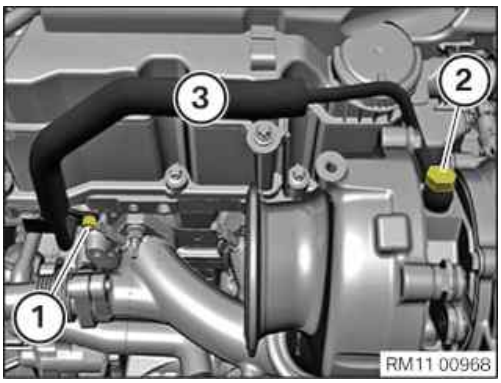
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

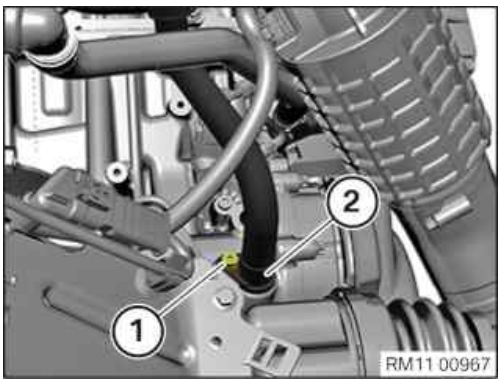
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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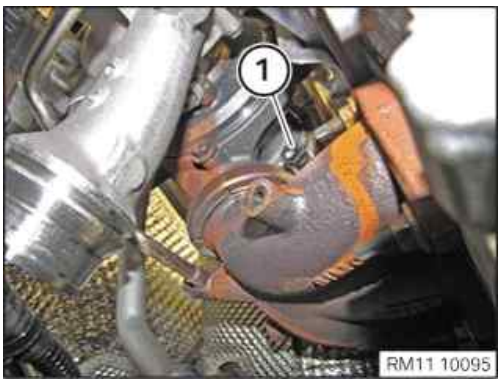
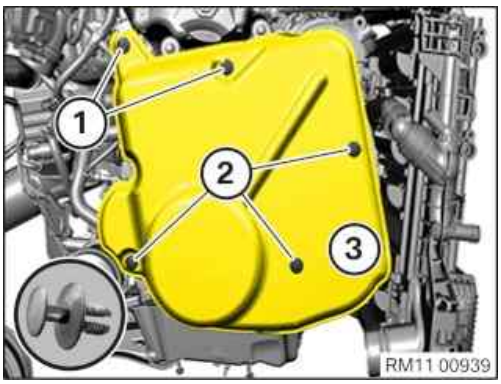
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

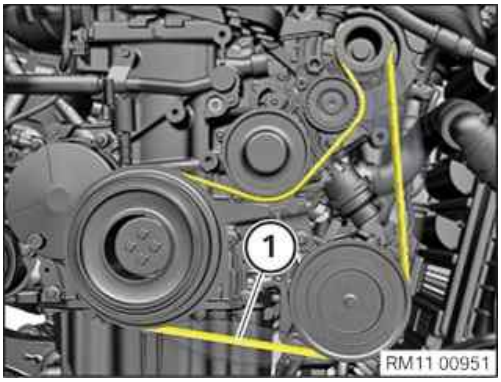
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

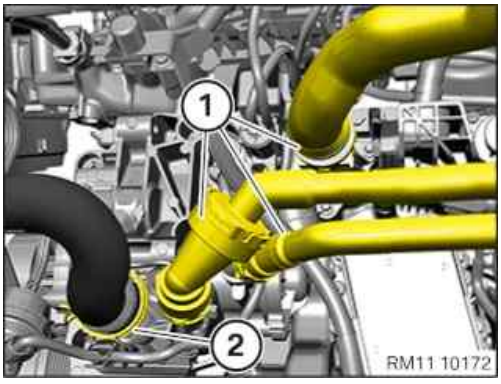
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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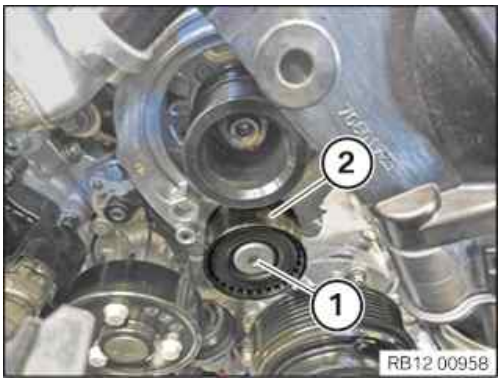
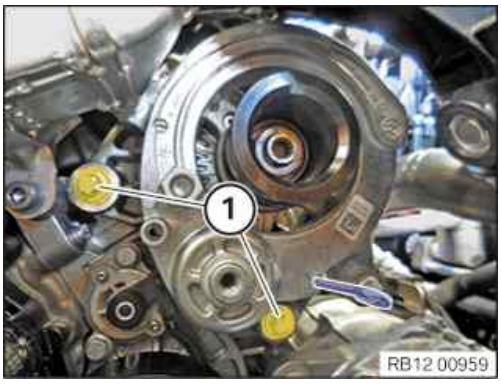
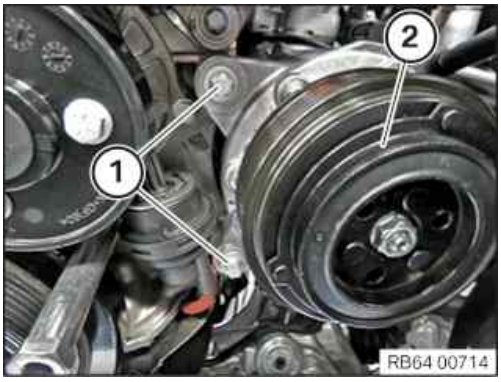


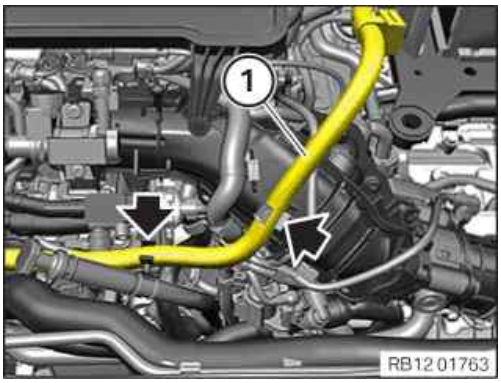
- Loosen screw (1).
- Remove the deflecting element (2).



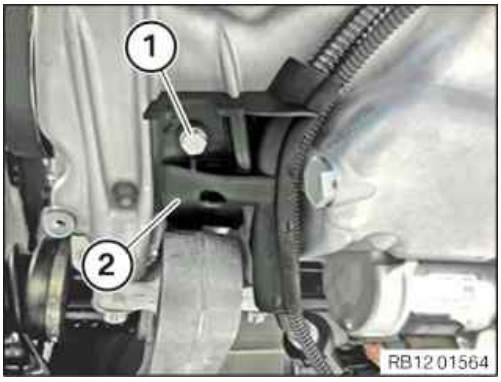
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

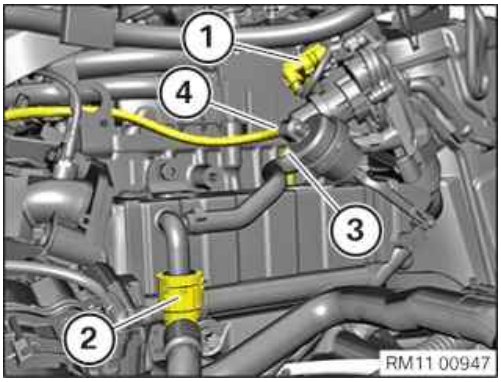
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

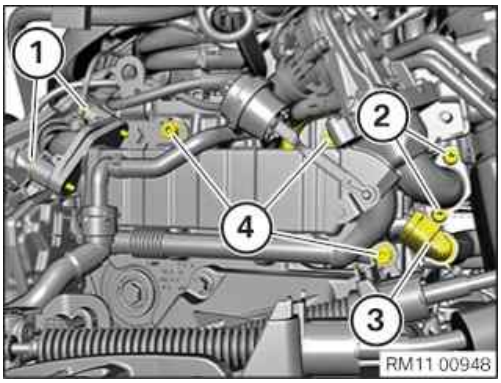
- Perform all work only on components that have cooled down.



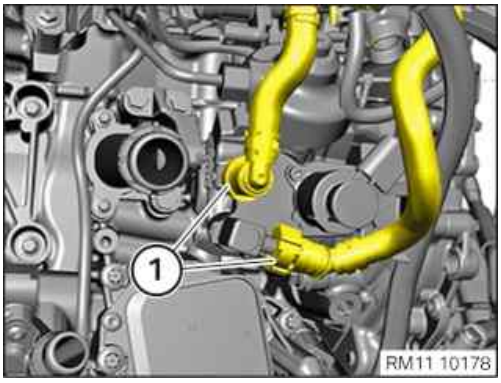
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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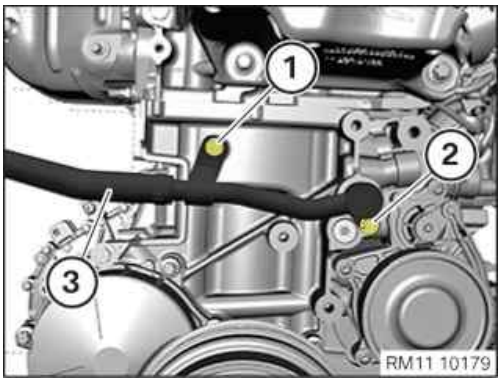


- Loosen screws (1) and (2).
- Remove coolant line (3).

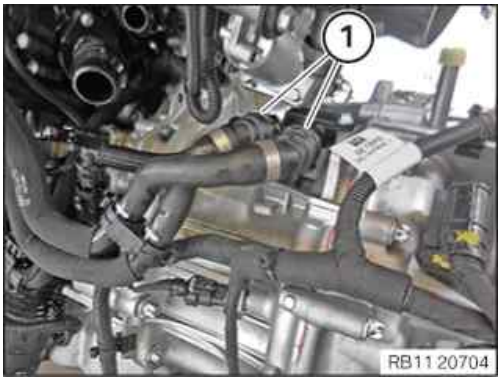
8 – Disconnect the engine from the double-clutch transmission (DKG)

RISK OF DAMAGE

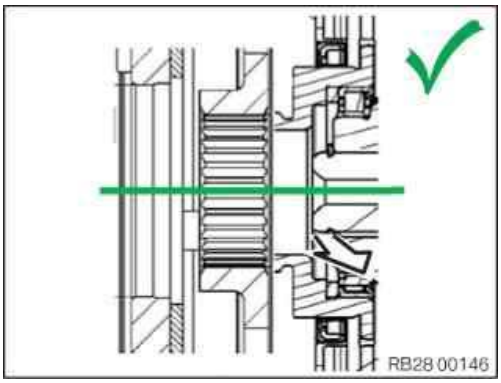
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

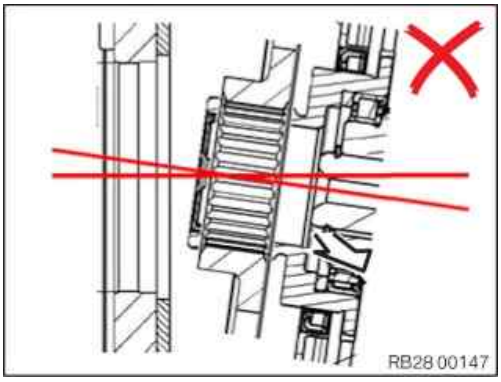
- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.



- Unlock and release coolant line (1).
- Catch and dispose of escaping coolant.



- **Correct:** Pull the double-clutch transmission (DKG) horizontally off the flywheel.



- **Wrong:** Do not pull the double-clutch transmission (DKG) off the flywheel if it is tilted.

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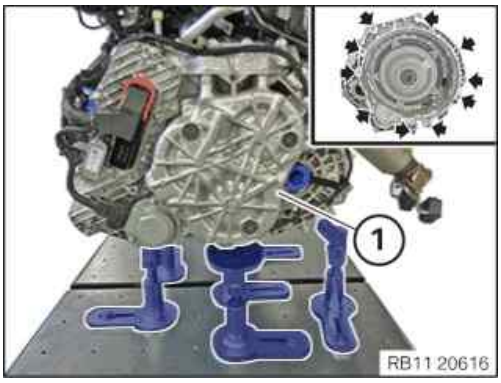
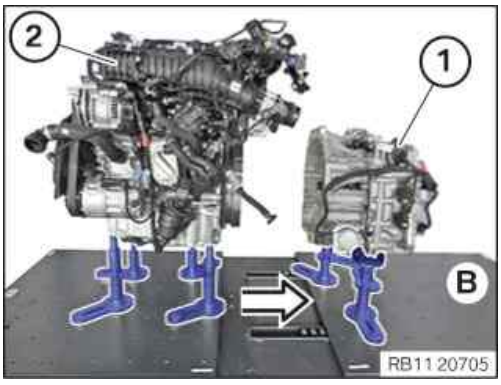


- Remove screws (arrows).
- Pull the double-clutch transmission (DKG) (1) off the flywheel when it is **absolutely** horizontal.



NOTICE

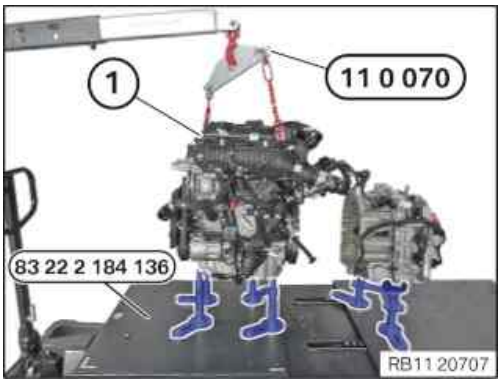
Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table top (B) in the direction of arrow and disconnect double-clutch transmission (DKG) (1) from the engine (2).

- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach the engine lifter with the special tool **0 490 579 (11 0 070)** and lift the engine (1) off the lifting table.

9 – Mount engine on assembly stand

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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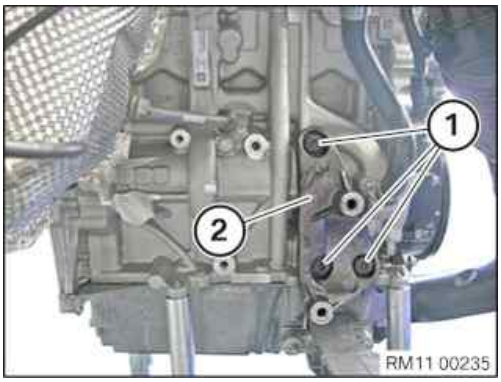
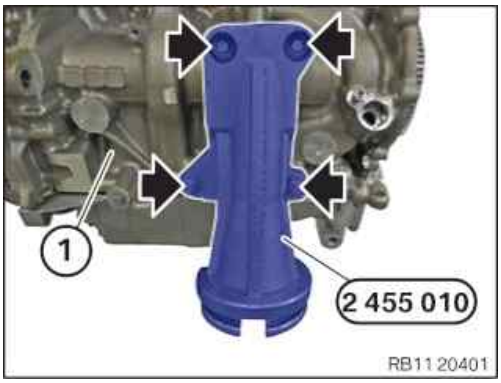


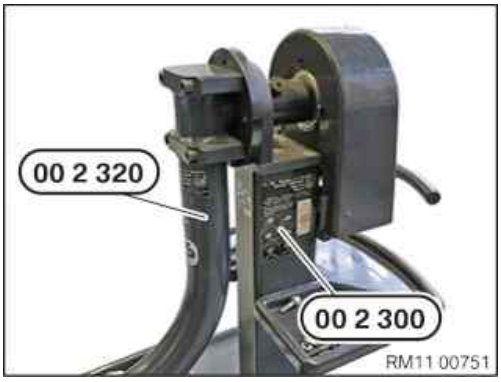
- Loosen screws (1).
- Guide out and remove holder (2).



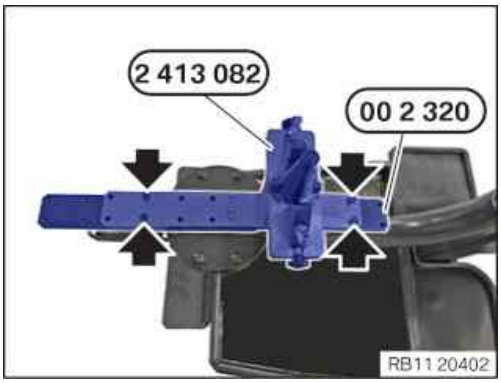
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.

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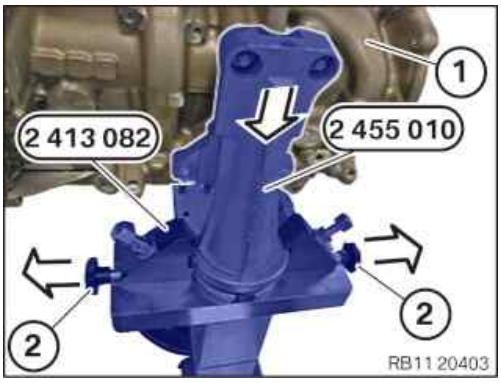
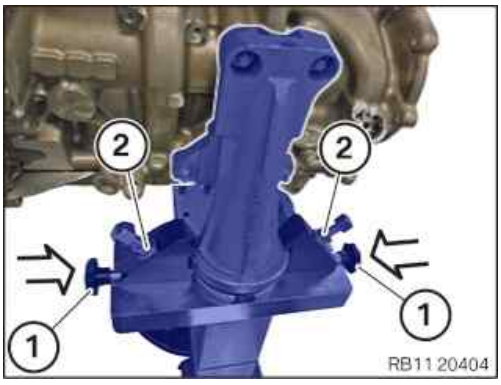


- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



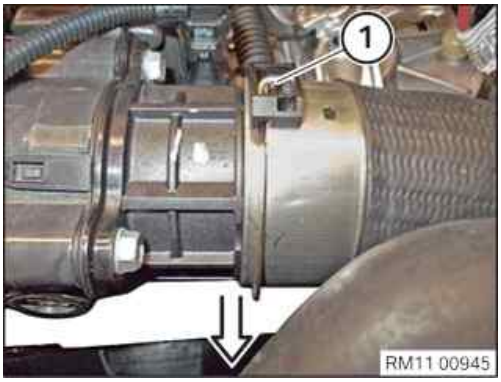
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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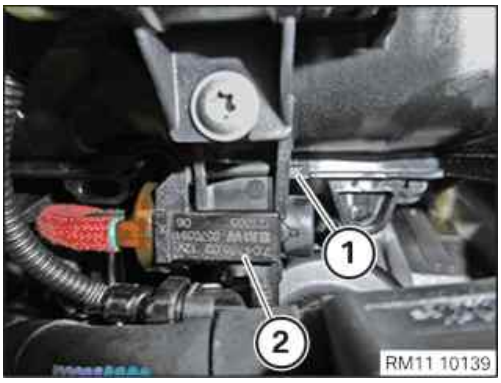
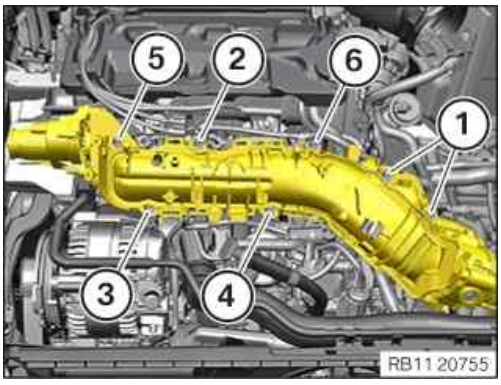
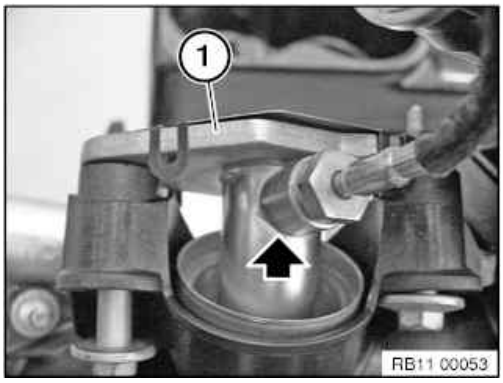


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

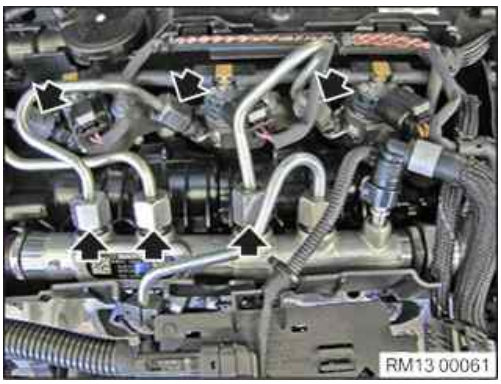
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

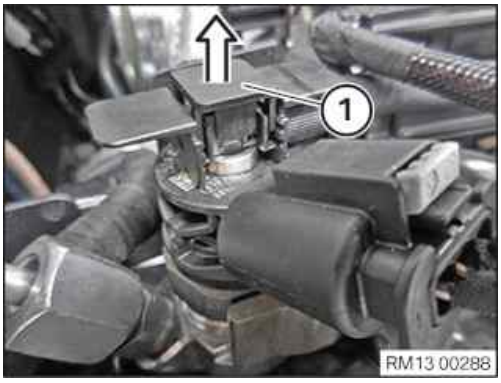
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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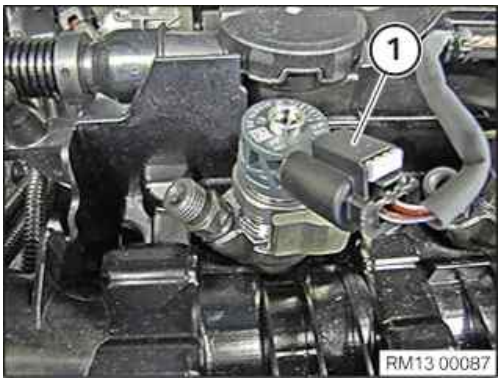
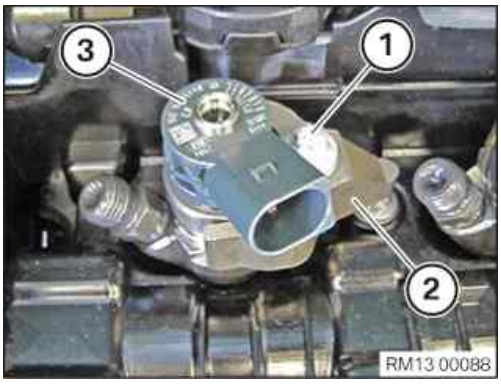


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

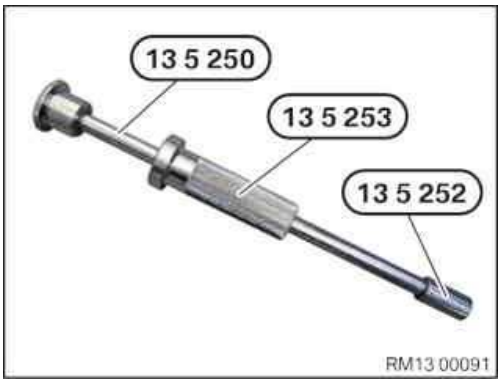
▶ **Loosen stuck injectors**

RISK OF DAMAGE

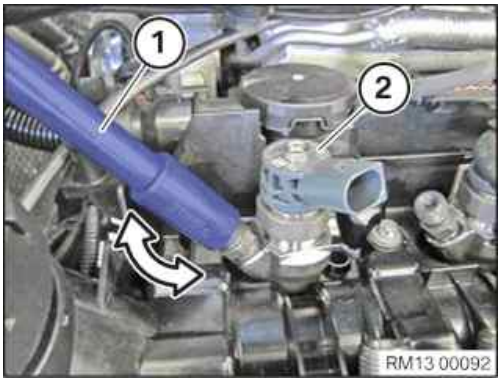
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

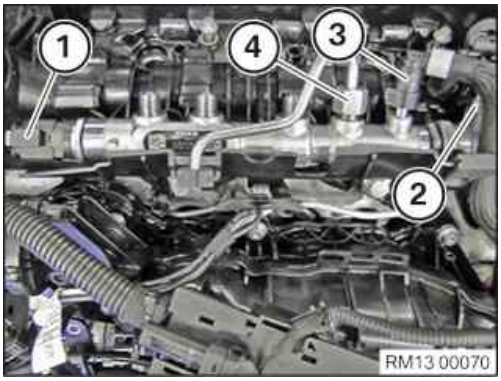
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

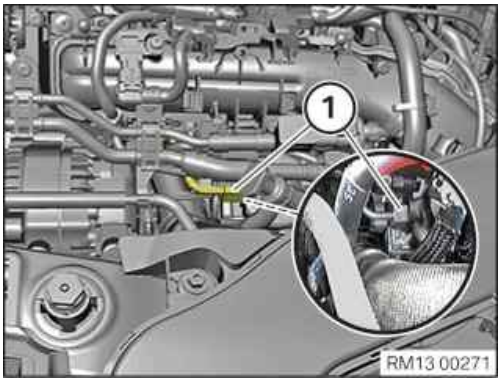
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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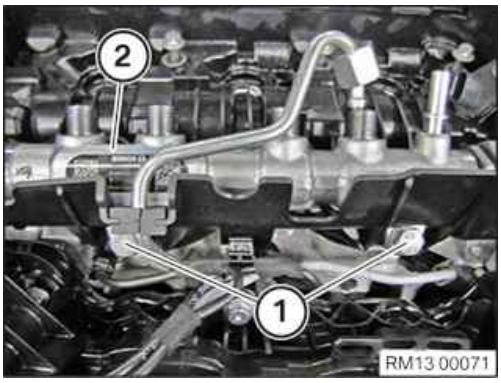
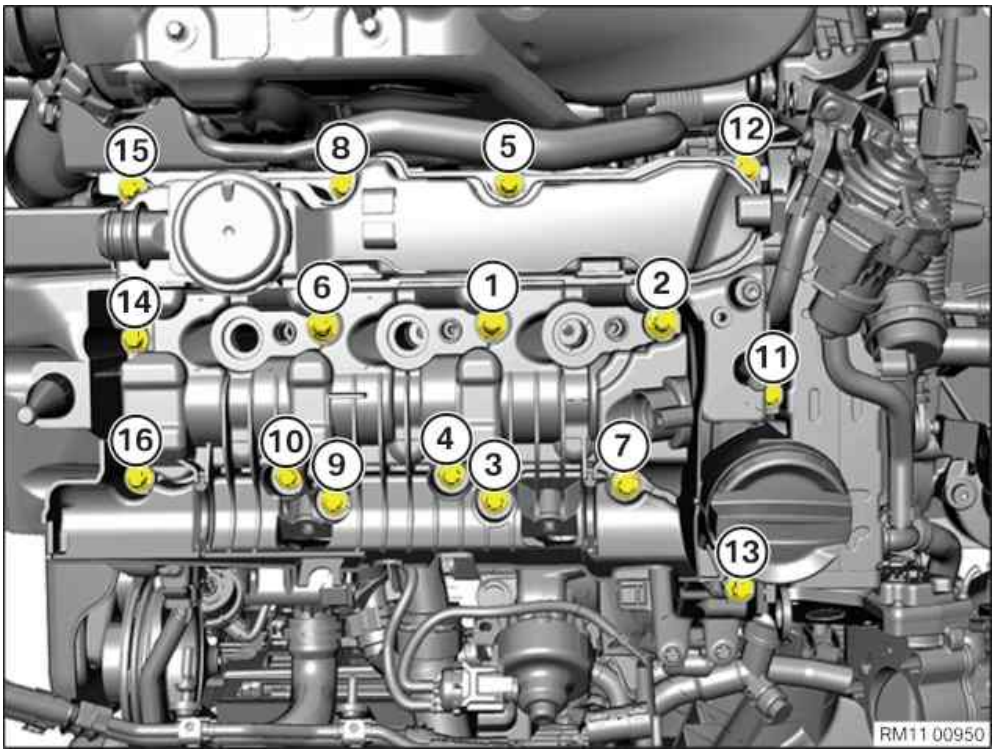


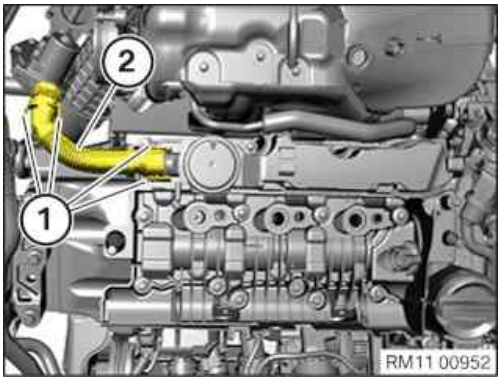
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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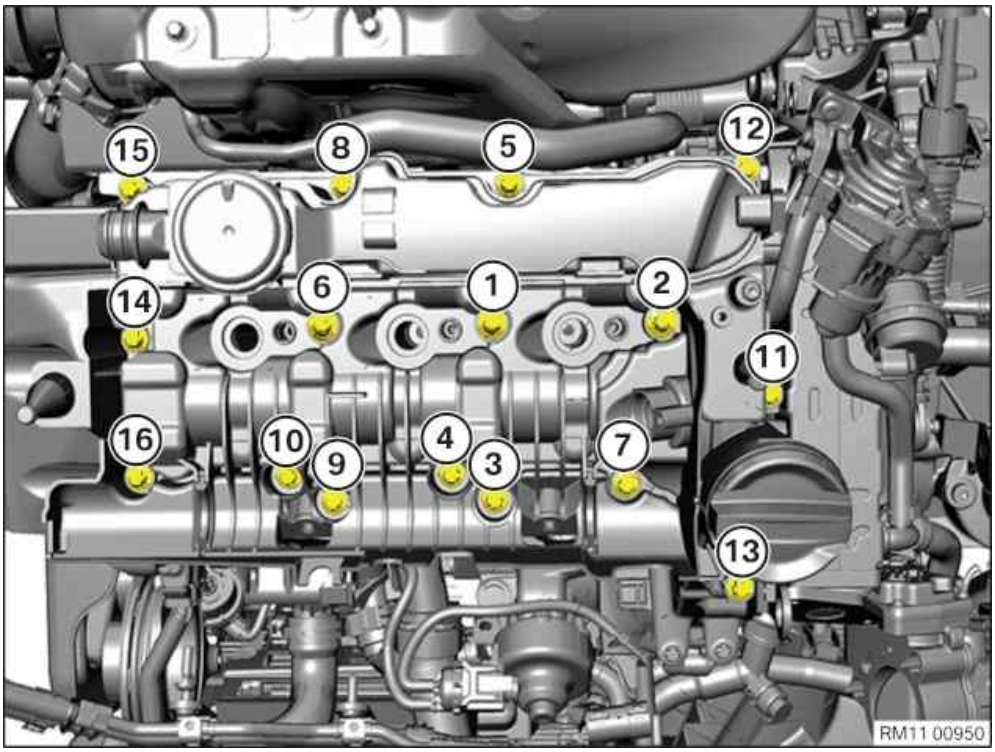

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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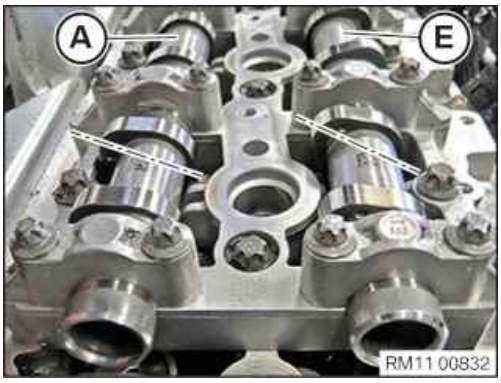
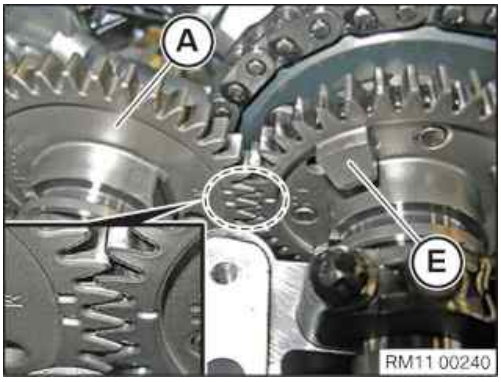


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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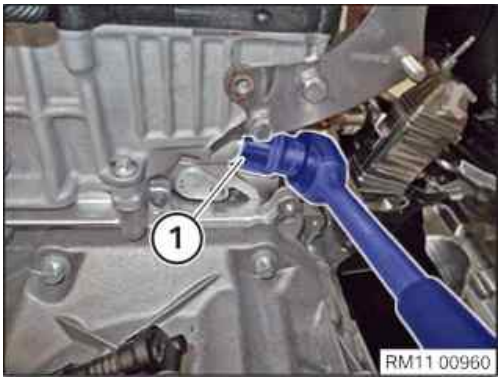
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

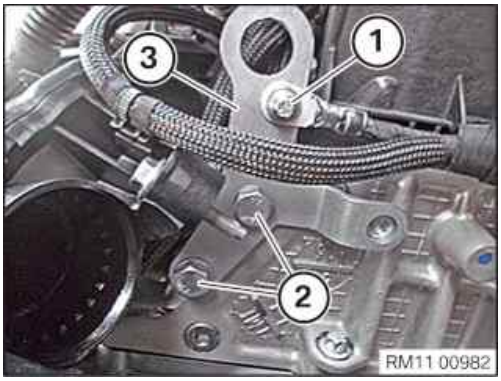


TECHNICAL INFORMATION

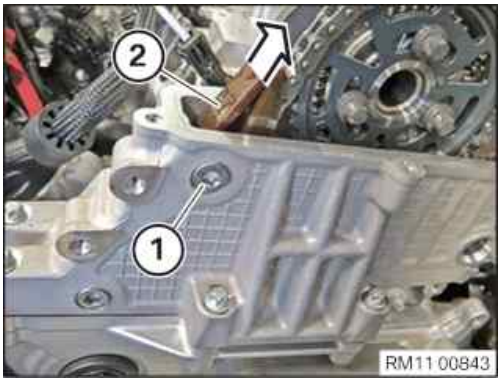
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

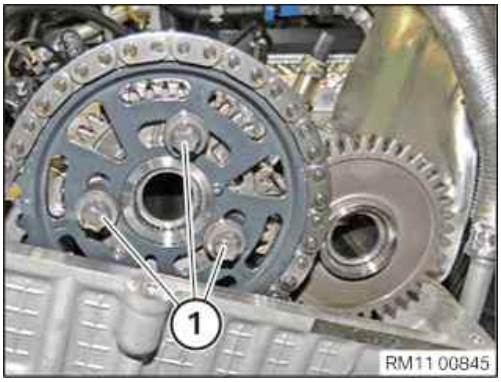


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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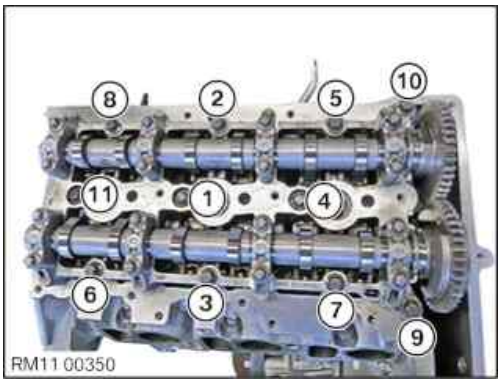
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

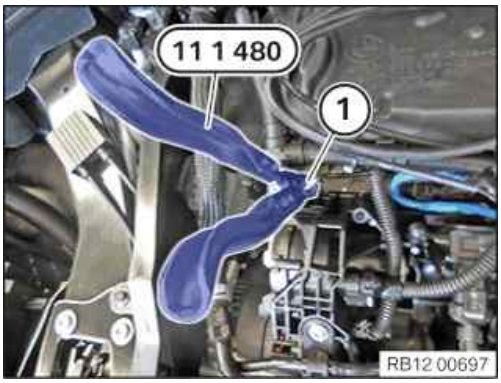
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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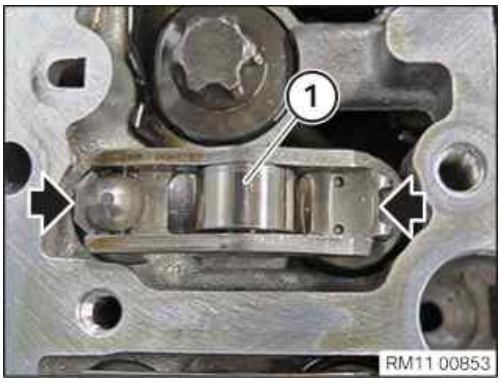


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

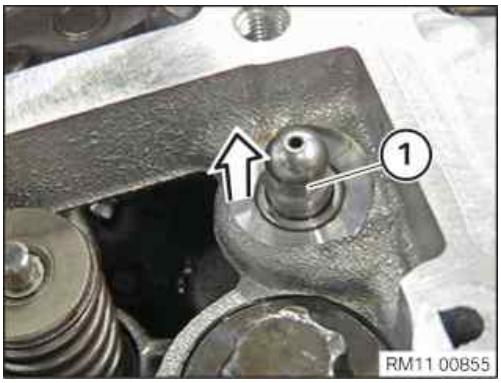
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

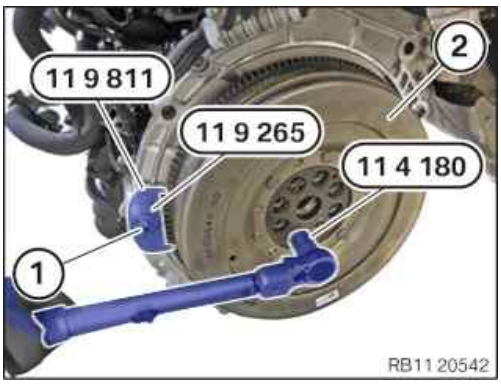
24 – Remove flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Position special tool **0 496 171 (11 9 811)** with a **standard** 5 mm thick washer between the crankcase and the flywheel.

  The 5 mm thick washer must be mounted between the crankcase and special tool **0 496 171 (11 9 811)** .
- Secure the special tool **0 494 793 (11 9 265)** with the transmission bolt (1).
- Protect the flywheel (2) from falling.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Guide out the flywheel (2) and remove.

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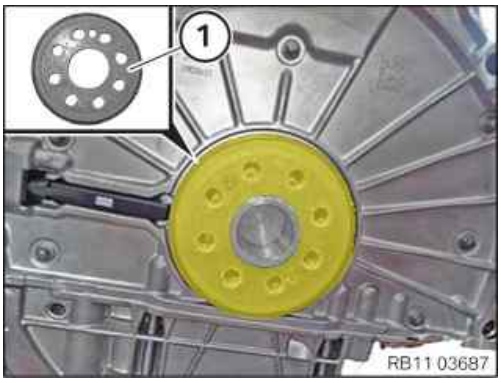


RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

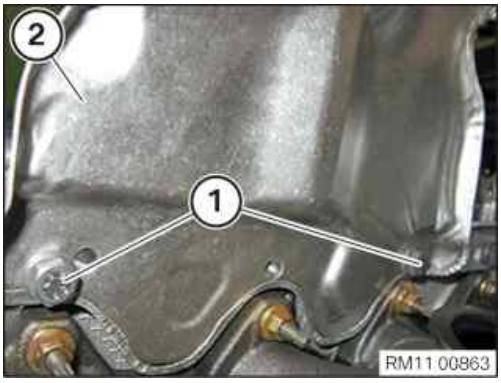
- Remove increment wheel (1) from the crankshaft and set it aside properly.

MAIN WORK

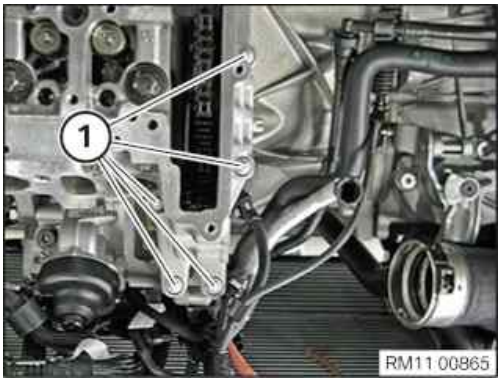
25 – Remove rear timing case cover

Prerequisite

Transmission is removed.



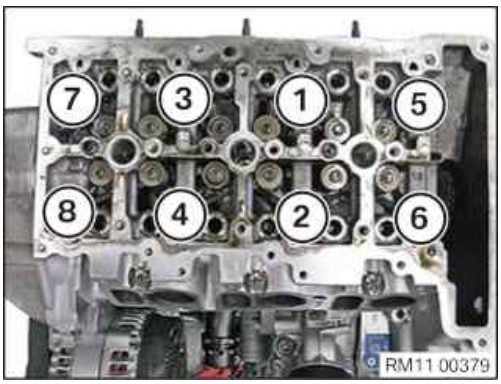
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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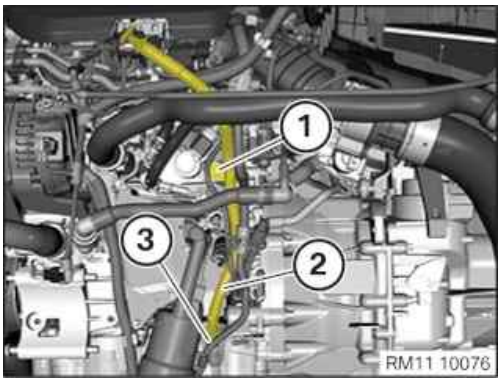
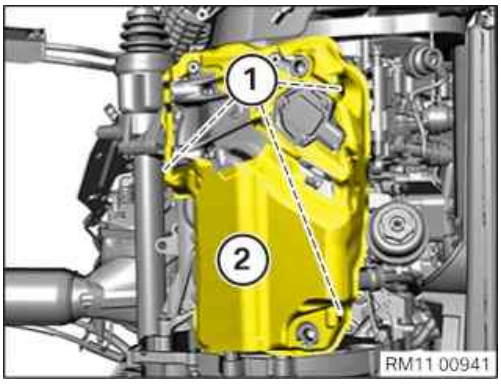
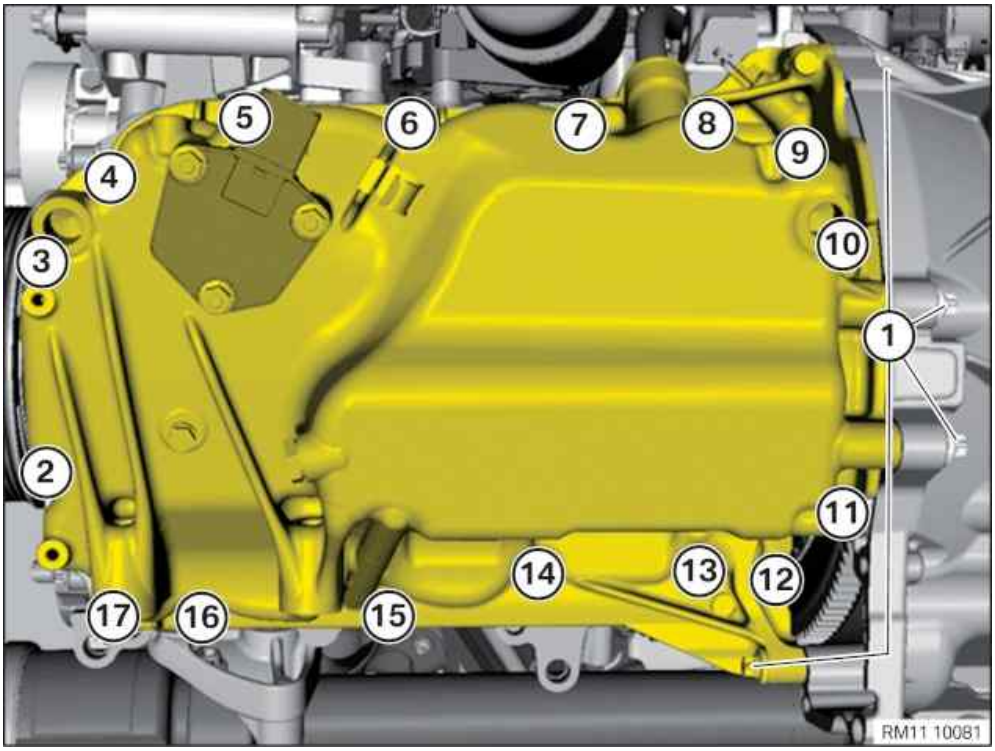


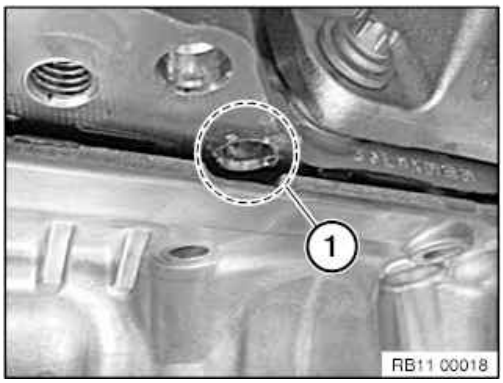
- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- If required, remove sealing ring (3) from oil sump.



- Remove the expanding rivet (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).



- Tighten the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release oil sump only in area (1).

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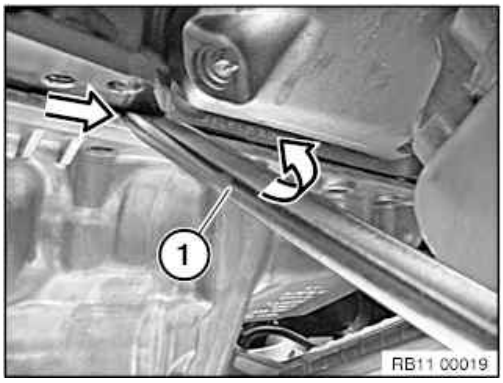
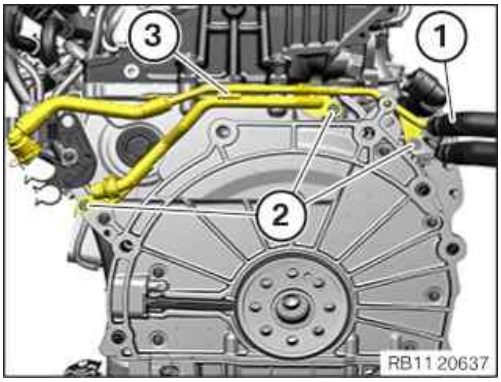
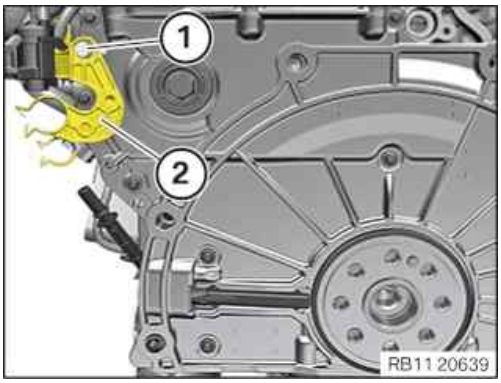


- Release the oil sump using a suitable mounting lever (1) carefully at the position intended for that.
- If required, secure the oil sump against falling.

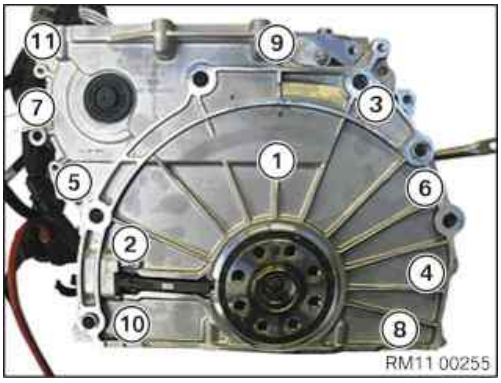
► **If installed: Remove coolant line of the SCR metering module**



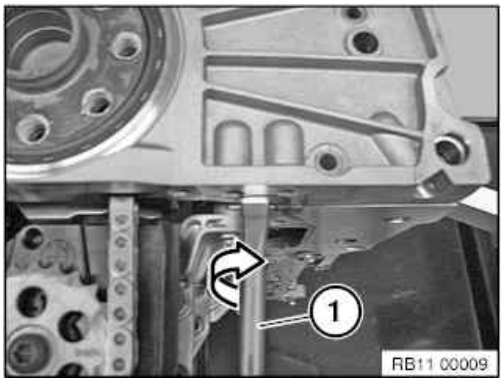
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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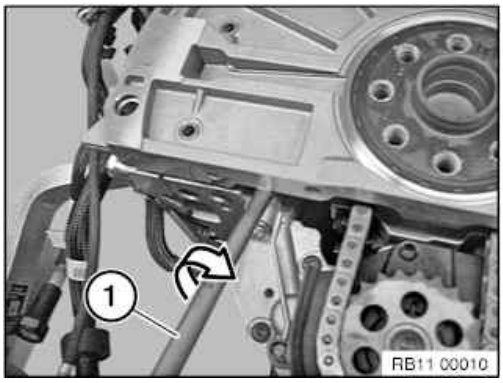
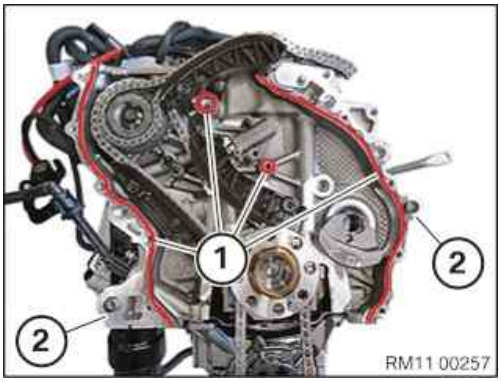


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

26 – Install the rear timing case cover

Prerequisite

Transmission is removed.



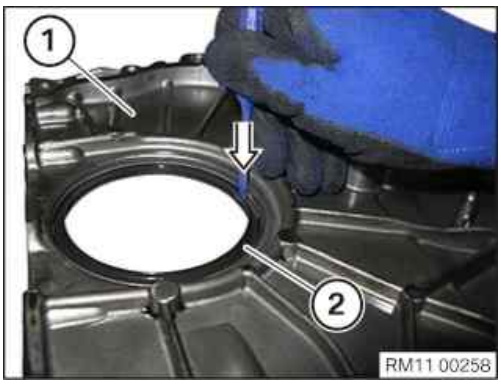
RISK OF DAMAGE

Damage to the surface.

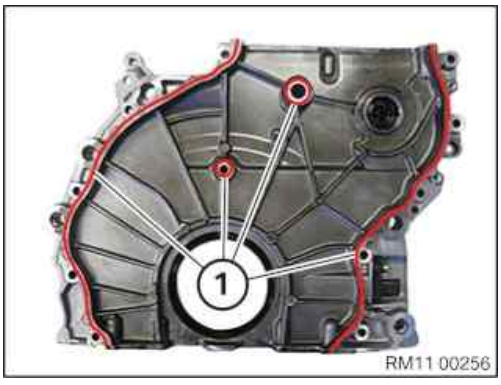
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.



- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

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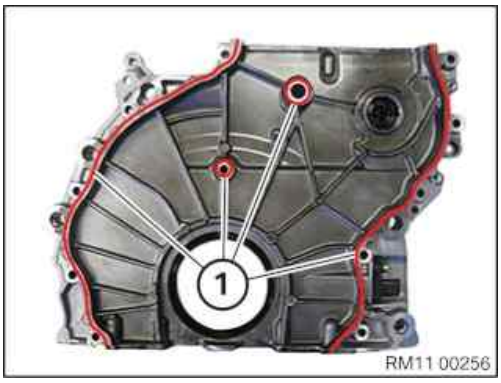

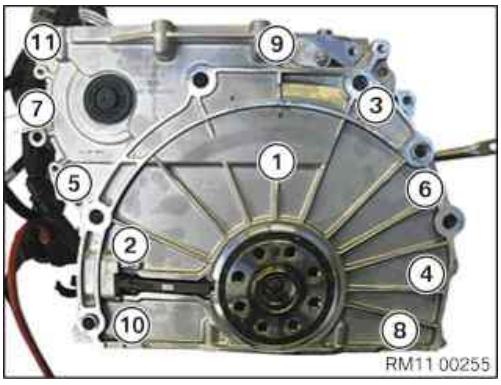

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.

- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

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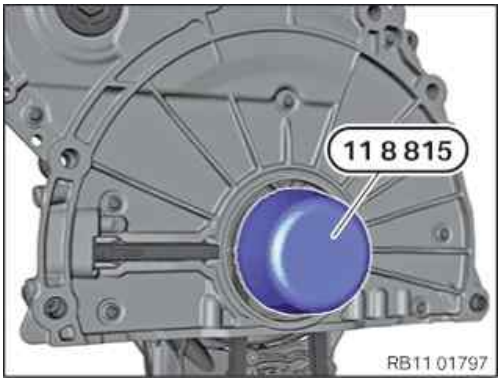
RISK OF DAMAGE

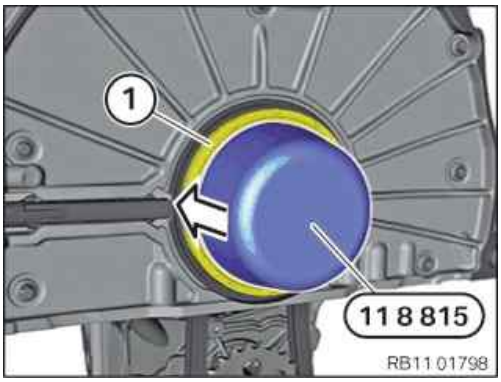
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

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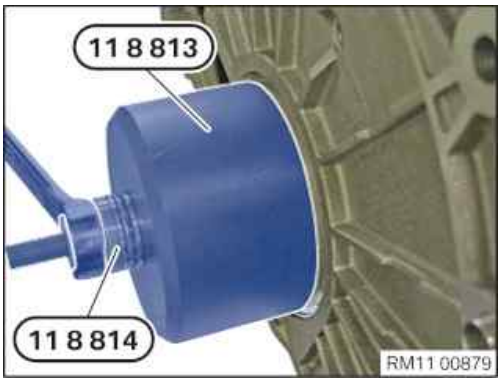
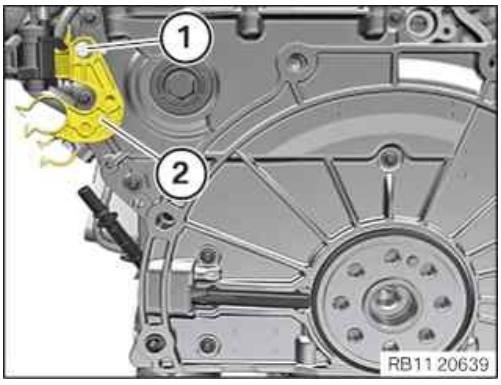
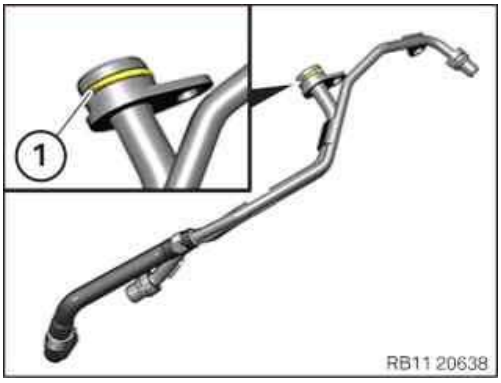


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



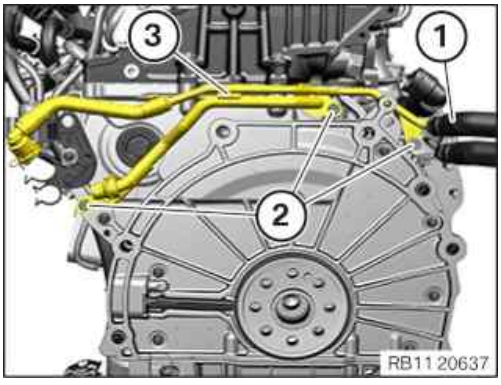
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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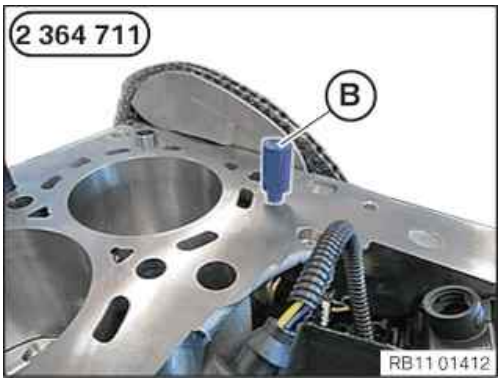


- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

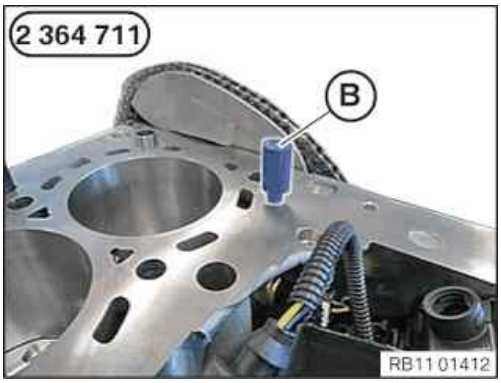
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

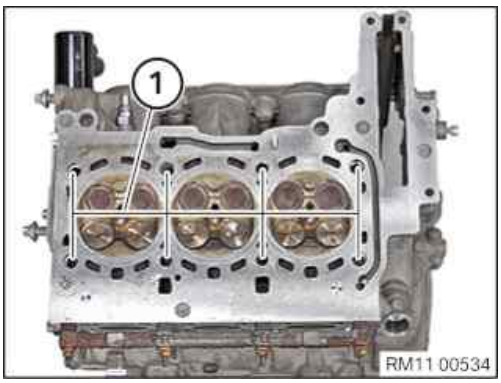
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ Renewing the cylinder head gasket



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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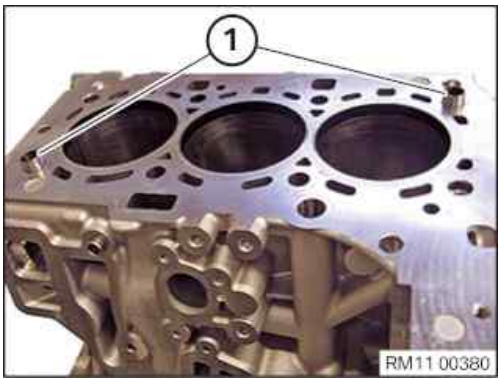
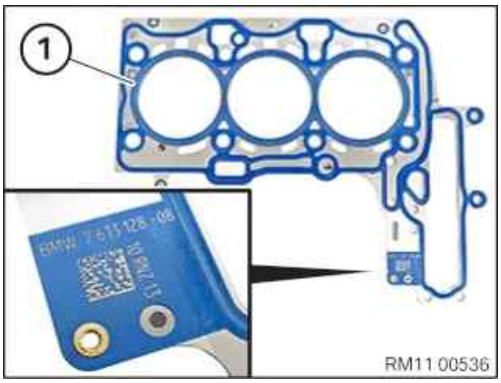
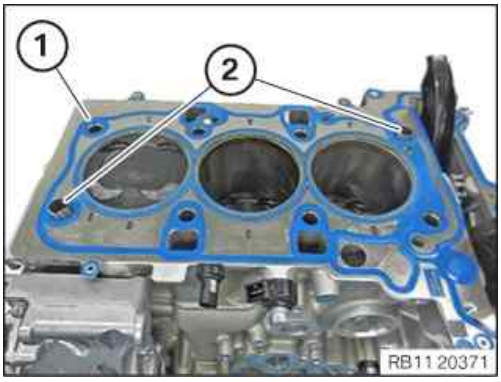


- Check the fitting sleeves (1) for secure fit and damage.

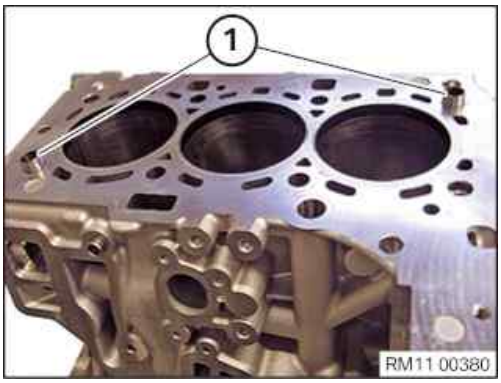


- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.

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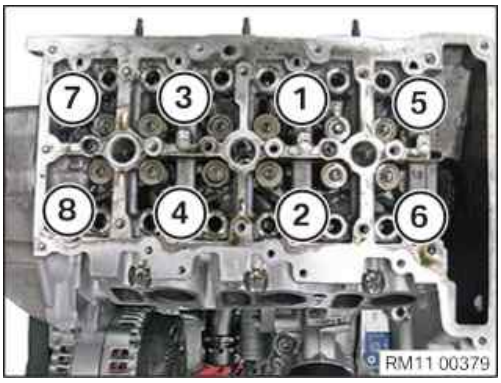


- Fit new cylinder head screws.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

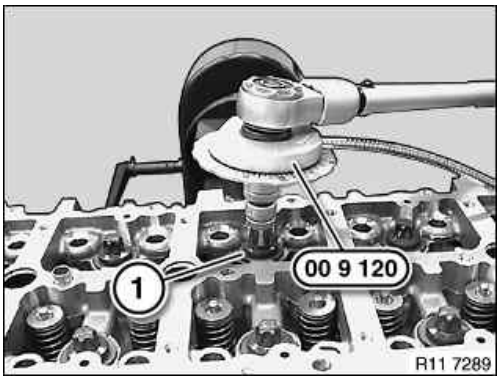
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

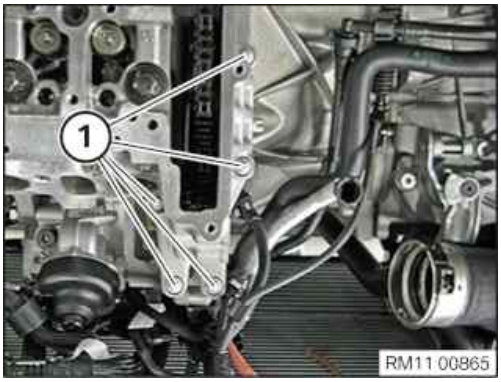
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolts in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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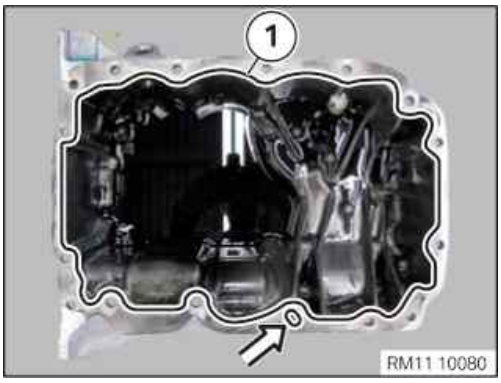


TECHNICAL INFORMATION

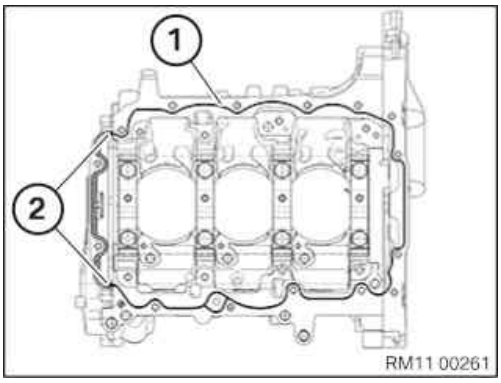
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

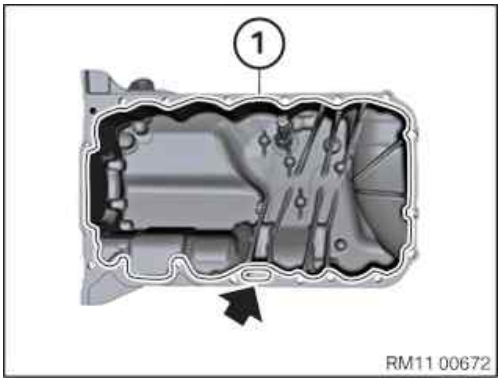
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

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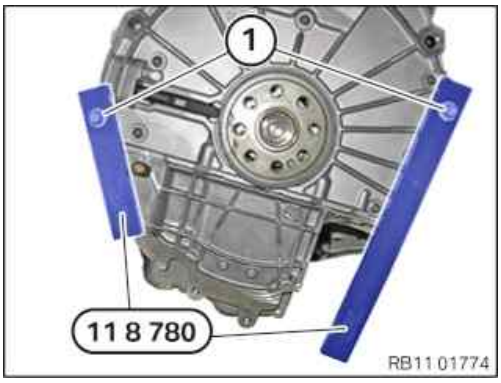
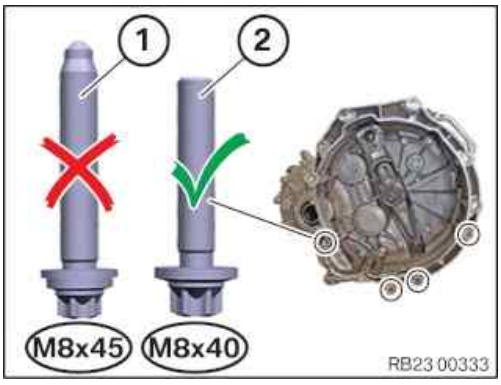


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

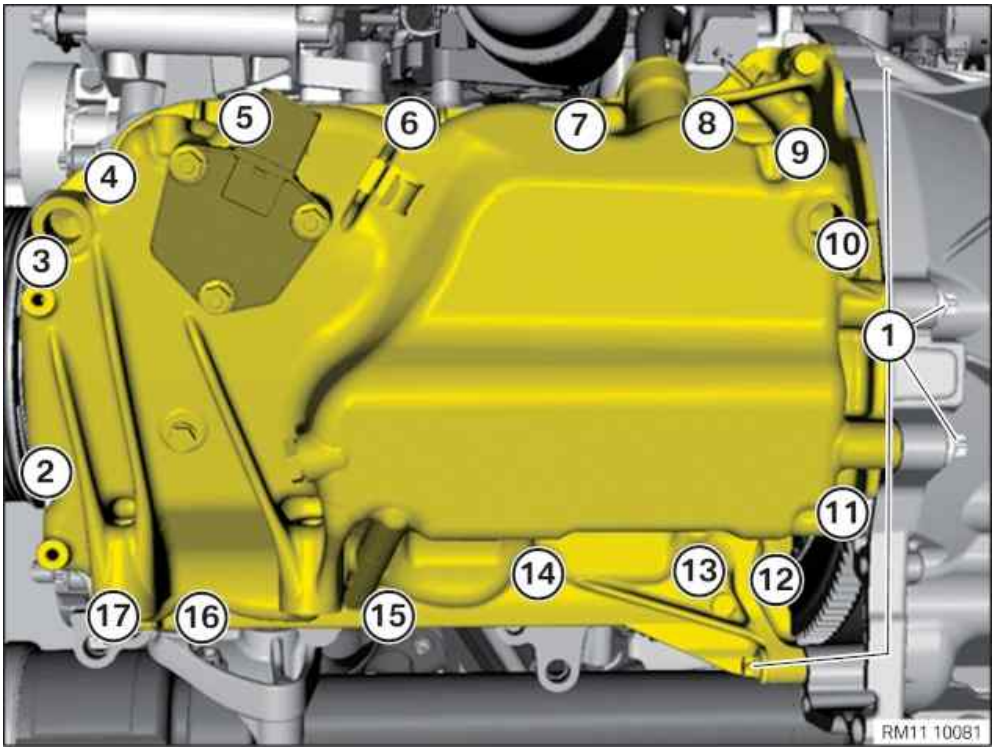
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Hand tighten the screws of oil sump (2) to (17) , but do **not** tighten completely yet.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

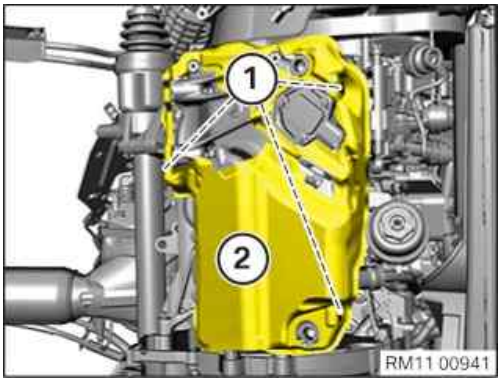
Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

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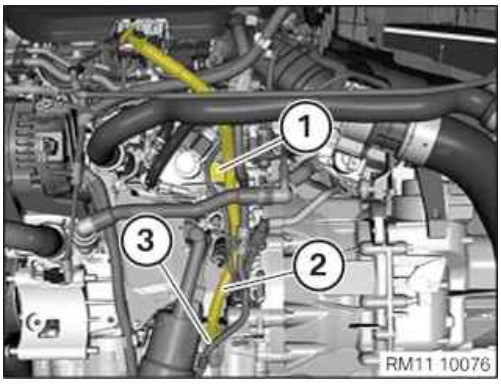
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

POSTPROCESSES

27 – Installing the flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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TECHNICAL INFORMATION

Clean all threads with a screw tap.

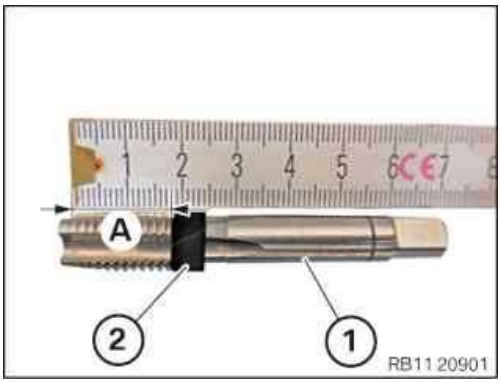
- Clean all the screw threads (1).

- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

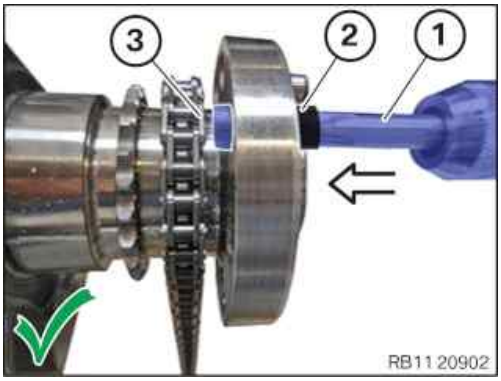
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the depth of insertion (A) on the thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

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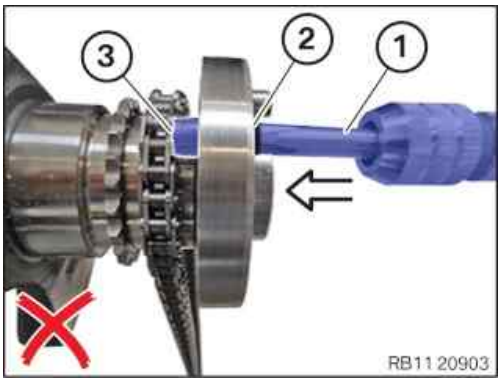
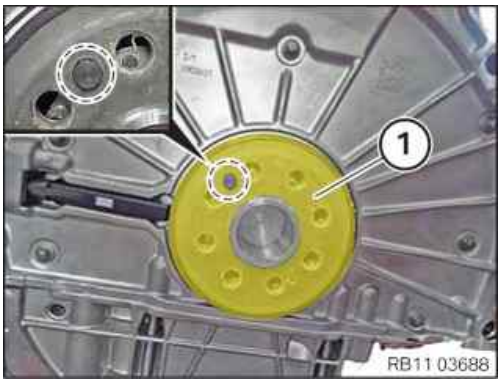


TECHNICAL INFORMATION

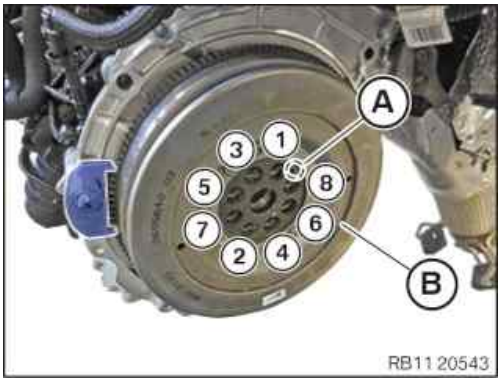
- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the depth of insertion (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- It is essential to observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

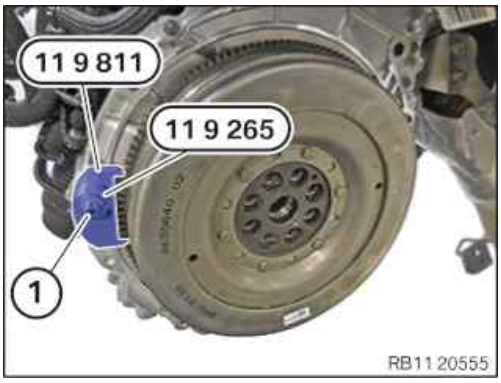


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Thread out special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)** remove.
- Ensure that the washer (5 mm) is removed.

28 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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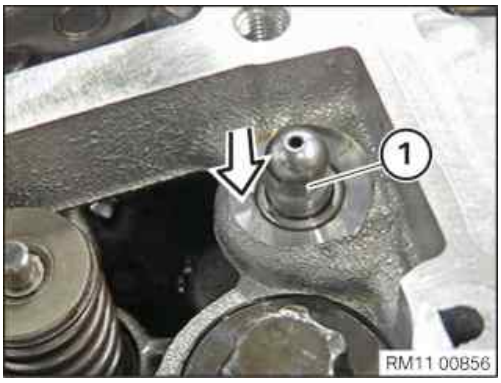
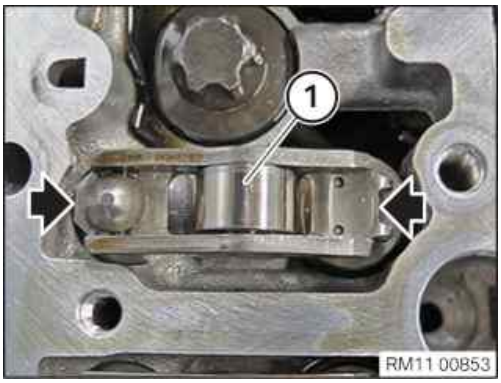


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

29 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

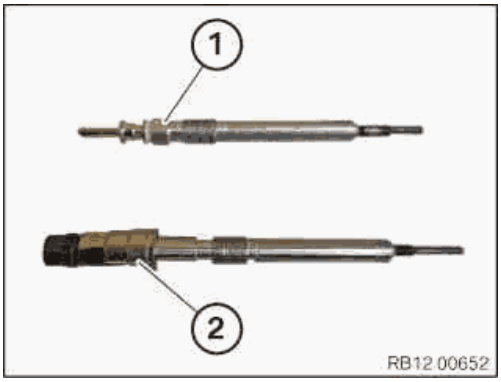


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

30 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

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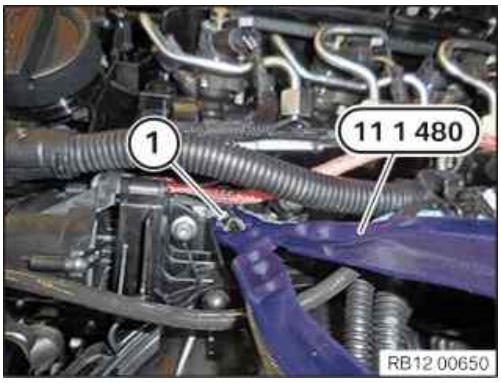


- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

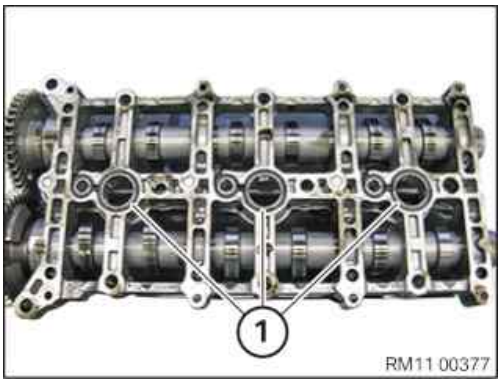
31 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

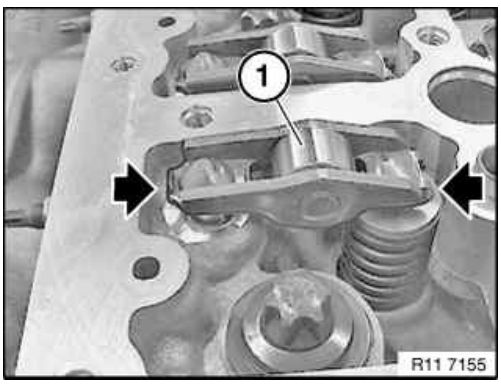
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

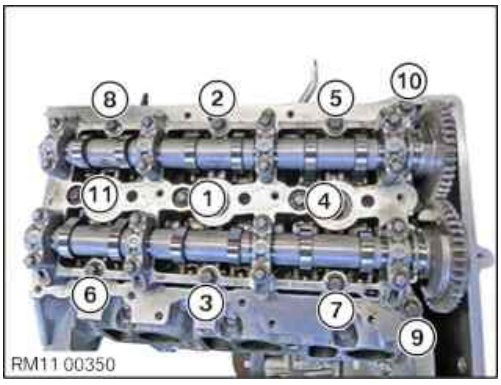


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

32 – Adjusting the timing of the camshafts

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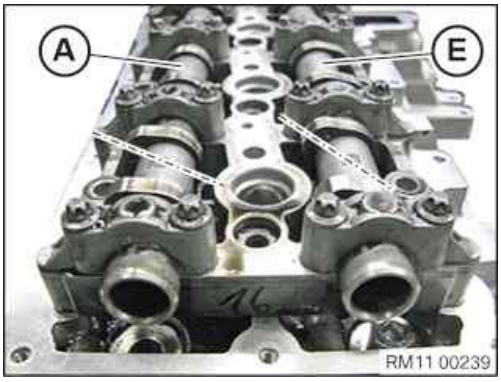
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

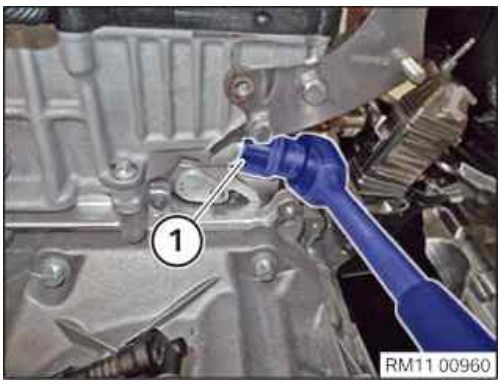
▶ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▶ **Remove exhaust camshaft.**

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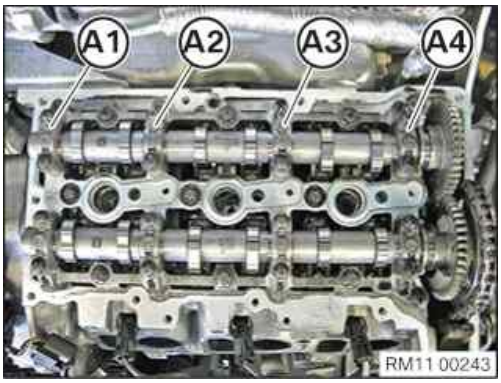
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

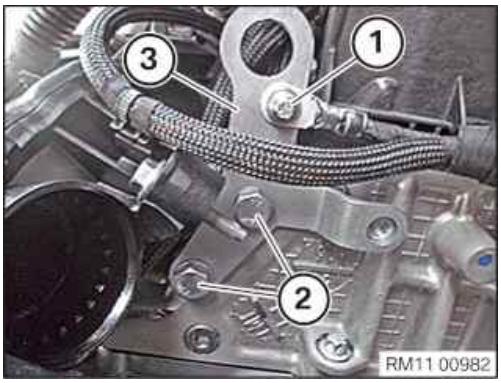


TECHNICAL INFORMATION

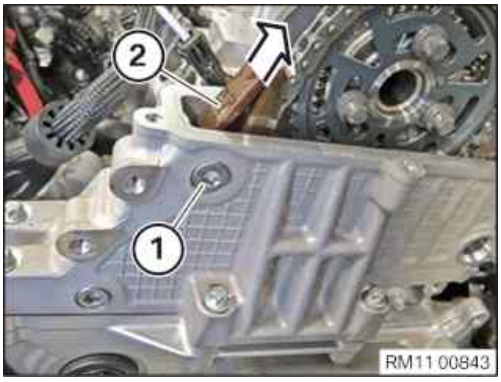
The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▶ **Remove the timing chain guide rail**



- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**

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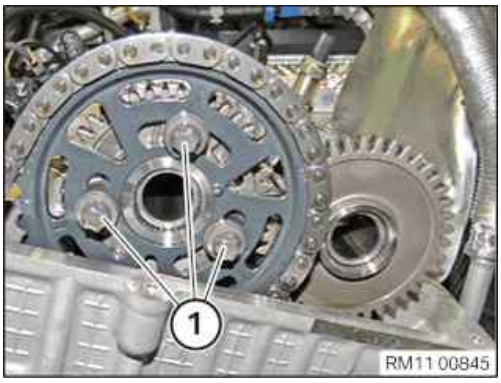


- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

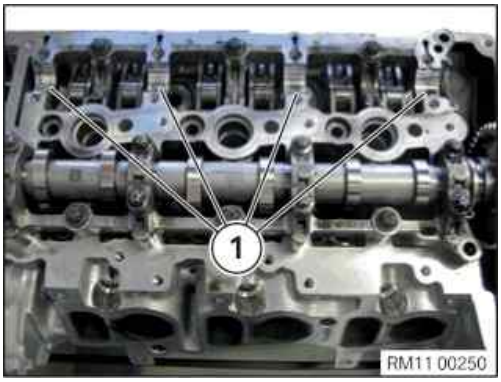
▶ Installing exhaust camshaft

RISK OF DAMAGE

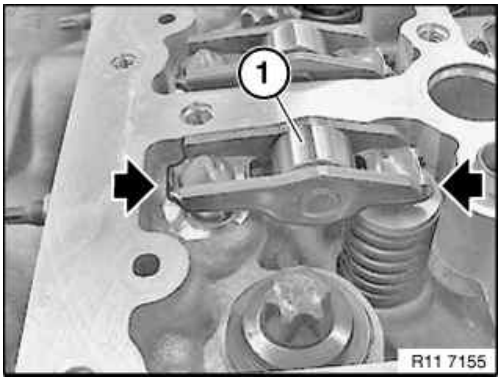
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

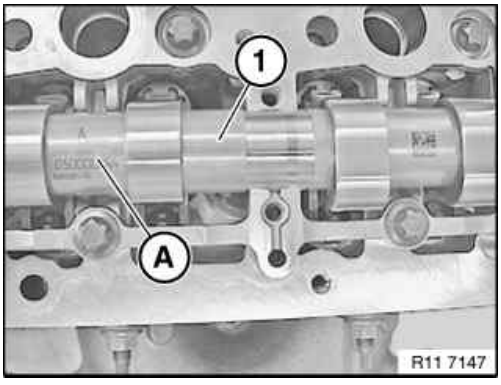
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.

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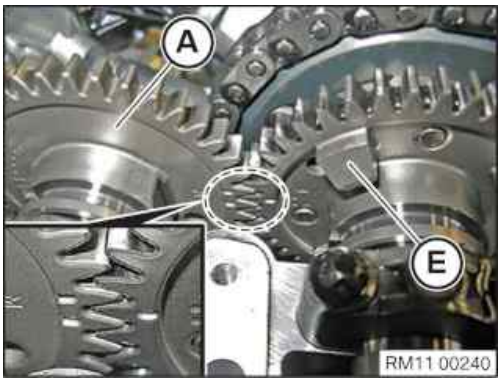
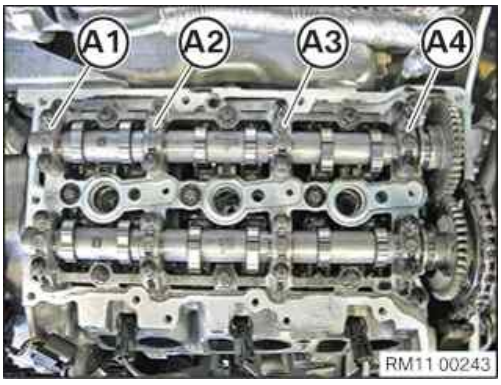


- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

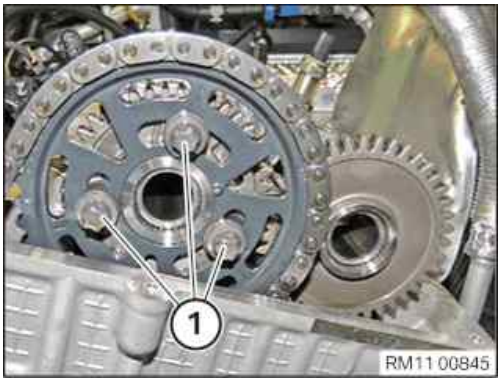
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

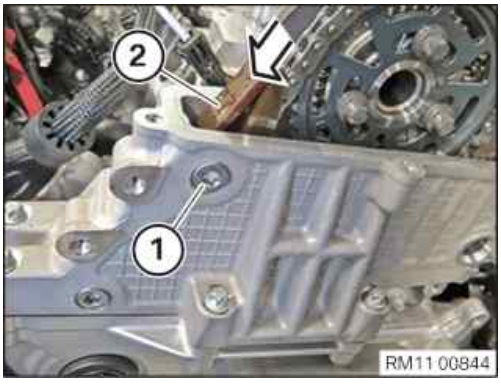
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

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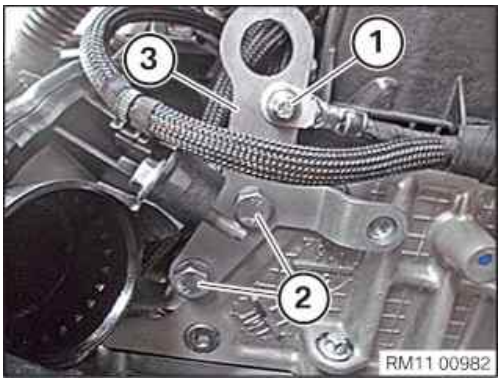


- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

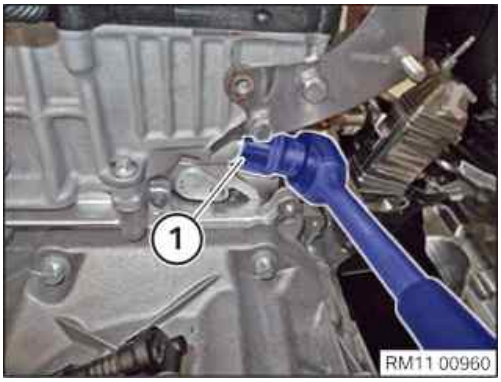
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▸ Tightening the camshaft sprocket on the intake camshaft

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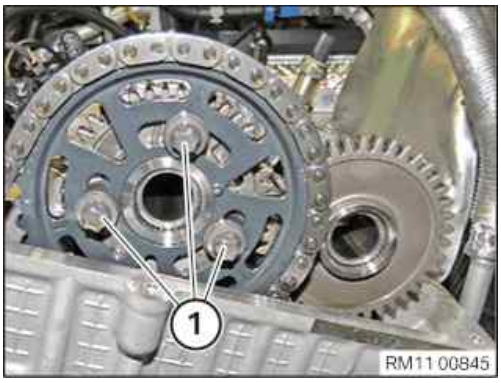

- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

33 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

34 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

35 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

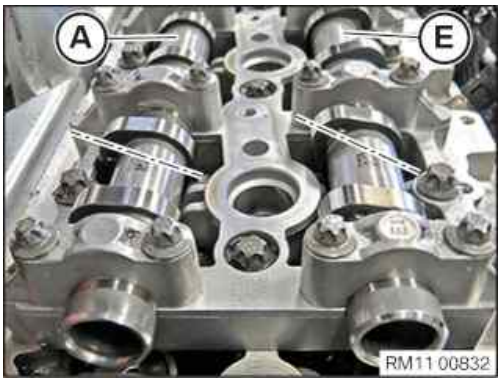
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

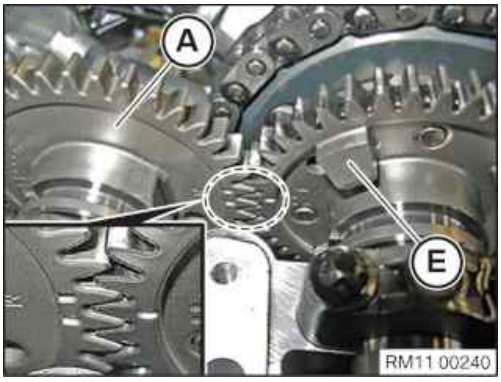
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

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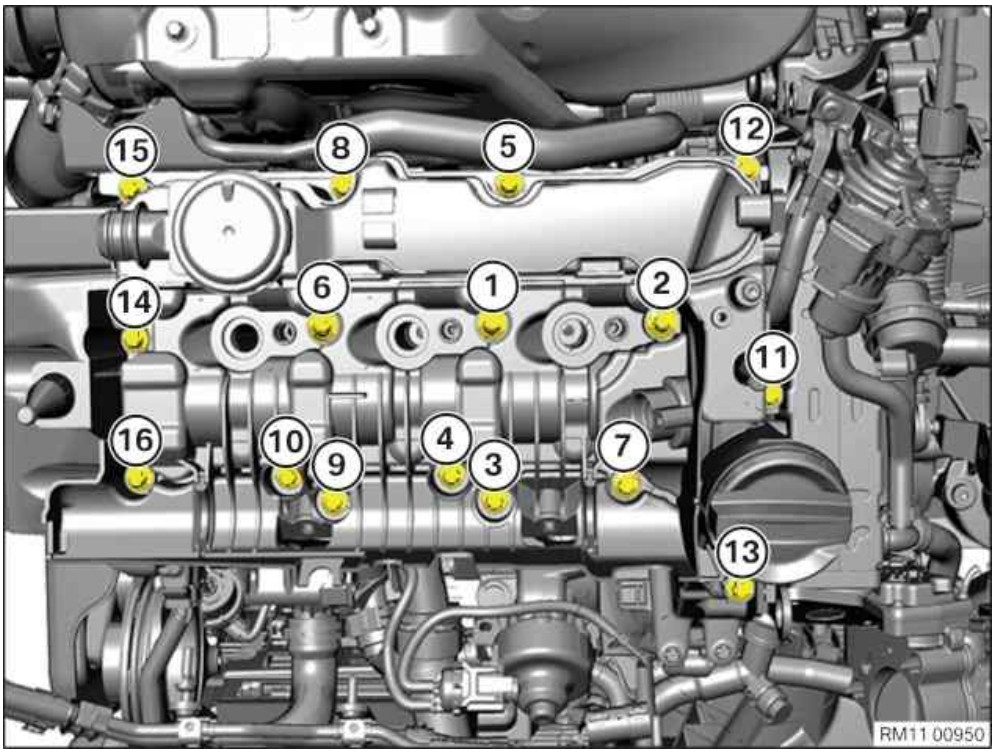
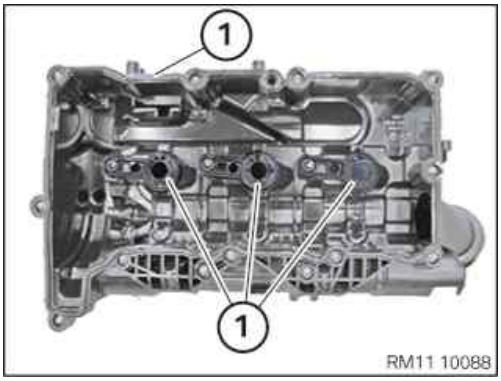
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

36 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

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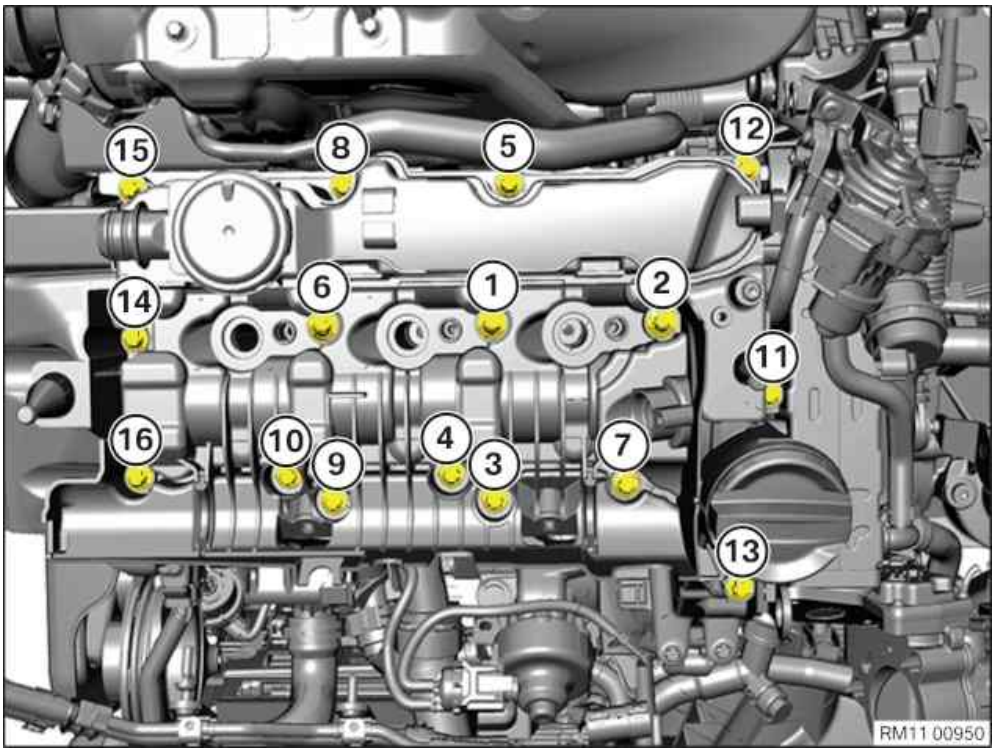
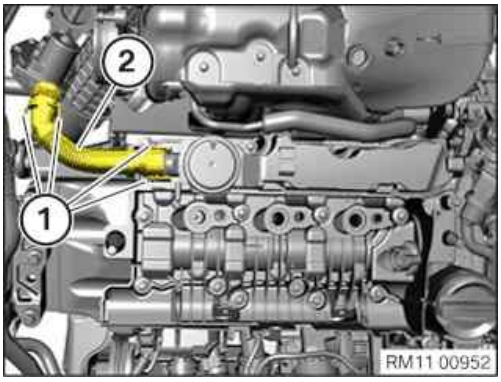


- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

37 – Installing injectors of injection system

▶ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

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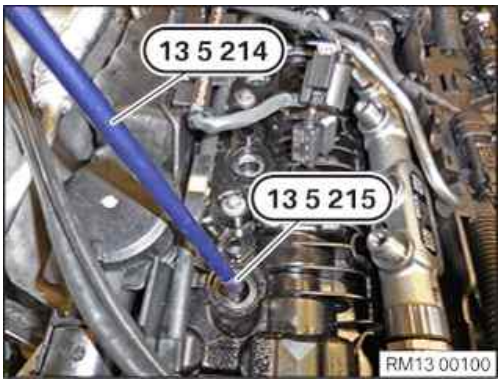
RISK OF DAMAGE

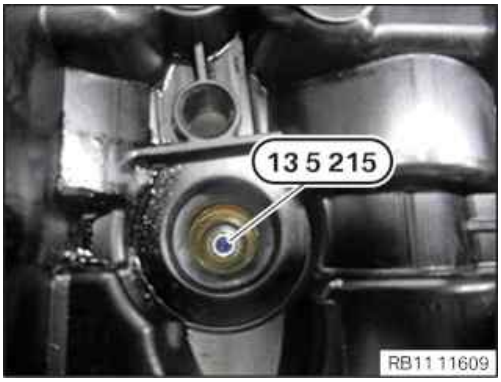
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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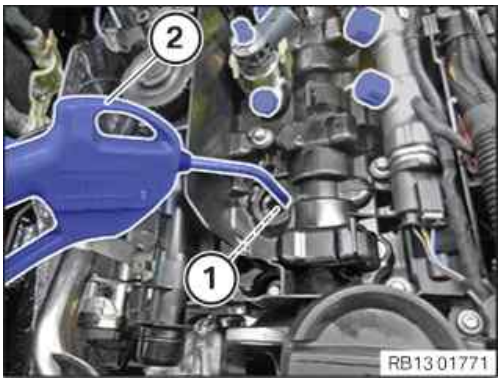
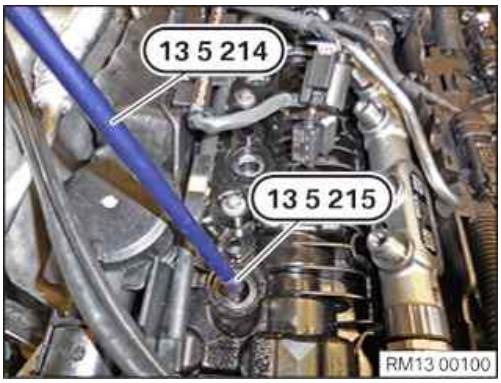


- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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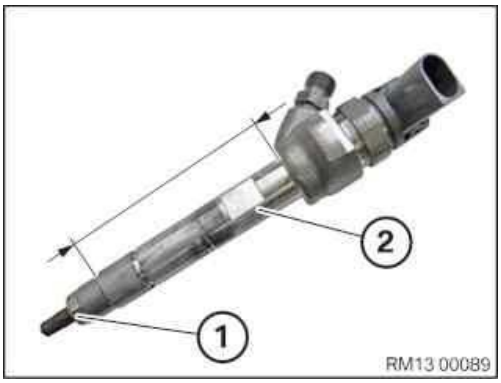
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

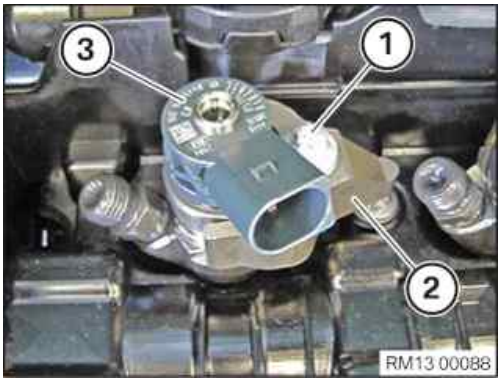


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

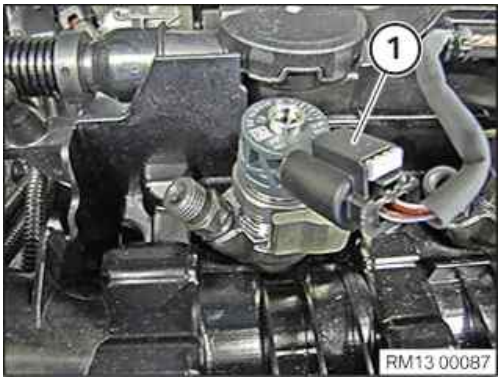
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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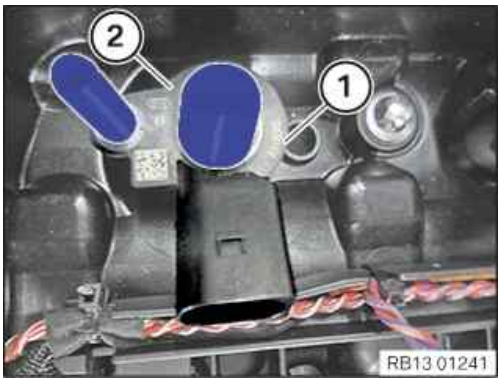
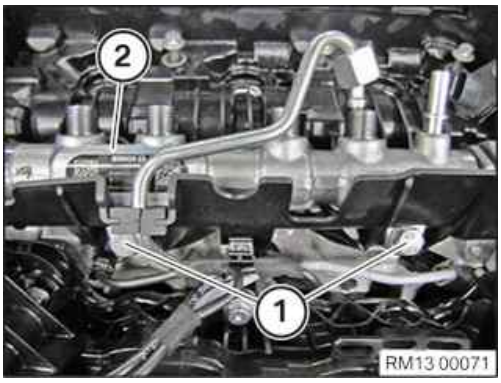


- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

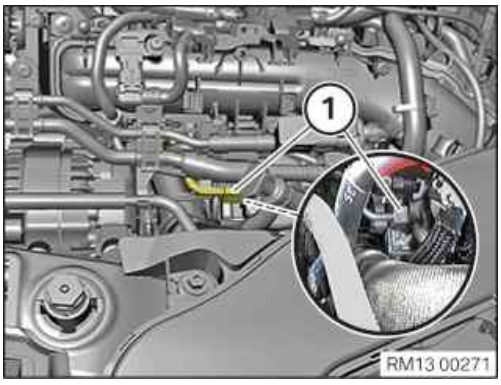
38 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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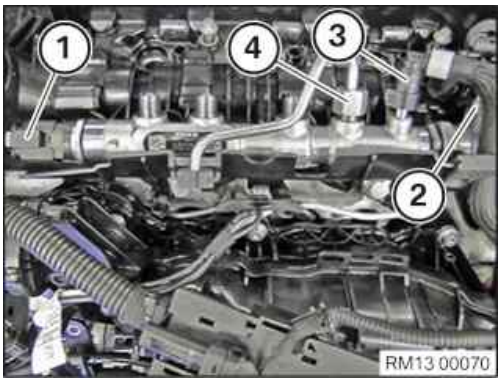

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

39 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

40 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

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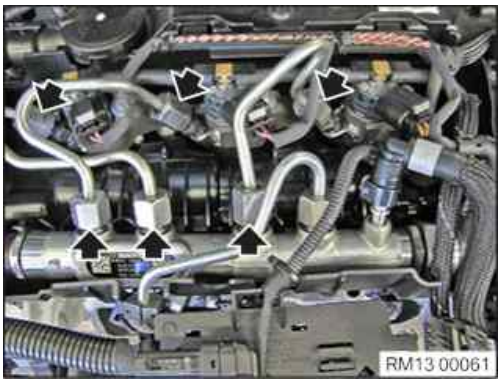
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

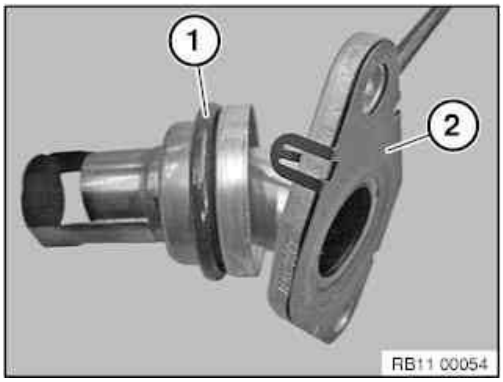
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

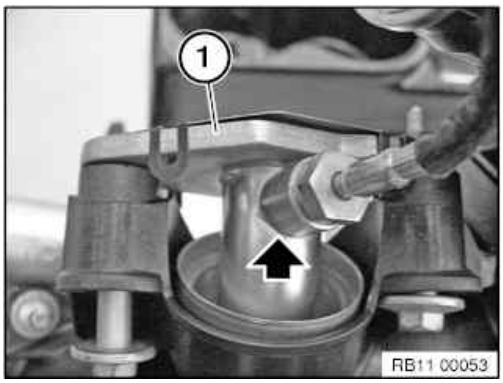
41 – Installing the intake plenum



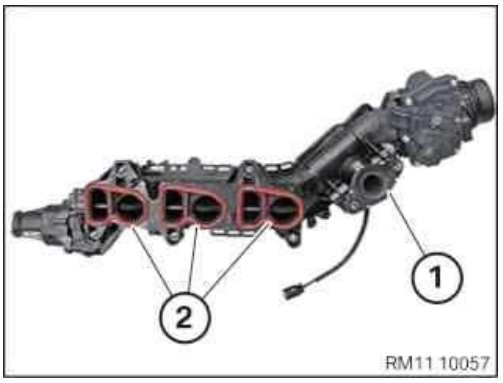
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

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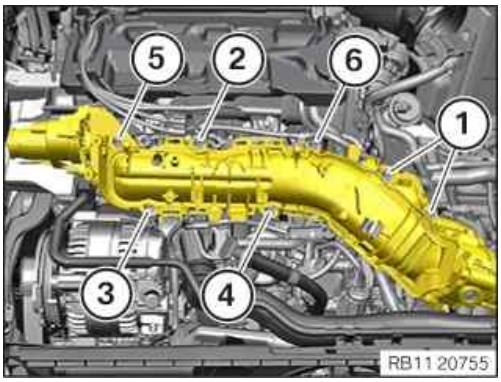
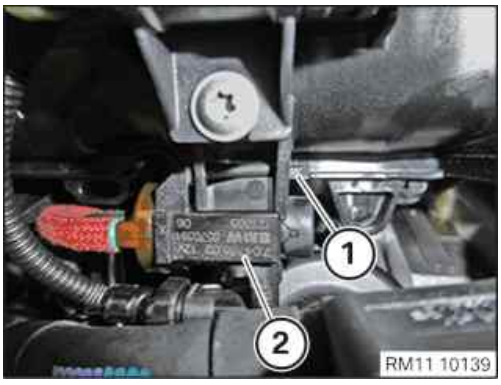


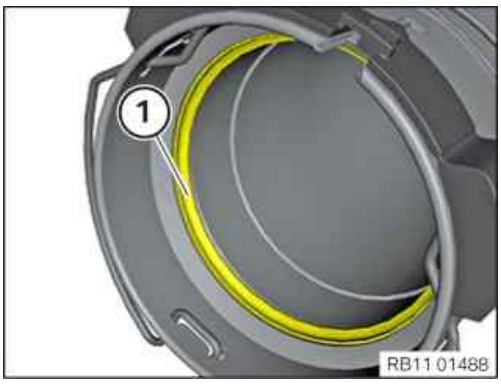
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

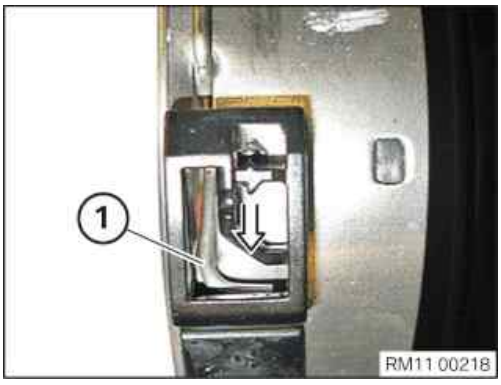


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.

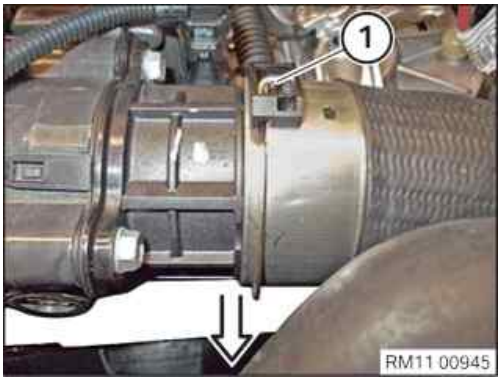


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

42 – Remove the engine from the assembly stand

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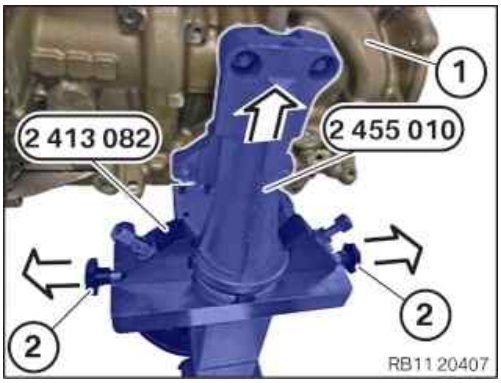
CAUTION

Heavy component.

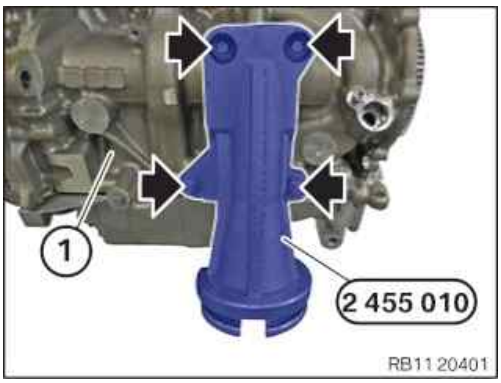
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

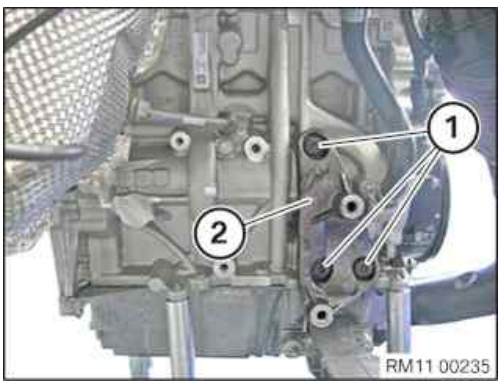
- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.



- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

M10		Tightening torque	38 Nm

43 – Install the engine on the double-clutch transmission (DKG)

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RISK OF DAMAGE

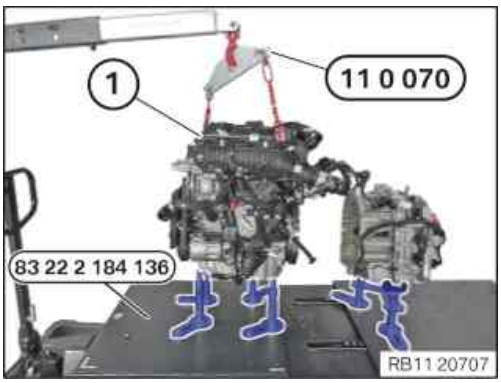
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.

TECHNICAL INFORMATION

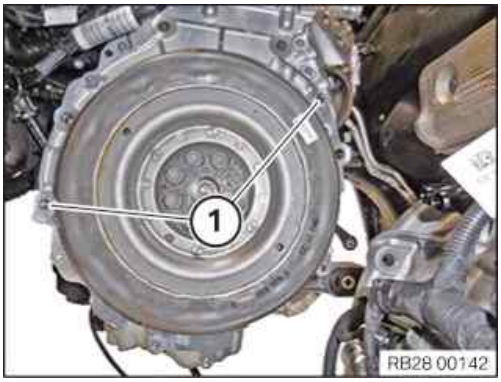
Transmission oil temperature 20 °C up to a maximum 40 °C!
Carry out the "Transmission oil adjustment" service function with the diagnosis system.
The double clutch also needs to be replaced if you exceed the oil change interval by more than 3000 km!
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox (DKG).



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Clean the gearing (1) of the drive shaft.
- Coat the gearing (1) with MI-Setral-43N grease (BMW part number 83 23 2 152 082).

  Tooth gaps must be filled with grease up to tooth height!

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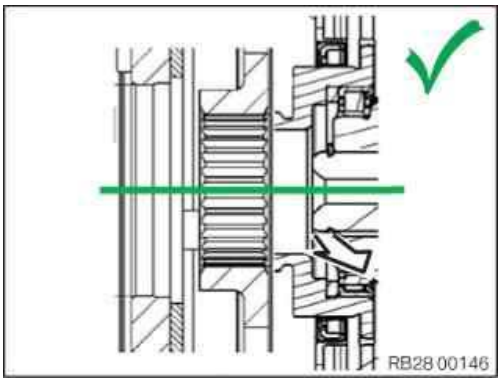
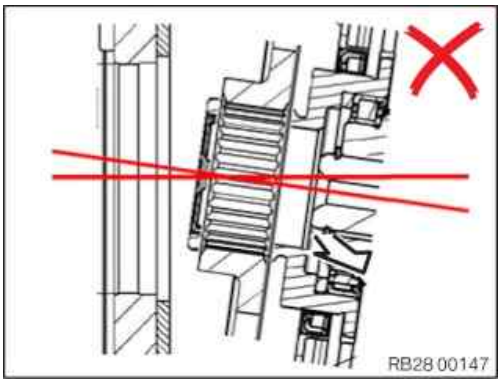
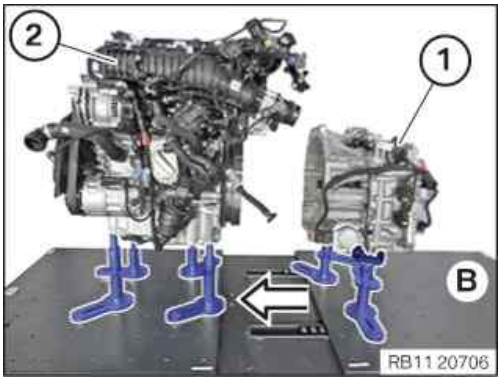


- **Correct:** Insert the double-clutch transmission (DKG) horizontally into the flywheel.



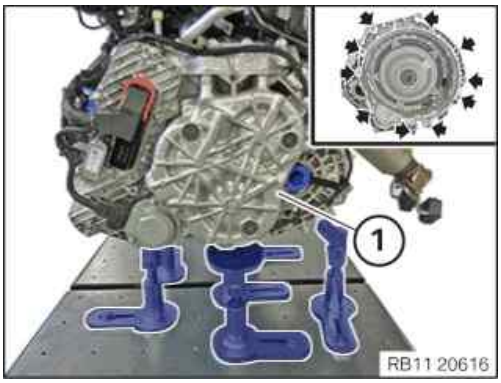
- **Wrong:** Do not tilt the double-clutch transmission (DKG) when inserting it into the flywheel.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table plate (B) in the direction of the arrow and position double-clutch transmission (DKG) (1) **carefully** on the engine (2).



- Flange-mount the double-clutch transmission (DKG) to the engine so that it is **absolutely** horizontal.
- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Connect and lock the coolant lines (1).
- Make sure that you can hear the coolant lines (1) engage.

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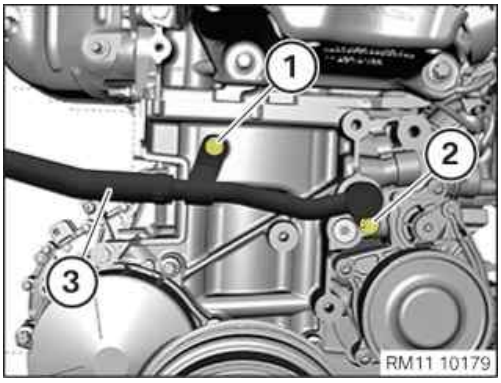
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

44 – Attaching assemblies (on lifting table)

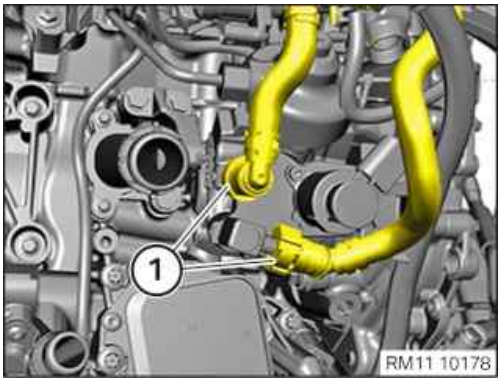


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The locks must engage audibly.

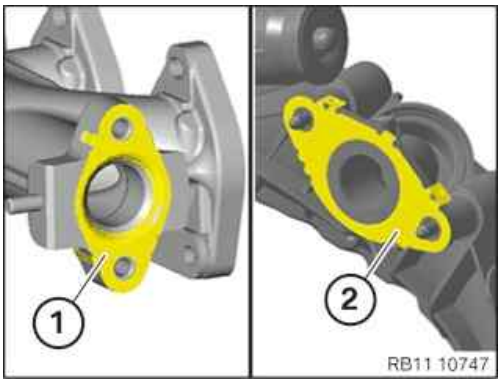
▸ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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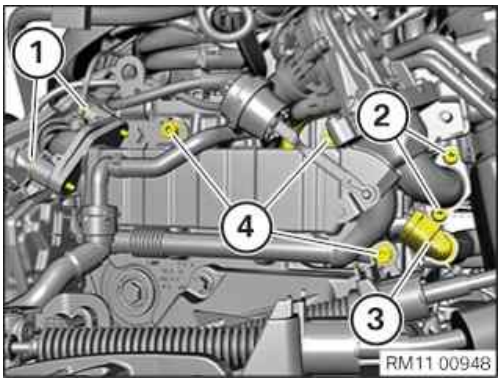


- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

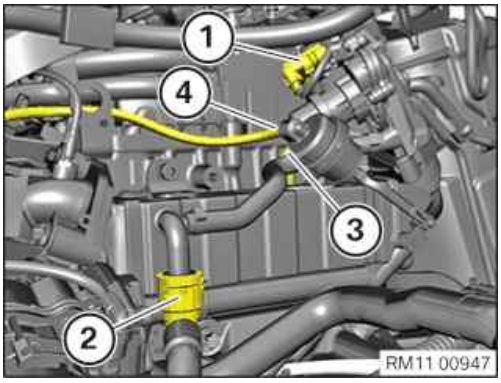
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

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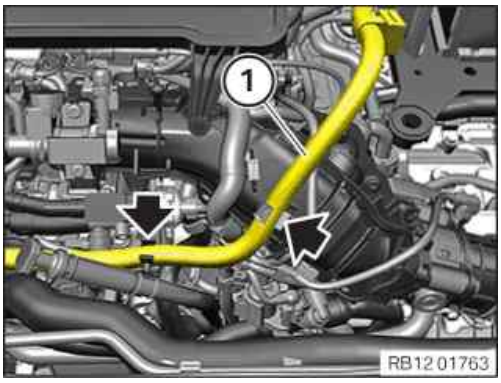


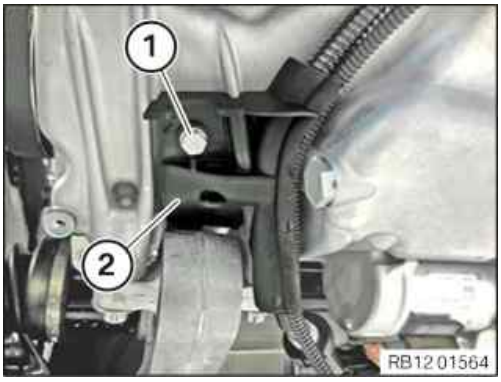
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

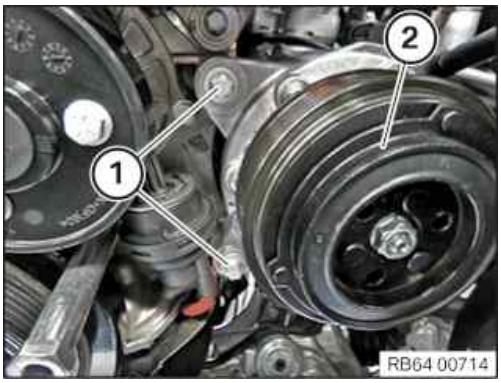
- Insert the positive battery cable (1) into the clamps (arrows).
- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

- Tighten the screws (1).

- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

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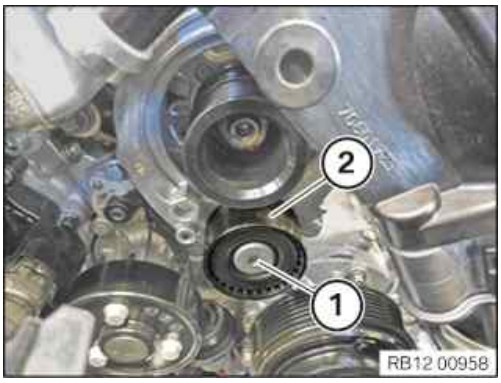
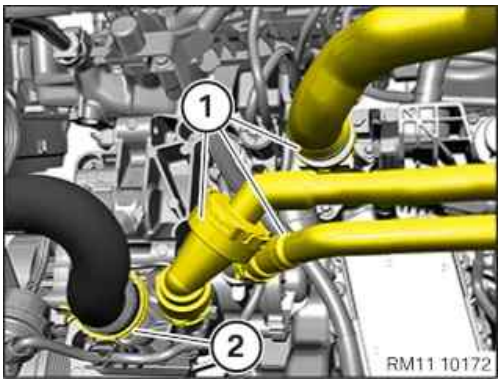


- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

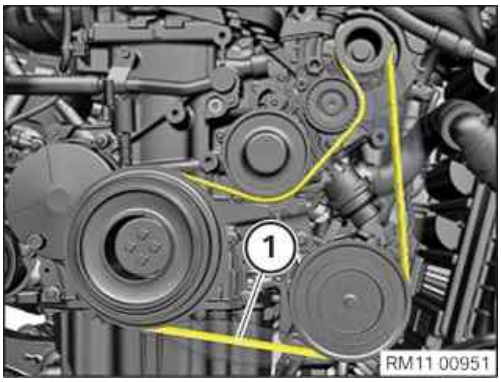
▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ Install the acoustic cover for the engine at the front

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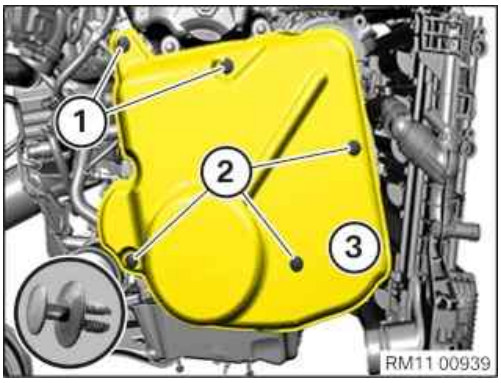
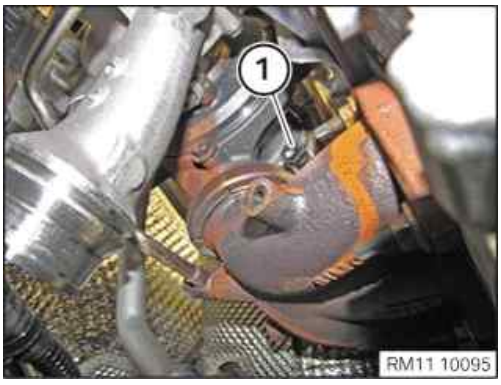


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

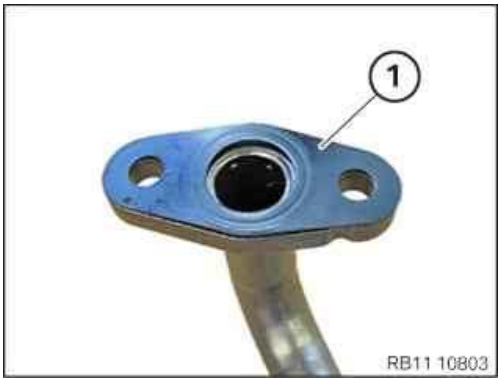
▸ Installing the oil return line for the exhaust turbocharger

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

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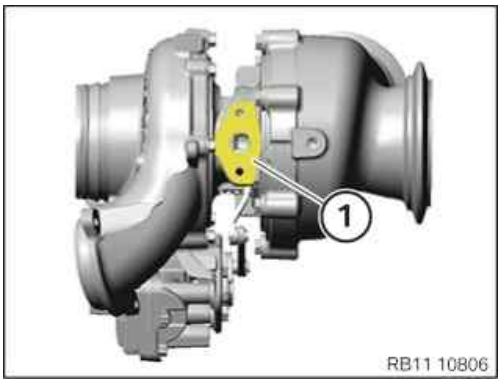
- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

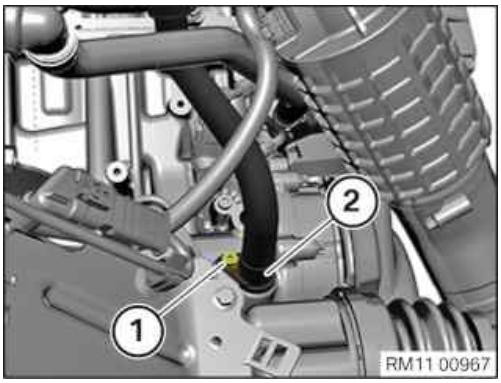
- Do not use any metal-cutting tools.

- Clean sealing surface.

- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm



- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

▸ **Install the oil feed line for the exhaust turbocharger**

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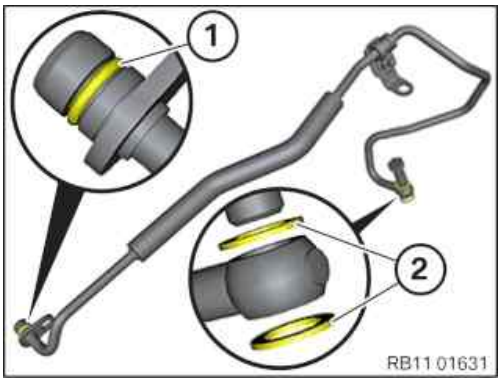
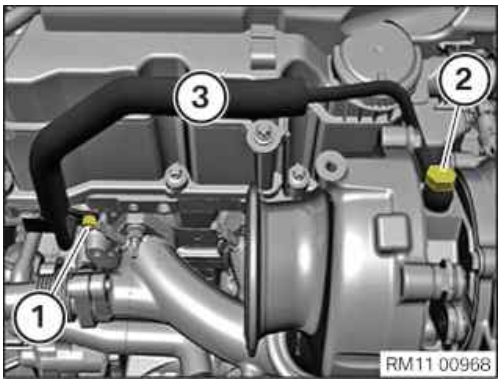


- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

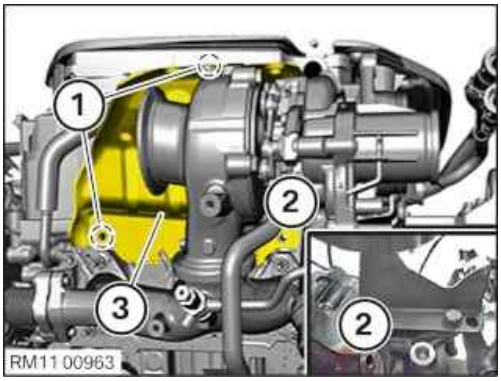
▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

▸ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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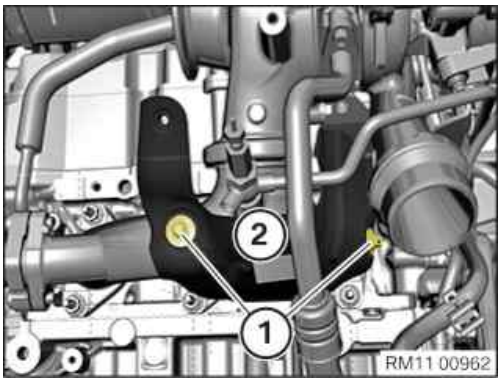


- Feed in and install the heat shield (2).
- Tighten the screws (1).

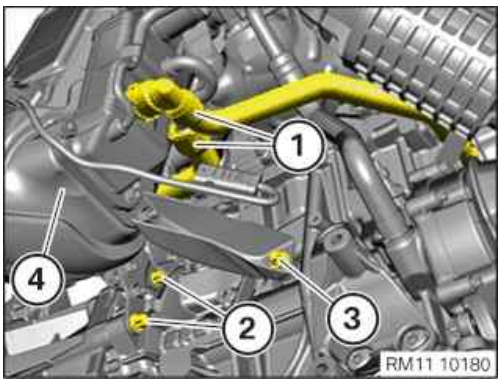
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

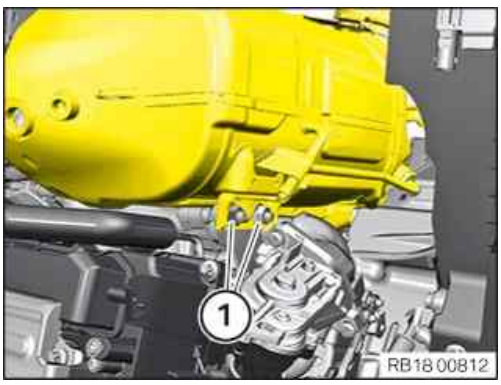
M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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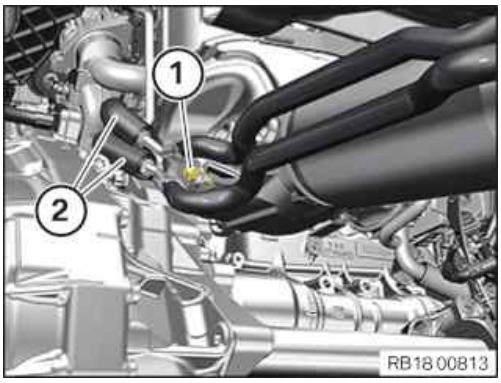


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

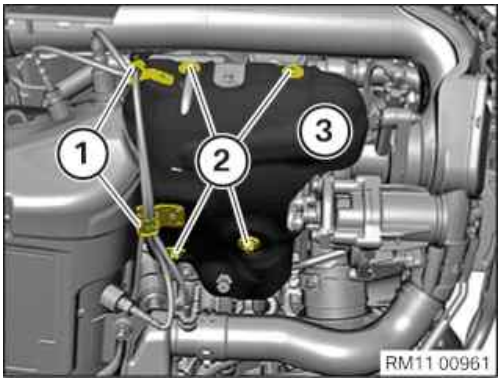
▶ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



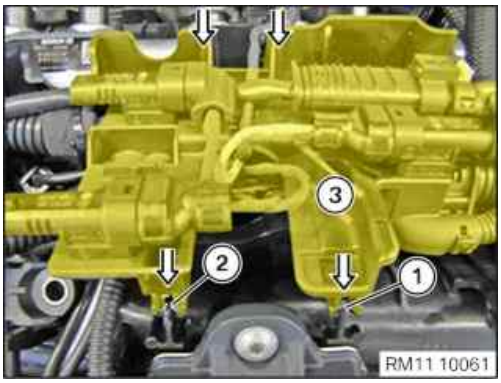
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

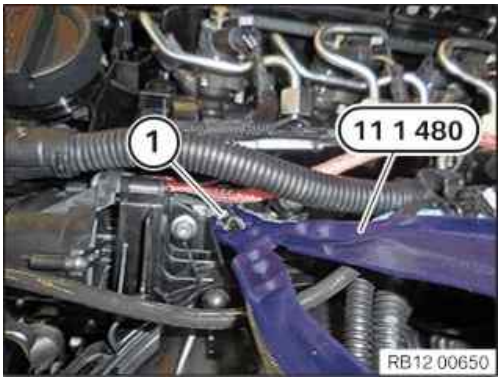
Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▶ **Installing the cable clip for the intake plenum**



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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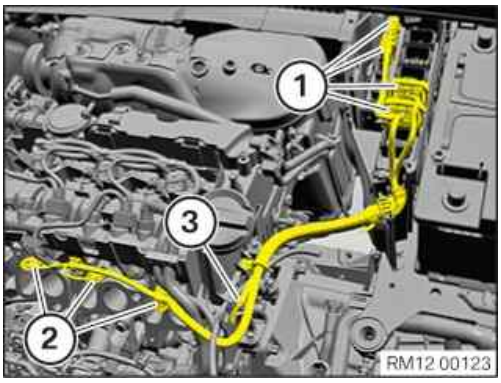
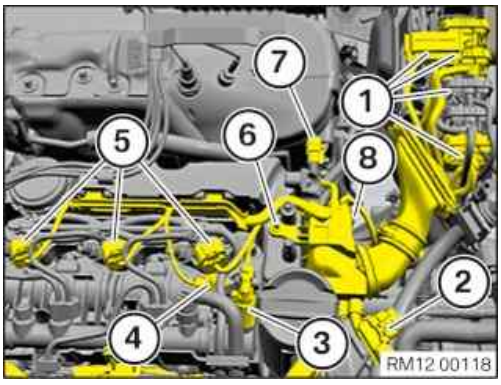


- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

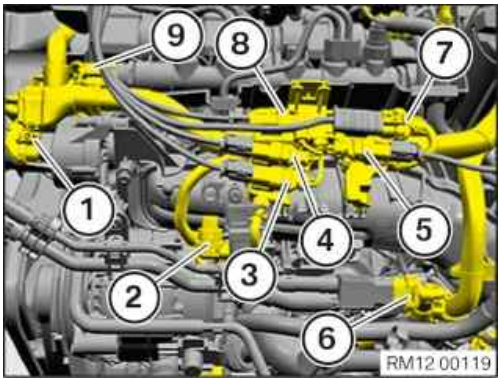


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

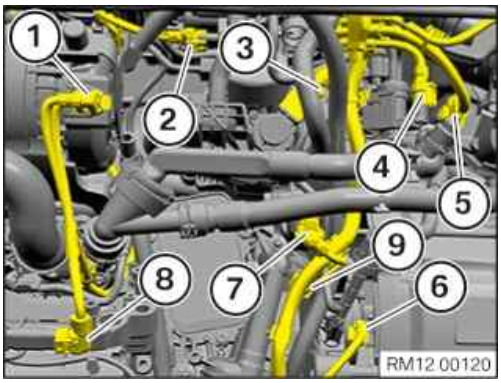
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.

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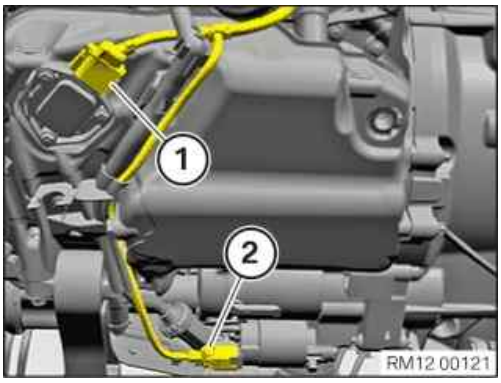
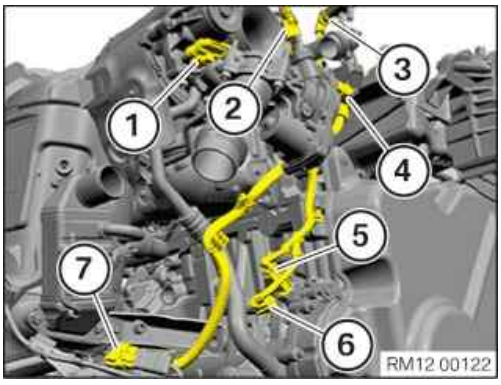
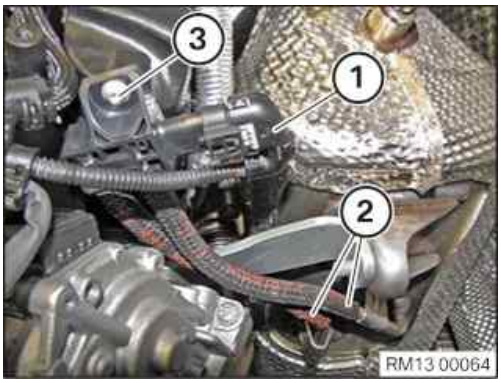


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

45 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

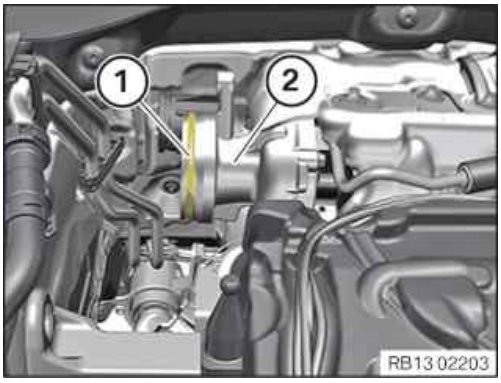
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

46 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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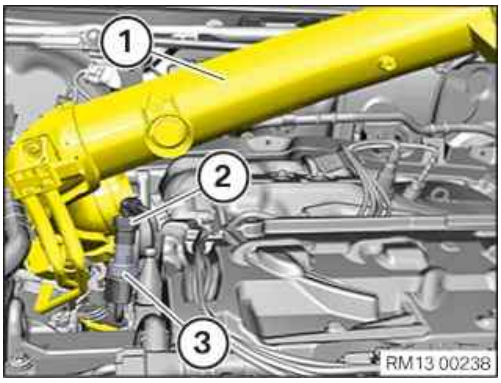


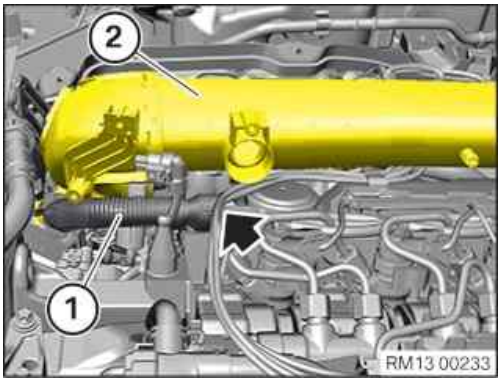
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

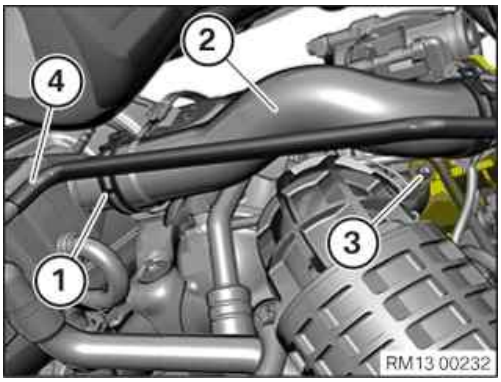
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

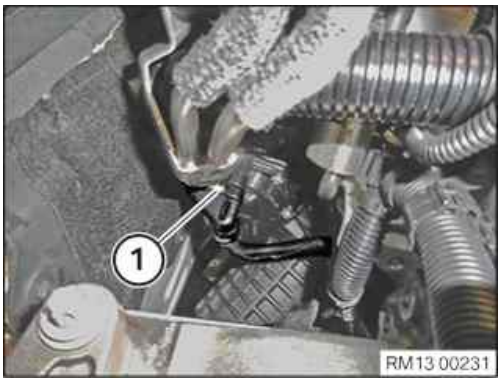
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.

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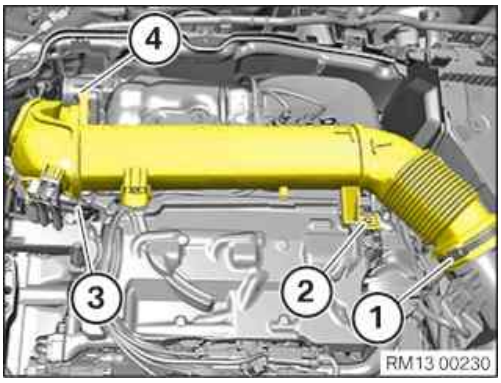


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

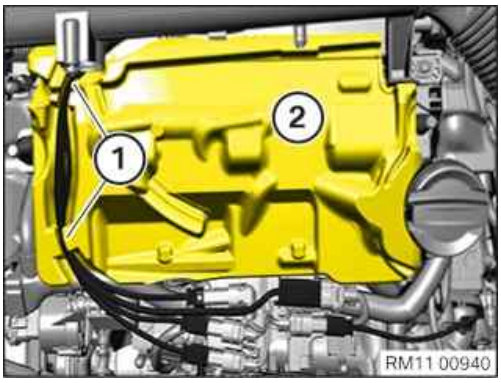
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

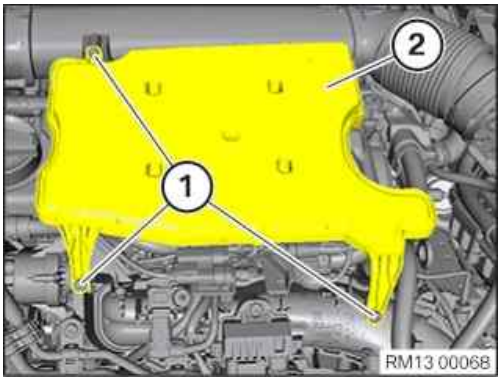
Clamp		Tightening torque	3 Nm

47 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

48 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

49 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

50 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 8

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 9

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 9

M14x35		Tightening torque	160 Nm

Rear timing case cover to crankcase

Used in step 26

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover

Used in step 26

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 26

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 26

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 26

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 26

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 26

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 27

M12x1.5	Renew screws.	Tightening torque	120 Nm

Glow elements to cylinder head

Used in step 30

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 31

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 32

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 32

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 32

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 32 44

M6			8 Nm

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Chain tensioner piston to cylinder head

Used in step 32

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 32

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 36

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 37

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 37

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 38

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 38

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 40

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 41

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 42 44

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 43 44

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 44

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 44

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 44

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 44

M8x20		Tightening torque	19 Nm

Bracket to oil sump

Used in step 44

M6		Tightening torque	8 Nm

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Air conditioning compressor in component carrier — Used in step 44

M10		Tightening torque	38 Nm

Alternator to component carrier — Used in step 44

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner — Used in step 44

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold — Used in step 44

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase — Used in step 44

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger — Used in step 44

M6x12		Tightening torque	8 Nm

Oil return line to crankcase — Used in step 44

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head — Used in step 44

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger — Used in step 44

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger — Used in step 44

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 44

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder — Used in step 44

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 44

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter — Used in step 44

Torx bolt BM6x16		Tightening torque	8 Nm

Ground cable to cylinder head — Used in step 44

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 44

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 45

Screw		Tightening torque	4 Nm

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Clamp for the pressure hose on the differential pressure sensor

Used in step 45 46

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor

Used in step 46

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger

Used in step 46

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover

Used in step 46

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 46

Clamp		Tightening torque	3 Nm

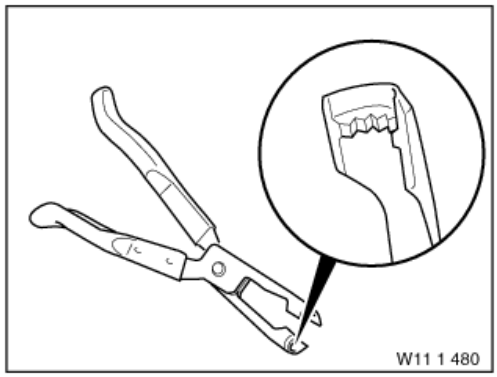
Resonator to manifold and clean air pipe

Used in step 48

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder

Common Used in step 8 43

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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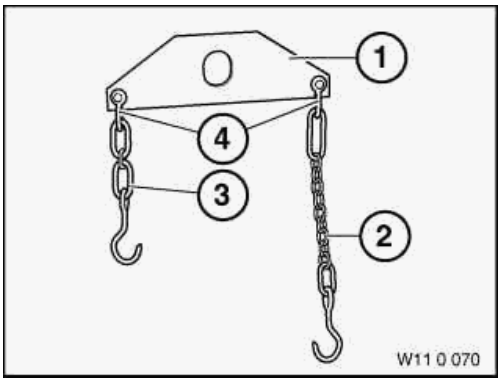
0 490 579 (11 0 070) Lifting gear



Common

Used in step 8 9 42 43

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

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2 455 010 Engine support

Common Used in step 9 42

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 9

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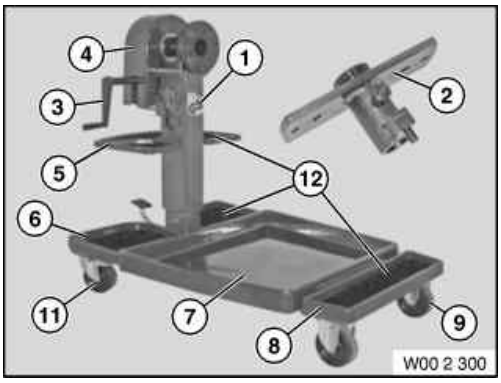

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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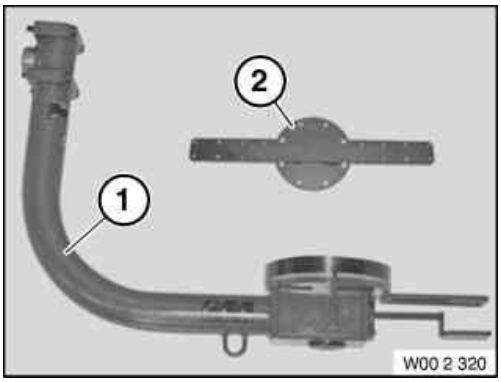
0 495 196 (00 2 320) Support arm



Common Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common Used in step 11 14 38 40

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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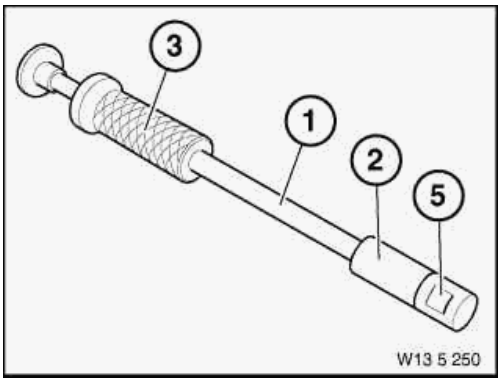
2 413 106 Fastener

Common Used in step 11 40

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush

Common Used in step 13

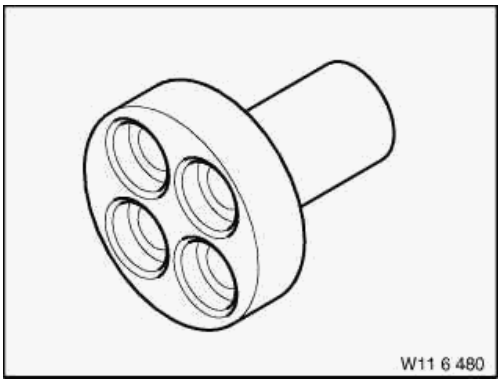
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 13

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 16 32 35

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 288 380 Locating stud

Common Used in step 16 32 33 35

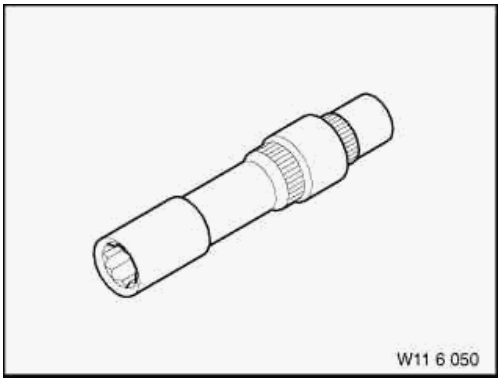
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common Used in step 16 32 34 35

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 21 30

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

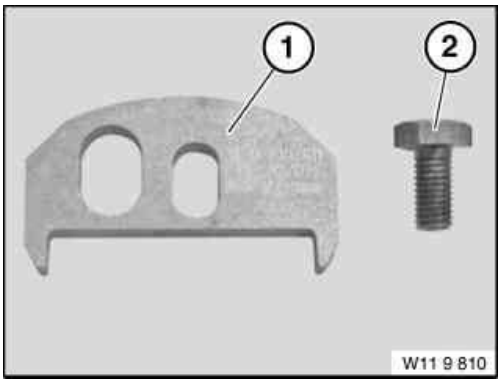
Common Used in step 22 23 32

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 171 (11 9 811) Holder



Common Used in step 24 27

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

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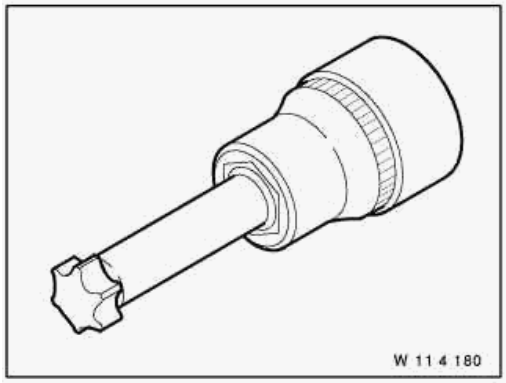
0 494 793 (11 9 265) Bush

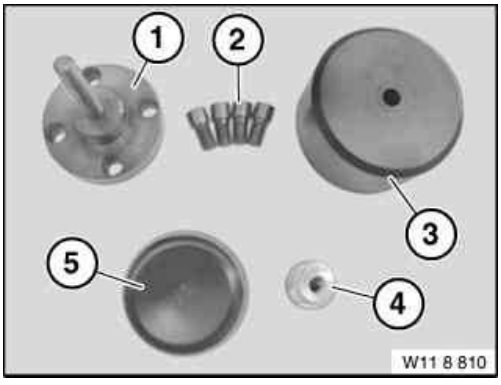
Common	Used in step 24 27
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 24 27
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

0 496 137 (11 8 815) Holding sleeve



Common	Used in step 26
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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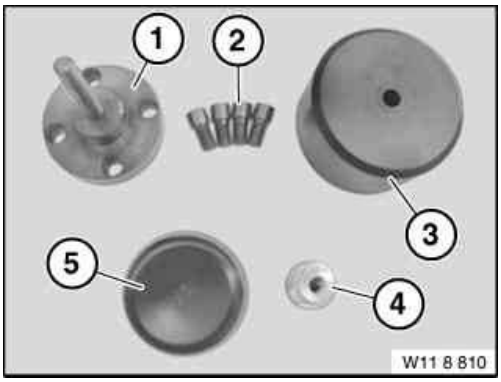
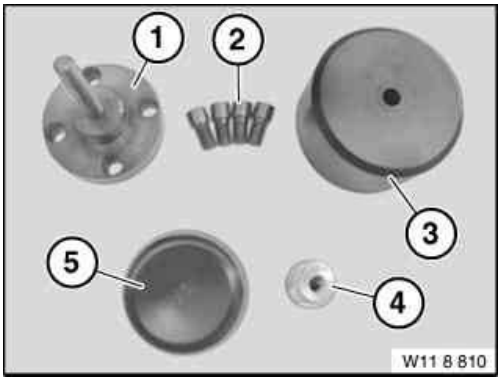
0 496 133 (11 8 811) Basic body



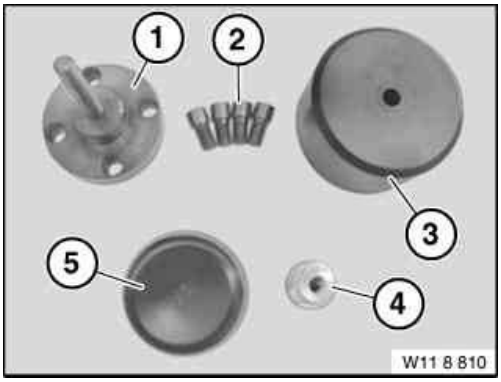
Common	Used in step 26
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 26
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve



Common	Used in step 26
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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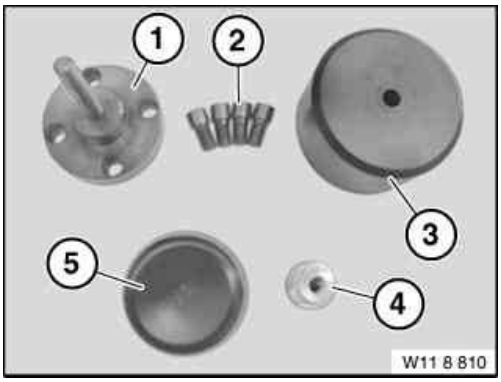
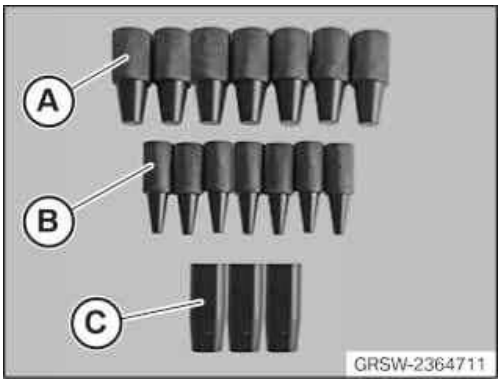
0 496 136 (11 8 814) Nut



Common	Used in step 26
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common	Used in step 26
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common	Used in step 26
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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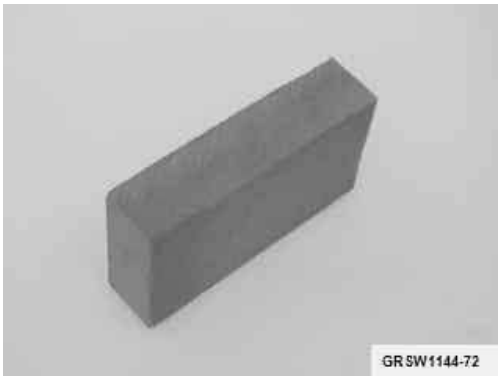
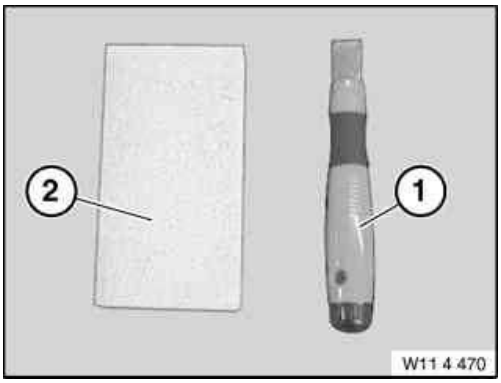
0 495 104 (11 4 472) Extractor



Common Used in step 26

Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 102 (11 4 470) Tool



Common Used in step 26

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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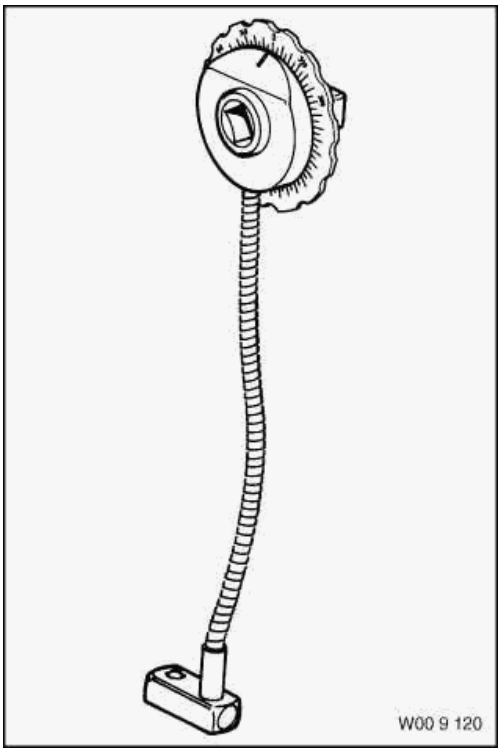
0 490 504 (00 9 120) Torque angle measuring dial



Common

Used in step 26

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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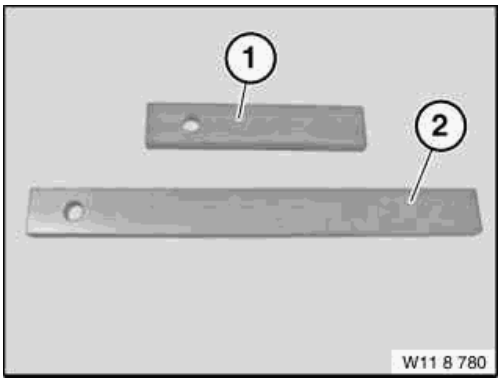
0 496 120 (11 8 780) Plate



Common Used in step 26

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

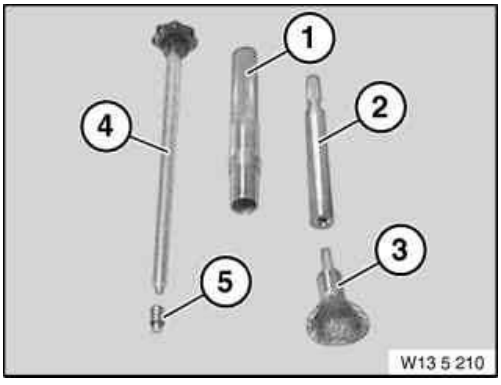
Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set

Common Used in step 27

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

0 493 763 (13 5 215) Plug



Common Used in step 37

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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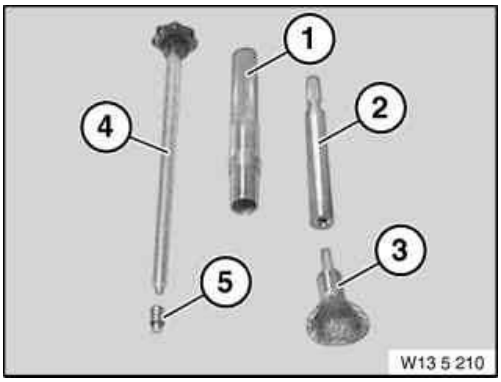
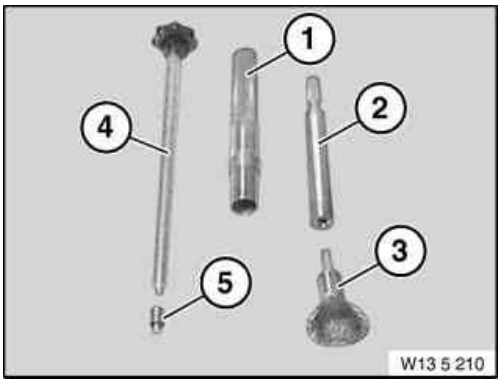
0 493 762 (13 5 214) Rod



Common	Used in step 37
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



Common	Used in step 37
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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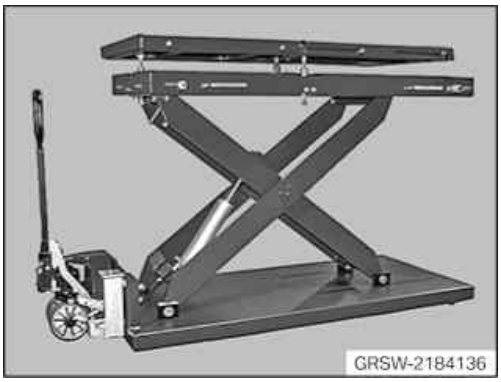
2 184 136 Mobile equipment table lift



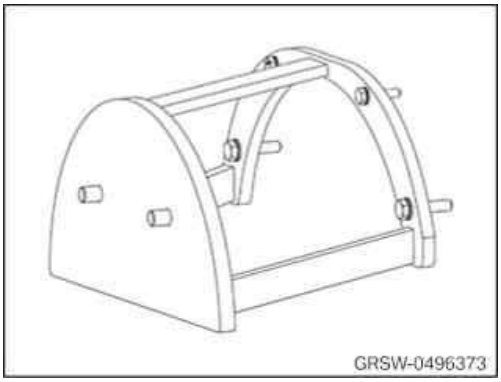
Common	Used in step 43
Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

Replacement tools:

2 299 563 Adapter

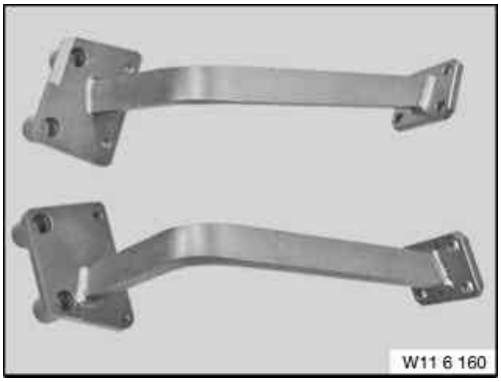
Common	Used in step 9
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 373 (11 5 420) Plate



Common	Used in step 9
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 9
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

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Overview Technical Data

Screw-in depth of thread cutter	Used in step 27
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 44
EGR controller	7 44

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	26

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
31 10 001 Completely removing and installing front axle with engine and transmission	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
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11 00 050 Removing and installing engine	1 50
11 00 050 Remove and install engine	1 50
11 00 050 Remove and install engine	1 50
11 00 050 Remove and install engine	1 50
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 50
11 00 050 Remove and install engine	1 50
11 00 050 Remove and install engine	1 50

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11 00 050 Remove and install engine	1 50
11 00 050 Remove and install engine	1 50
11 00 050 Removing and installing the engine (manual gearbox)	1 50
11 00 050 Remove and install engine (Automatic)	1 50
11 00 050 Remove and install engine	1 50
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11 00 050 Remove and install engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine \PREMIUM	1 50
11 00 050 Removing and installing/replacing engine (N63)	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Removing and installing engine	1 50
11 00 050 Remove and install engine	1 50
11 00 050 Remove and install engine (Automatic)	1 50
11 00 050 Remove and install engine (Automatic)	1 50
11 00 050 Remove and install engine	1 50
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11 00 050 Remove and install engine (Automatic)	1 50
11 00 050 Remove and install engine (Automatic)	1 50
11 00 050 Remove and install engine	1 50
11 00 050 Remove and install engine	1 50
11 00 050 Remove and install engine	1 50
11 00 050 Remove and install engine	1 50
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 50
11 00 050 Remove and install engine	1 50
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21 26
61 35 ... Notes on ESD protection (Electro Static Discharge)	26

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	32
Exhaust-gas recirculation cooler seal on exhaust manifold	44
Exhaust-gas recirculation cooler seal on intake plenum	44

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11 14 151 Replacing rear crankshaft seal (B37C)

Special tools required:

- 23 0 490
- 11 8 815
- 11 8 811
- 11 8 812
- 11 8 813
- 11 8 814
- 11 8 810

Necessary preliminary work:

- Remove transmission
- Remove flywheel

Attention!

Before the radial shaft seal is removed, the engine must be moved to the installation position using a suitable tool.

Engine oil may escape.

The radial shaft seal must be installed dry.

Do not use engine oil or lubricant.

Risk of damage to crankshaft sensor.

Read and comply with notes on protection against electrostatic discharge (ESD protection).

Removal:

Attention!

Magnet wheel (1) is magnetic.

Keep magnet wheel (1) in a plastic bag away from swarf.

Remove magnet wheel (1) from crankshaft.

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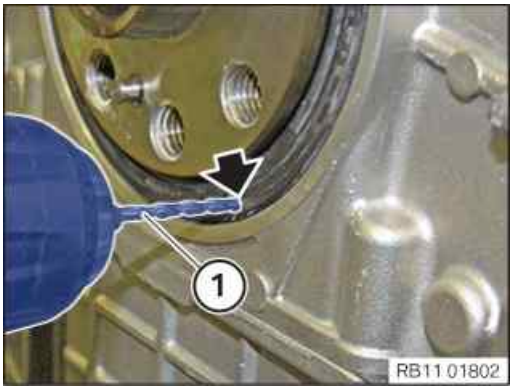


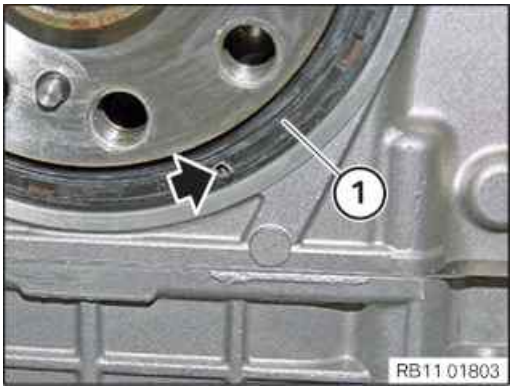
Attention!

Drill size maximum 2,5 mm.

Remove swarf immediately with vacuum cleaner.

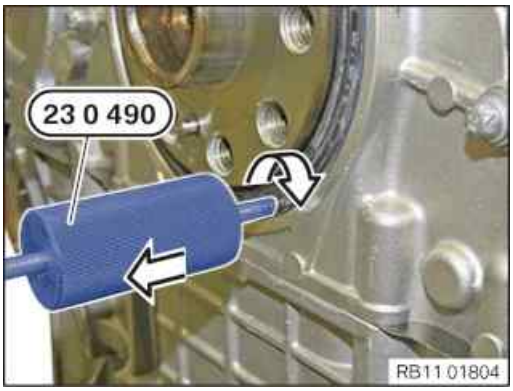
Do not remove swarf with compressed air!

Drill a hole with a drill (1) in the radial shaft seal (see arrow).



Attention!

Remove swarf from the radial shaft seal (1).



Attention!

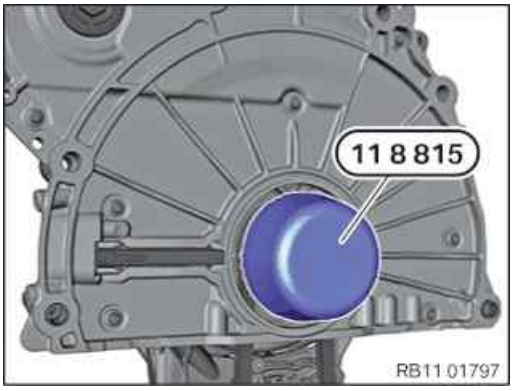
Risk of damage at the crankcase and on the running surface of the crankshaft.

Immediately carefully remove residual swarf.

Screw in special tool23 0 490 in direction of arrow.

Drive out radial shaft seal with impact weight in direction of arrow.

Installation:



Position special tool11 8 815 on crankshaft.

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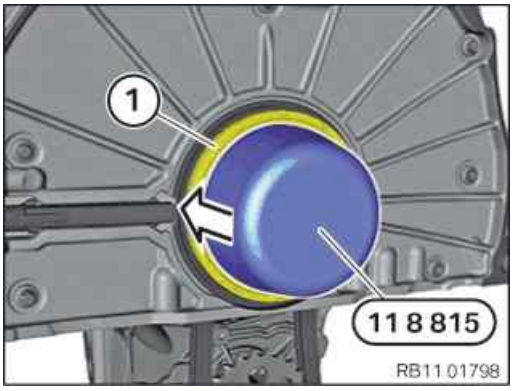


Use special tool 11 8 815 to fit the radial shaft seal (1) in the direction of the arrow just up to radial shaft seal and position.

Remove special tool 11 8 815 .

Fasten special tool 11 8 811 with special tool 11 8 812 on the crankshaft.

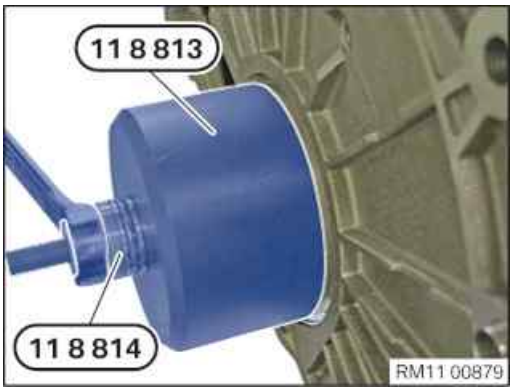
Attention!

Risk of damage to crankshaft sensor.

Check freedom of movement between special tool 11 8 813 and the crankshaft sensor during installation.

Slide on special tool 11 8 813 .

Screw down special tool 11 8 814 .



Press in radial shaft seal with special tool 11 8 813 .

Screw in special tool 11 8 813 up to timing case cover.

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Note:
Check the fitting sleeve for damage.

Note the installation position of the magnet wheel.

Position magnet wheel (1) on crankshaft.

Remove all special tools 11 8 810 .

Required follow-up work:

- Installing the flywheel
- Install transmission

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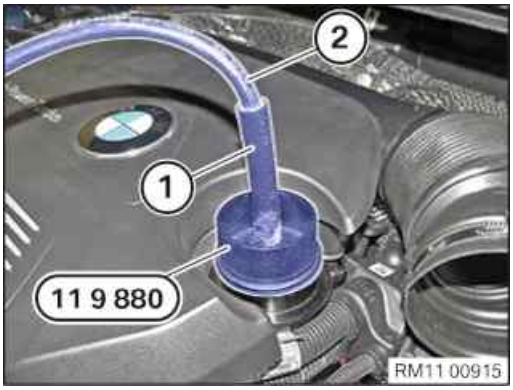
11 15 510 Measuring the internal engine pressure (B37C)

Special tools required:

- 11 9 880
- 81 31 2 357 800

Note:

- Follow the diagnosis instruction for pressure testing.
- Check engine oil level.



Note:
Create hose piece (1), Ø = 8 x 13 mm, length = 70 mm.

Create hose piece of low pressure line (2), length = 300 mm.

Connect hose piece (1) with low pressure line (2).

Connect low pressure line (2) with the diagnosis connection of the Integrated Measurement Interface Speaker (IMIB).

Connect tube (1) to special tool 11 9 880 .

Open oil filler cap .

Insert special tool 11 9 880 **hand-tight** into oil filler neck opening.

Start engine and run at idle speed.

Note:
Order number for low-pressure hose: 81 31 2 357 800 (previously: 81 38 2 201 924)

Different fault patterns as example:

0.97 bar	Ambient pressure.
0.95 bar	Engine internal pressure normal.

If the deviation is significantly greater than -0.04 bar, the engine ventilation system is faulty.

0.80 bar	Pressure control valve faulty.

If the deviation is significantly greater than +0.04 bar, the engine ventilation system is clogged.

1.07 bar	Clogged ventilation system, e.g. iced up, contaminated or kinked vent line.

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11 16 550 Removing and installing/replacing alternator support (B37C)

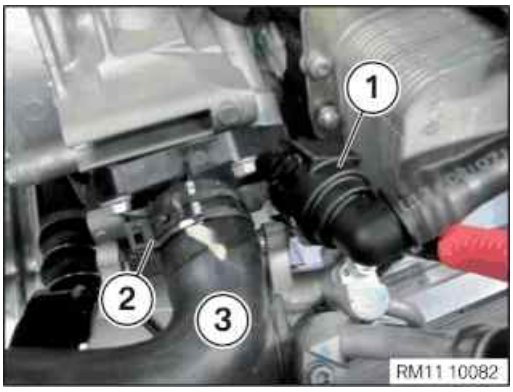
Special tools required:

- 11 4 470

Necessary preliminary tasks:

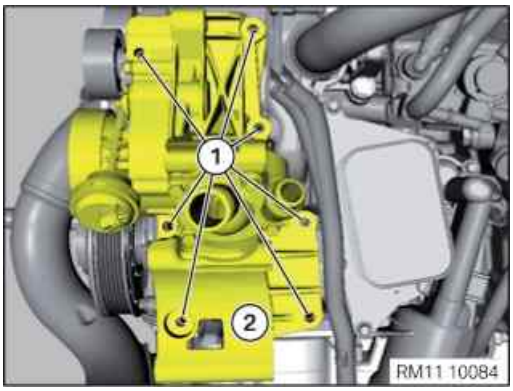
- Remove alternator.
- Remove fan cowl.
- Only release air conditioning compressor for air conditioning and secure to prevent falling down. (Air conditioning does not have to be drawn off.)
- Drain coolant.

Removal:



Unlock and detach coolant hose (1).

Release clamp (2) and pull off coolant hose (3).



Release screws (1).

Remove alternator support (2).

Installation:

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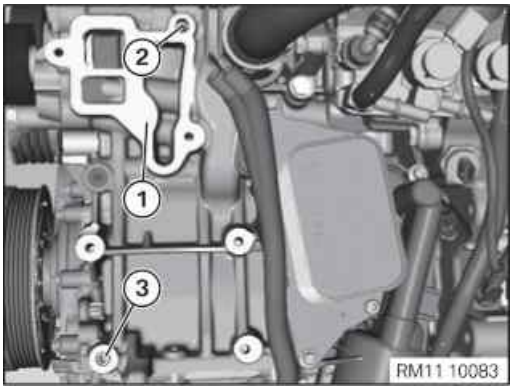


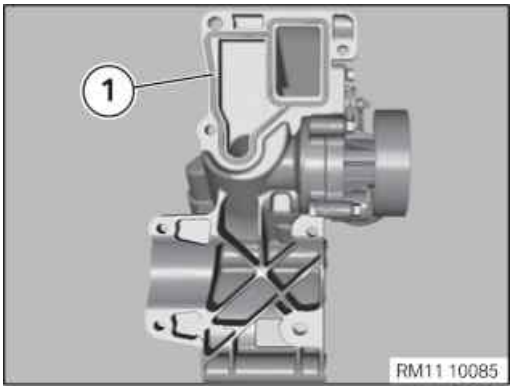
Clean sealing surface (1) with special tool 11 4 470 .

Check centring bushes (2 and 3) for damage, replace if necessary.

Replacement:

Remounting the coolant pump.

Remounting the coolant thermostat.



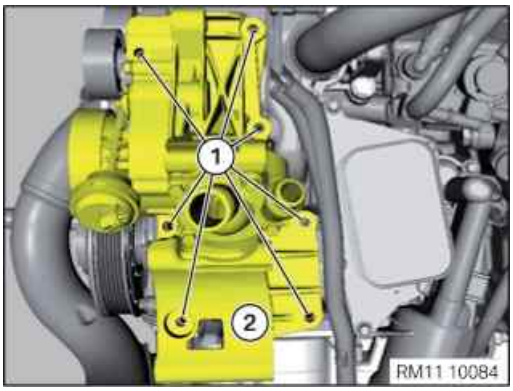
Note:
Sealing bead (1) is bonded to housing of the new alternator support.

Installation note:
If the sealing bead (1) protrudes slightly and if the sealing bead (1) is not damaged, the alternator support can be reinstalled.

If damaged: remove sealing bead (1) using suitable tool.

Replacing the sealing bead (1) sealant 2 2 (Loctite 5970).

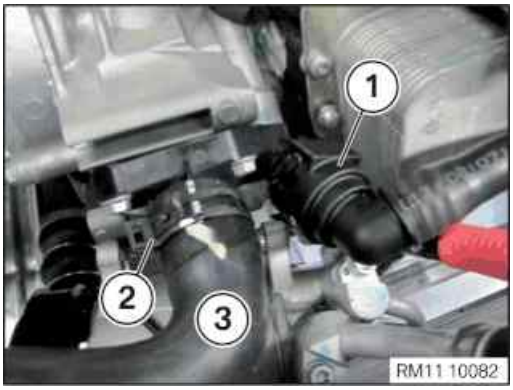
Sealant height approximately 2 to 2.5 mm.



Mount alternator support (2).

Tighten down screws (1).

Tightening torque 11 51 3AZ.



Mount coolant hose (1) (must audibly engage).

Mount coolant hose (3).

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Required follow-up work:

- Mount air conditioning compressor for air conditioning.
- Install fan cowl.
- Install alternator.
- Top up coolant.

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11 16 550 Removing and installing/replacing component carrier

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.
For additional information see:
Main group 17
17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.
Non-compliance will result in danger of component damage and/or engine damage.
Filling specification **absolutely must** be adhered to.
The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.
A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

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- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

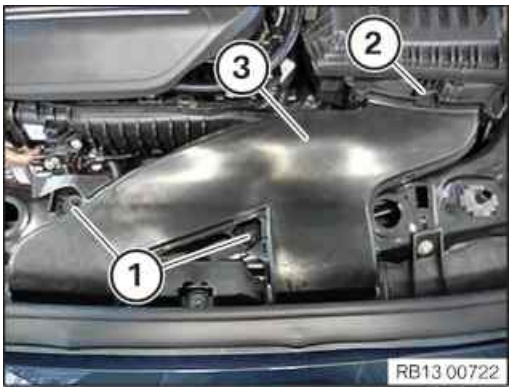
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

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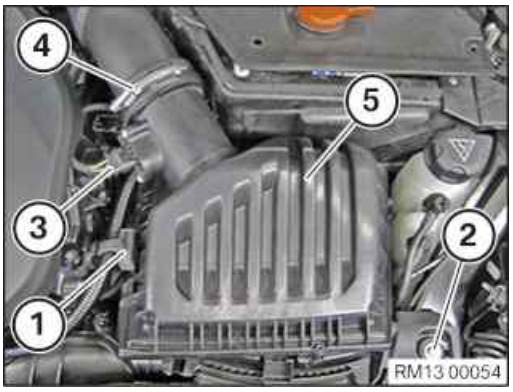
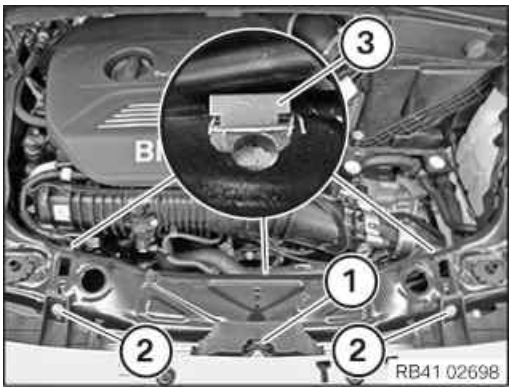
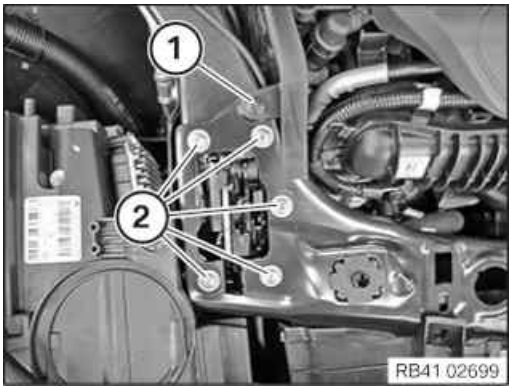


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

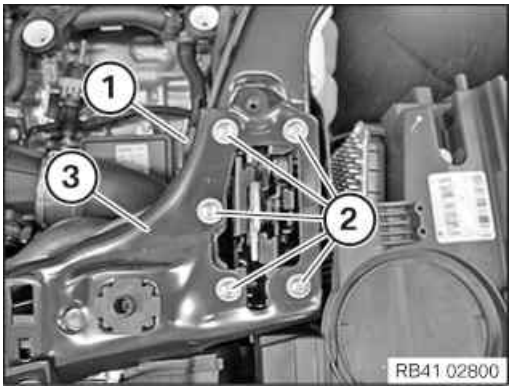
5 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.

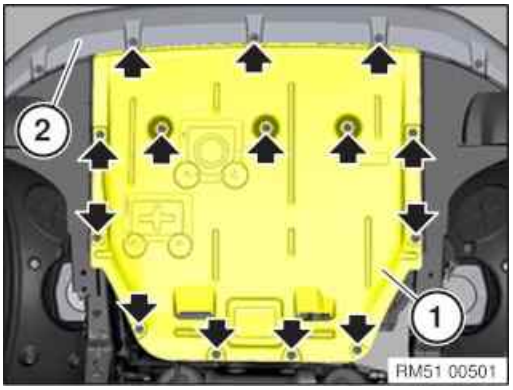


- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

6 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

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7 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

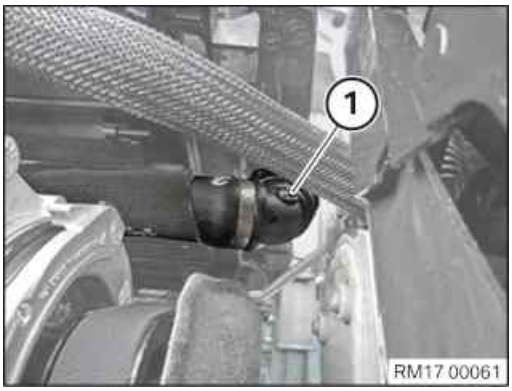
When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

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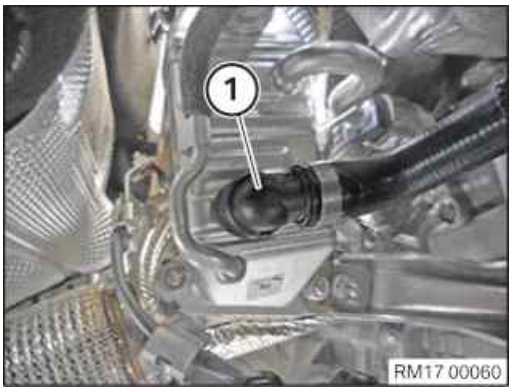


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

8 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

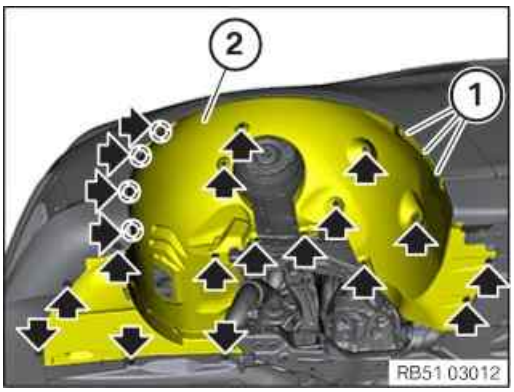
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

9 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

10 – Remove right charge-air line

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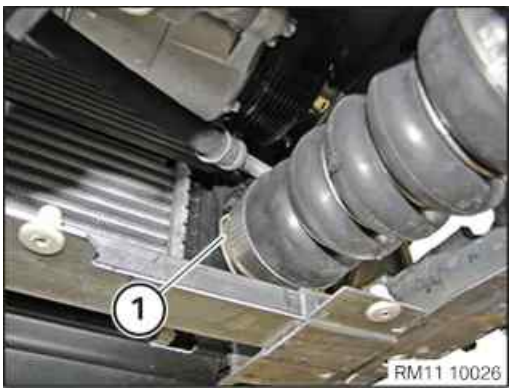
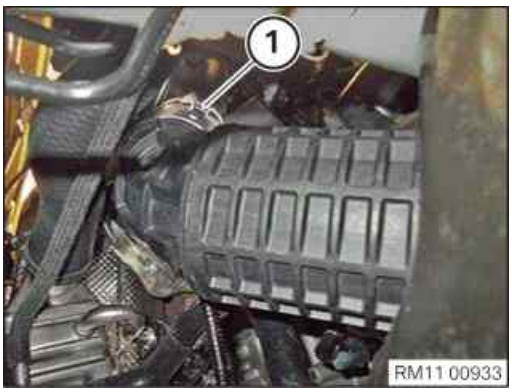
- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

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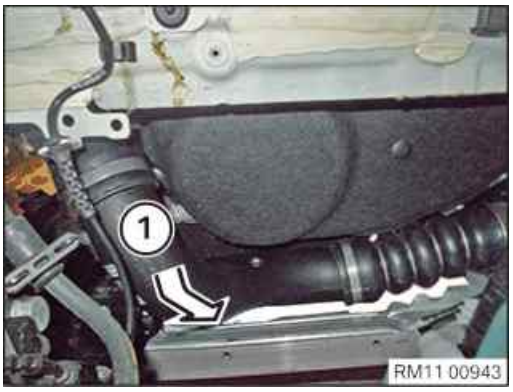
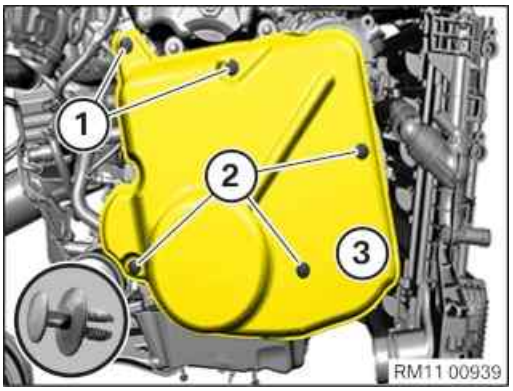


- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

11 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

12 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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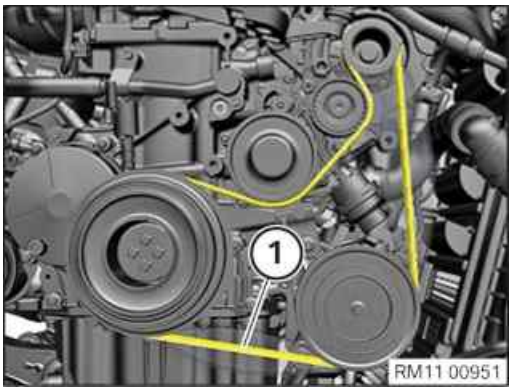
- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .

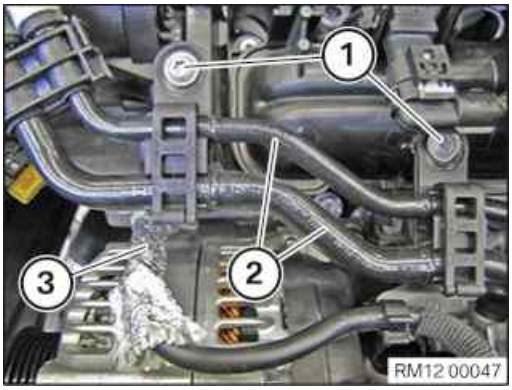


- Guide out the drive belt for the alternator (1) and remove it.

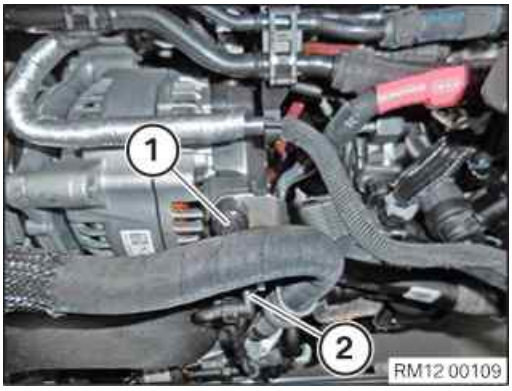
13 – Removing the alternator

Prerequisite

Battery earth lead is disconnected.



- Loosen screws (1).
- Place fuel feed and return line (2) to one side.
- Unlock the coolant ventilation line (3) and pull it off the cylinder head.
- Catch and dispose of escaping coolant.



- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock the plug connection (2) and pull off from the alternator.

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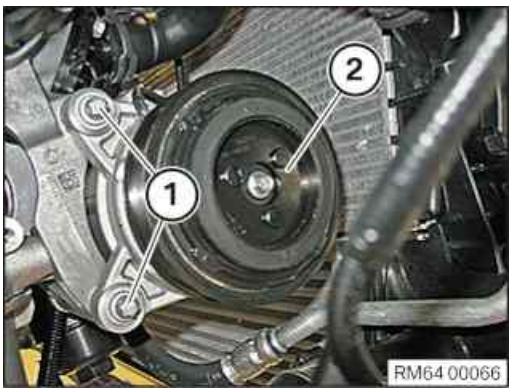
- Loosen screws (1).

- Feed the alternator (1) out toward the top and remove it.

14 – Releasing air conditioning compressor



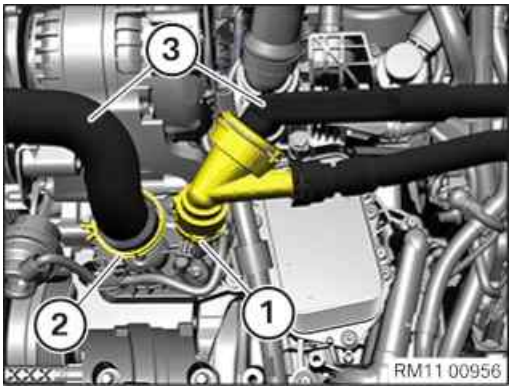
- Protect the air conditioning compressor (2) from falling.
- Loosen screws (1).
- Slide the air conditioning compressor (2) out and set it aside.

MAIN WORK

15 – Removing the component carrier

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock (1) on the coolant pipe.
- Loosen hose clamp (2).
- Pull off coolant lines (3) and place to one side.

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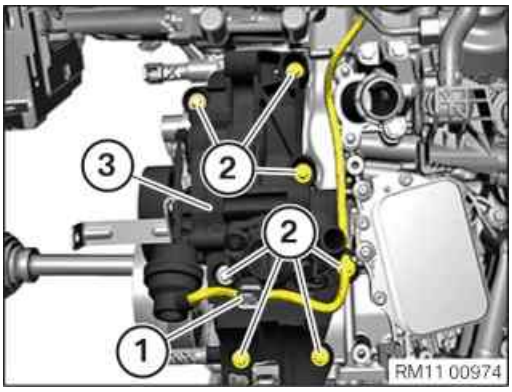


- Disconnect the vacuum line (1) from the vacuum unit and detach it from the clamp on the component carrier.
- Loosen screws (2).
- Lift off and remove the component carrier (3) from the crankcase.

16 – Installing the component carrier

RISK OF DAMAGE

Contaminant or foreign body.

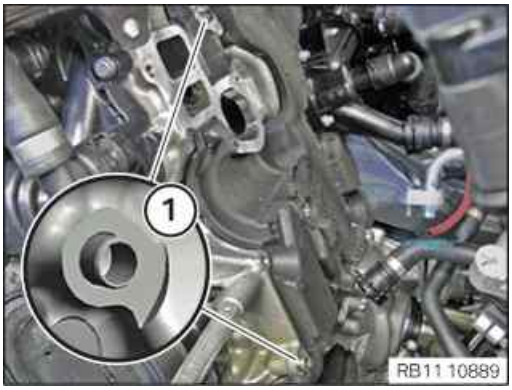
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Clean the sealing surface using special tool **0 495 102 (11 4 470)**.

Check

- Check the fitting sleeves (1) for damage.



desired state

- Fitting sleeves must not be scratched or deformed.

Result

» Fitting sleeves are damaged.

Measure

- Renew fitting sleeves.

Check

- Check the sealing bead (1) for damage.
- Measure the height of the sealing bead in reference to the surface.

Height of the sealing bead

	2,0 mm ... 2,5 mm

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Result

» The sealing bead is damaged or the measured dimension deviates.

Measure

- Remove sealing bead.
- Reapply sealing bead.

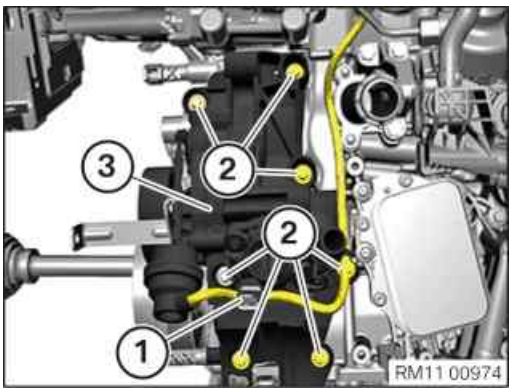
Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

Processing time of liquid sealing compound

< 12 min

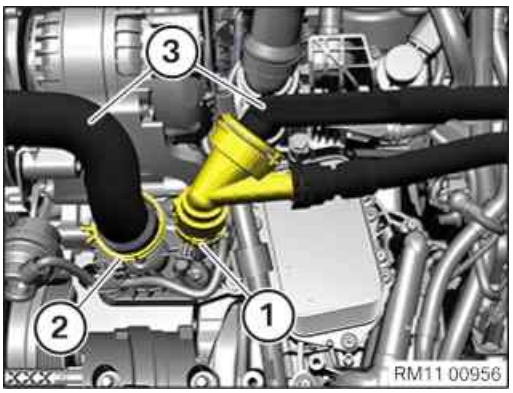


- Position the component carrier (3) on the crankcase.
- Tighten down screws (2).

Component carrier to crankcase

M8x35		Tightening torque	19 Nm

- Connect the vacuum line (1) on the vacuum unit and attach it in the clamp on the component carrier.

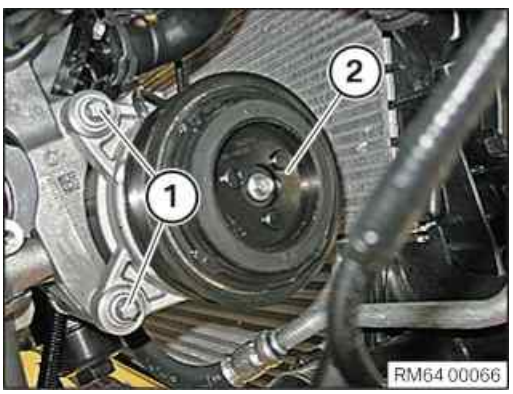


- Connect the coolant lines (3).
- Secure hose clamp (2).
- Lock the lock (1).

  The lock (1) must audibly engage.

POSTPROCESSES

17 – Tighten the air conditioning compressor



- Position the air conditioning compressor (2).
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

18 – Installing the alternator

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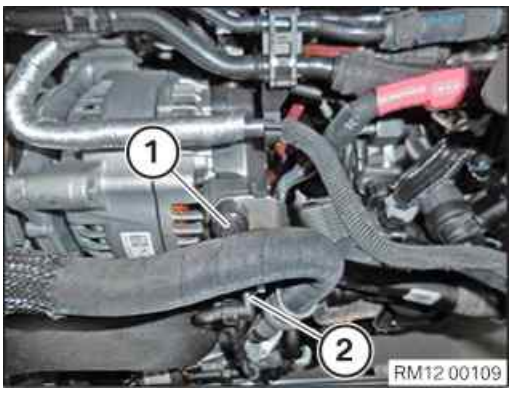
- Insert and install the alternator (1).

- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

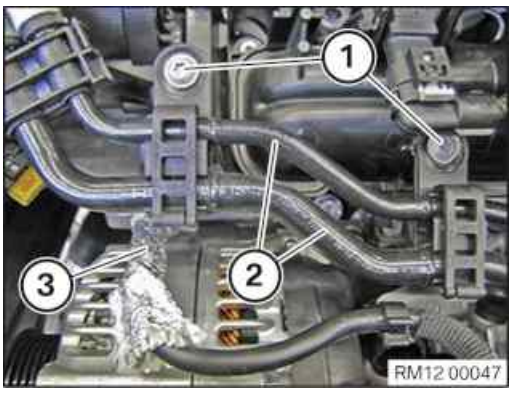


- Mount the positive battery cable to the alternator and secure it with the nut.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1) on the nut.
- Connect the connector (2) to the alternator and lock audibly.



- Mount fuel supply and return line (2).
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect the coolant ventilation line (3) to the cylinder head and audibly lock.

19 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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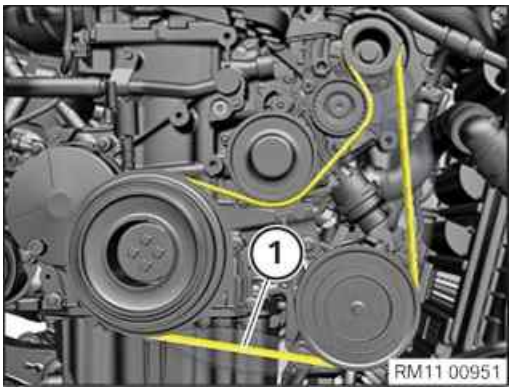
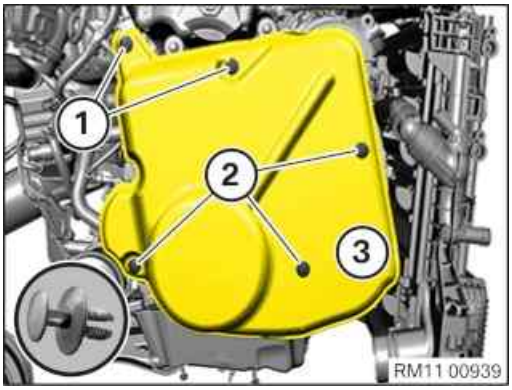


- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

20 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

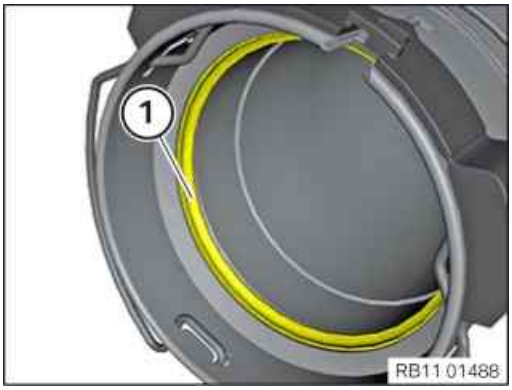
21 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket

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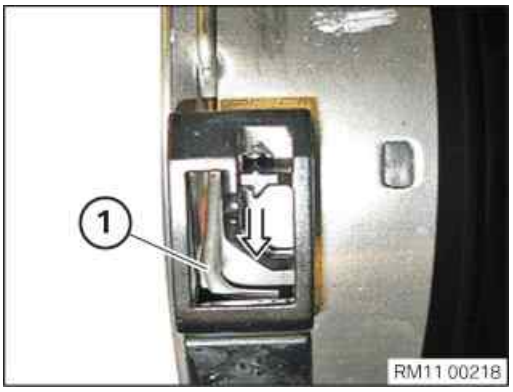
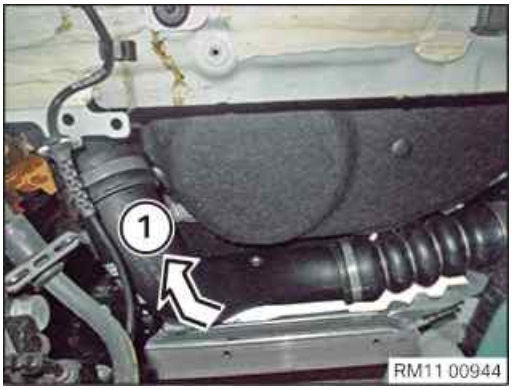
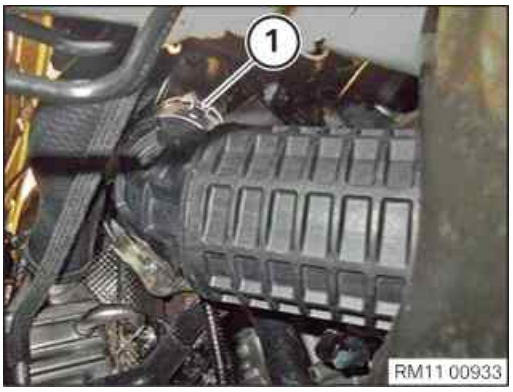


- Let the lock (1) engage at the holder (arrow).

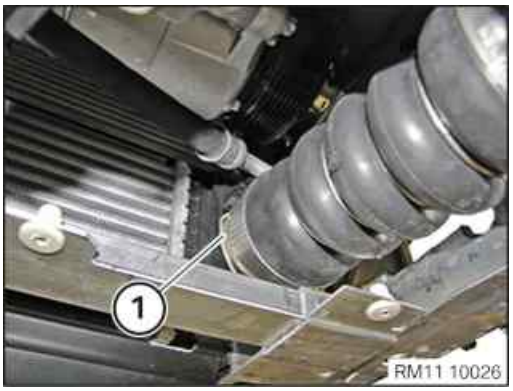


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

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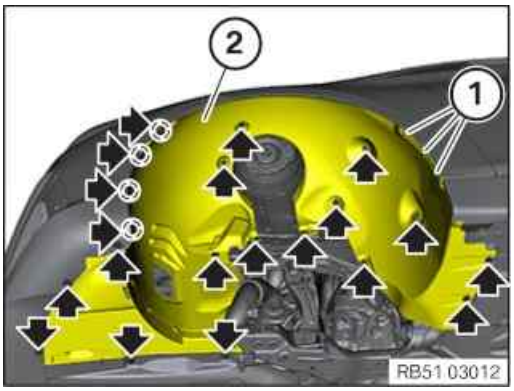
- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

22 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

23 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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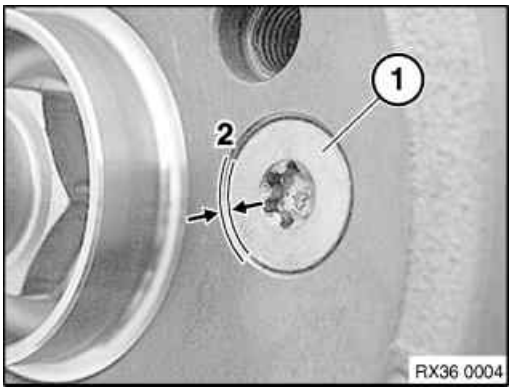
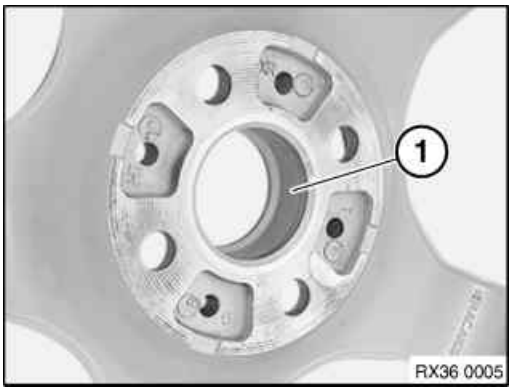


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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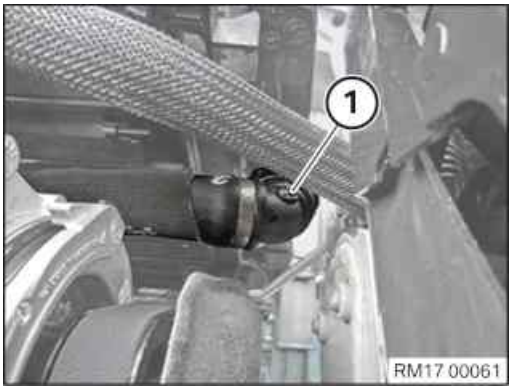
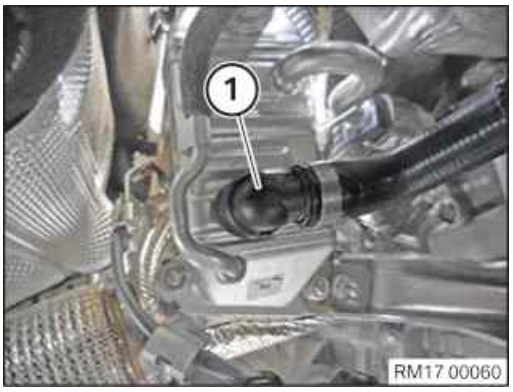
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

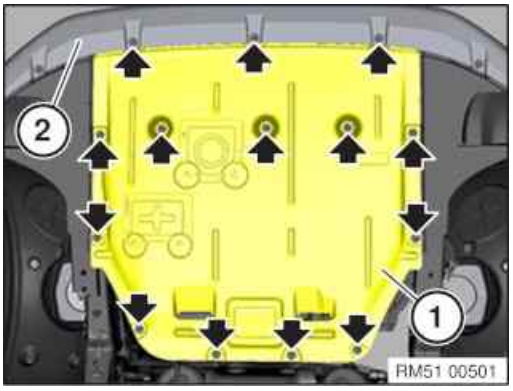


- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

25 – Installing the front underbody protection

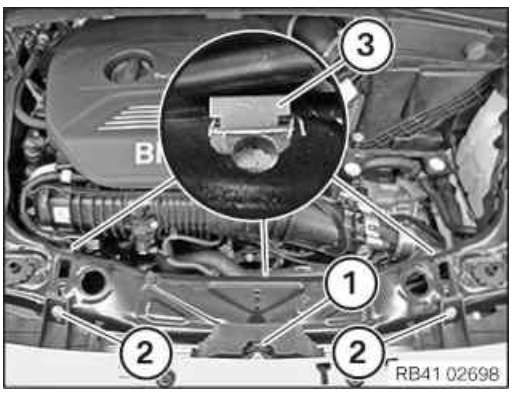


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

26 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

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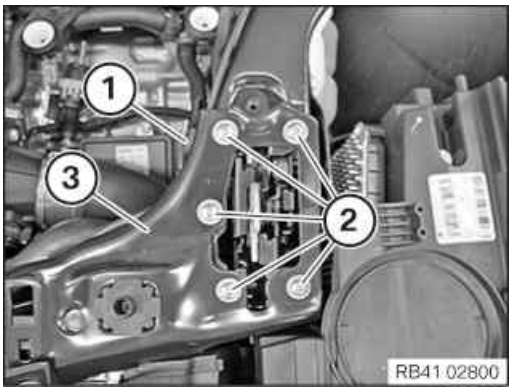
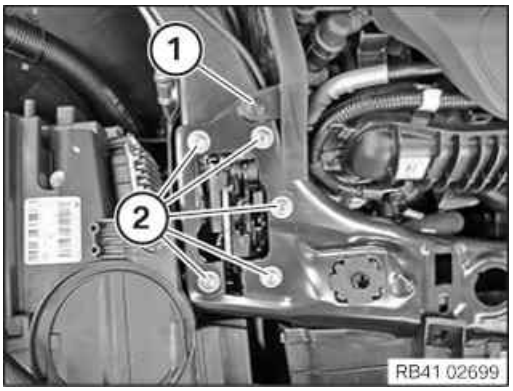


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



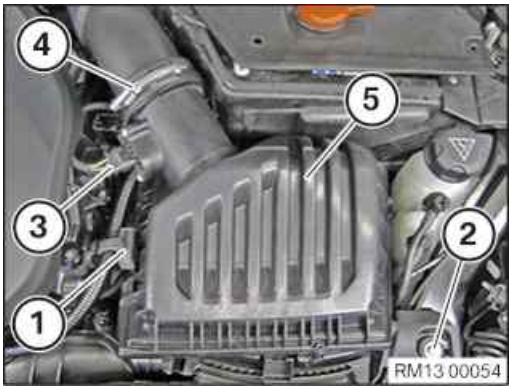
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

27 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

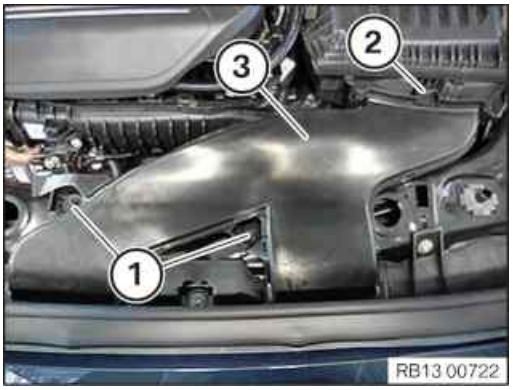
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

28 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

29 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

30 – Disconnecting all battery earth leads

- See additional information.

31 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Component carrier to crankcase			Used in step 16
M8x35		Tightening torque	19 Nm

Air conditioning compressor in component carrier			Used in step 17
M10		Tightening torque	38 Nm

Alternator to component carrier			Used in step 18
M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator			Used in step 18
M8		Tightening torque	19 Nm

Fuel line to intake plenum			Used in step 18
TS6x20		Tightening torque	5 Nm

Charge air line to crankcase			Used in step 21
M6x25		Tightening torque	5 Nm

Charge air duct to oil sump			Used in step 21
M6		Tightening torque	8 Nm

Wheel arch cover			Used in step 22
Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub			Used in step 23
M8	Renew screw.		16 Nm

Wheel bolts			Used in step 23
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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Underbody protection front — Used in step 25

			3 Nm

Bracing strut to top cross connection — Used in step 26

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 26

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 26

M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge — Used in step 27

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 27

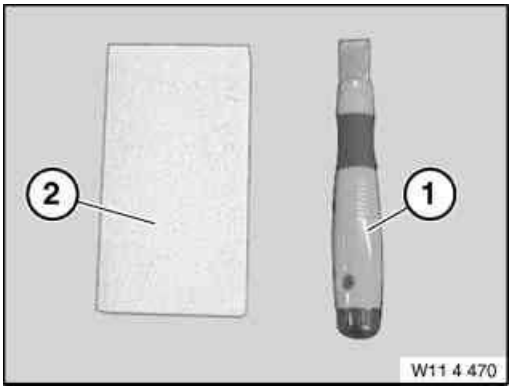
Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 28

M6		Tightening torque	8 Nm

Overview of Special Tools

0 495 102 (11 4 470) Tool



Common — Used in step 16

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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2 344 011 Tool

Common	Used in step 23
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 8
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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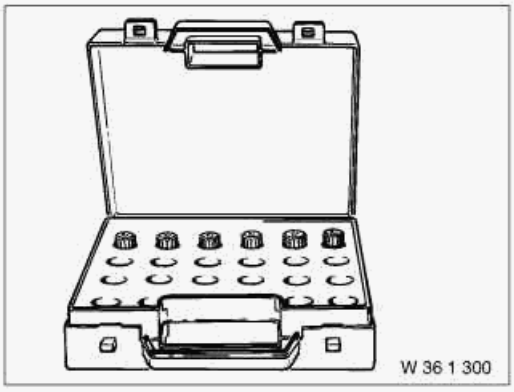
0 495 224 (36 1 326) Wheel stud



Common	Used in step 8
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 8
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 8
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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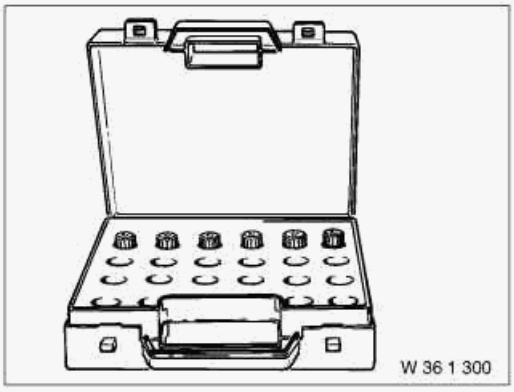
0 495 227 (36 1 329) Wheel stud



Common	Used in step 8
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 8
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 8
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 8
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Height of the sealing bead

Used in step 16

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	2,0 mm ... 2,5 mm

Processing time of liquid sealing compound	Used in step 16
	< 12 min

Links

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	16

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 30
61 20 900 Disconnecting and connecting battery earth lead	1 30
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 30
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 30
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61 20 900 Disconnecting and connecting battery earth lead	1 30
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31

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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	31
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	31

Operating materials	Used in step

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11 21 531 Replacing all crankshaft main bearing shells (B37C)

Special tools required:

- 00 2 010

Caution!

Replace main bearing bolts.

There must be no oil in the blind holes **(risk of cracking)**.

Do not wash off bolt coating.

Incorrect assembly of the bearing caps will result in damage to the crankcase.

The code letter **K** on the crankcase stands for ”Kupplungsseite” (German = clutch end).

Installation note:

Bearing classification from **1** to **3** (bearing cap) and **A** to **C** (crankcase) possible.

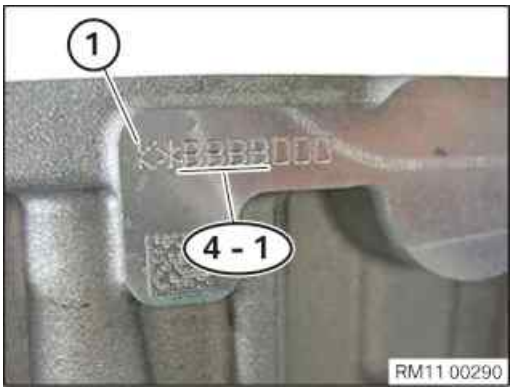
The new main bearing shells and guide bearing shells are indicated in colour or with numbers.

- Bearing colour **blue = 1**
- Bearing colour **green = 2**
- Bearing colour **brown = 3**

Necessary preliminary work:

- Remove crankshaft.

Pay attention to the different bearing classification sequences in the crankcase and the bearing caps!



Bearing classification in crankcase: A / B / C

The code letter (1) **K** on the crankcase stands for "Kupplungsseite" (English = clutch end).

The following code letters (4 - 1) describe the bearing positions **4** to **1** from left to right.

Example (see graphic):

Bearing seat **4**:	Code letter **B**= green bearing shell with lubricating groove.
Bearing seat **3**:	Code letter **B**= green bearing shell with lubricating groove (thrust bearing).
Bearing seat **2**:	Code letter **B**= green bearing shell with lubricating groove.
Bearing seat **1**:	Code letter **B**= green bearing shell with lubricating groove.

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Bearing classification in bearing cap: 1 / 2 / 3

The coefficients (1- 4) describe the bearing positions **1** to **4** from left to right.

Example (see graphic):

Bearing cap **1**: ID code **2**= green bearing shell without lubricating groove.

Bearing cap **2**: ID code **2**= green bearing shell without lubricating groove.

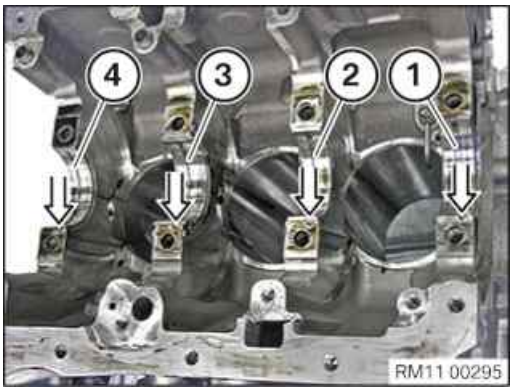
Bearing cap **3**: ID code **2**= green bearing shell without lubricating groove (axial guide bearing).

Bearing cap **4**: ID code **2**= green bearing shell without lubricating groove.

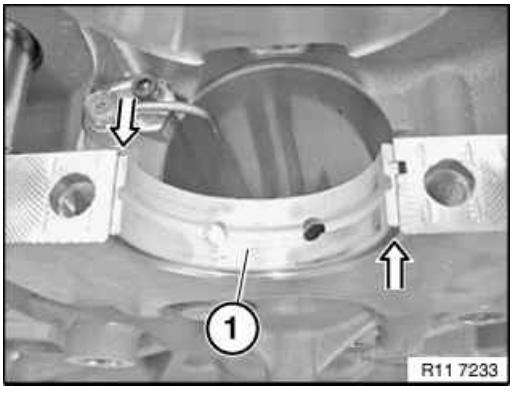
(A/1) Bearing cap / Blue	**(A/2)** Bearing cap / Green	**(A/3)** Bearing cap / Brown
(A/1) Crankcase / Blue	**(A/2)** Crankcase / Blue	**(A/3)** Crankcase / Blue
(B/1) Bearing cap / Blue	**(B/2)** Bearing cap / Green	**(B/3)** Bearing cap / Brown
(B/1) Crankcase / Green	**(B/2)** Crankcase / Green	**(B/3)** Crankcase / Green
(C/1) Bearing cap / Blue	**(C/2)** Bearing cap / Green	**(C/3)** Bearing cap / Brown
(C/1) Crankcase / Brown	**(C/2)** Crankcase / Brown	**(C/3)** Crankcase / Brown

Enter code letters and numbers for crankcase and crankshaft

Code letters/numbers	Bearing seat **1**	Bearing seat **2**	Bearing seat **3**	Bearing seat **4**
Crankcase at top **code letter**				
Crankshaft at bottom **code number**				



Remove bearing shells 1 to 4.



Place main bearing shell (1) with lubricating groove in crankcase (see arrows).

Observe combination of bearing colours according to the table.

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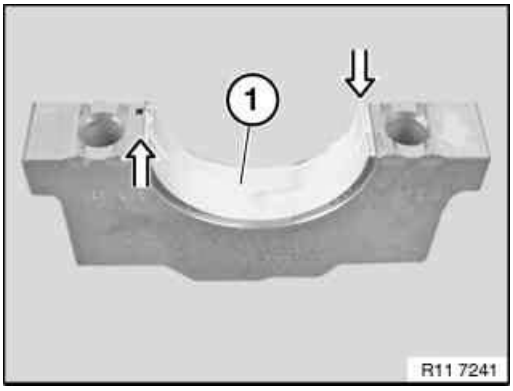
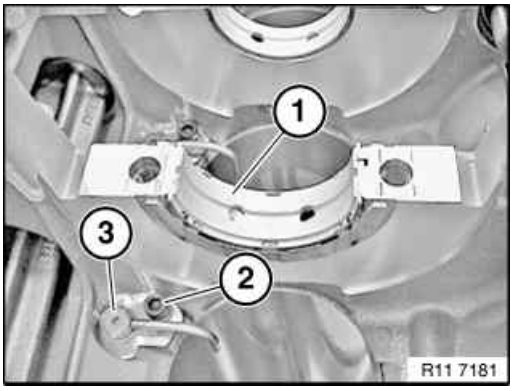


Place main bearing shell (1) with no lubricating groove in the bearing cap (see arrows).

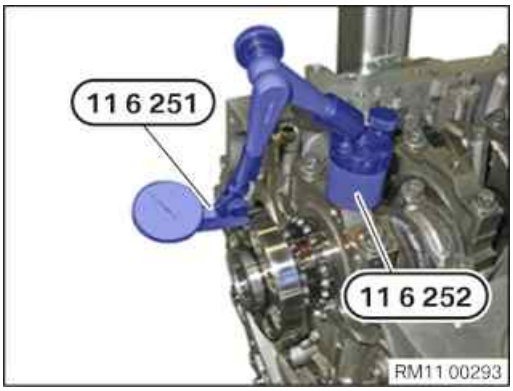
Installation note:
Pay attention to guide lug on main bearing shell (1).

Observe combination of bearing colours according to the table.



Installation note:
Thrust bearing (1) on the crankshaft is installed at bearing position 3.

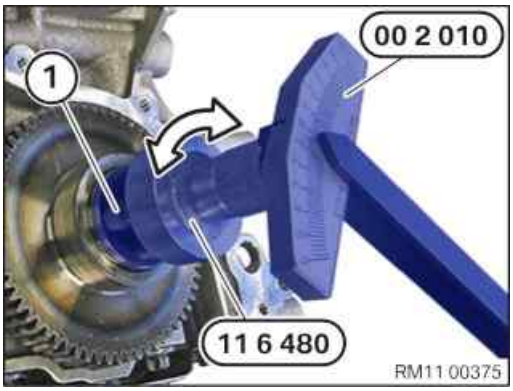
Observe combination of bearing colours according to the table.



Install crankshaft.

Check side clearance.

If necessary, check guide bearing shells, crankshaft and engine block.



Rotate crankshaft (1) with special tool 00 2 010 in direction of arrow.

Check crankshaft coefficient of friction.

Required follow-up work:

Assemble engine.

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This documentation refers to special tools that were not yet available when going to press.

11 21 001 Replacing crankshaft

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

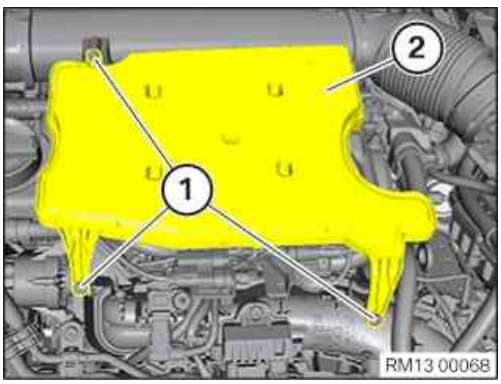
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

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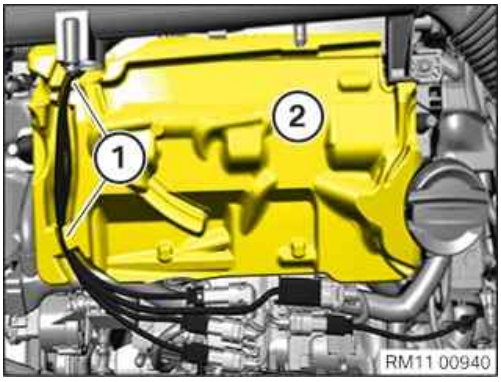
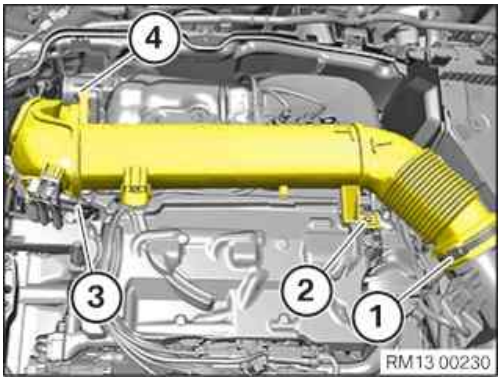
4 – Remove the acoustic cover for the injectors

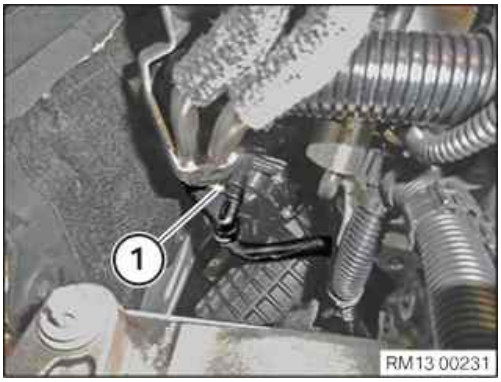


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

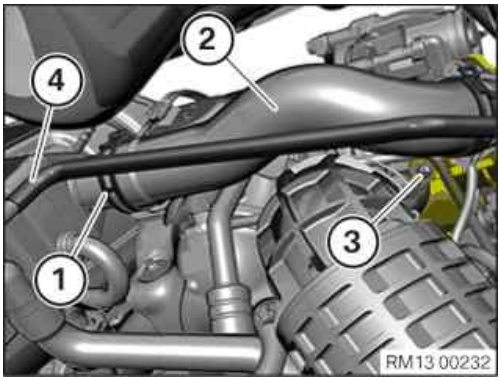
5 – Removing clean air pipe



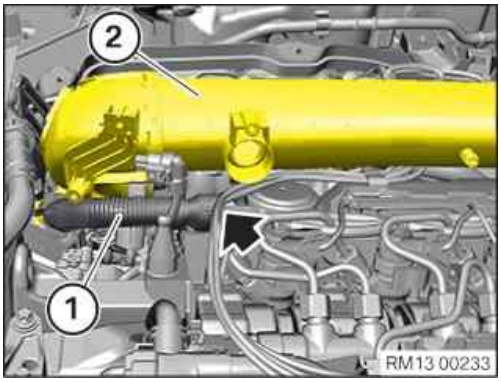
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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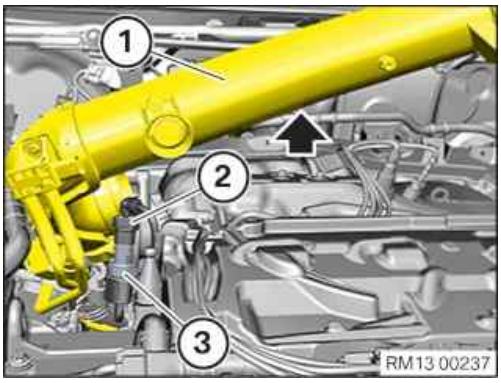


- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

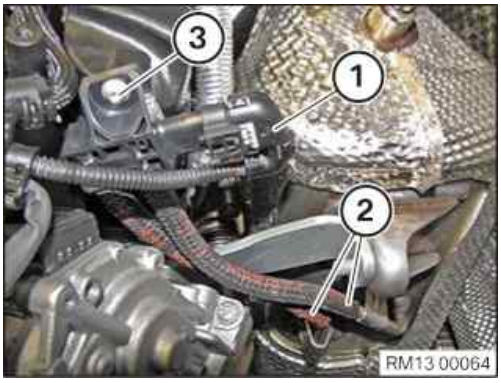
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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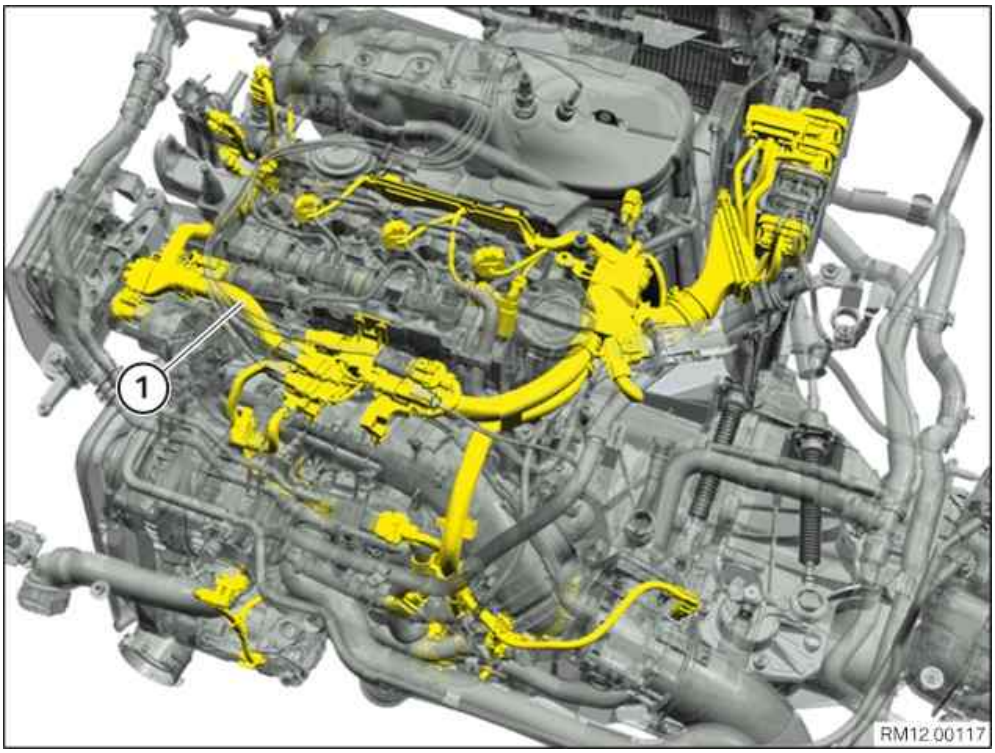
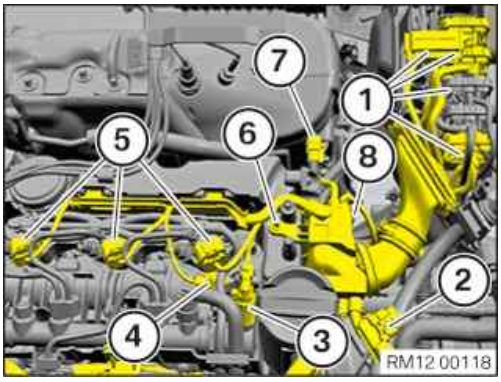
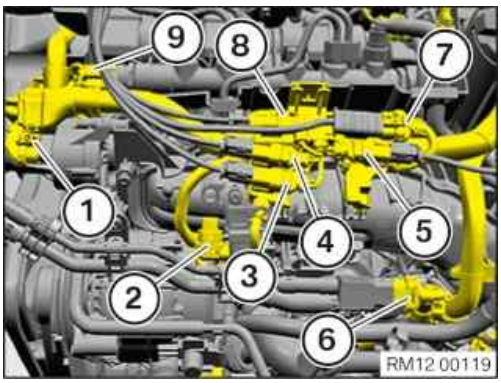
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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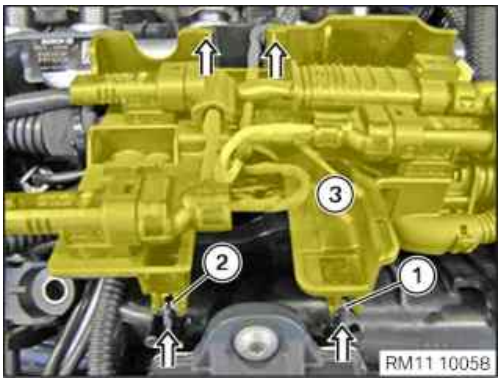
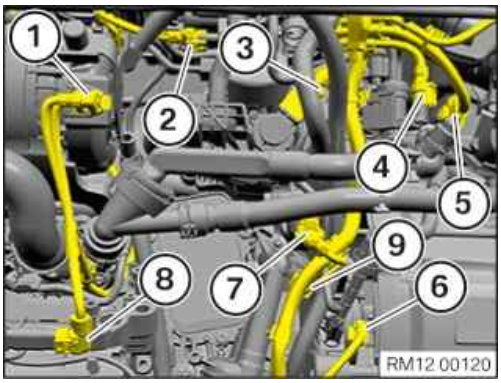
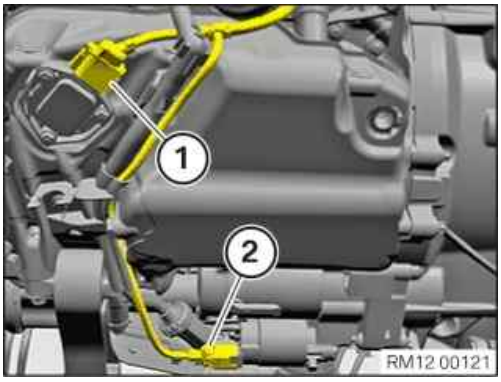


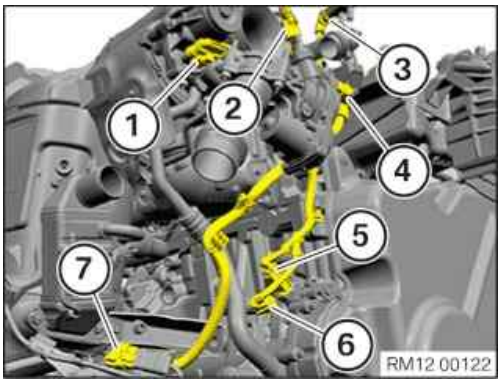
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



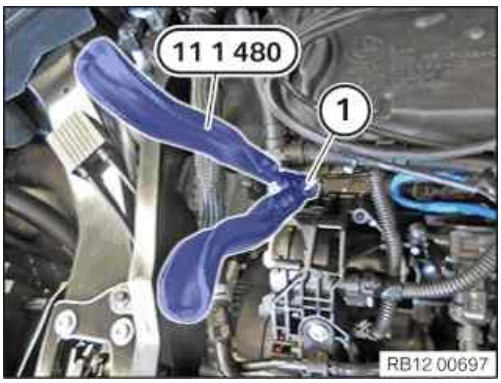
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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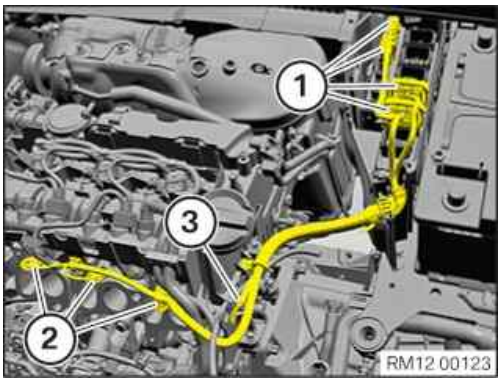


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

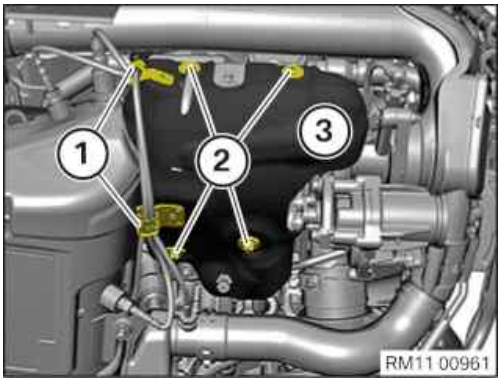
▶ Removing heat shield from top exhaust turbocharger

WARNING

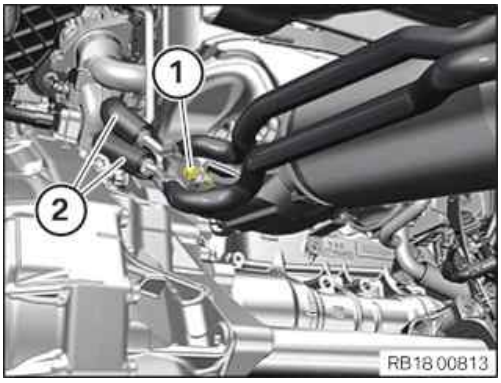
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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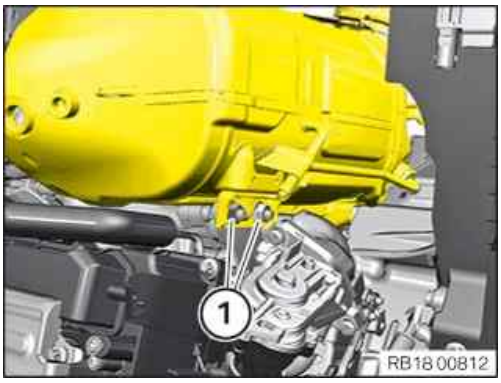
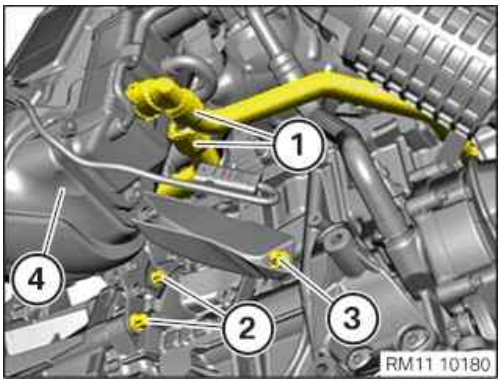


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

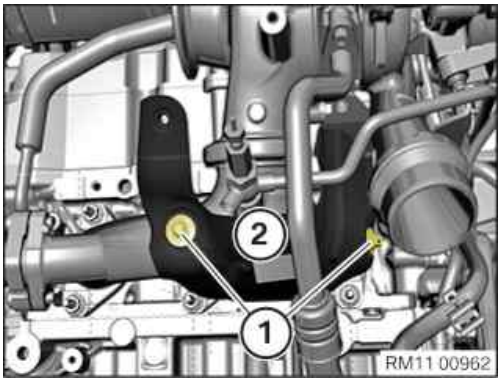
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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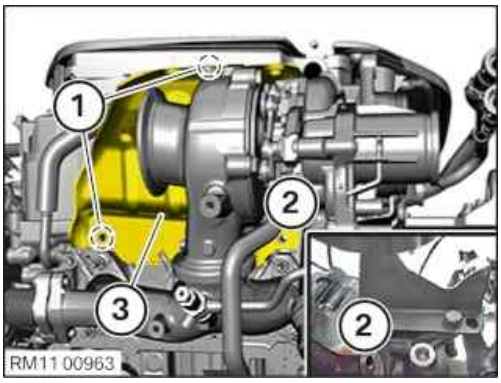


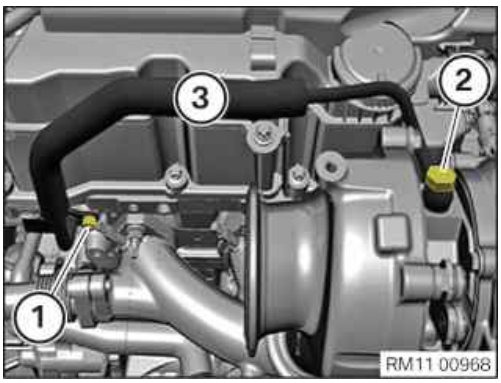
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

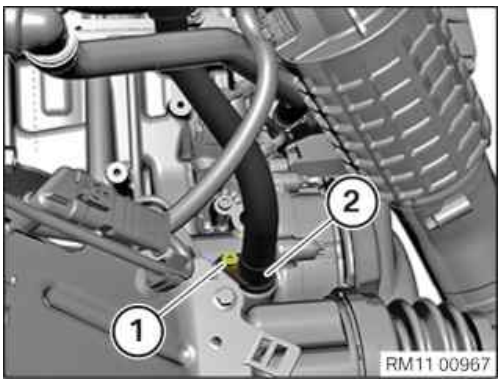
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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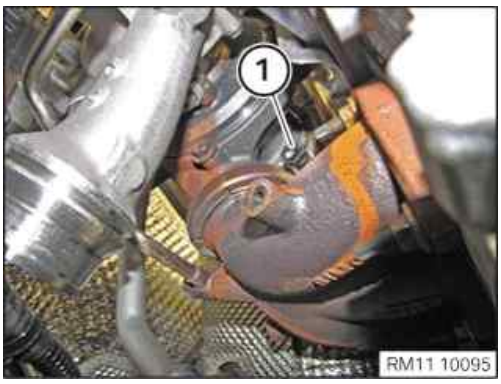
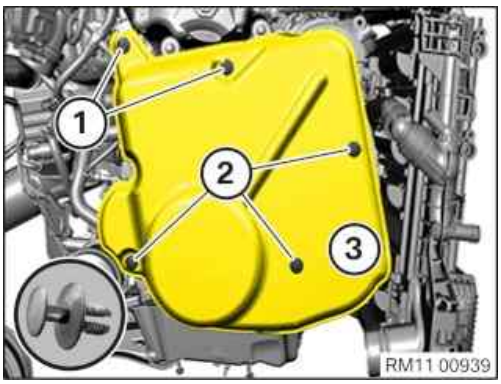
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

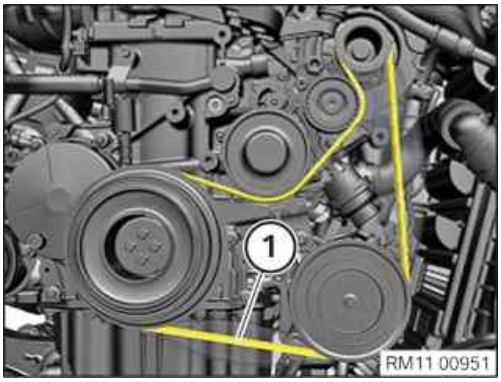
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

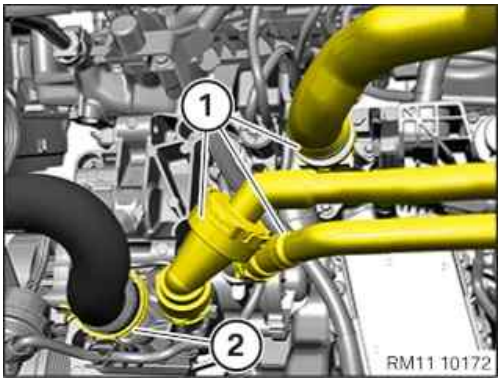
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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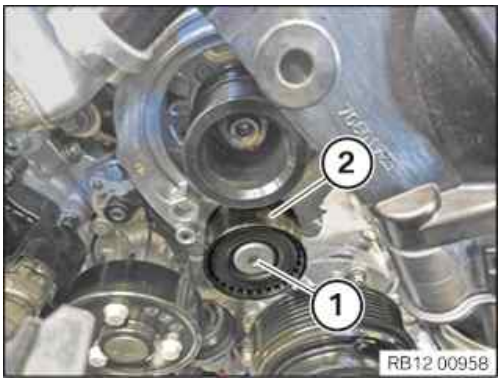
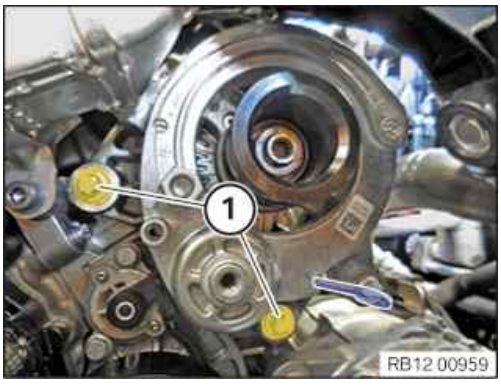
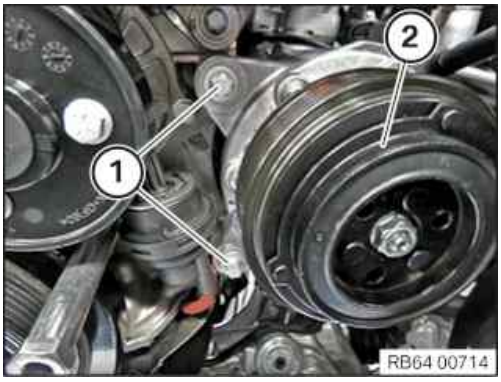


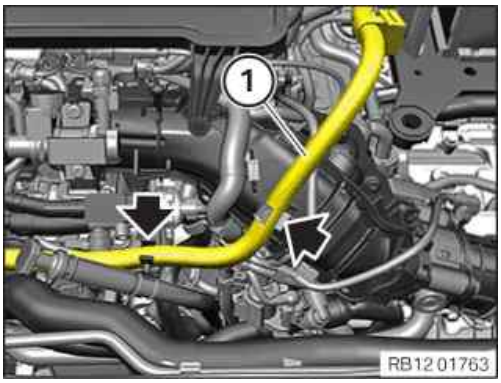
- Loosen screw (1).
- Remove the deflecting element (2).



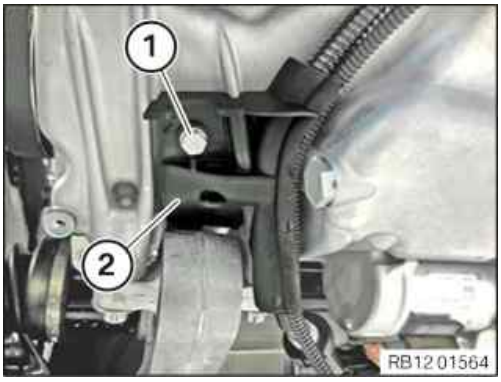
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

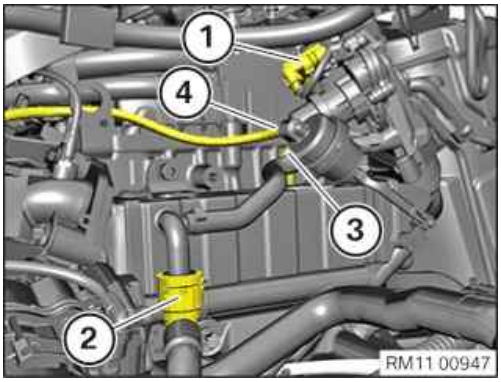
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

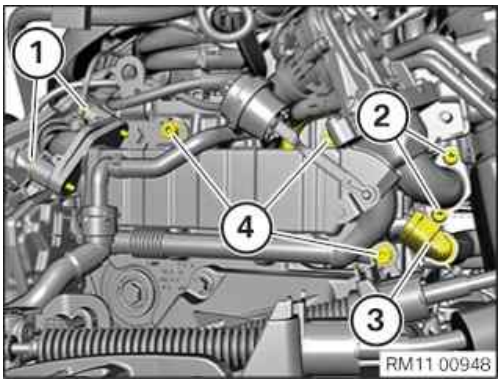
- Perform all work only on components that have cooled down.



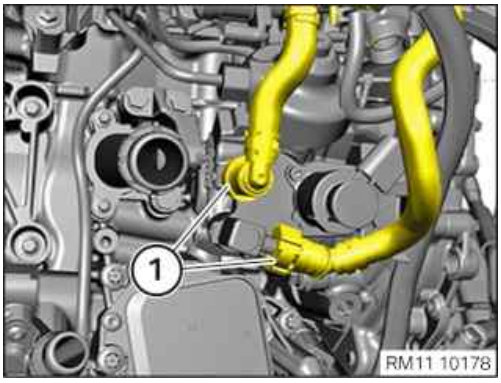
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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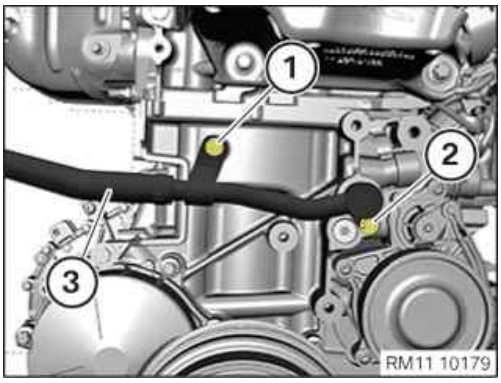


- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Detach the engine from the manual gearbox

Prerequisite

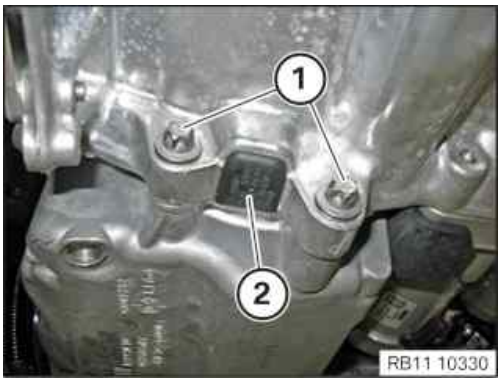
Engine has been removed.

CAUTION

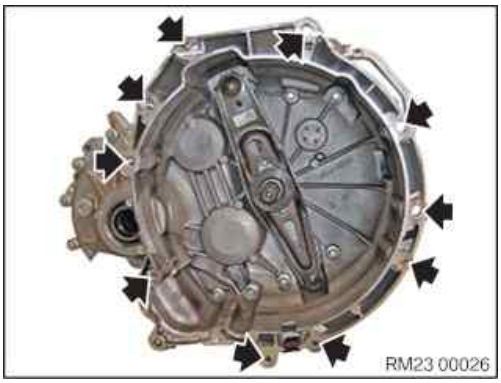
Heavy component.

Heavy components can lead to injury or damage.

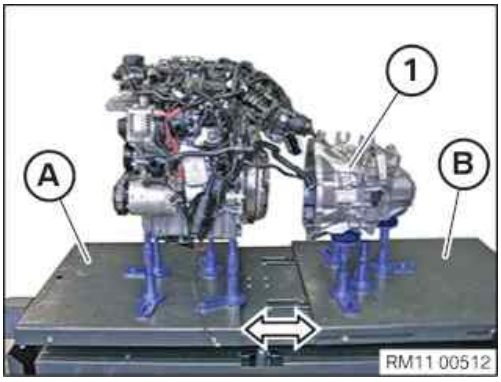
- Remove and install heavy components with the aid of another person/other persons.



- Loosen screws (1).
- Remove protective cap (2).



- Remove screws (arrows).



- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.

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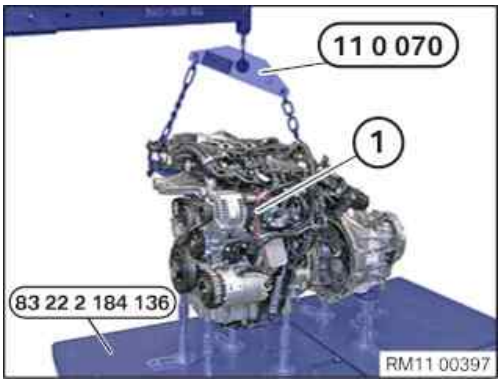
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool **0 490 579 (11 0 070)** and lift engine (1) off lifting table.

9 – Mount engine on assembly stand

CAUTION

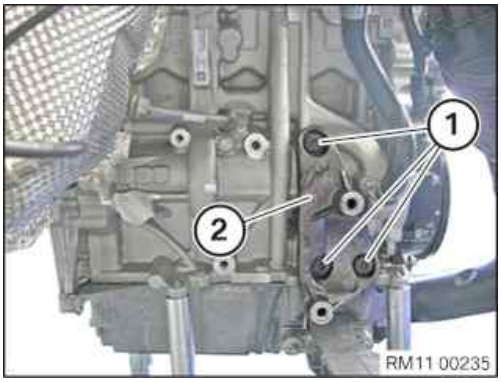
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

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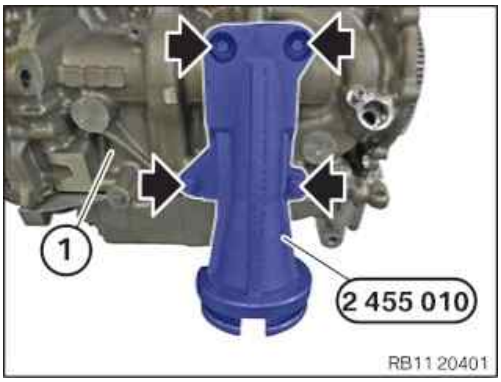
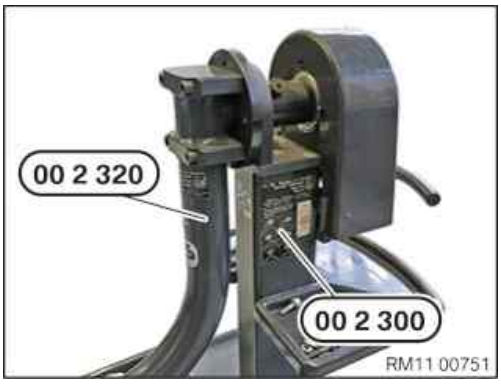


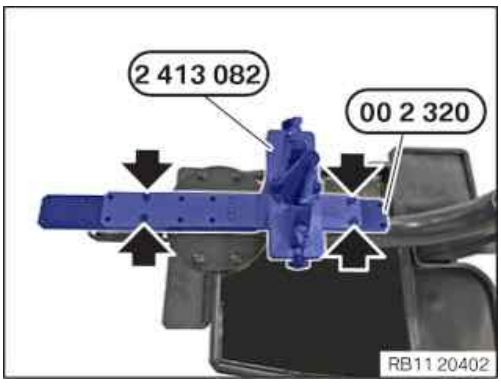
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.

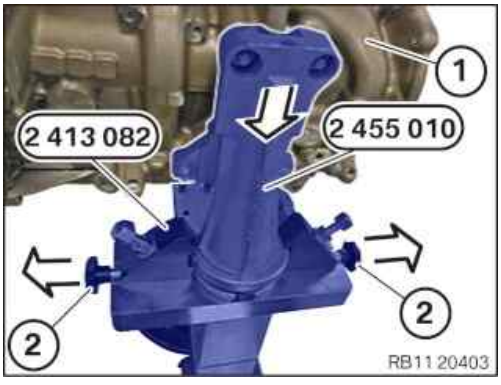


- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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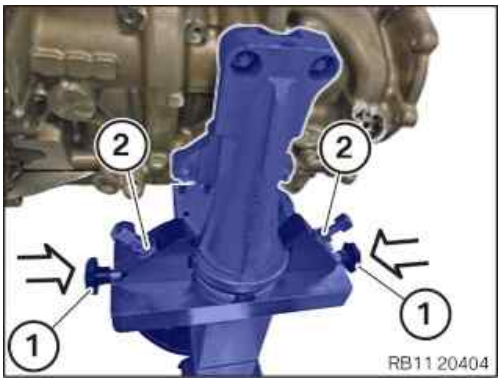


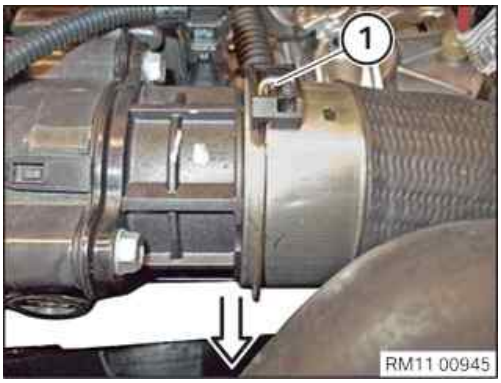
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

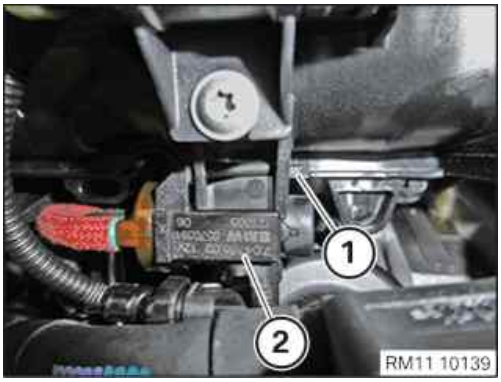
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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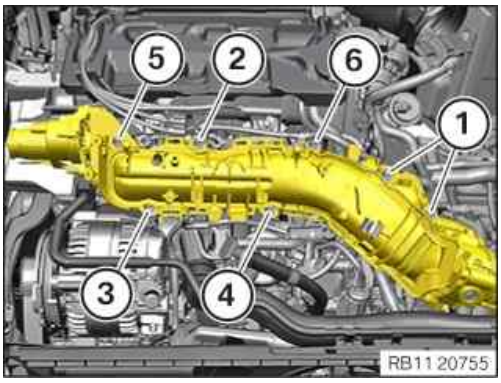
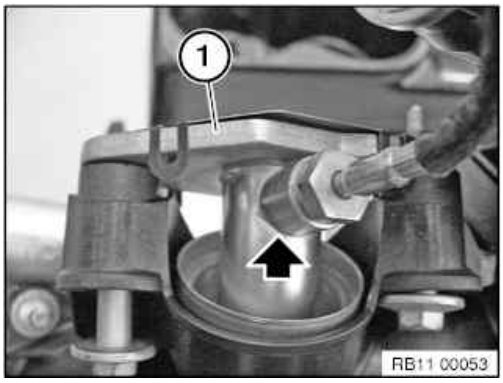


- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

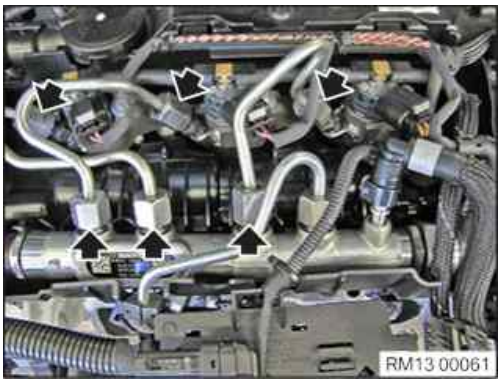
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

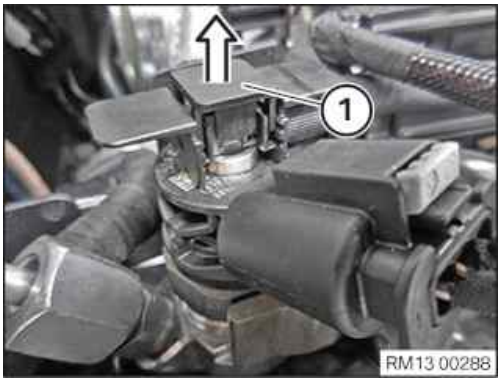
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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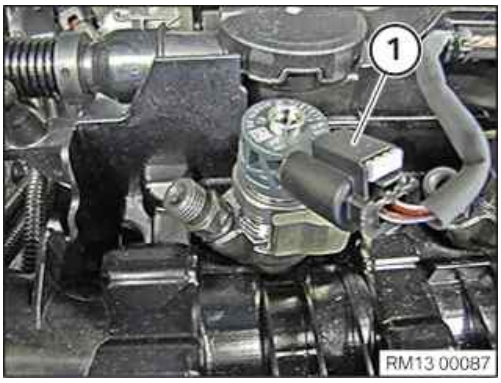
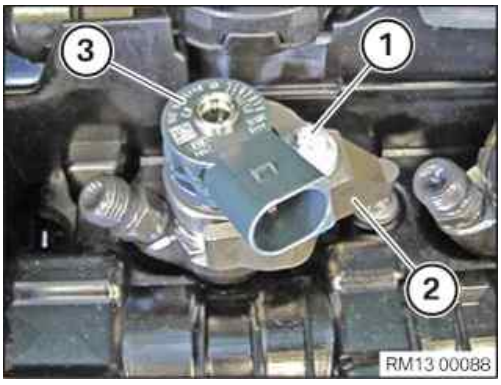


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

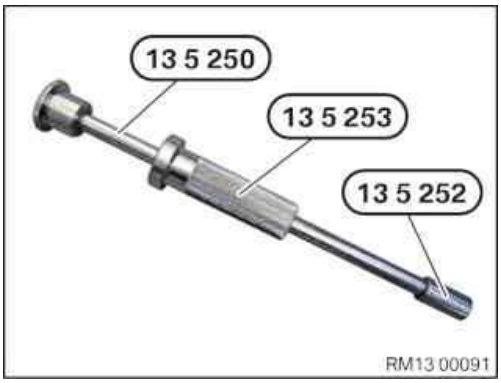
▶ **Loosen stuck injectors**

RISK OF DAMAGE

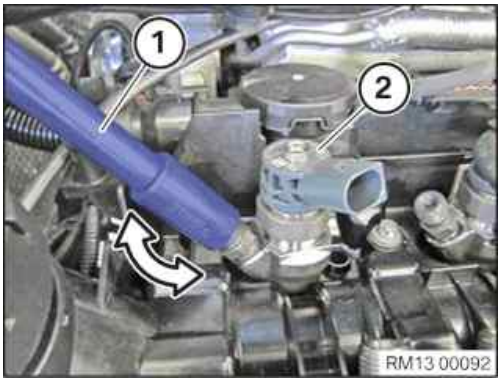
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

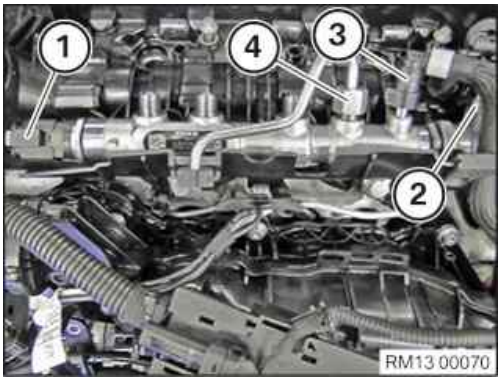
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

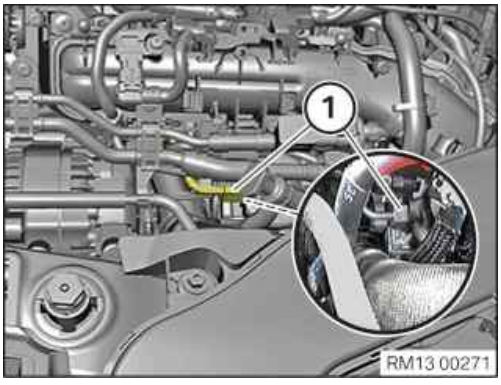
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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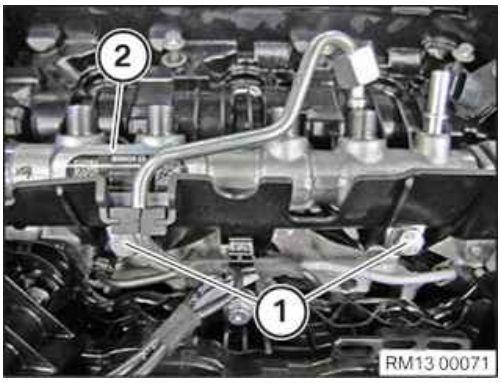
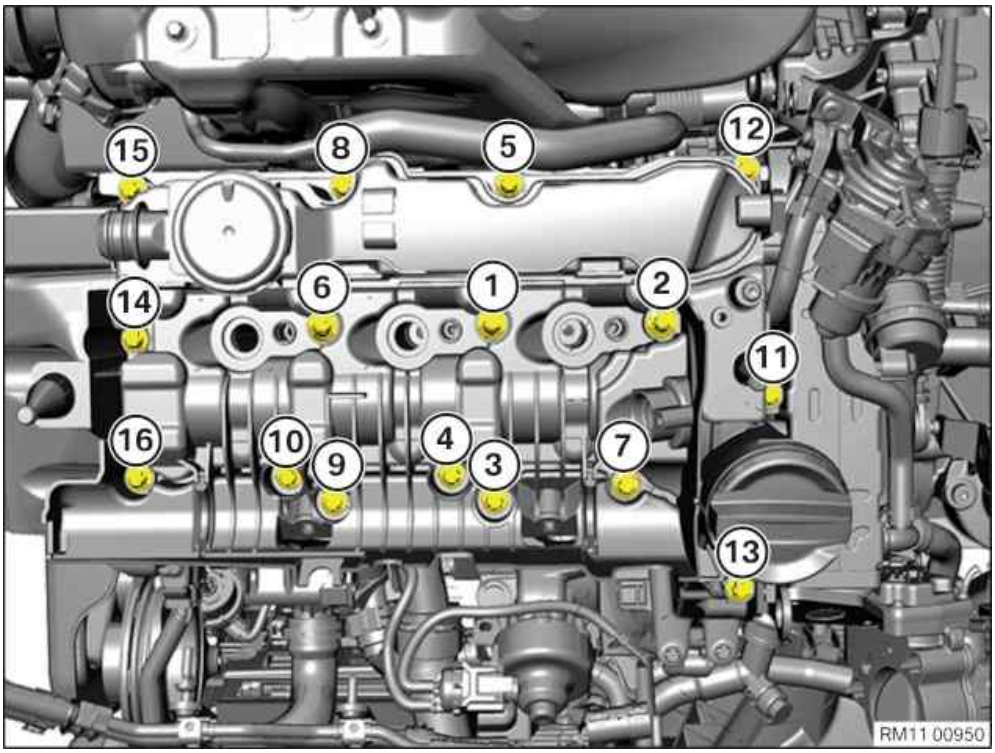


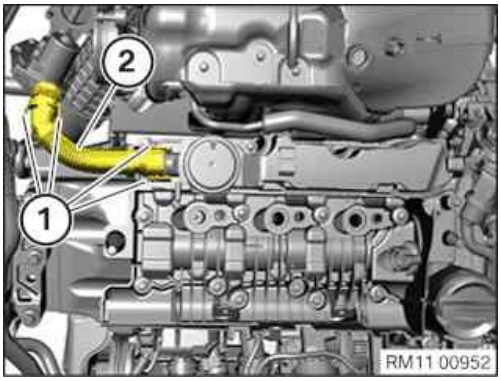
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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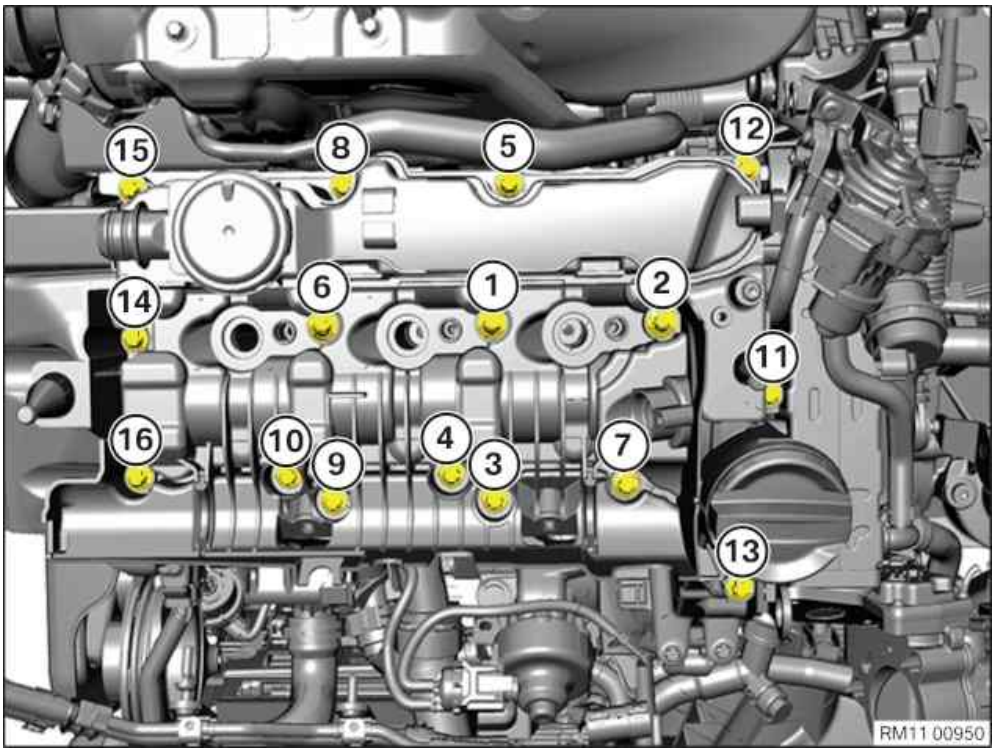

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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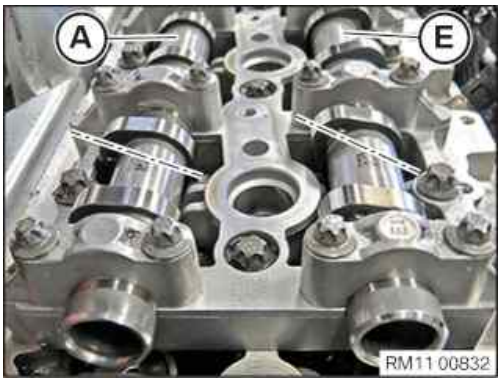
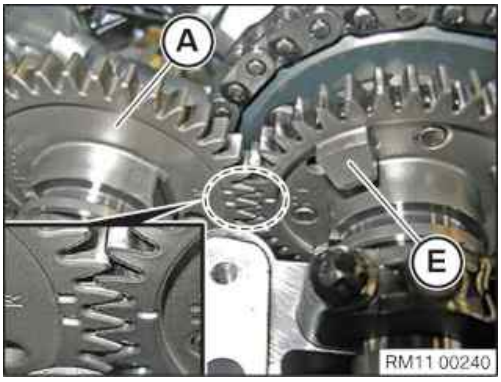


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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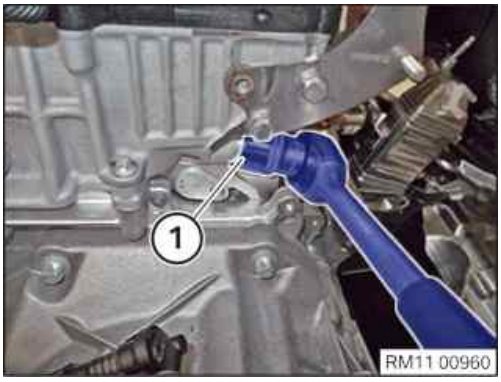
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

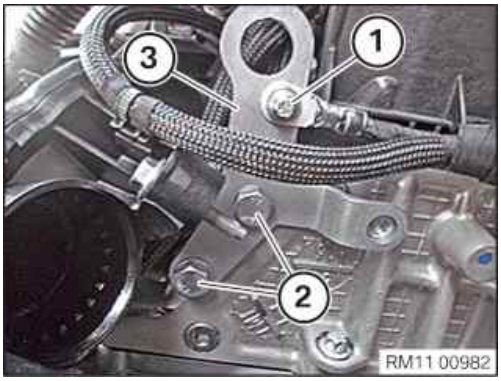


TECHNICAL INFORMATION

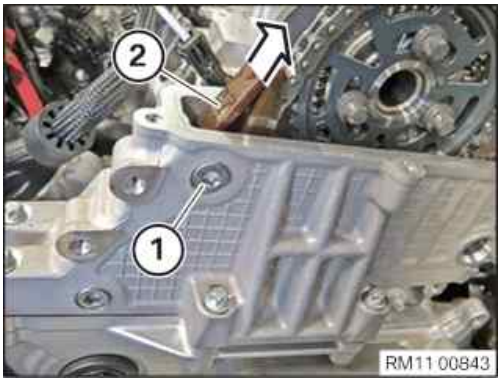
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

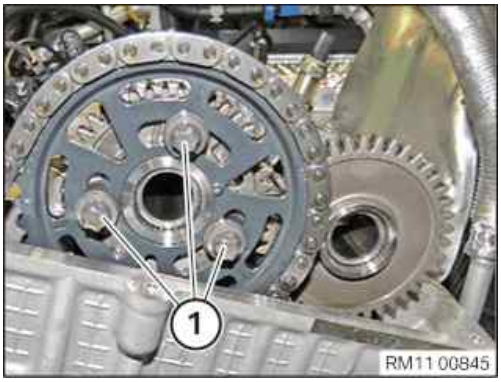


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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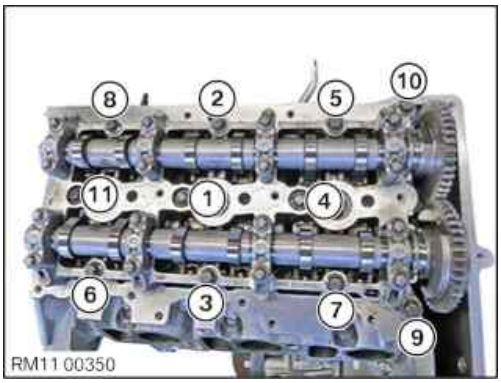
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

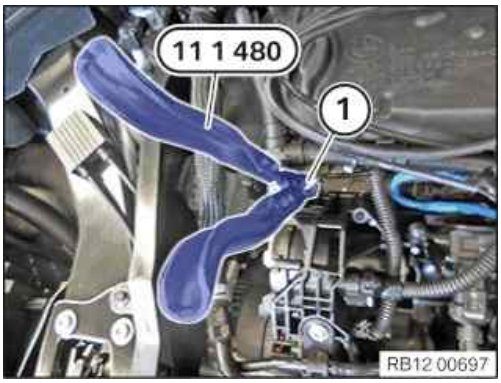
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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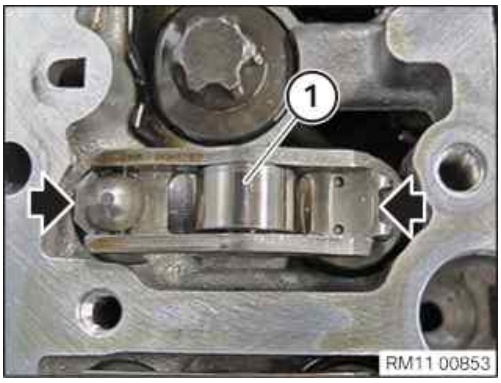


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

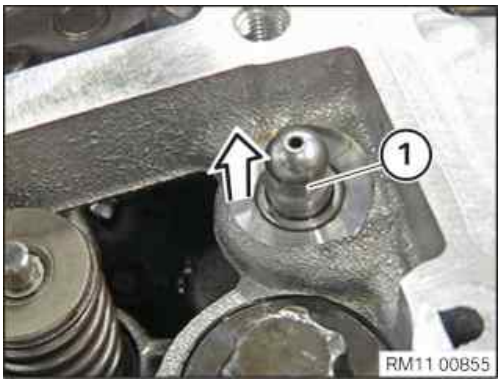
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

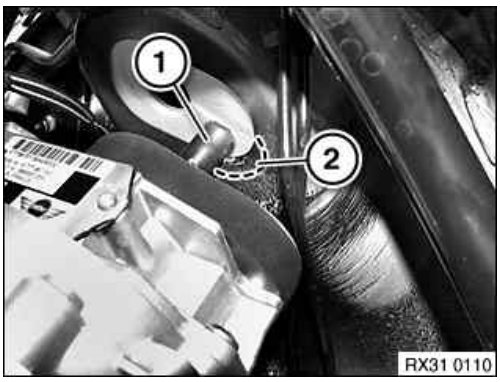
24 – Remove cylinder head.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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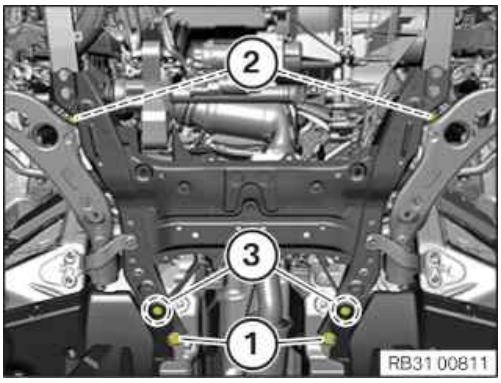


- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

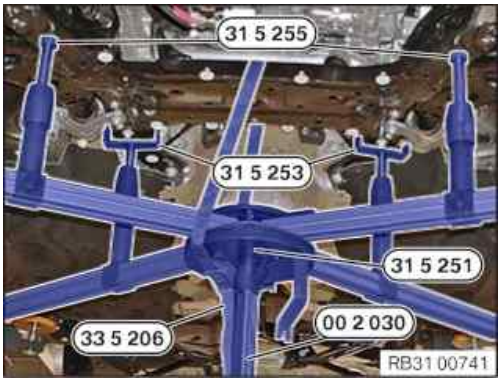
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

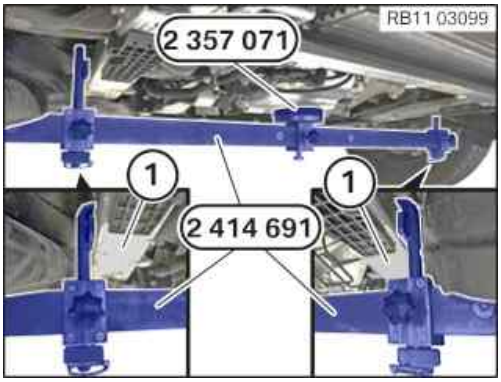
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and set it aside.



- Prepare special tool **2 414 691** together with the special tool **2 357 071**.
- Attach special tool **2 414 691** to front axle support and correctly align the special tool **2 357 071** under the oil sump and tighten.
- Turn special tool **2 414 691** at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools**2 414 691** and **2 357 071**.

- Remove all glow elements with special tool **0 491 068 (11 6 050)** or a standard tool.

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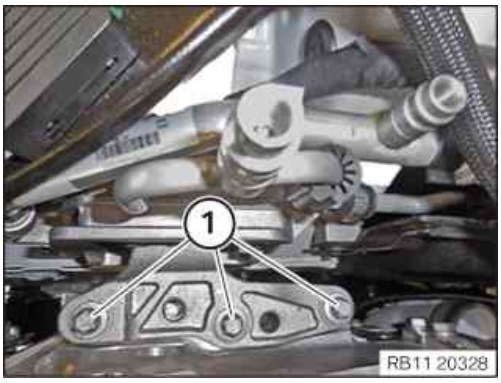
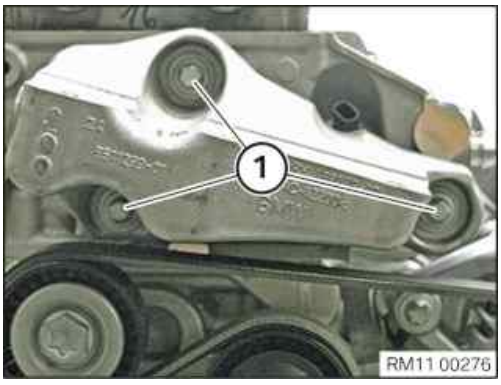


- Loosen screws (1).

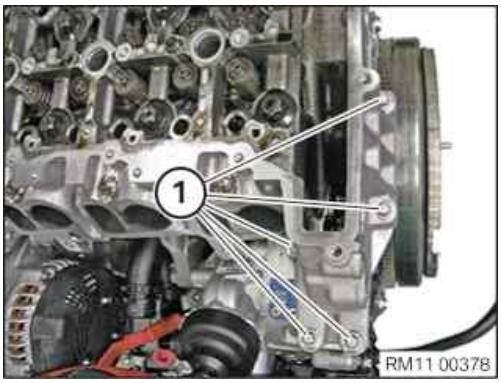


- Loosen screws (1).

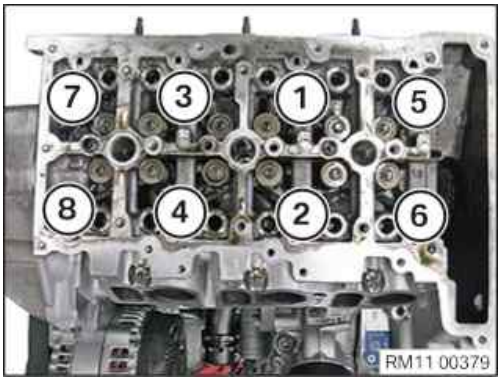
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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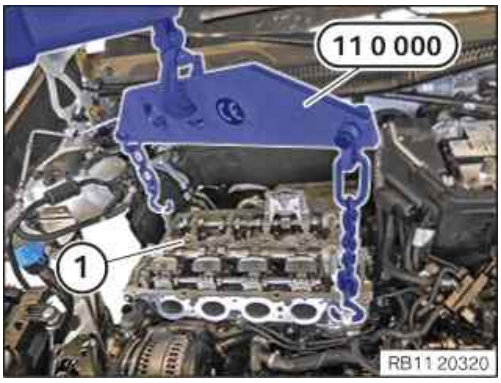


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

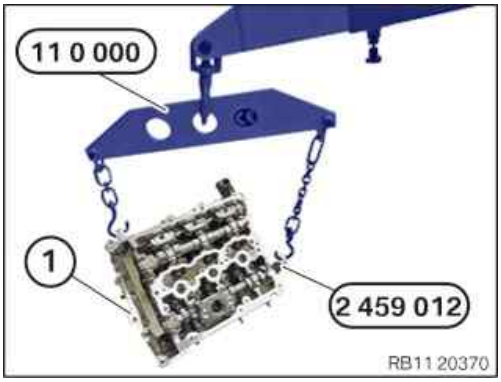
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

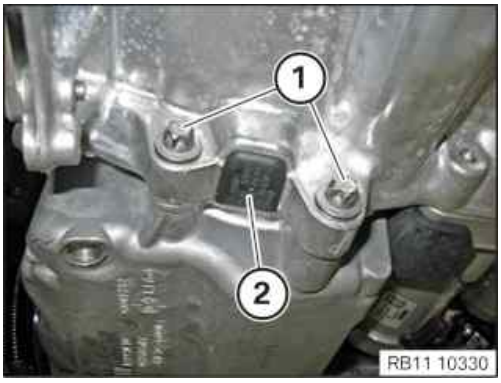
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.

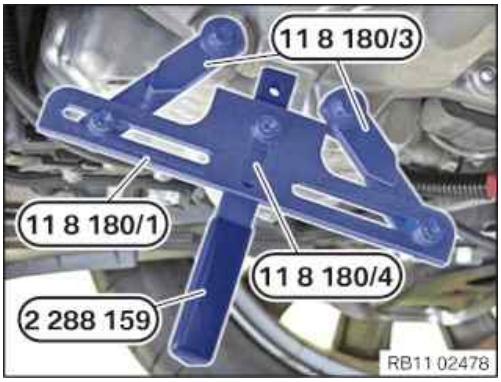


- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

25 – Removing the vibration damper



- Release the transmission bolts (1).
- Remove the protective cap (2).



- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.

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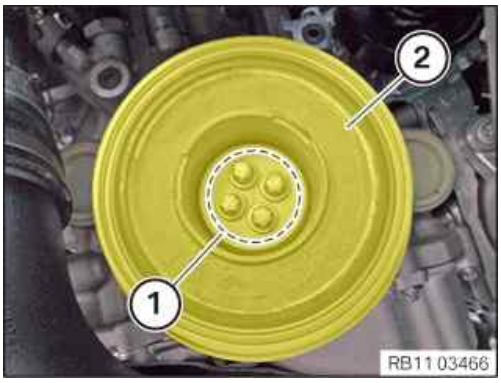
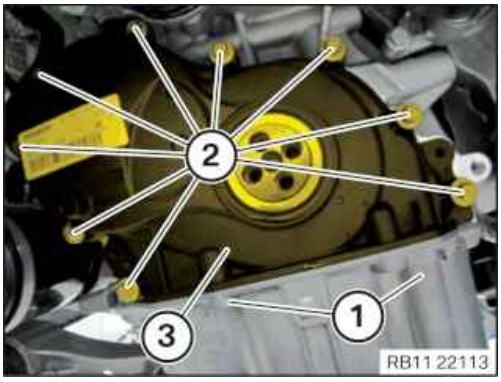


- Loosen screws in the area (1).
- Remove the vibration damper (2).

26 – Remove gear case cover



- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove timing case cover (3).

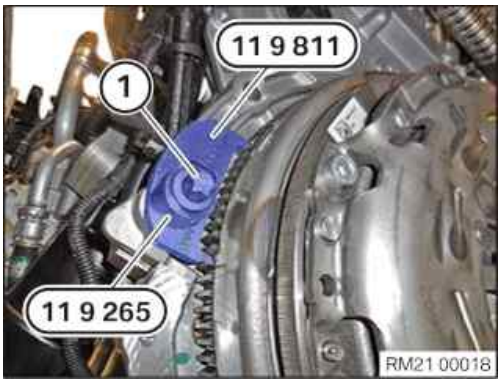
27 – Remove clutch

CAUTION

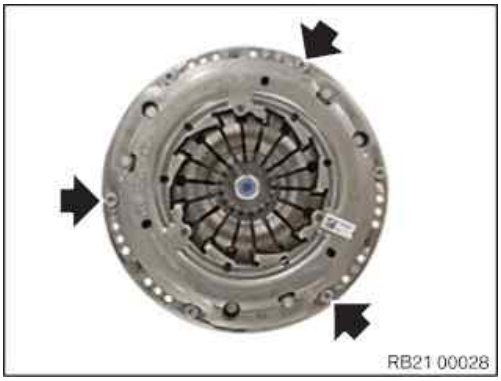
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.



- Detach 3 screws to attach special tool **0 493 839 (21 2 170)** and **2 288 165**.

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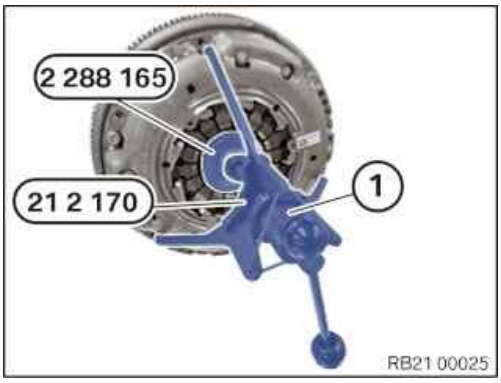
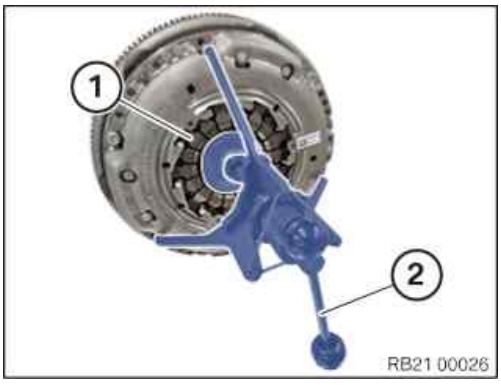
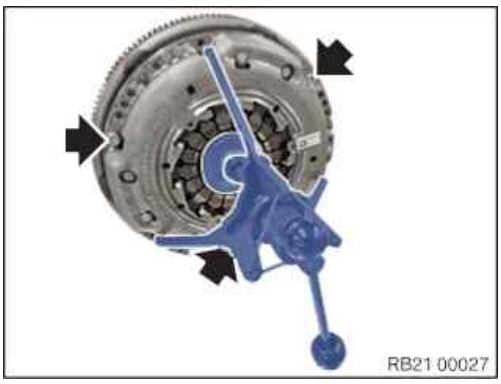


- Position special tool **0 493 839 (21 2 170)** and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

28 – Removing flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.

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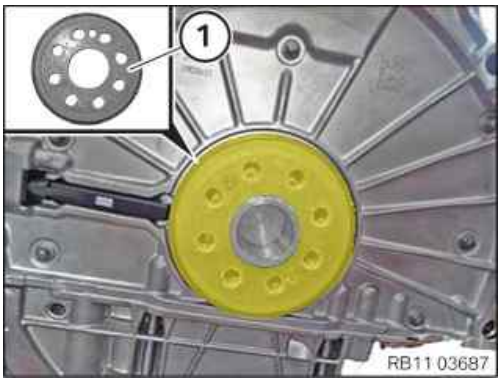


RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

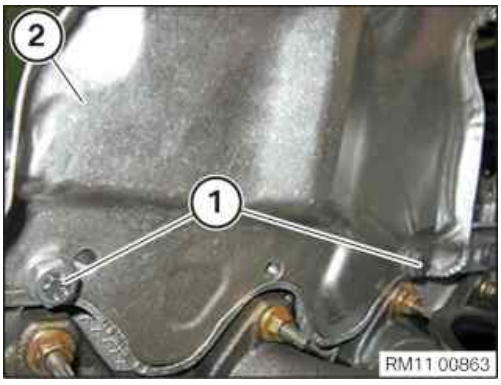
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

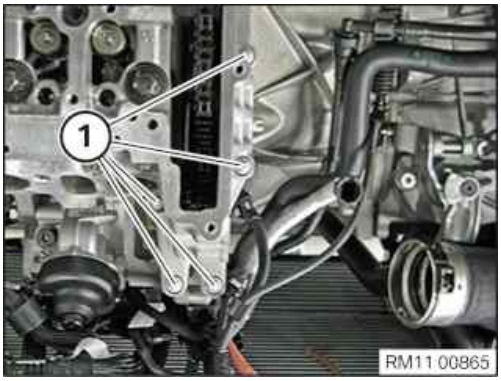
29 – Remove rear timing case cover

Prerequisite

Transmission is removed.



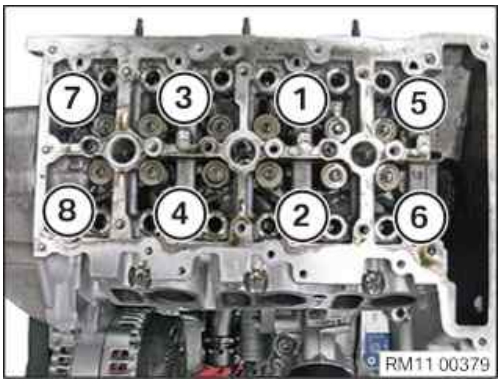
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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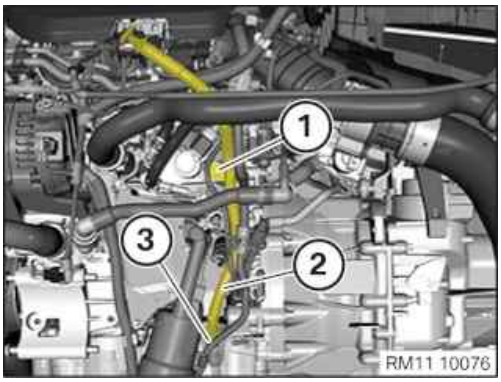
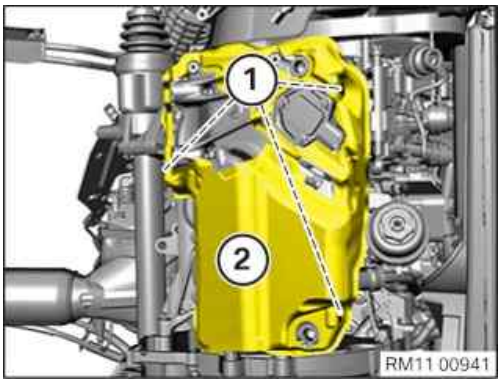
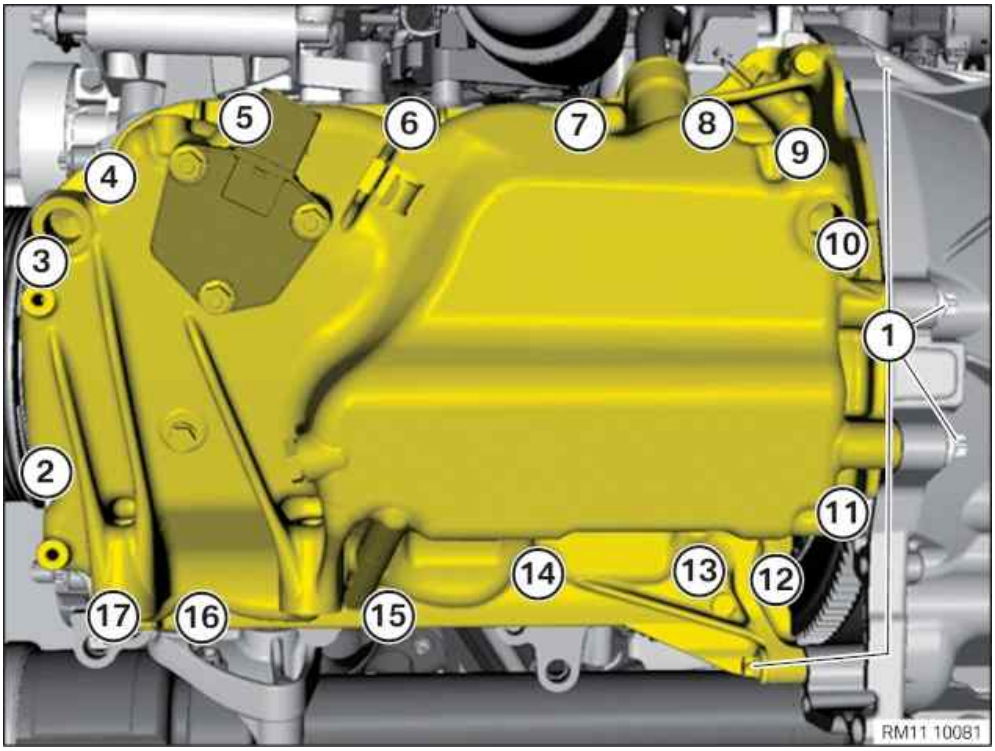


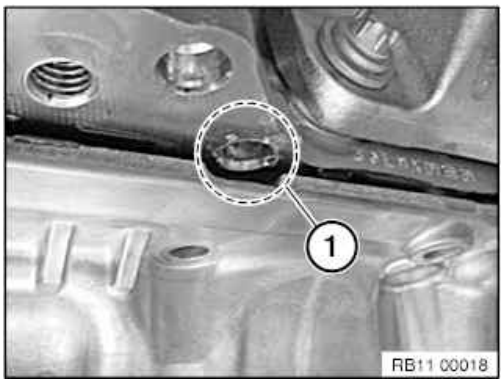
- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- If required, remove sealing ring (3) from oil sump.



- Remove the expanding rivet (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).



- Tighten the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release oil sump only in area (1).

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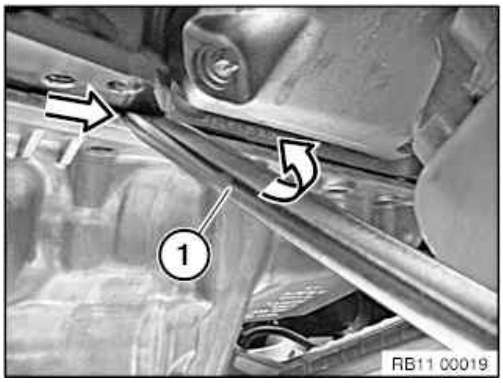
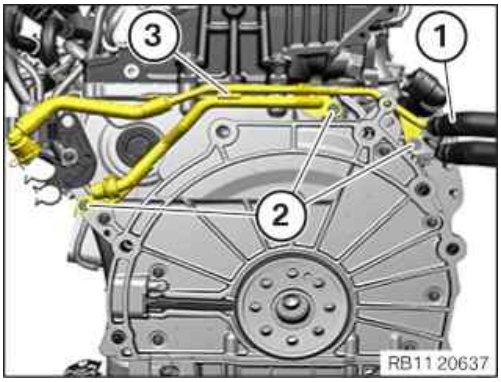
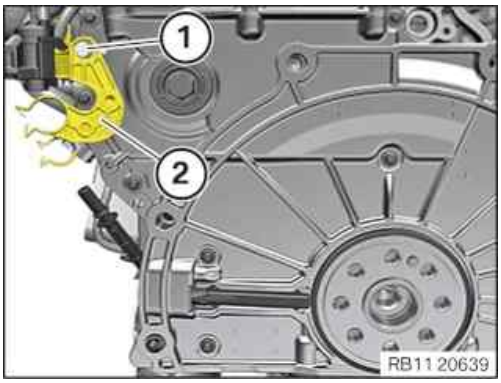


- Release the oil sump using a suitable mounting lever (1) carefully at the position intended for that.
- If required, secure the oil sump against falling.

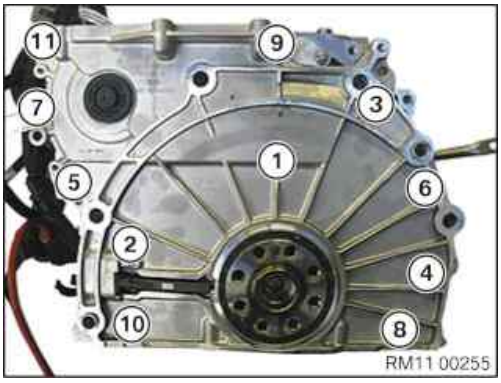
► **If installed: Remove coolant line of the SCR metering module**



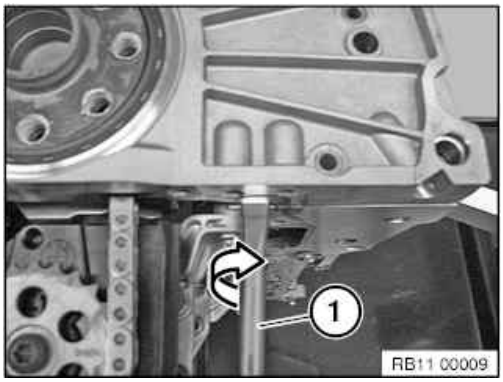
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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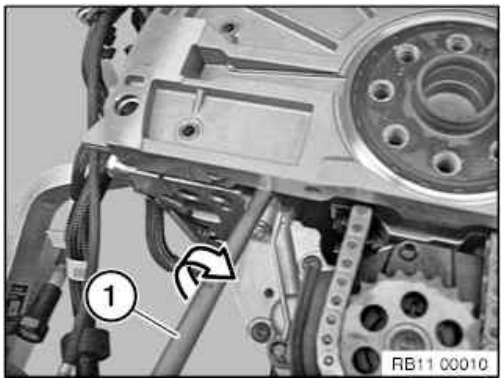


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

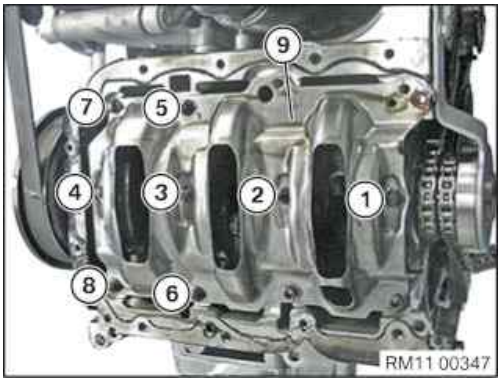
30 – Removing the oil deflector

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

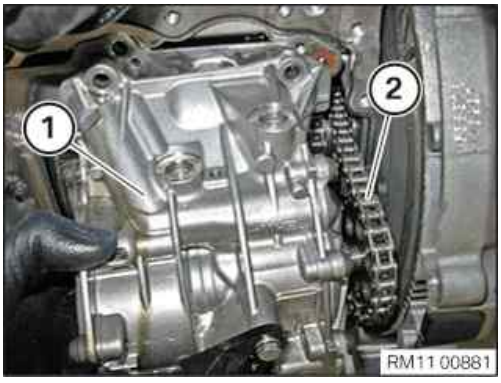
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen screws in the order (8) to (1).
- Guide out and remove the oil deflector (9).

31 – Remove the oil vacuum pump

- Loosen screws (1) of the oil vacuum pump (2).



- Remove oil vacuum pump (1) and remove from the drive chain (2).

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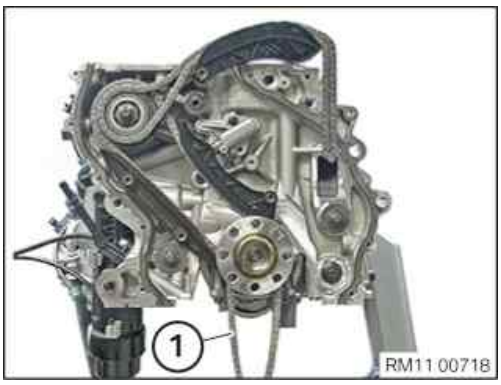
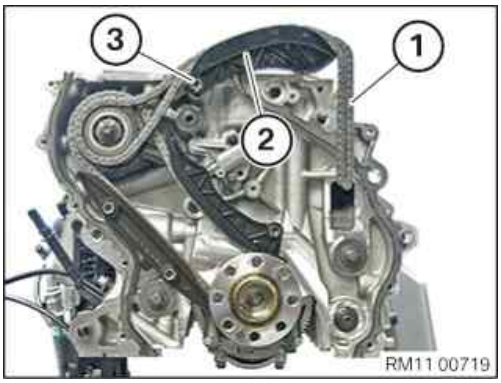
32 – Remove both timing chains

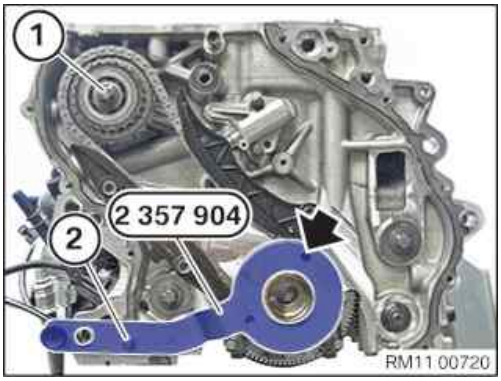


- Remove drive chain (1) for oil pump.

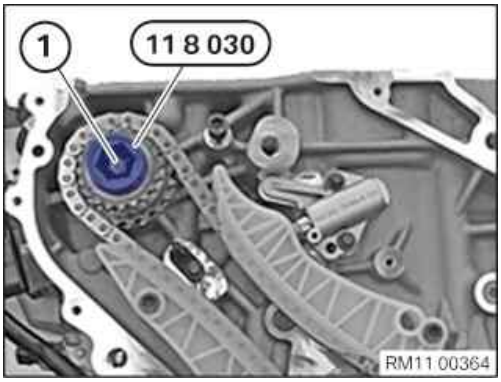


- Remove the timing chain (1) for the camshafts.
- Remove the tensioning rail (2) from the bearing journal (3).

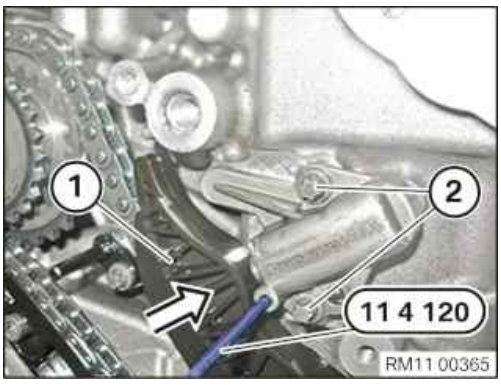
  Bearing journal (3) does not have to be disassembled.



- Secure crankshaft to release central bolt (1) of high pressure pump.
- Position crankshaft with guide pin (arrow).
- Secure special tool **2 357 904** with bolt (2) on crankcase.
- Release central bolt (1) of high pressure pump; do not remove.



- Screw special tool **0 496 725 (11 8 030)** into sprocket of high pressure pump.
- Unscrew central bolt (1) of high pressure pump until central bolt can be supported on special tool **0 496 725 (11 8 030)**.
- Continue turning central bolt (1) until camshaft sprocket is released from high pressure pump shaft.



- Press chain tensioner in with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove chain tensioner.

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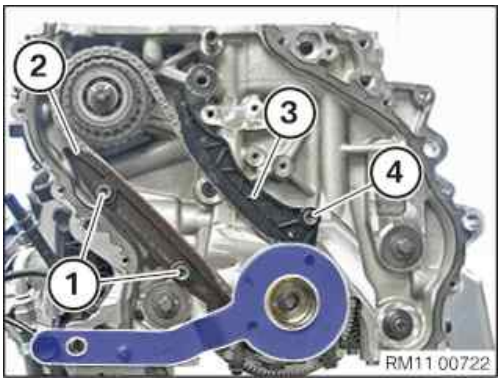
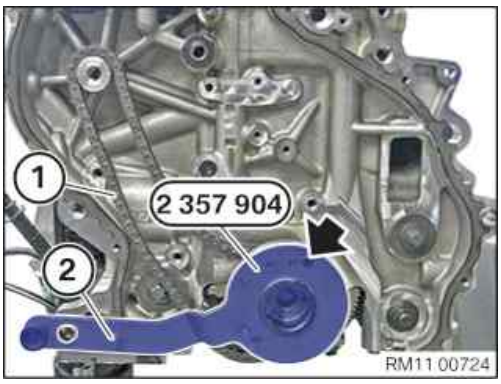


- Loosen both bearing journals (1).
- Remove the guide rail (2).
- Loosen the bearing journals (4).
- Remove the tensioning rail (3).

- Remove bolt and camshaft sprocket (1) of high pressure pump.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

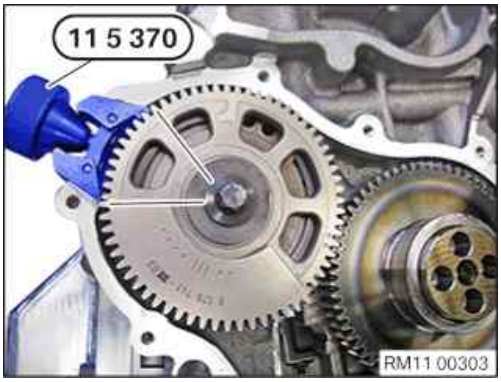
- Unscrew the bolt (2) and remove the special tool **2 357 904**.
- Remove the timing chain (1).

33 – Remove counterbalance shaft

- Fasten counterbalance shaft with special tool in the TDC position of cylinder no. 1.
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



- Ensure that the gear of the counterbalance shaft is pretensioned and blocked before removal.
- Install the special tool **0 495 131 (11 5 370)** as shown and pre-load the gear.

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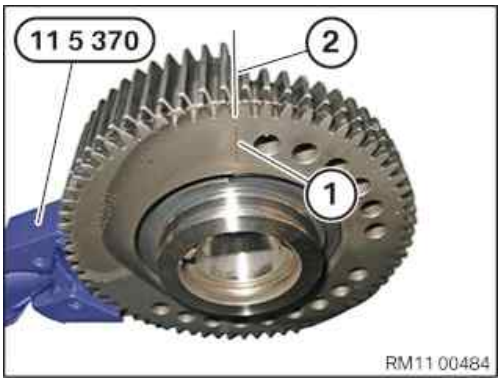
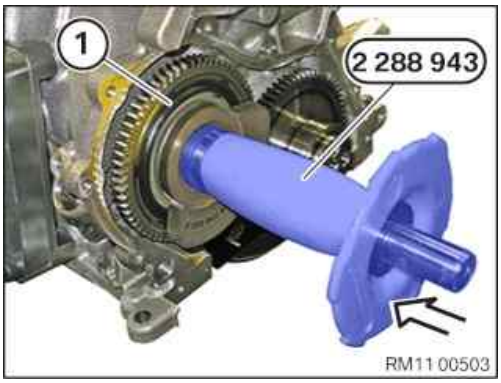


- Block gear wheels (1) and (2) until re-installation with the special tool **0 495 131 (11 5 370)**.

- Check whether the marks on the counterbalance shaft gear are aligned with the marks on the crankshaft gear.
- Loosen screw (1).

- Loosen screws (1).
- Remove special tool .



- Screw the special tool **2 288 943** far as it will go into the counterbalance shaft.
- Secure counterbalance shaft and gear against falling down!
- By means of targeted hammer blows on the special tool **2 288 943** in the direction of the arrow, loosen the counterbalance shaft from gear (1) .
- Remove special tool **2 288 943**.

- Remove the counterbalance shaft gear in the direction of the arrow.

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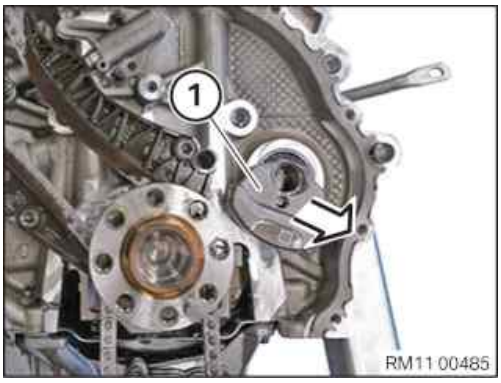


- Remove counterbalance shaft (1) in direction of arrow.

34 – Remove the connecting rod bearing cap

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

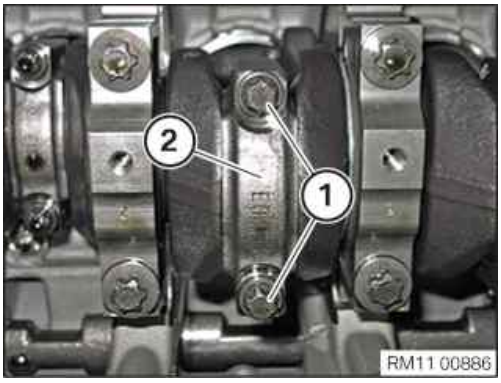
- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

- Turn the crankshaft until the connecting rod bearing journal (1) reaches a vertical position.



- Unscrew the connecting rod bolts (1).

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing cap (2) and put to one side in the correct order.

35 – Removing the piston with connecting rod

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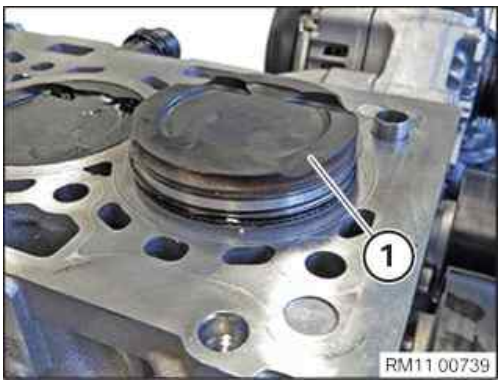
TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Screw special tool **0 496 144 (11 8 860)** in at large connecting rod eye.



RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Remove the piston (1) and connecting rod.

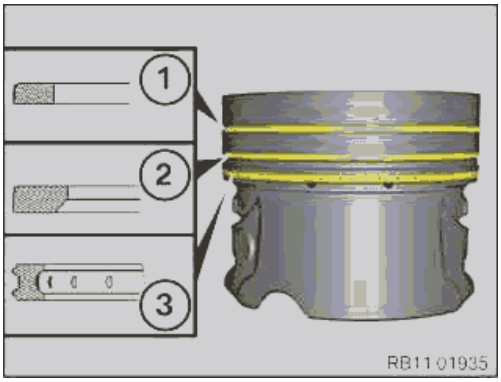
36 – Measure side clearance of piston rings

RISK OF DAMAGE

Damage to the piston rings.

Piston rings can bend or break due to large applications of force.

- Handle piston rings carefully.
- Only bend piston ring up lightly.



TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

- Mounting orientation of the piston rings

Position number	Description
1	1. Piston ring (plain rectangular compression ring)
2	2. Piston ring (taper faced piston ring)
3	3. Piston ring (oil scraper ring with spiral expander)

Check

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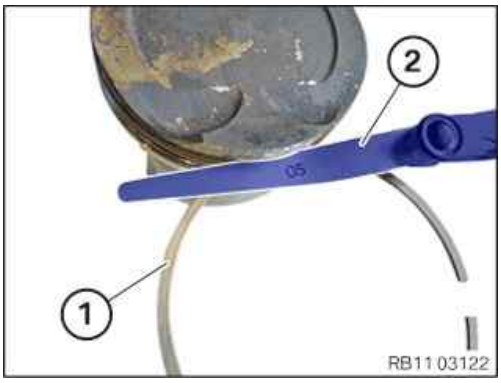


- Install all piston rings (1) consecutively as shown in the piston ring groove. Measure the side clearance with a feeler gauge (2).

desired state

- The side clearance of the piston rings is within the tolerance.

Side clearance of piston rings

Clean all components before measuring the side clearance.	
Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

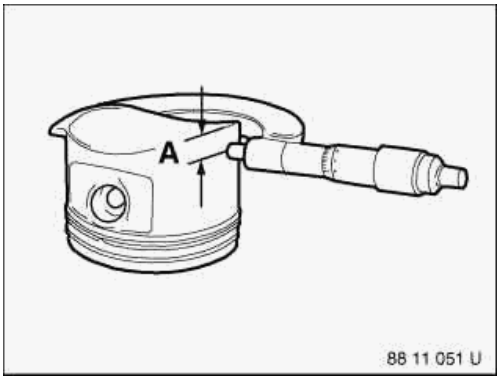
Result

» The side clearance of the piston rings is outside of the tolerance.

Measure

- Renew the piston ring.

37 – Measure the piston diameter



Check

- Position the measuring bolt in the area (A) and measure the piston installation clearance 90 ° transversely to the gudgeon pin.

Piston diameter

Measure the piston diameter at distance (A) from the lower end of the piston skirt.	
Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Result

» The piston does not correspond to the specifications.

Measure

- Renew the piston.

38 – Measure the cylinder bores

Prerequisite

Cylinder barrel is cleaned.

Check

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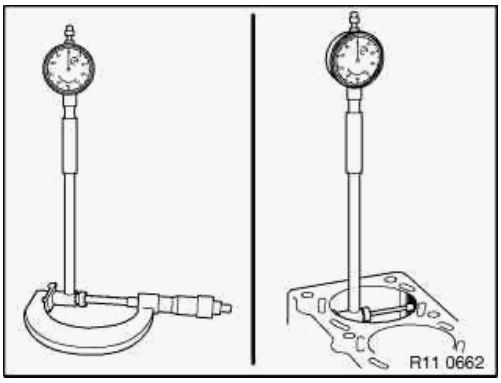


- Adjusting measuring screw to nominal dimension of cylinder bore.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

- Insert internal measuring device into measuring screw and set to zero.
- With the internal measuring device, measure the cylinder at the following points. Check the deviations from the nominal dimension.
  - Lower third of the cylinder bore in direction of travel,
  - Lower third of the cylinder bore transversely to direction of travel,
  - Middle third of the cylinder bore in direction of travel,
  - Middle third of the cylinder bore transversely to direction of travel,
  - Upper third of the cylinder bore in direction of travel,
  - Upper third of the cylinder bore transversely to direction of travel.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Result

» Cylinder does not correspond to the specifications.

Measure

- Replace motor.

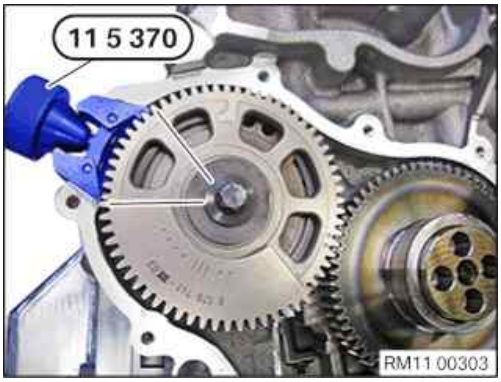
  Parts: Engine

39 – Remove counterbalance shaft

- Fasten counterbalance shaft with special tool in the TDC position of cylinder no. 1.
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



- Ensure that the gear of the counterbalance shaft is pretensioned and blocked before removal.
- Install the special tool **0 495 131 (11 5 370)** as shown and pre-load the gear.

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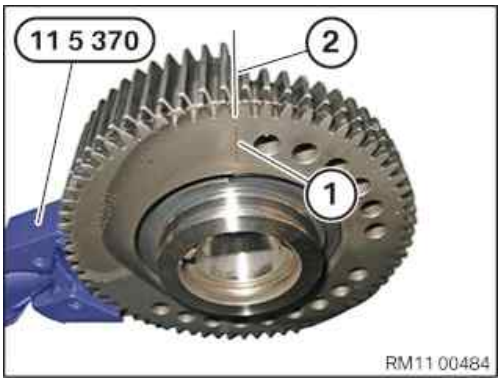
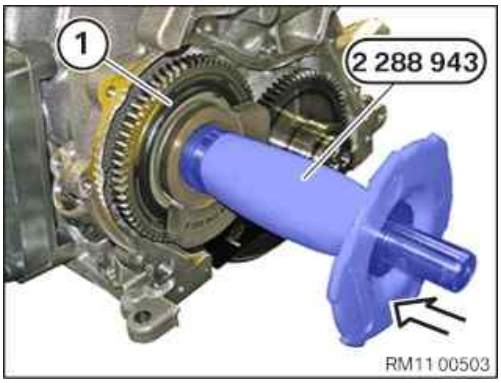


- Block gear wheels (1) and (2) until re-installation with the special tool **0 495 131 (11 5 370)**.

- Check whether the marks on the counterbalance shaft gear are aligned with the marks on the crankshaft gear.
- Loosen screw (1).

- Loosen screws (1).
- Remove special tool .



- Screw the special tool **2 288 943** far as it will go into the counterbalance shaft.
- Secure counterbalance shaft and gear against falling down!
- By means of targeted hammer blows on the special tool **2 288 943** in the direction of the arrow, loosen the counterbalance shaft from gear (1) .
- Remove special tool **2 288 943**.

- Remove the counterbalance shaft gear in the direction of the arrow.

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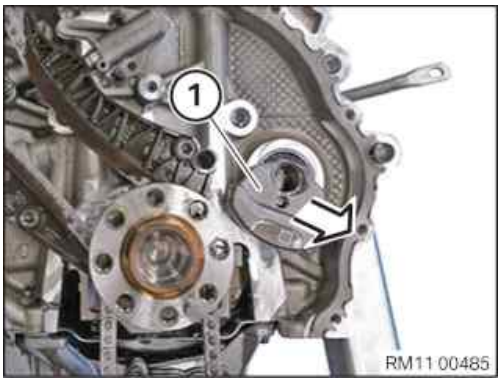
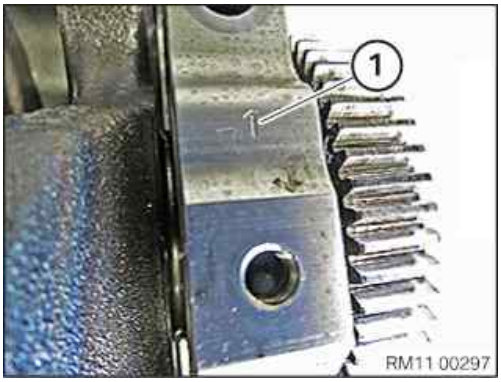


- Remove counterbalance shaft (1) in direction of arrow.

MAIN WORK

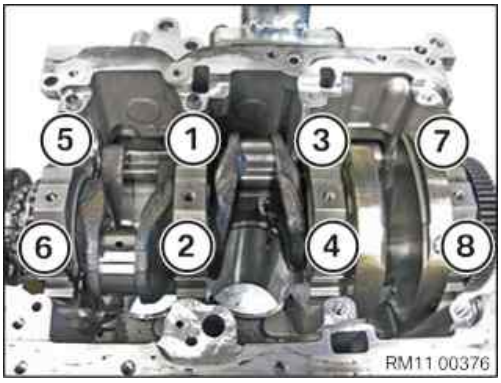
40 – Remove crankshaft



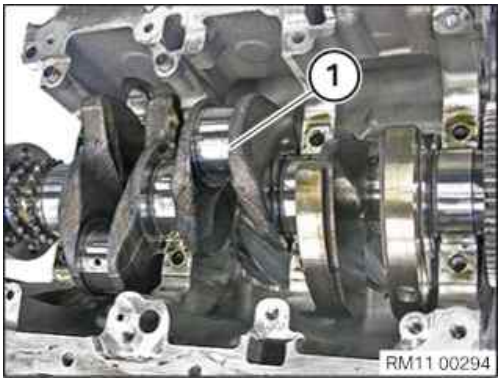
- Observe the marks on the main bearing caps.

  All main bearing caps (1) are numbered according to their installation location (cylinders 1 to 4).

  Main bearing cap number 3 is installed as a thrust bearing.



- Loosen screws in the order (8) to (1).
- Remove all main bearing caps and store them properly.



- Remove the crankshaft (1) with a second person and carefully set it aside.

41 – Determine the classification of the main bearing shells and the guide bearing shells

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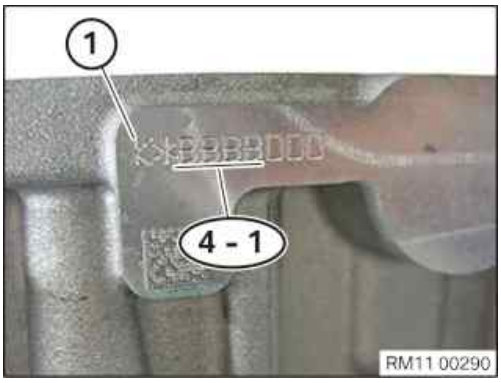

- Position (1) K = clutch side
- Item numbers (4) to (1) describe the bearing seats 7 to 1 (key performance indicator on each of the crankshaft bearing caps).
- Enter the code letter on the crankcase in the table.

- K = Clutch side
- Item numbers (1) to (4) describe the bearing seats 1 to 4 (coefficient on each of the crankshaft bearing caps).
- Enter the identification numbers on the crankshaft in the table.

- Enter the code letters and coefficients of the crankcase and the crankshaft.

	Code letter on the crankcase	**Key performance indicator** on the crankshaft
Bearing seat 1		
Bearing seat 2		
Bearing seat 3		
Bearing seat 4		
Bearing seat 5		
Bearing seat 6		
Bearing seat 7		

- The main bearing shells and guide bearing shells are identified by **colour or by number**.
- Use the table below to determine the colours of the main bearing shells and the guide bearing shells in the **crankcase**:

	1	2	3
A	Blue = 1	Blue = 1	Blue = 1
B	Green = 2	Green = 2	Green = 2
C	Brown = 3	Brown = 3	Brown = 3

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- Use the table below to determine the colours of the main bearing shells and the guide bearing shells in the **crankshaft bearing caps**:

	1	2	3
A	Blue = 1	Green = 2	Brown = 3
B	Blue = 1	Green = 2	Brown = 3
C	Blue = 1	Green = 2	Brown = 3

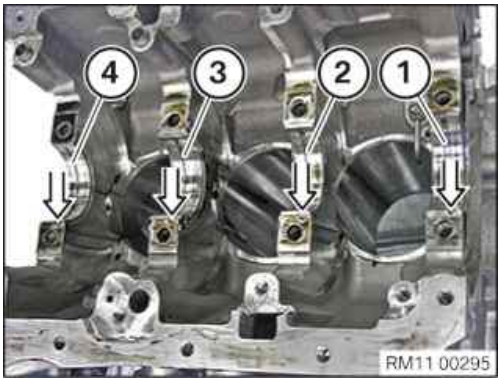
42 – Renewing main bearing shells and guide bearing shells

RISK OF DAMAGE

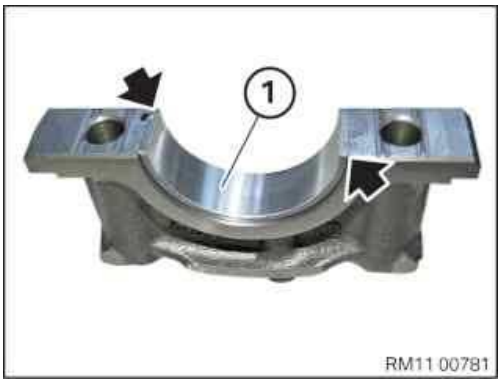
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

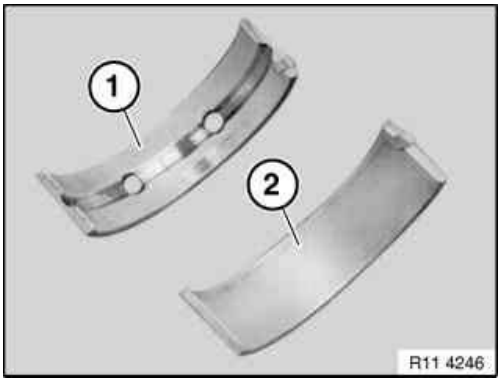
- Always install all bearing shells and bearing supports in the same position from which they were removed.



- Guide the main bearing shells with the lubricating groove (1) and (2) and also (4) out of the crankcase and remove them.
- Feed out and remove the guide bearing shell (3) (with lubricating groove) from the crankcase.



- Feed out and remove the main bearing shells (1) from the crankshaft bearing caps (1), (2) and (4).
- Feed out and remove the guide bearing shell (1) from the crankshaft bearing cap (3).



- Replace main bearing shells with lubricating groove (1) and the main bearing shells (2).

  Parts: Main bearing shells

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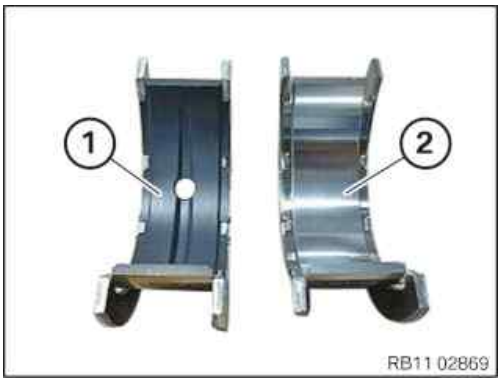


- Replace guide bearing shells with lubricating groove (1) and guide bearing shells (2).

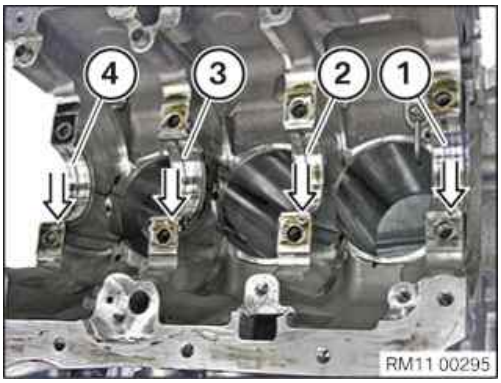
  Parts: Guide bearing shells

- Make sure the guide bearing shells and main bearing shells with lubricating groove (1) are correctly positioned in the crankcase.

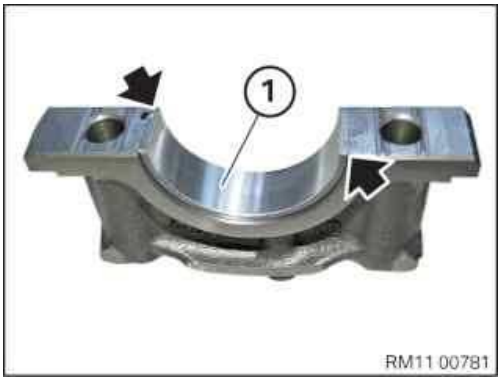
  All guide bearing shells and main bearing shell with lubricating groove (1) in the crankcase are protected against incorrect assembly (mark).

- Make sure the guide bearing shells and main bearing shells (1) are correctly positioned in the crankshaft bearing cap.

  All guide bearing shells and the main bearing shells (1) in the crankshaft bearing caps have protection against incorrect assembly (mark).



- Guide the main bearing shell with the lubricating groove (1) and (2) and (4) into the crankcase and install it.
- Oil the main bearing shell with the lubricating groove (1) and (2) and (4) .
- Insert and install the guide bearing shell (3) (with lubricating groove) in the crankcase.
- Oil guide bearing shell with lubricating groove (3).



- Guide the main bearing shells (1) into the crankshaft bearing caps (1) and (2) and (4) and install them.
- Oil the main bearing shells (1) and (2) and (4) .
- Insert and install the guide bearing shell (3) in the crankshaft bearing cap.
- Oil the guide bearing shell (3).

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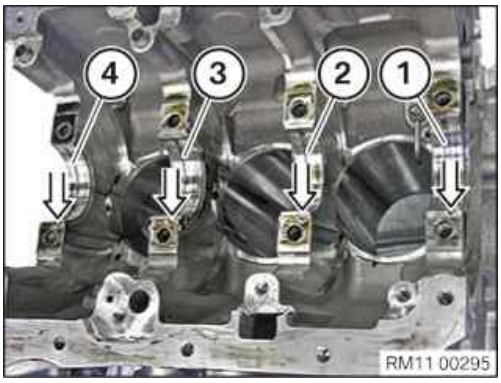
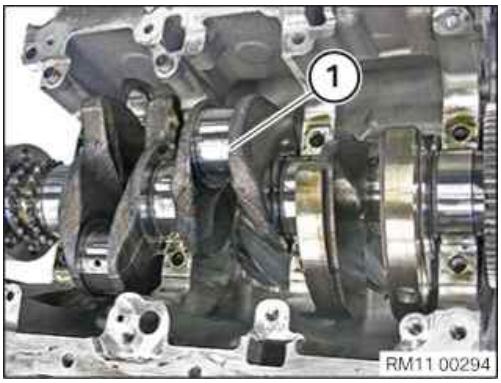


- Ensure correct installation of the main bearing shells 1 to 4 with the guide lug (arrows).



CAUTION

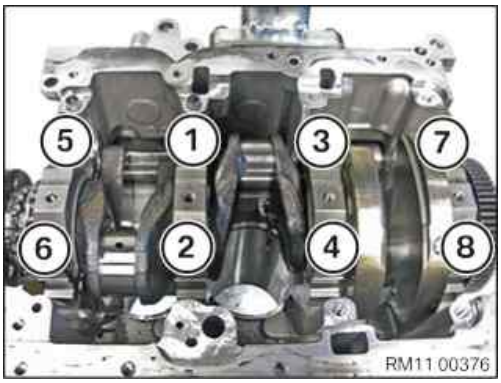
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Install the crankshaft (1).

  Parts: Crankshaft



- Observe the assignment and numbering 1 to 4 of the main bearing caps.

  Assign the main bearing caps according to the order of the cylinders.
- Do not install the main bearing cap in an incorrect position.
- Do not install the main bearing cap in a position twisted by 180 degrees!

  Main bearing caps are coded to prevent incorrect assembly.
- Align main bearing caps exactly.
- Replace main bearing bolts.

  Parts: Bolts
- Tighten the main bearing bolts in the sequence (1) to (8).

Main bearing cap to crankcase

M10x85	Replace screws.	1. tightening torque	25 Nm
		2. tightening torque	50 Nm
		3. Angle of rotation	60 °
		4. Angle of rotation	60 °

POSTPROCESSES

44 – Check the coefficient of friction for the crankshaft

Check

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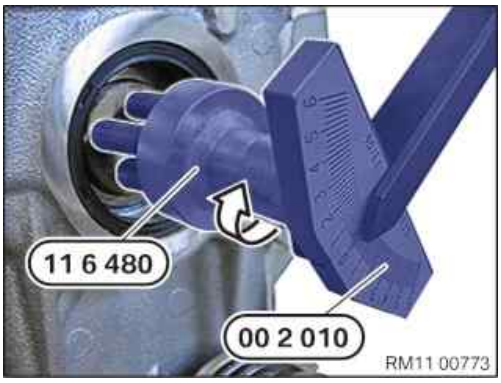


- Turn the crankshaft clockwise with the special tool **0 490 130 (00 2 010)** and compare the reading on the scale to the maximum permitted torque.

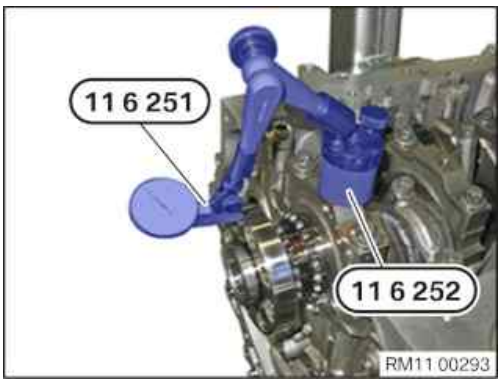
Result

» The maximum permitted torque is exceeded.

Measure

- Correct the radial clearance.

45 – Checking the crankshaft side clearance



Check

- Attach the dial gauge **0 493 144 (11 6 251)** with the tripod **0 493 145 (11 6 252)** to the engine.

Axial play of crankshaft

	min. 0,053 mm
	max. 0,204 mm

Result

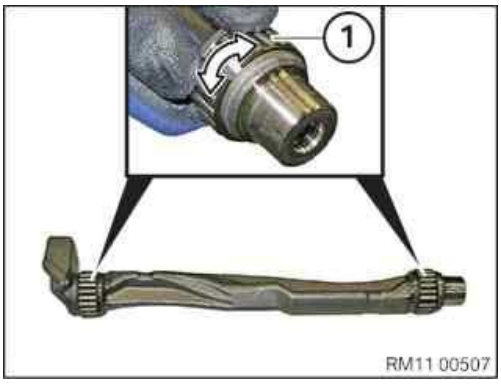
» The side clearance has been exceeded.

Measure

- Renew worn components.

46 – Install counterbalance shaft

- If a new gear is installed, the ring gear must remain blocked until installation using the factory-mounted fixation (1) .



- Check both needle bearings (1) of counterbalance shaft for damage.
- Pull off damaged needle bearing (1) from the counterbalance shaft and renew it.

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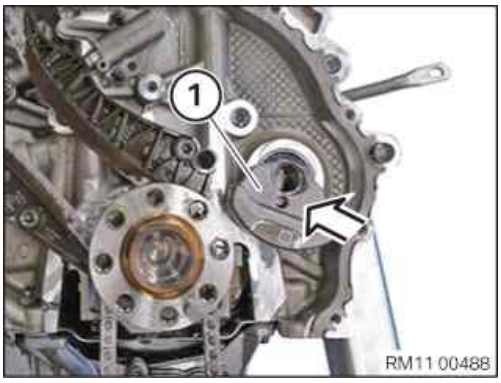
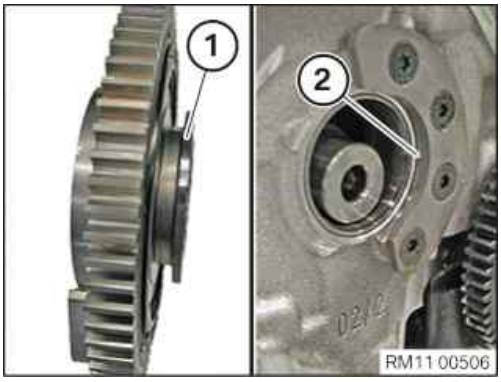


- Install counterbalance shaft (1) in direction of arrow into crankcase.

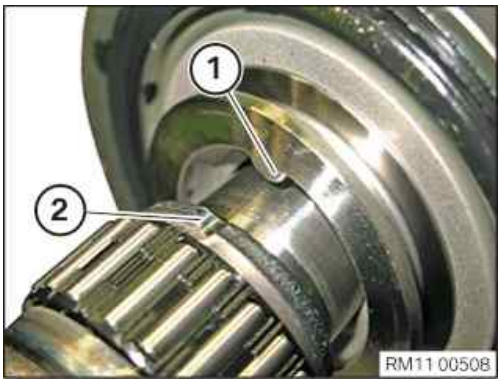
- Fix the counterbalance shaft in the TDC setting of the first cylinder using the special tool .
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



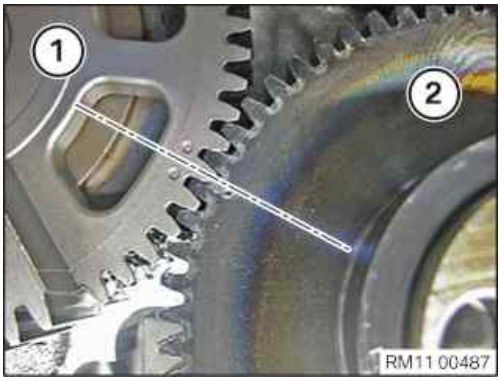
- On installation, make sure that ring (1) of gear is guided in crankcase (2).



NOTICE

For a better overview the removed condition is shown here.

- On installation of counterbalance shaft in gear, make sure that lug (1) on gear is inserted into groove (2) of counterbalance shaft.



- Bring gear (1) of counterbalance shaft into contact in correct installation position (mark) relative to crankshaft (2).

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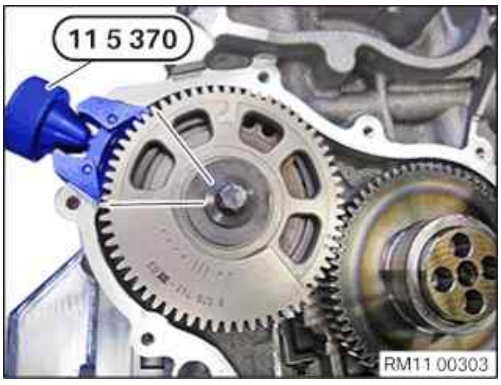
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Gear to counterbalance shaft

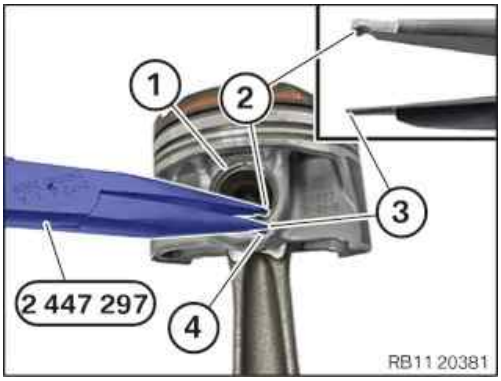
	Renew screw.	Tightening torque	20 Nm
		Angle of rotation	60 °



- Remove special tool **0 495 131 (11 5 370)**.

- Loosen screws (1).
- Remove special tool .

47 – If necessary: Renew the piston



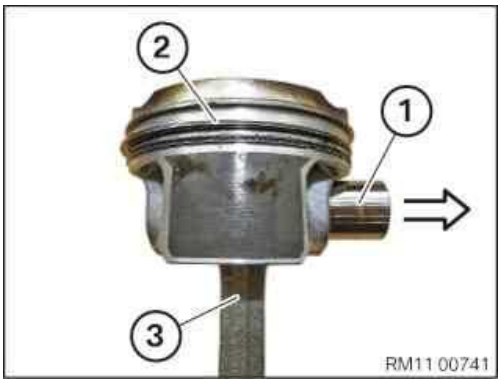
CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

- Use special tool to remove the gudgeon pin circlip.
- Insert the flat side (3) of special tool into the groove (4).
- Grab and remove the gudgeon pin circlip (1) with the arched side (2).



TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Remove the gudgeon pin (1) in the direction of arrow.
- Remove piston (2) from connecting rod (3).

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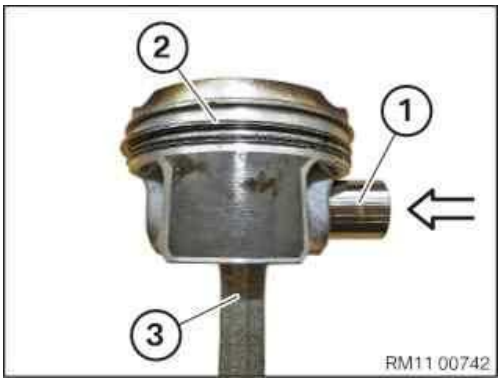


- Renew piston with gudgeon pin.

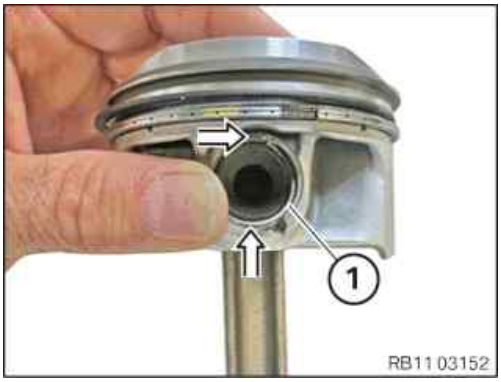
  Parts: Pistons

TECHNICAL INFORMATION

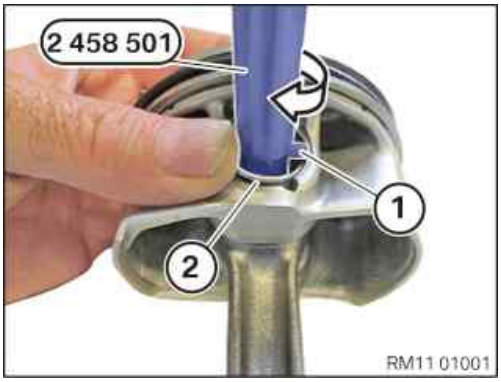
Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Position piston (2) on the connecting rod (3).
- Install the gudgeon pin (1) in the direction of arrow.
- You must be able to install the gudgeon pin (1) without major effort.
- Gudgeon pin (1) must be free of play in piston and connecting rod.

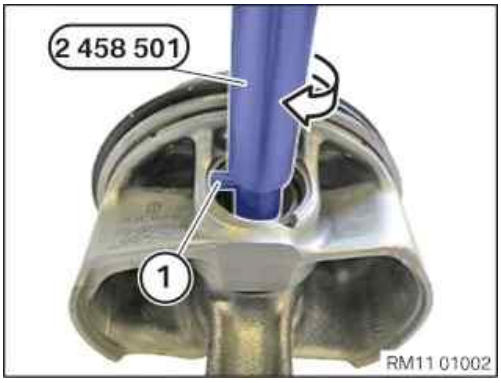
- Prepare special tool on the fitting aid .



- Insert the gudgeon pin circlip (1) into the groove on the piston (see arrows).



- Screw in the positioned gudgeon pin circlip (2)with and with the guide pin (1) in the direction of the arrow.



- Screw the gudgeon pin circlip with guide pin (1) into the groove of the piston in the direction of the arrow.

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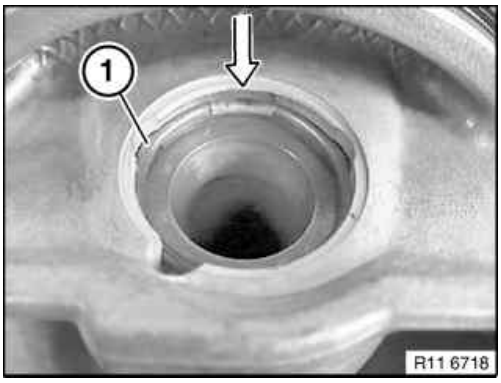


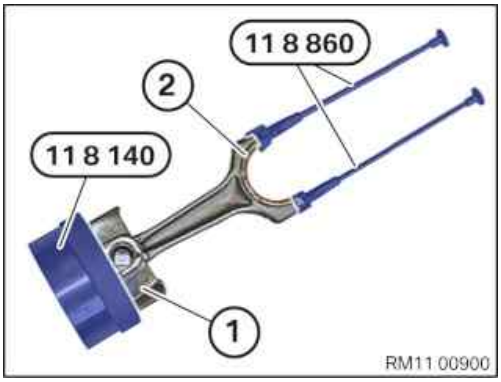
- Gudgeon pin circlip (1) must be fitted correctly in the groove (arrow).

48 – Installing piston with connecting rod

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Coat the pistons (1) and piston rings lightly with oil.
- Mount the special tool **0 493 582 (11 8 140)** on the piston (1).
- Screw the special tool **0 496 144 (11 8 860)** in on the large connecting rod eye (2).

- Insert the piston with the special tool **0 493 582 (11 8 140)** with the arrow pointing to cylinder 1.

RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.
- Install the piston in the crankcase.
- Remove special tool **0 496 144 (11 8 860)** from large connecting rod eye.

49 – Install the connecting rod bearing cap

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RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

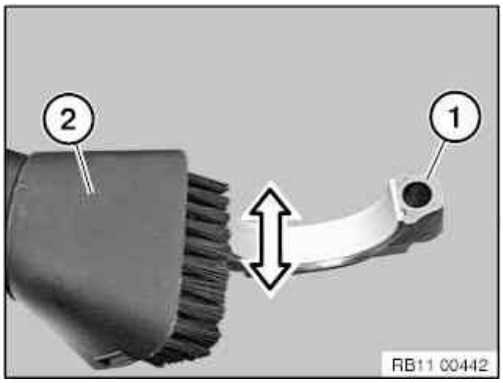
Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

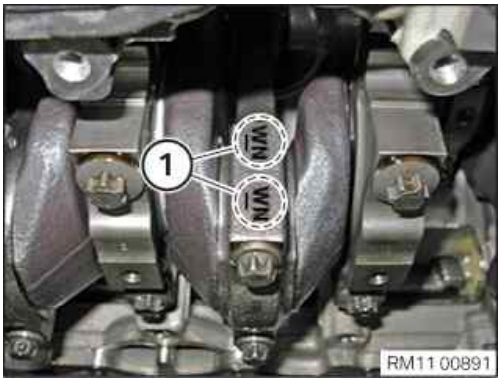
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



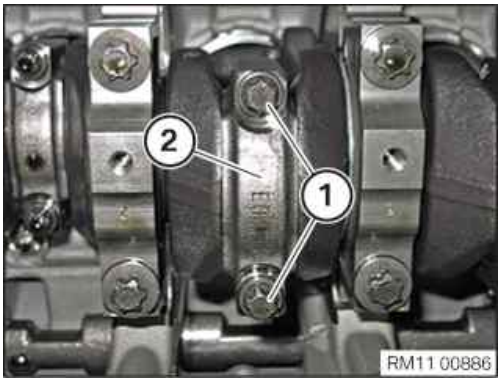
- Attach the connecting rod bearing caps to the connecting rod until the designations (1) match.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Make sure that the connecting rod bearing is attached to the same connecting rod that it was detached from.



- Position the connecting rod bearing cap (2).
- Tighten the bolts (1) with the special tool **0 490 504 (00 9 120)**.

Connecting rod bearing cap to connecting rod

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

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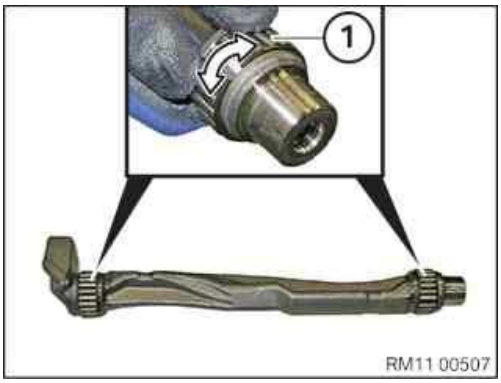
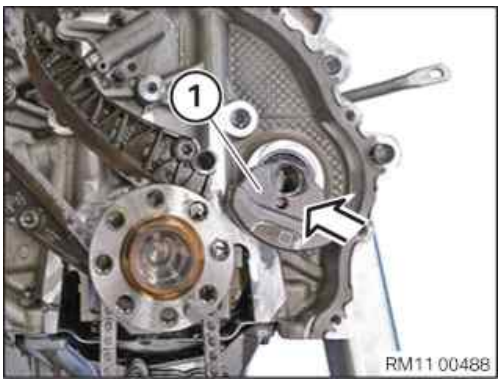
- If a new gear is installed, the ring gear must remain blocked until installation using the factory-mounted fixation (1) .



- Check both needle bearings (1) of counterbalance shaft for damage.
- Pull off damaged needle bearing (1) from the counterbalance shaft and renew it.

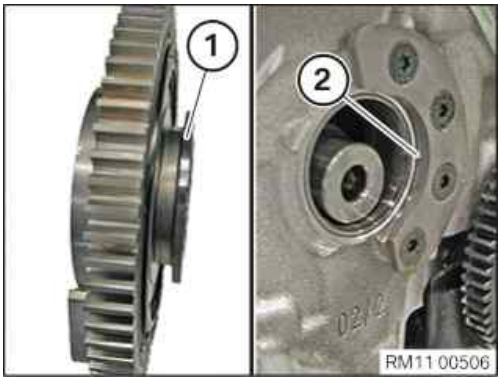


- Install counterbalance shaft (1) in direction of arrow into crankcase.

- Fix the counterbalance shaft in the TDC setting of the first cylinder using the special tool .
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



- On installation, make sure that ring (1) of gear is guided in crankcase (2).

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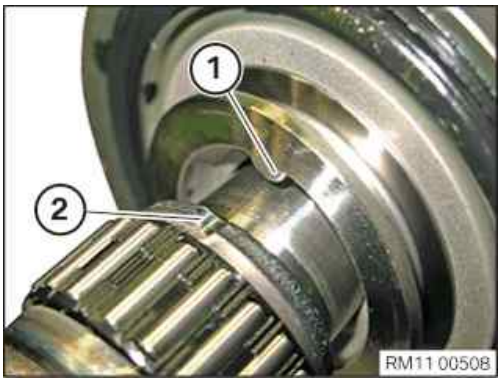
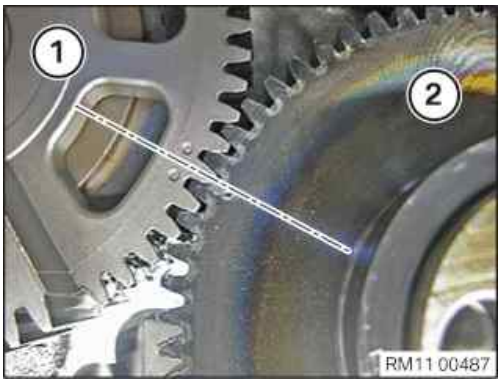


NOTICE

For a better overview the removed condition is shown here.

- On installation of counterbalance shaft in gear, make sure that lug (1) on gear is inserted into groove (2) of counterbalance shaft.



- Bring gear (1) of counterbalance shaft into contact in correct installation position (mark) relative to crankshaft (2).

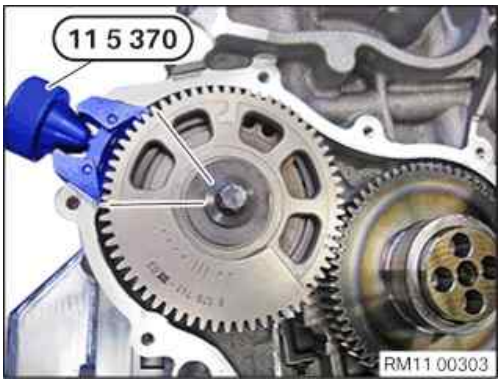
- Renew the screw (1).

  Parts: Screw

- Tighten down screw (1).

Gear to counterbalance shaft

	Renew screw.	Tightening torque	20 Nm
		Angle of rotation	60 °



- Remove special tool **0 495 131 (11 5 370)**.

- Loosen screws (1).
- Remove special tool .

51 – Install both timing chains

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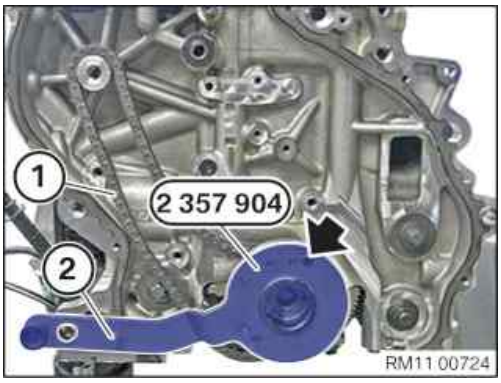
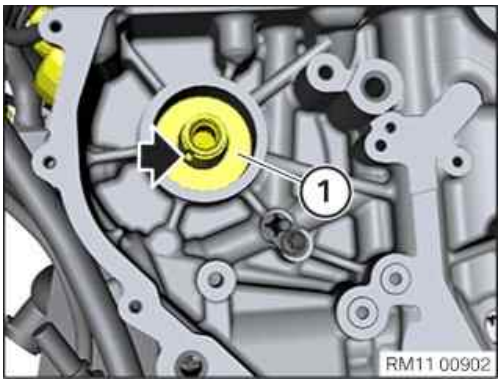


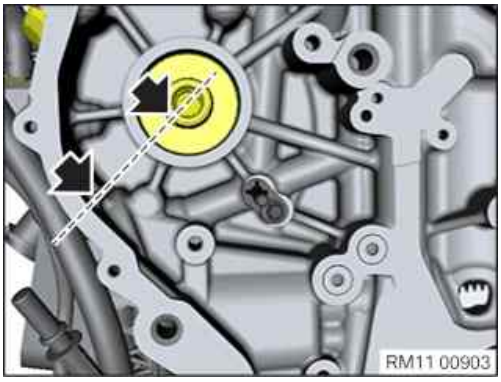
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

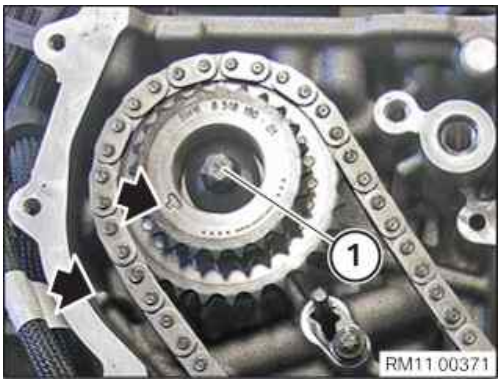
- Position the timing chain (1).
- Secure crankshaft with special tool **2 357 904**.
- Secure special tool **2 357 904** with bolt (2) on crankcase.



- Note spline groove on high pressure pump (1).



- Mark and groove (arrows) on high pressure pump and crankcase must align.



- Position the impeller with timing chain on the high pressure pump.
- Screw in and fasten central bolt (1) of high pressure pump.
- Mark and cast lug (arrows) must align.

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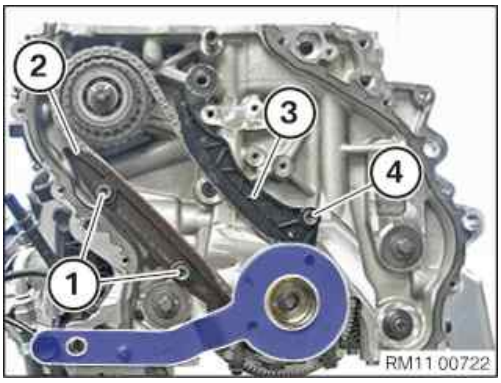


- Position tensioning rail (3).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten the bearing journals (4).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

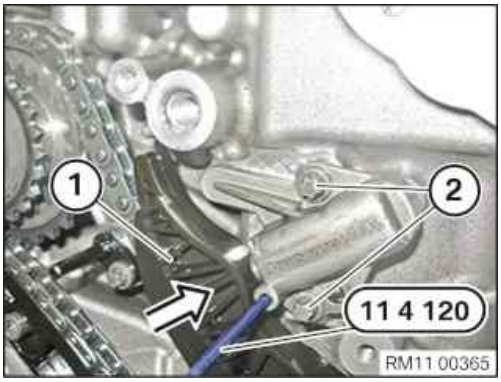
- Position the guide rail (2).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten both bearing journals (1).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

- Clean sealing surfaces (1) with compressed air.

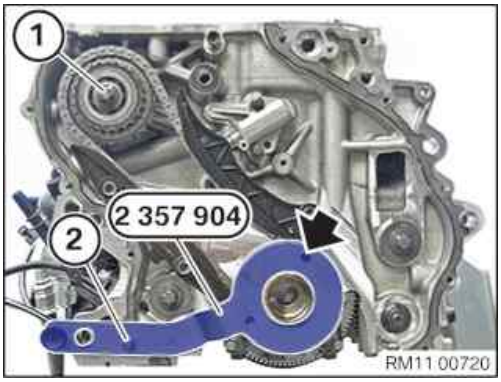


- Position hydraulic chain tensioner.
- Tighten down screws (2).

Chain tensioner to crankcase

M6x22		Tightening torque	10 Nm

- Press chain tensioner in by hand with tensioning rail (1) in direction of arrow until special tool **0 491 012 (11 4 120)** can be removed.



- To fasten central bolt (1) of high pressure pump, crankshaft must remain secured with special tool **2 357 904** and bolt (2).
- Renew central bolt (1).

  Parts: Central bolt
- Tighten central bolt (1).

Camshaft sprocket on high pressure pump

M12		Tightening torque	65 Nm

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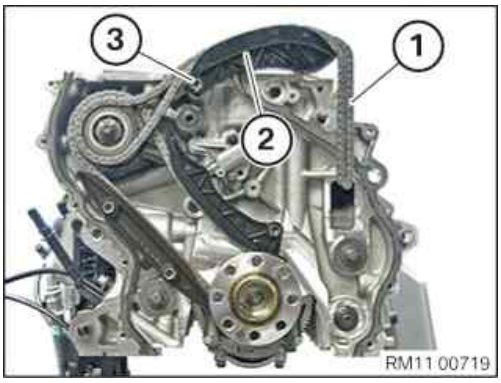
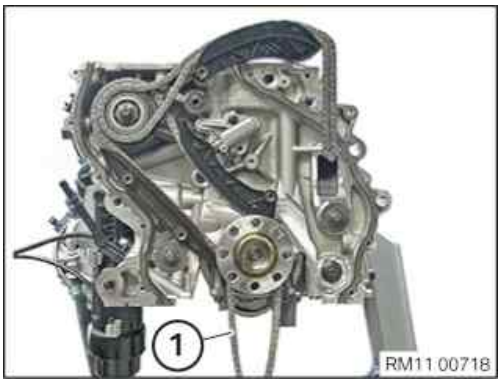
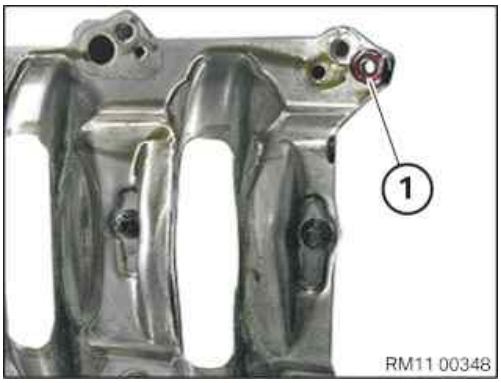


- Position tensioning rail (2) on bearing journal (3).
- Position camshaft timing chain (1).

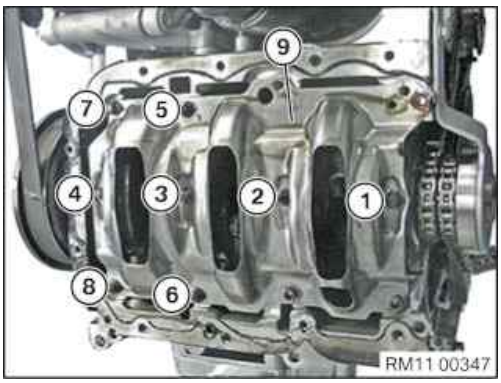


- Mount drive chain (1) for oil pump on crankshaft.

52 – Installing the oil deflector



- Check sealing ring (1) for damage and replace oil deflector if necessary.



- Insert and install the oil deflector (9).
- Renew screws (1) to (4).

  Parts: Bolts
- Hand-tighten the bolts (1) to (4).
-
- Tighten the screws (1) to (8).

Oil deflector to crankshaft bearing cap

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

- Tighten the screws (5) to (8).

Oil deflector to crankcase

M8x14		Tightening torque	19 Nm

53 – Install the oil vacuum pump

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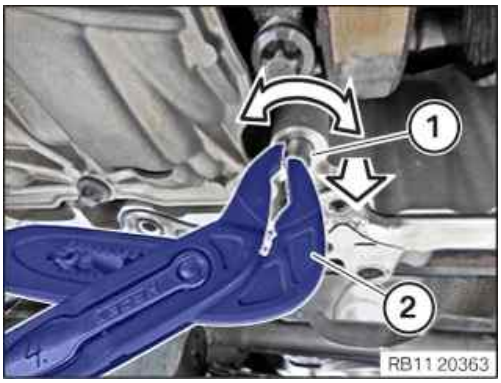
RISK OF DAMAGE

Contaminant or foreign body.

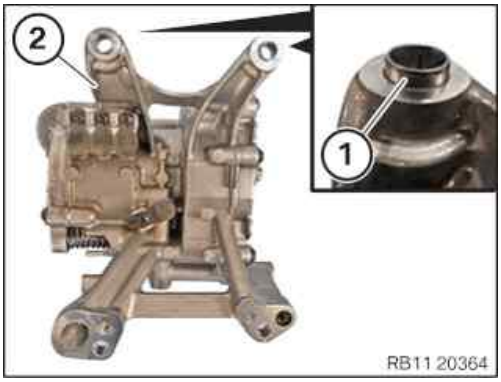
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

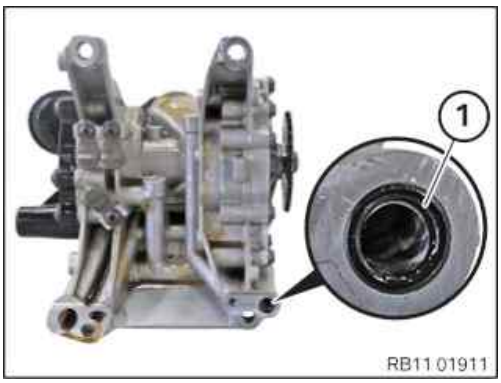


- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

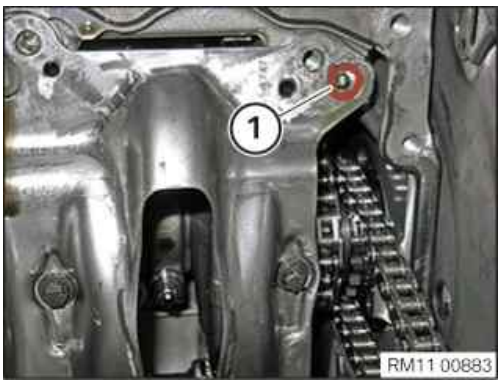
  Parts: Centring sleeves



- Install centering sleeves (1) in the oil vacuum pump (2).



- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector

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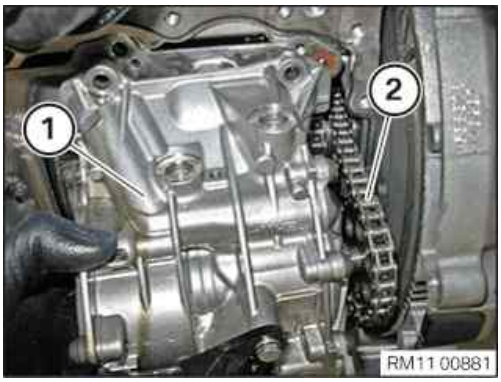


- Insert oil vacuum pump (1) into the drive chain (2).

- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1) of the oil vacuum pump (2).

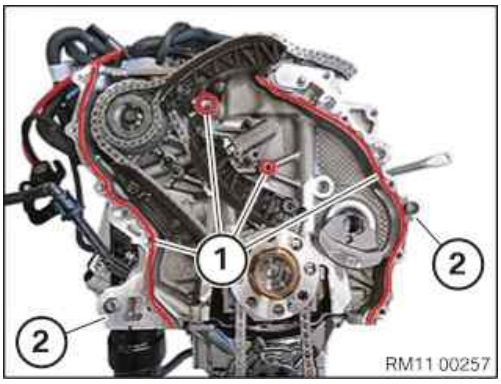
Oil vacuum pump to crankcaseB37

M8x35	*Renew screws.*	Tightening torque	15 Nm
		Angle of rotation	45 °

54 – Install the rear timing case cover

Prerequisite

Transmission is removed.



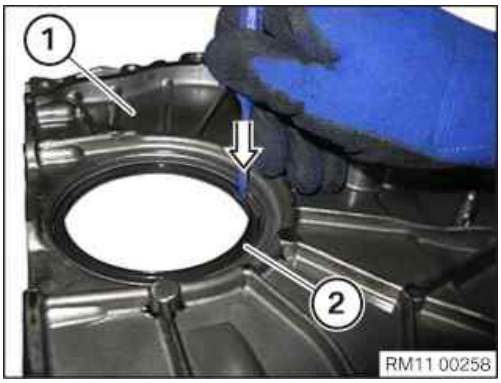
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.

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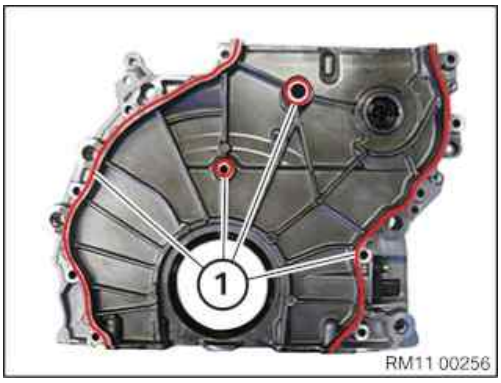
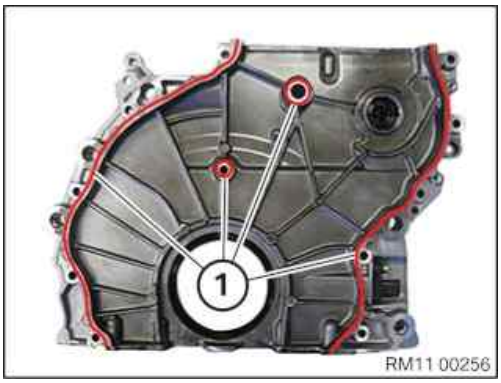


- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

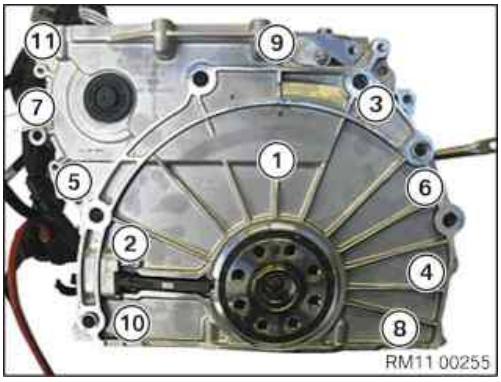


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

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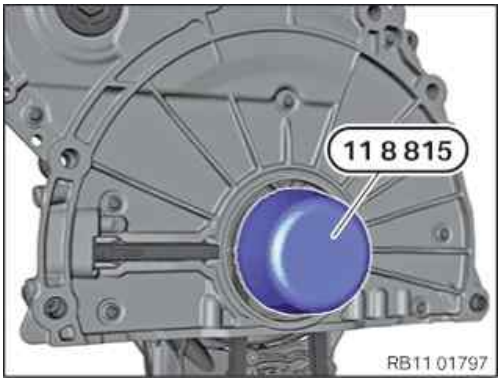
RISK OF DAMAGE

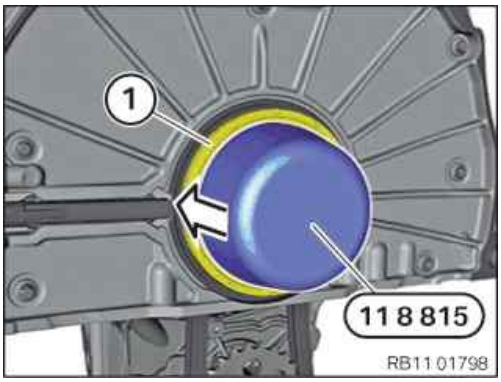
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

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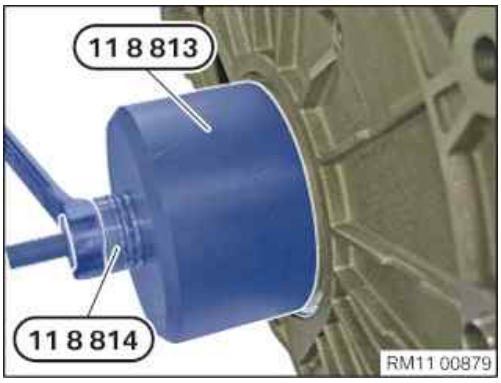
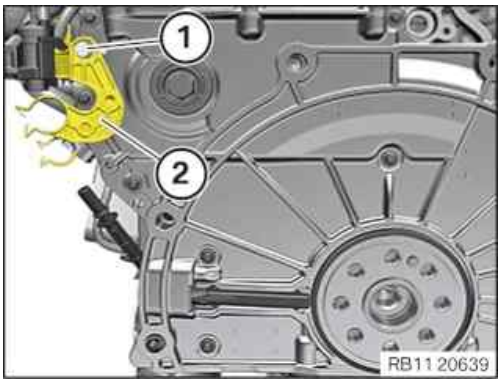
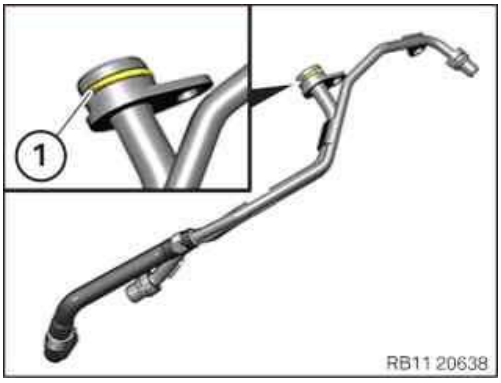


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



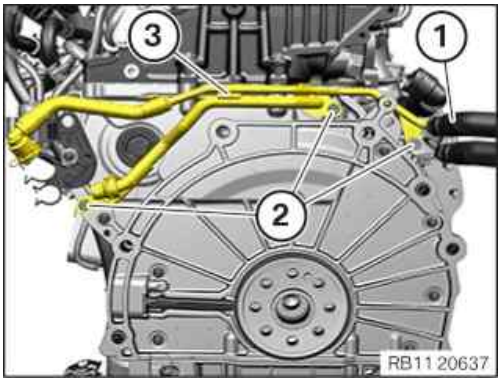
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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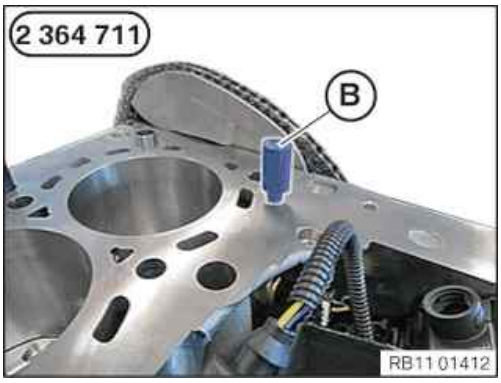


- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

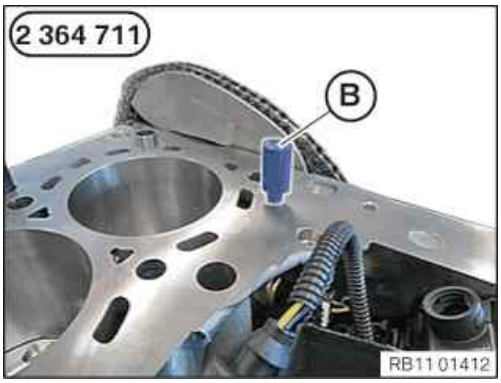
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

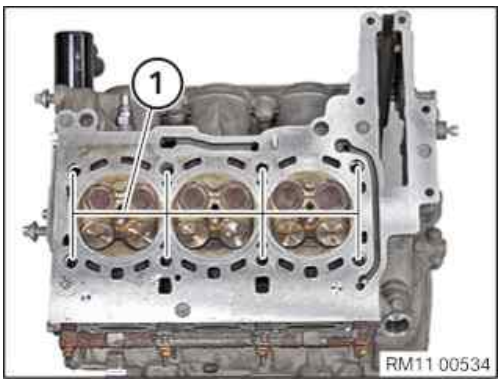
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ Renewing the cylinder head gasket



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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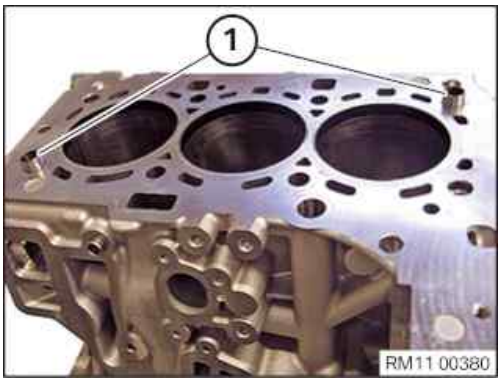
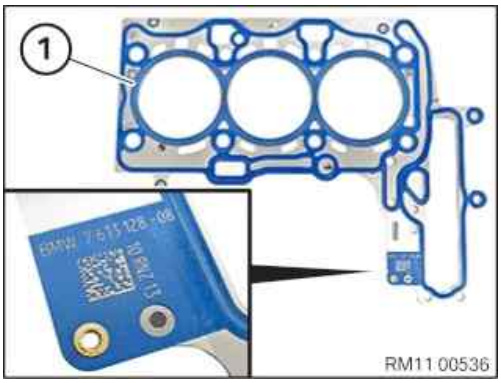
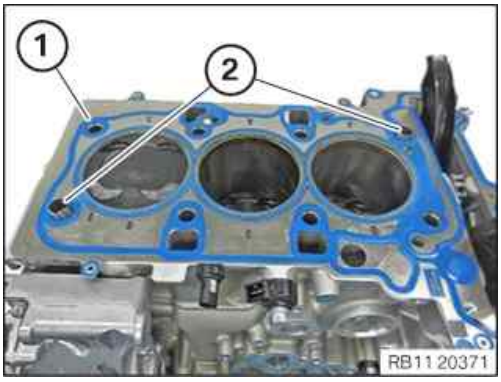


- Check the fitting sleeves (1) for secure fit and damage.

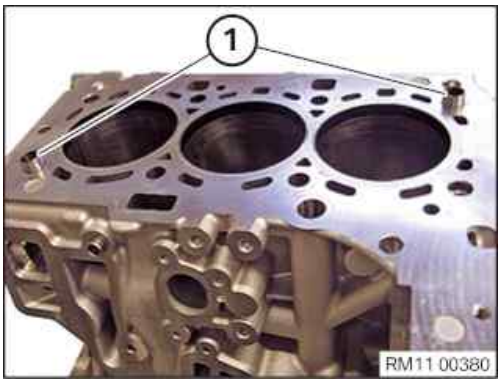


- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.

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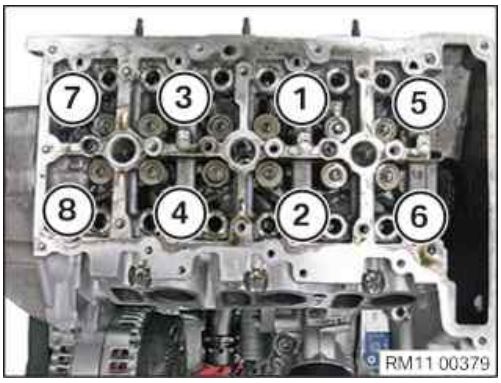


- Fit new cylinder head screws.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

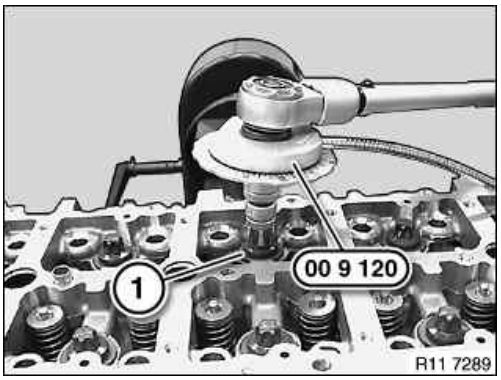
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

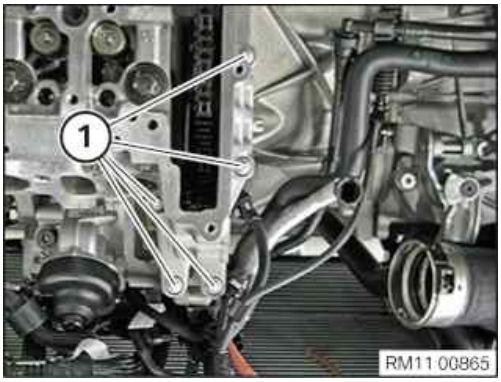
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolts in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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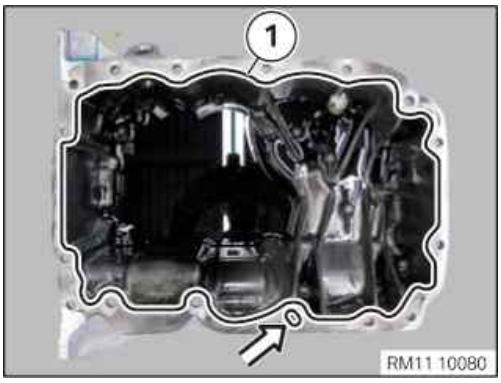


TECHNICAL INFORMATION

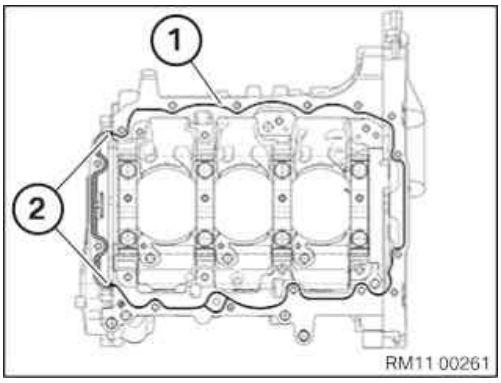
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

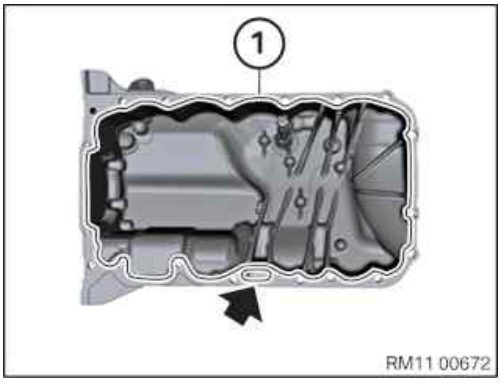
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

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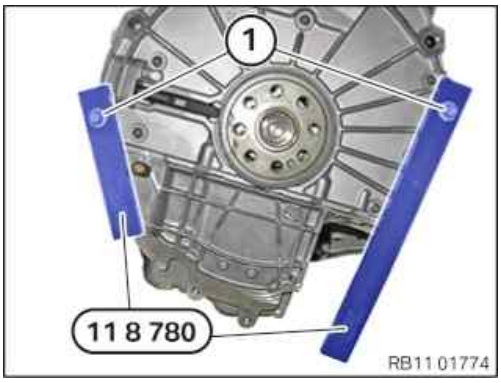
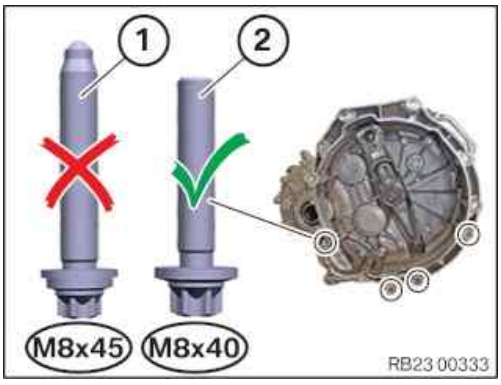


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

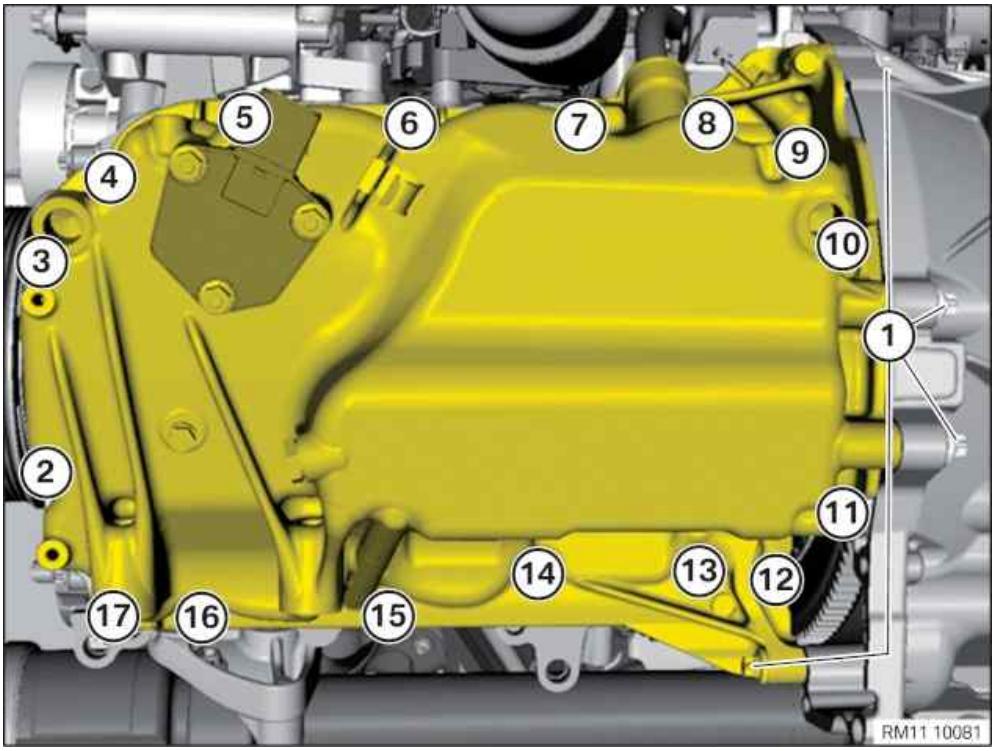
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Hand tighten the screws of oil sump (2) to (17) , but do **not** tighten completely yet.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

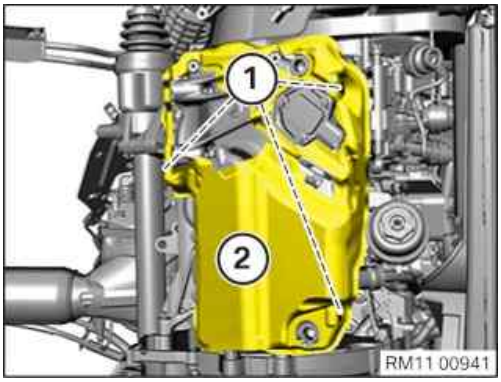
Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

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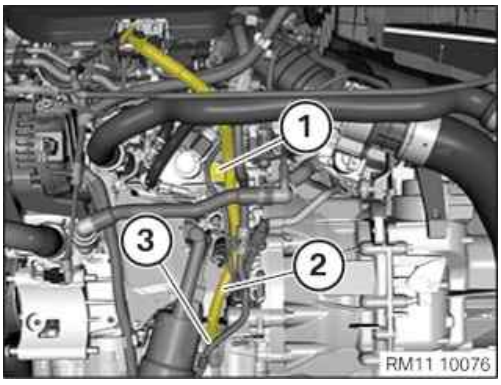
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

55 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).

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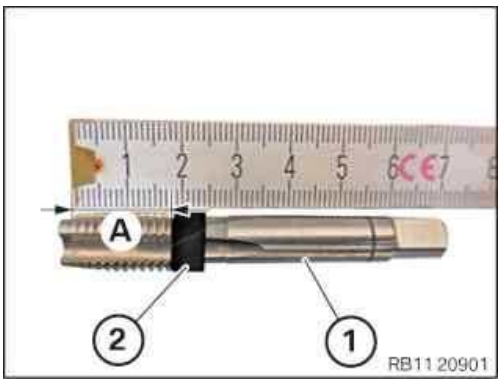
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

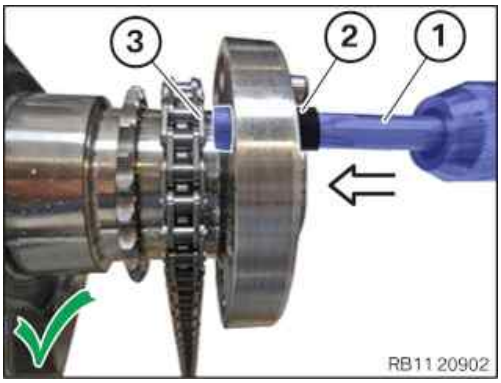
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

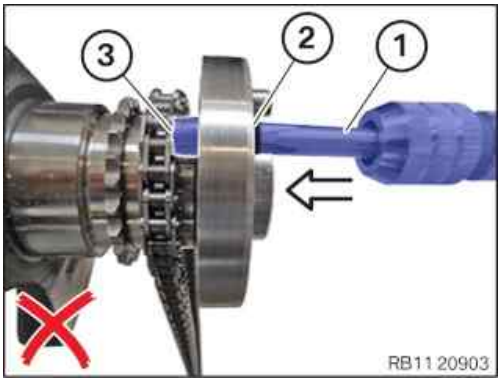
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).



TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).

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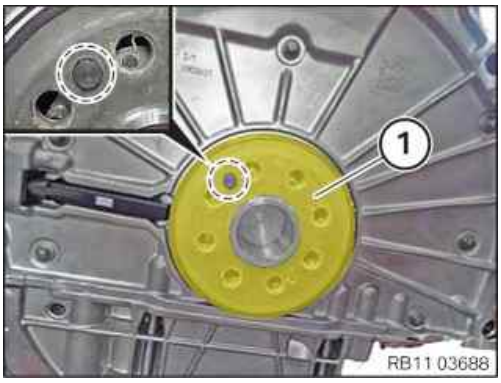
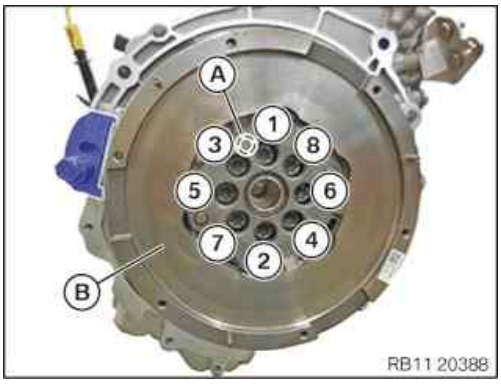


- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

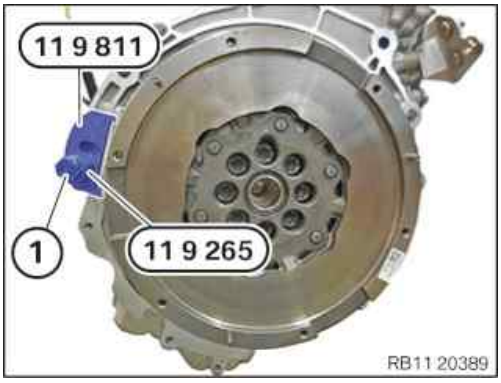


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

56 – Install clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.

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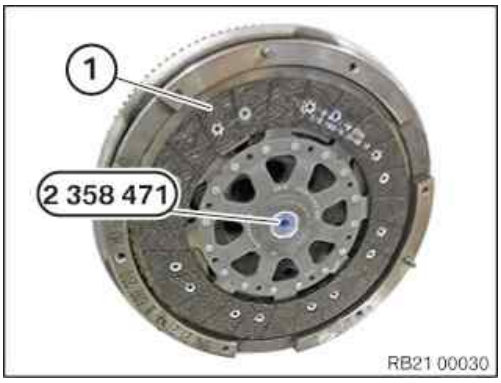
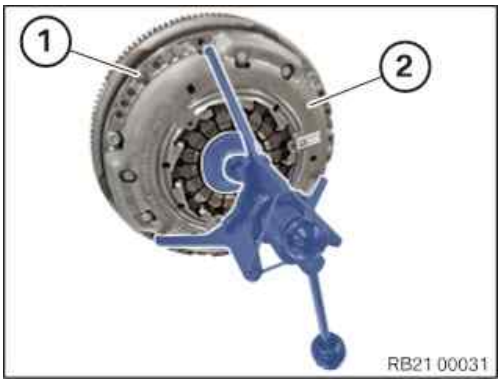
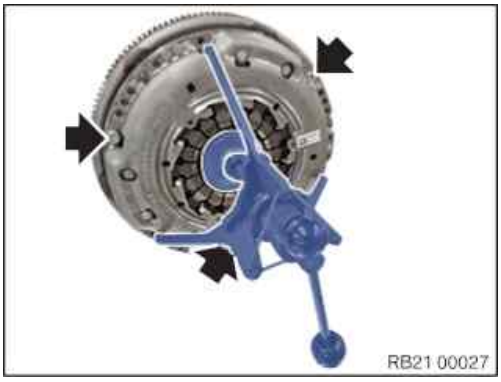


- Centre the clutch disc (1) using special tool **2 358 471**.



- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

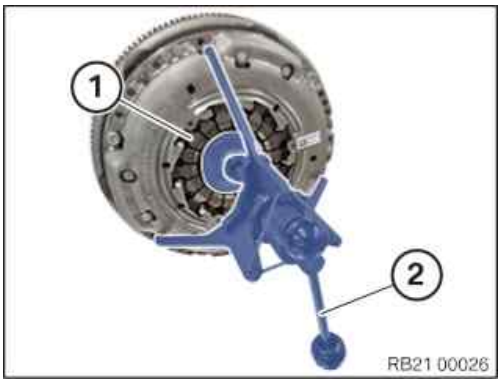


- Renew the bolts (arrows).

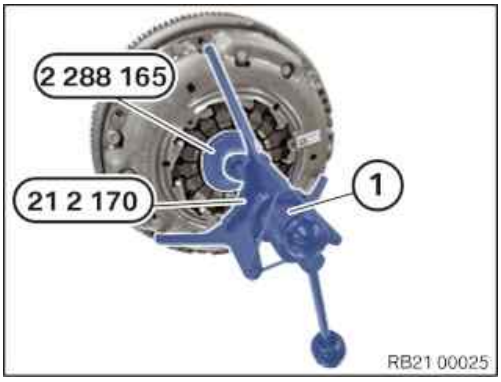
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool **0 493 839 (21 2 170)** with **2 288 165** from the clutch.

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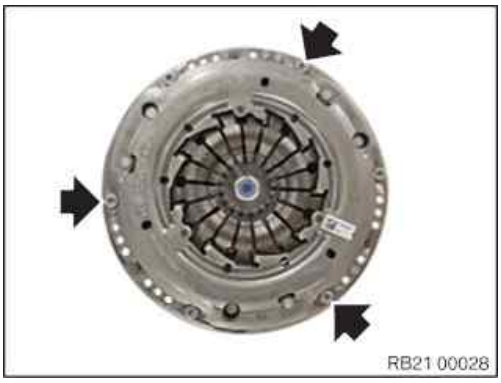


- Renew the bolts (arrows).

  Parts: Bolts

- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

- Withdraw special tool **2 358 471** from clutch disc with aid of accompanying screw.

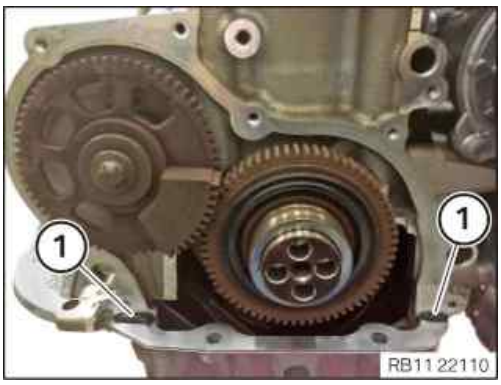
57 – Installing the timing case cover

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply sealing compound (1) approx. **5 mm** as shown.

  The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.

- Assemble special tool **2 357 900** as shown.
- Please note that no greases or lubricants may be used on the special tool **2 357 900**.

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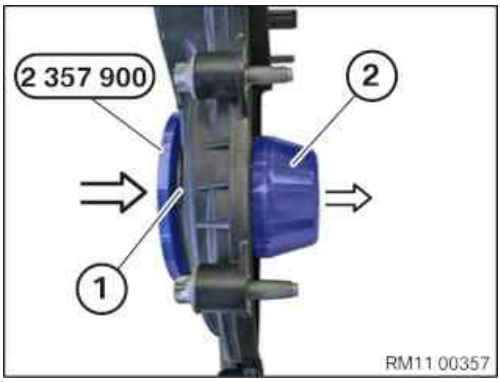
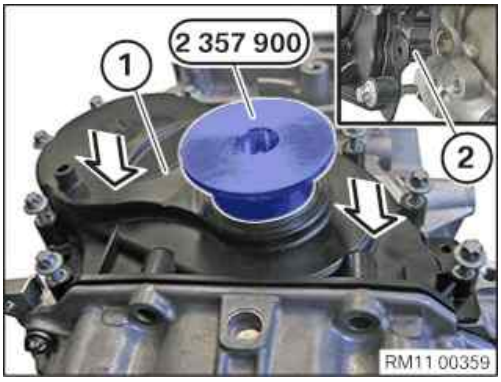


- Carefully slide the special tool **2 357 900** in the direction of the arrow through the sealing ring into the timing case cover (1).
- Make sure that the special tool **2 357 900** rests flat against the timing case cover (1).
- Remove the fitting aid (2).

- Connect special tool **2 357 900** to the timing case cover (1) on the hub of the crankshaft (2).



- Feed in and install timing case cover (1) in the direction of the arrow.
- Ensure the guide pins (2) are fitted correctly.
- Tighten screws hand-tight.
- Remove special tool **2 357 900**.

- Make sure that the air guide (1) faces out.

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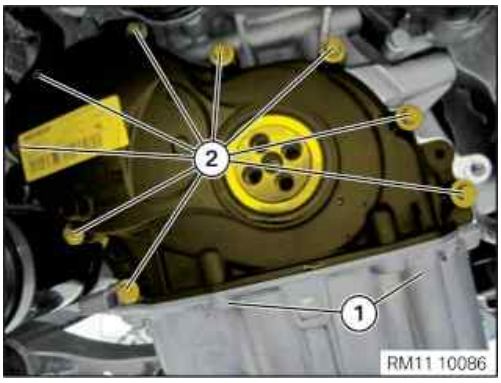


- Hand-tighten the bolts (1).
- Tighten the screws (2) in a crosswise sequence with a tightening torque.

Timing case cover, front, to crankcase

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

- Tighten the screws (1).

Oil sump to crankcase

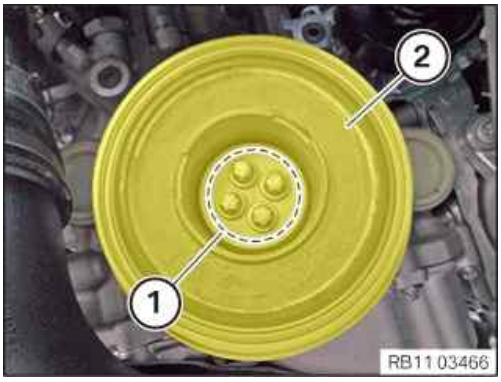
M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

- Tighten the screws (2) in a crosswise sequence with an angle of rotation.

Timing case cover, front, to crankcase

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

58 – Installing the vibration damper

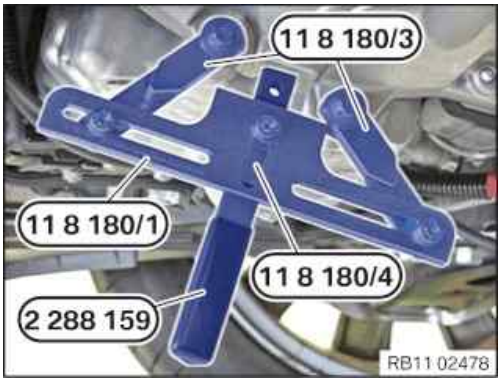


- Position vibration damper (2).
- Renew screws (1).

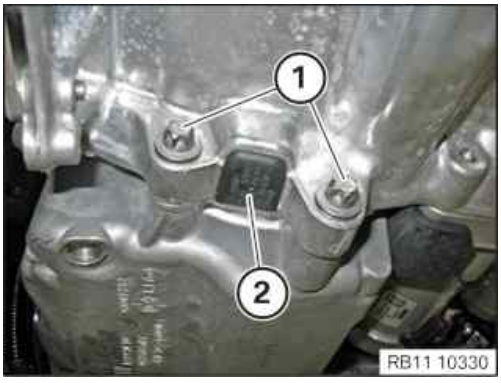
  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

Vibration damper with belt pulley to crankshaft

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.



- Tighten transmission screws (1).

Transmission to oil sump

M8			19 Nm

- Install protective cap (2).

59 – Cleaning the sealing surface

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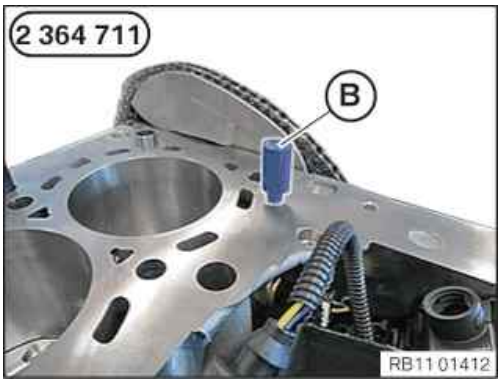
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

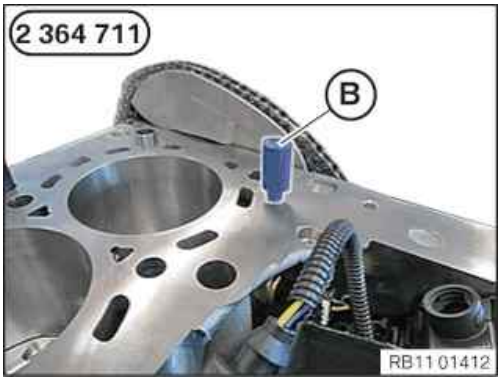
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

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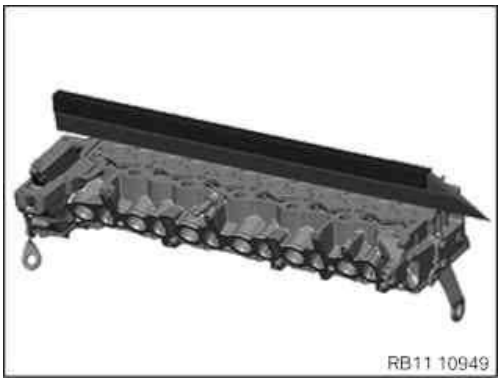
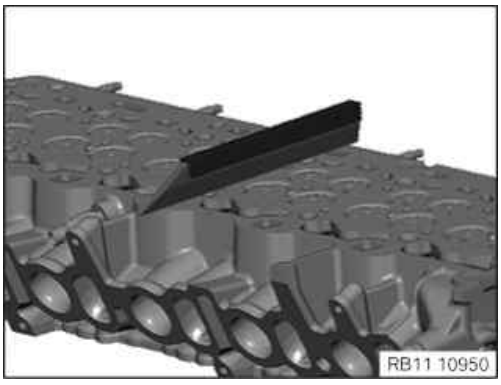


- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm



- Check the flatness of the cylinder head crosswise using a straightedge.

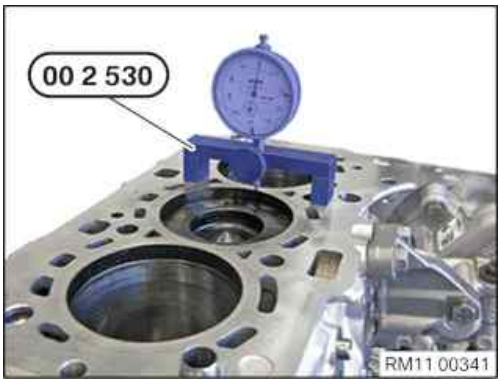
Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

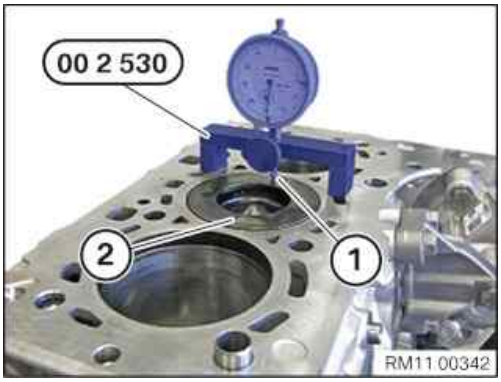
61 – Determining the thickness of the cylinder head gasket

TECHNICAL INFORMATION

The highest piston protrusion on both measuring points of all pistons determines the strength of the cylinder head gasket.



- For measuring the piston protrusion: position special tool **0 490 185 (00 2 530)** including the dial gauge on the cleaned cylinder head lower face.
- Set dial gauge to zero under preload.



- Clean the pistons at the measuring points (1) and (2).
- Place the dial gauge onto the cleaned piston at measuring points (1) and (2).
- Determine highest point by turning crankshaft.
- Measure and record the piston protrusion at measuring points (1) and (2) on all pistons.

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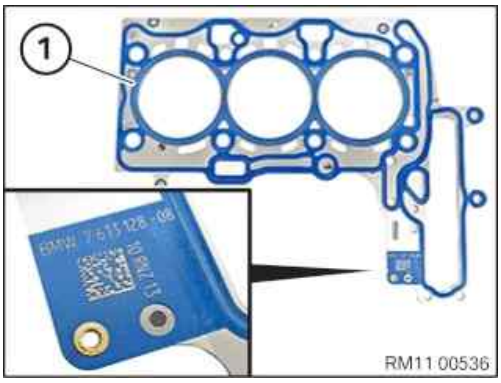


- Renew cylinder head gasket.

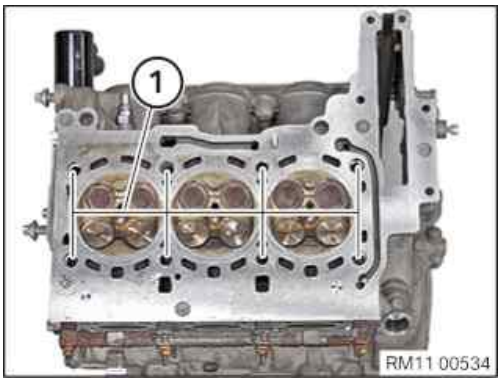
  Parts: Cylinder head gasket

Selecting the cylinder head gasket

A decision is made to determine which cylinder head gasket must be used based on the measuring result of the measurement of the piston protrusion.

Cylinder head gasket with number of holes 1	0 mm ... 0,92 mm
Cylinder head gasket with number of holes 2	0,93 mm ... 1,03 mm
Cylinder head gasket with number of holes 3	1,04 mm ... 1,18 mm

62 – Renewing the cylinder head gasket



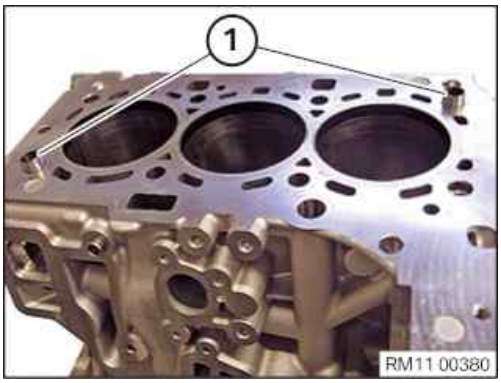
RISK OF DAMAGE

Damage to the surface.

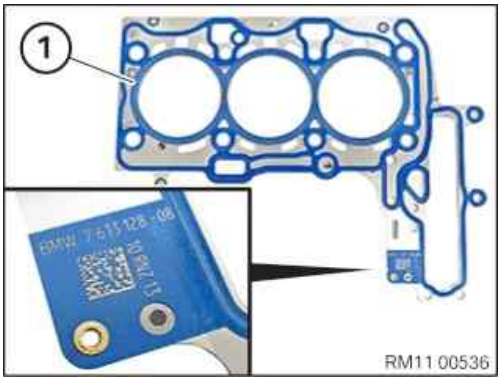
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

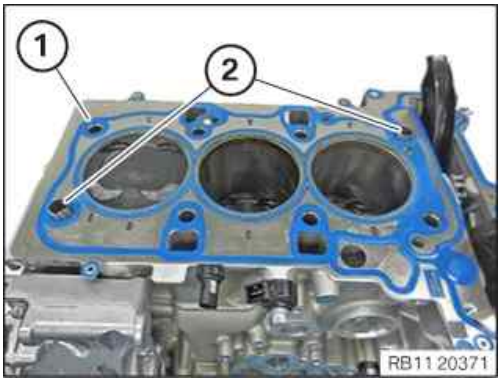
- Remove oil and dirt residue from the blind holes (1).



- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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63 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

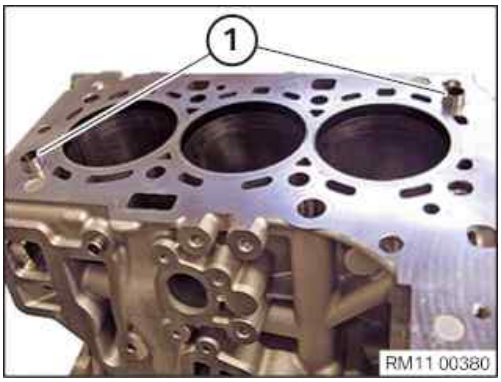
Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

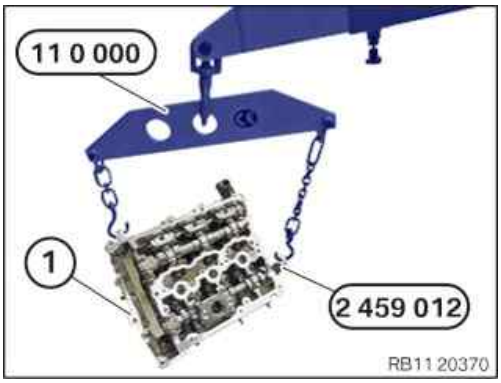
Do not remove bolt coating.



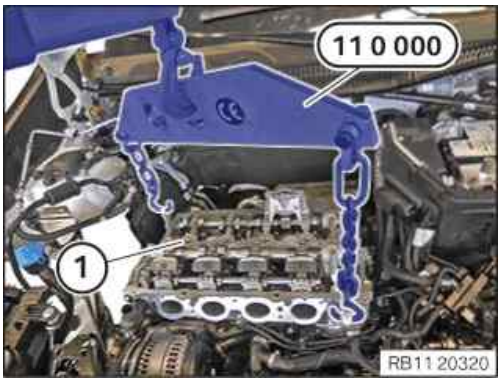
- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.

- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.

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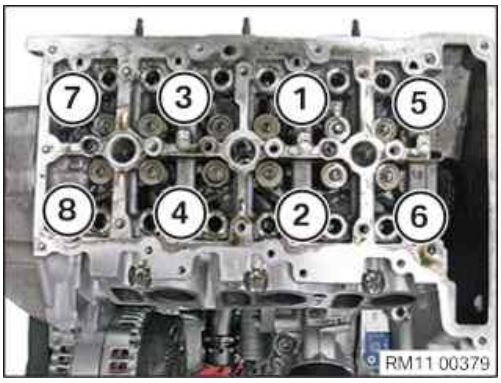


- Fit new cylinder head bolts.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

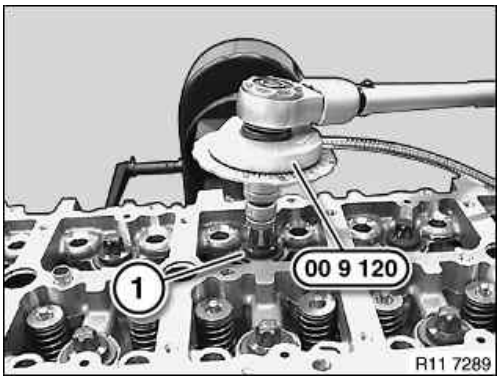
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

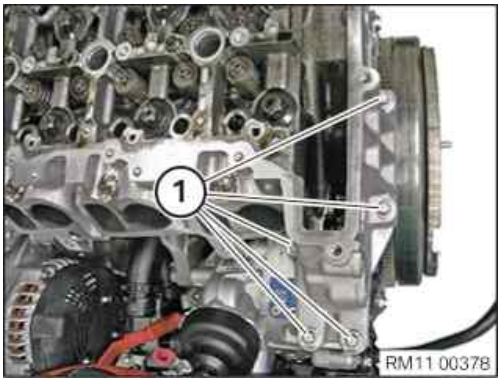
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

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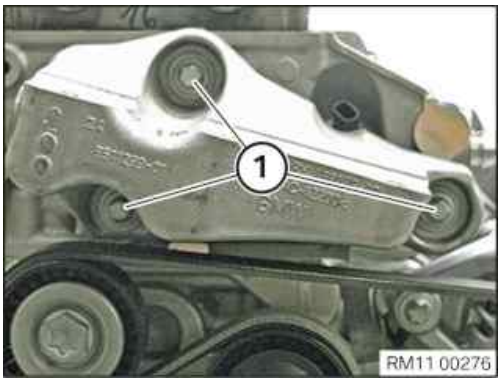
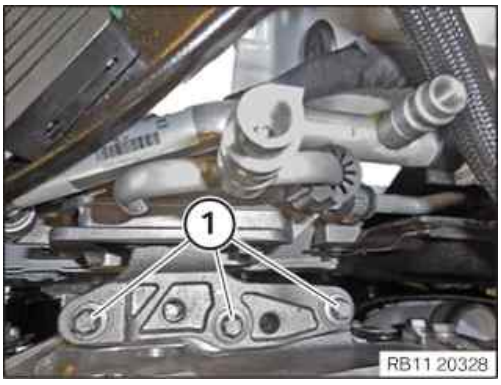


- Tighten the screws (1).

Engine support to cylinder head

M10X45		Tightening torque	41 Nm



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

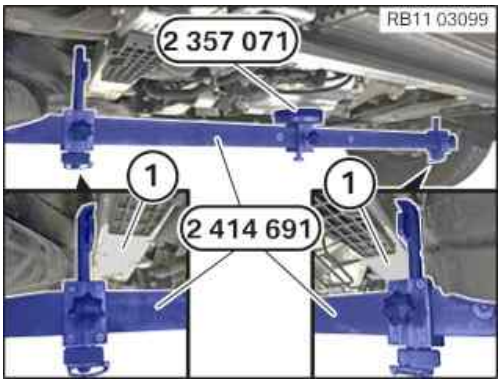
Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

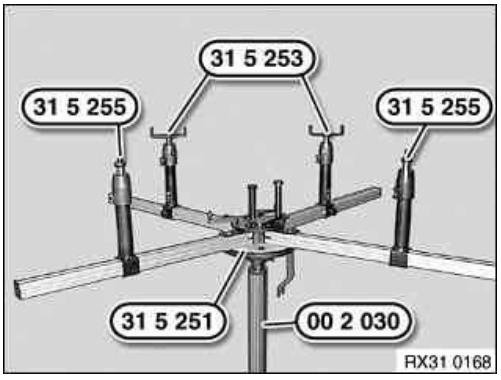
- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Disassemble special tool **2 414 691** using special tool **2 357 071**.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

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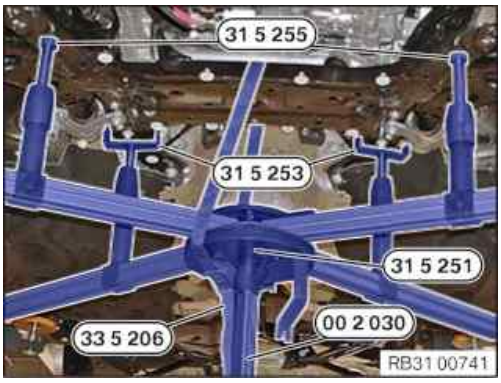
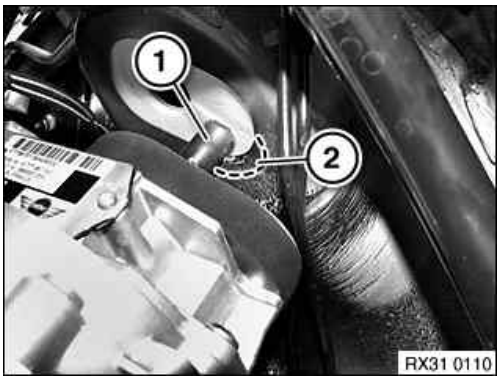


- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

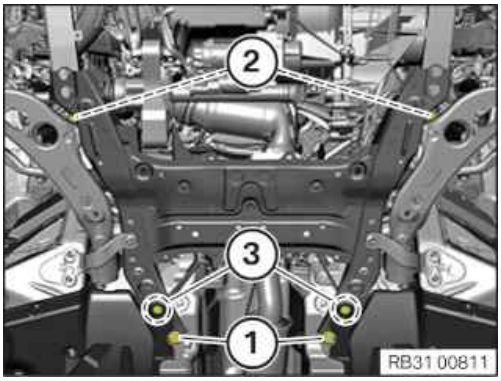


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

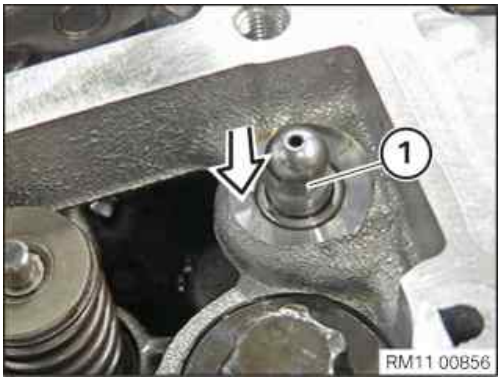
64 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

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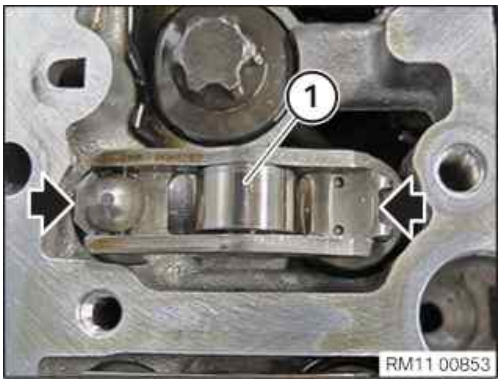
65 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

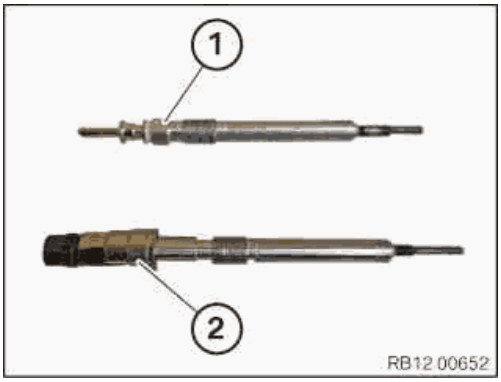


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

66 – Install glow elements

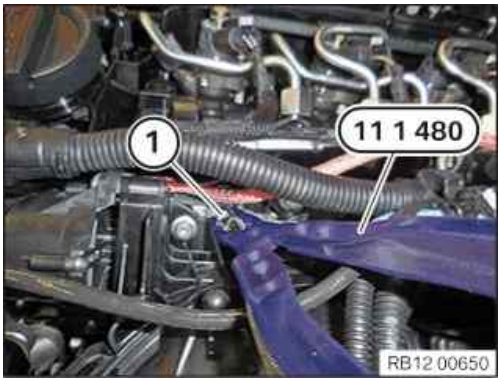


- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

67 – Installing the camshaft support

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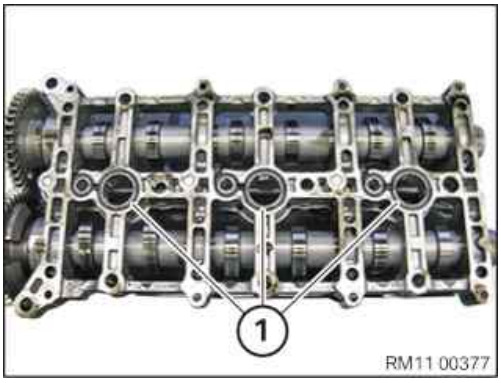
RISK OF DAMAGE

Damage of the engine and mounted parts.

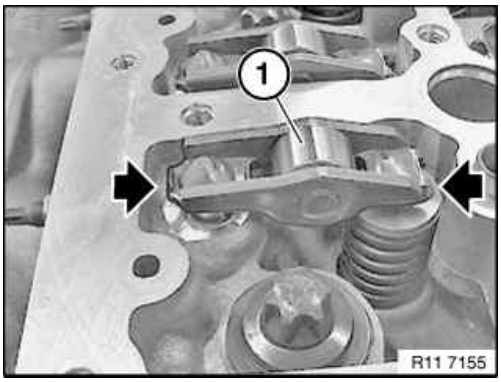
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

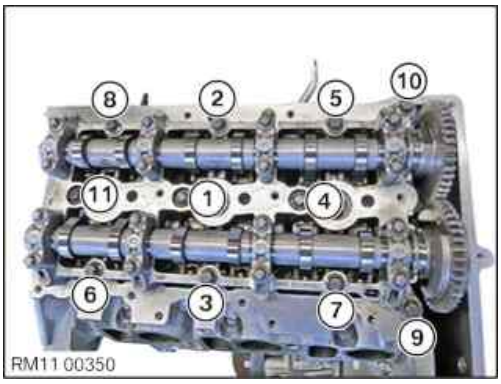


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

68 – Adjusting the timing of the camshafts

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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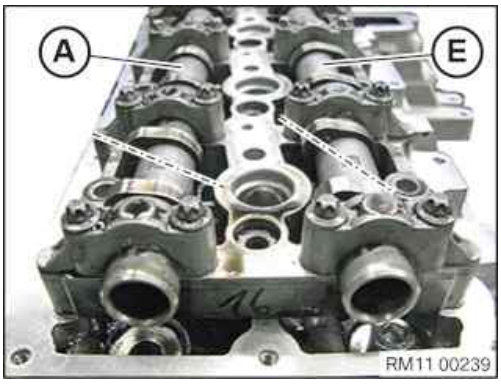
- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

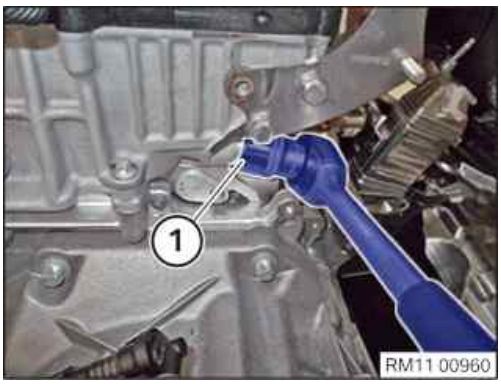
▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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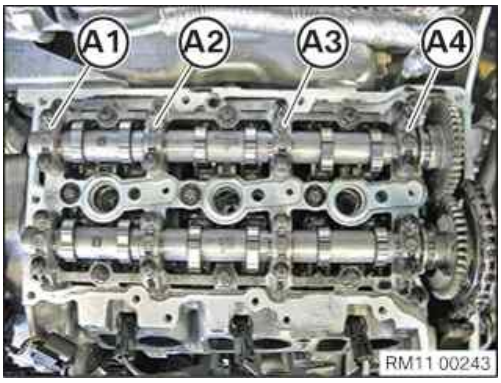
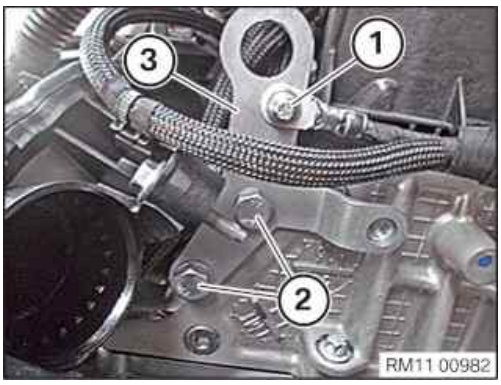


TECHNICAL INFORMATION

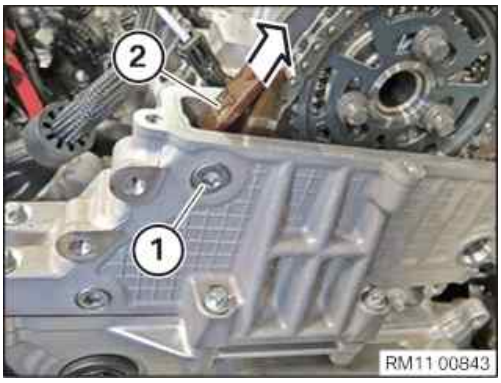
The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▸ **Remove the timing chain guide rail**

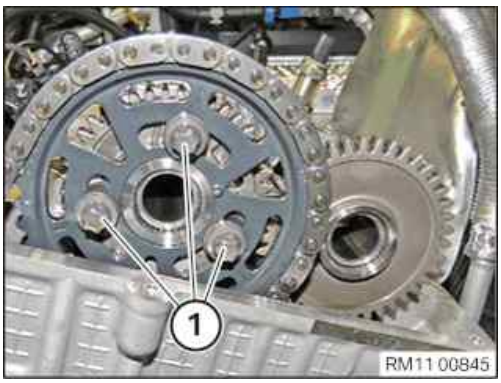


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▸ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▸ **Installing exhaust camshaft**

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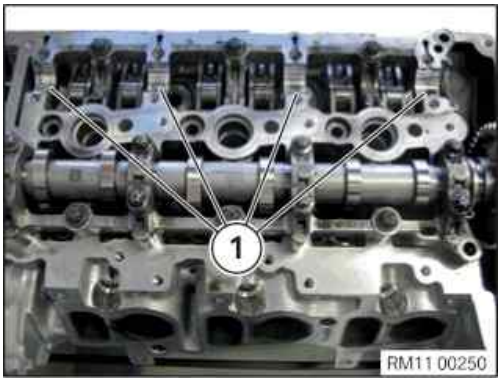
RISK OF DAMAGE

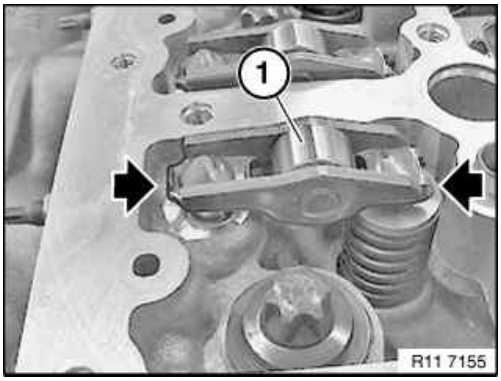
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

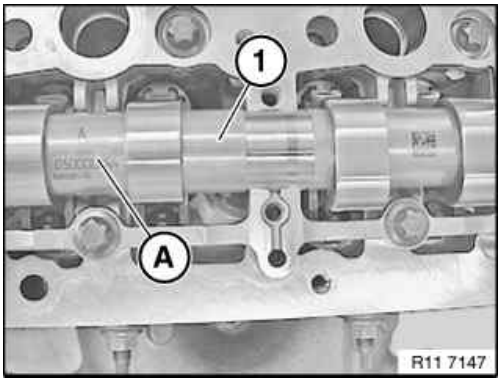
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



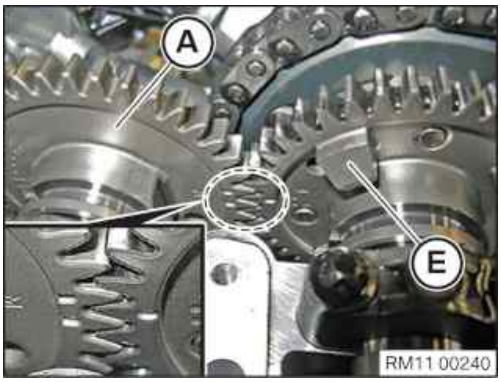
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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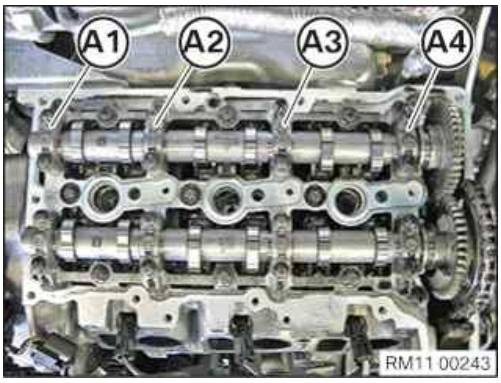


- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

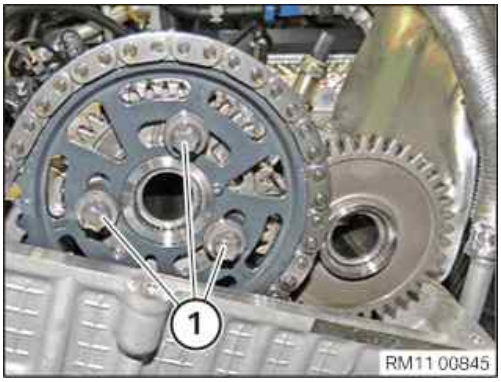
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

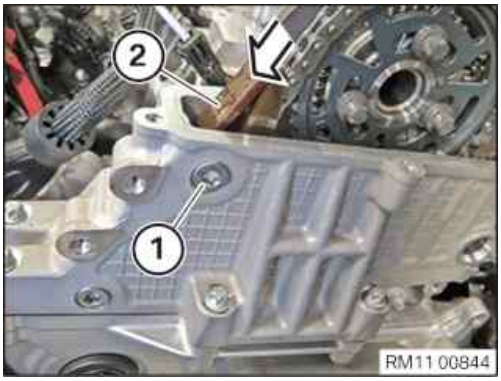
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



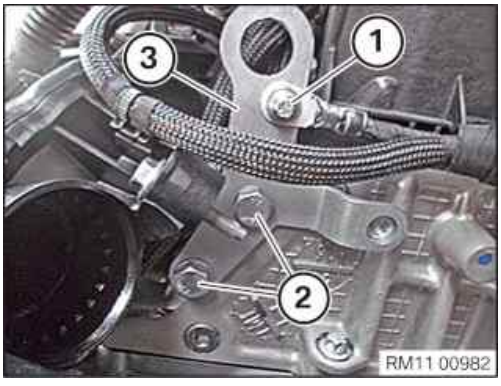
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▸ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

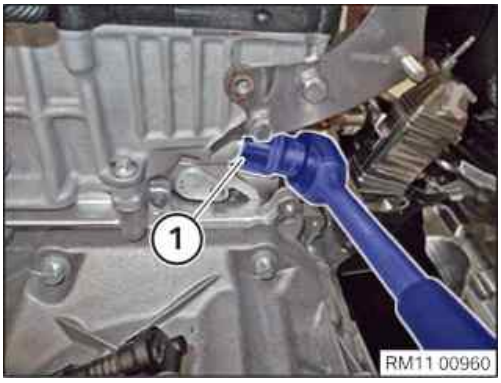
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

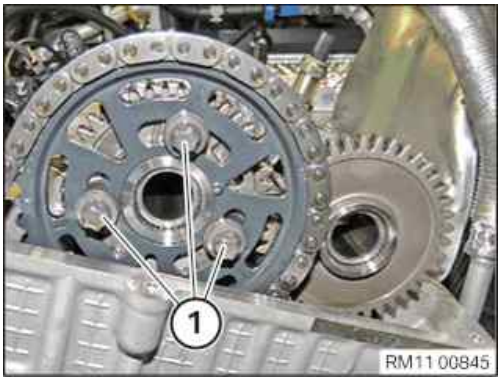


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▸ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

69 – Remove special tool to disconnect the crank shaft

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- Remove special tool **2 288 380**.

70 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

71 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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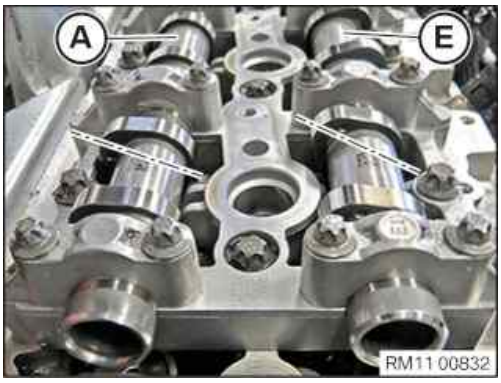
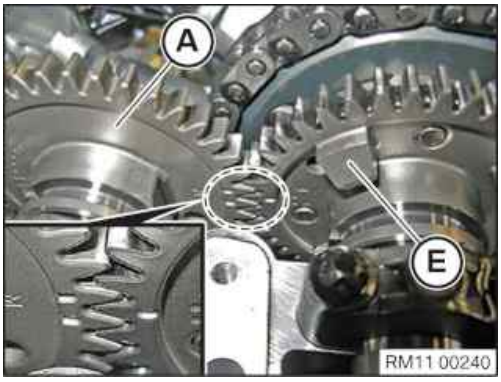


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

72 – Installing cylinder head cover

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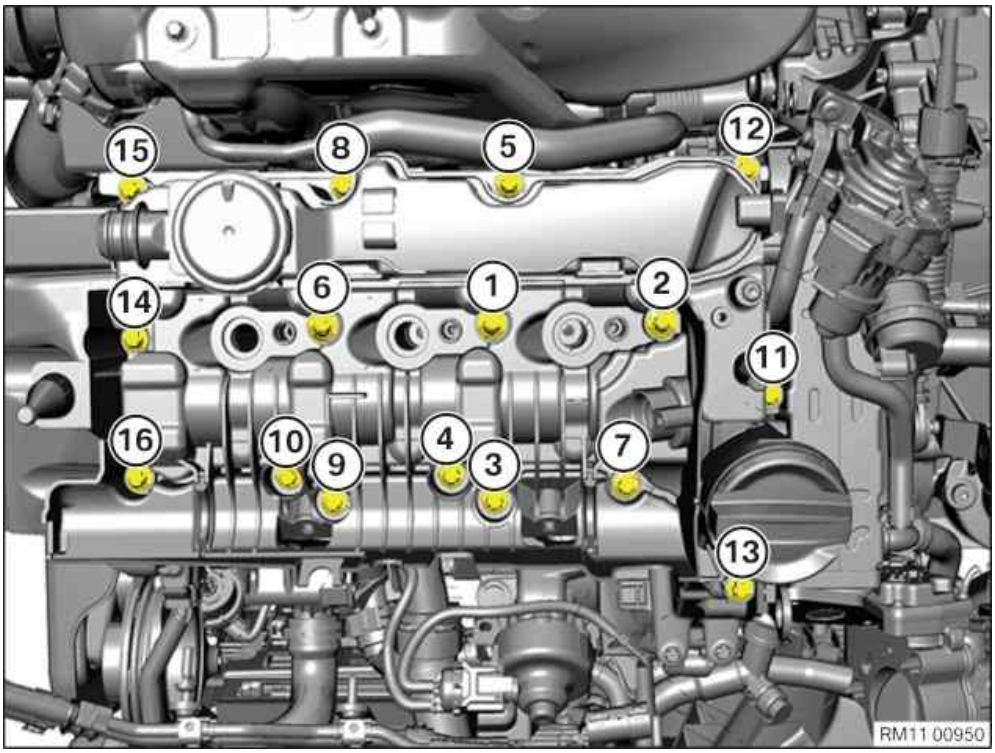
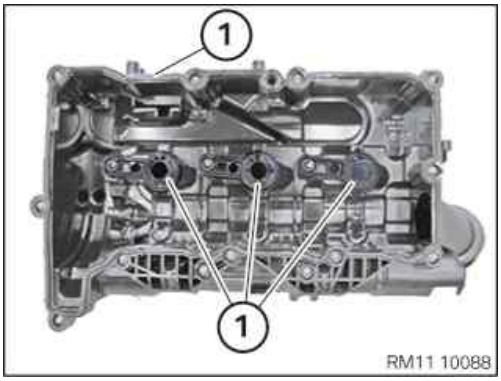
Overview: Screw connection of the cylinder head cover

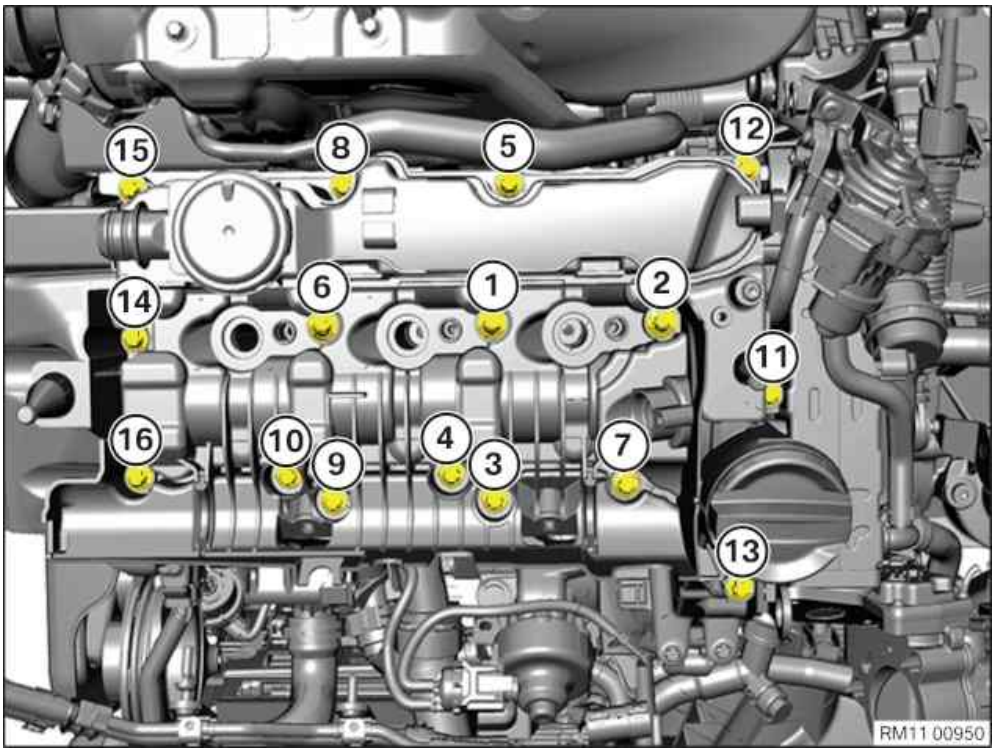


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nm

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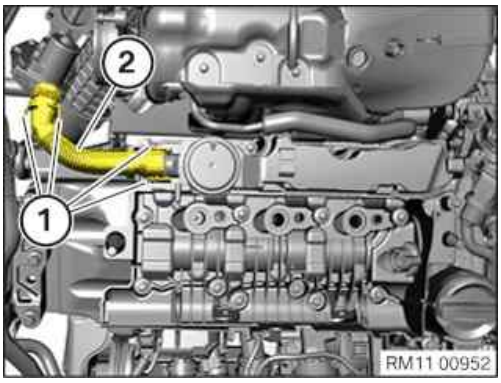


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

73 – Installing injectors of injection system

▶ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

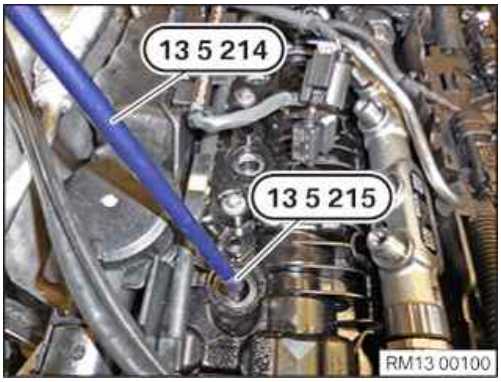
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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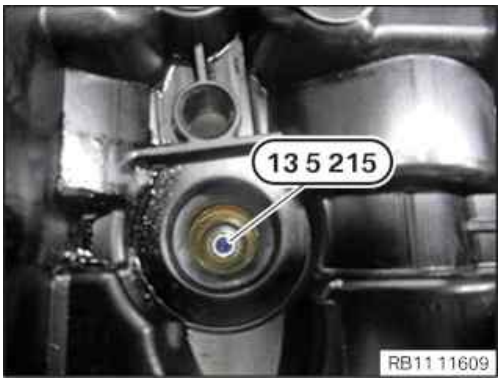
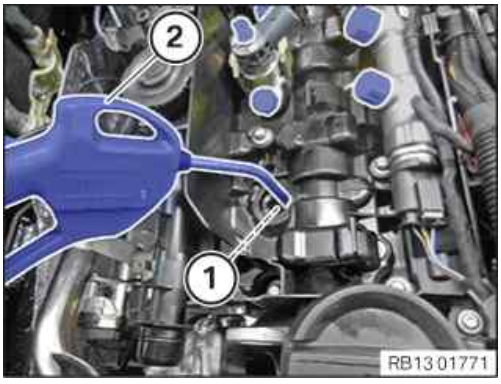


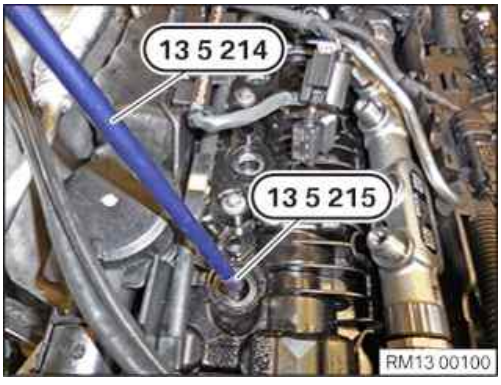
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

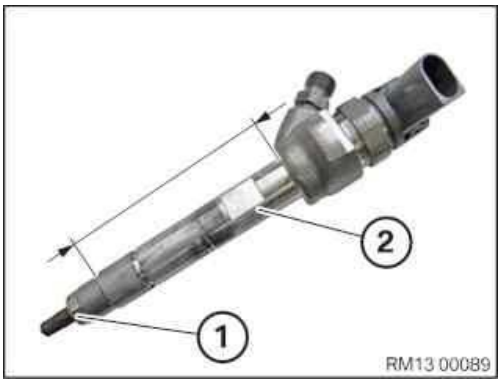
▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

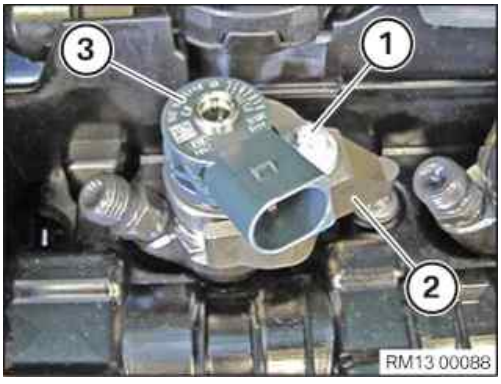


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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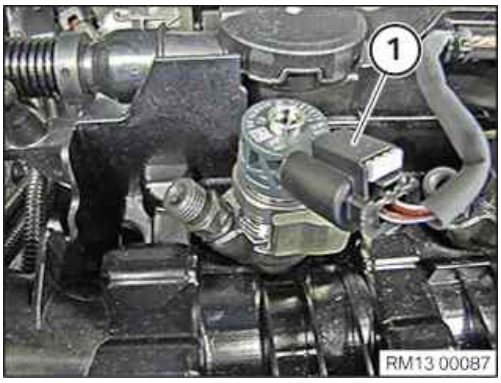


- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

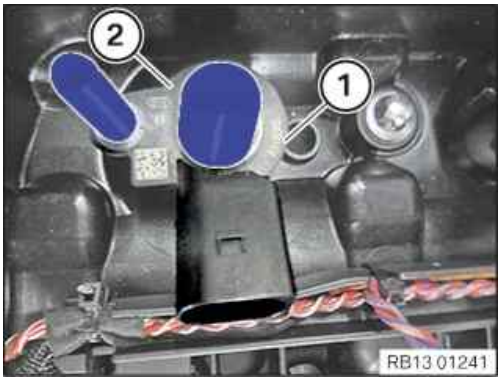
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

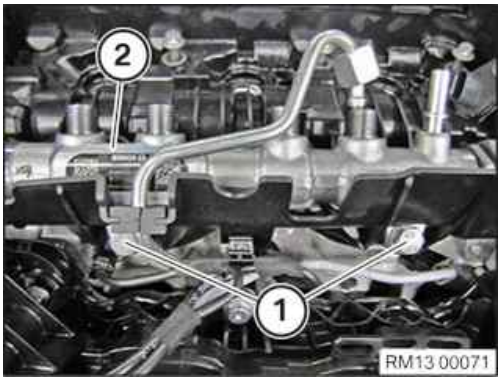
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

74 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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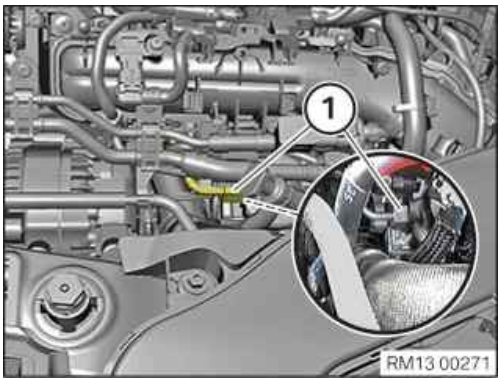


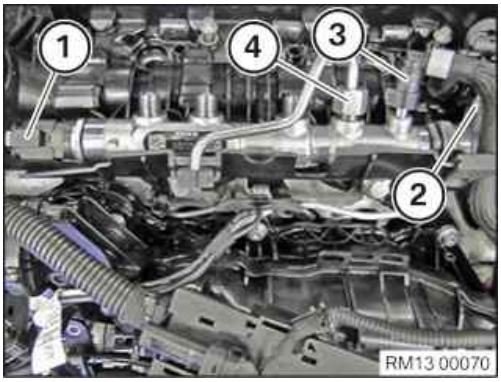
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

75 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

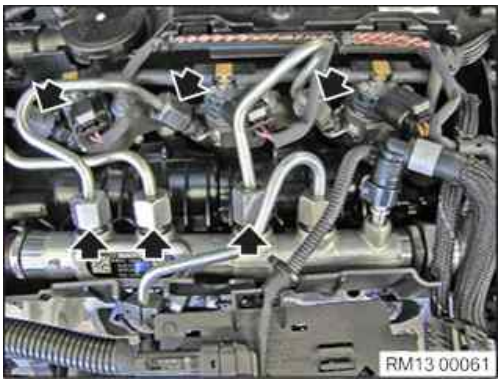
76 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

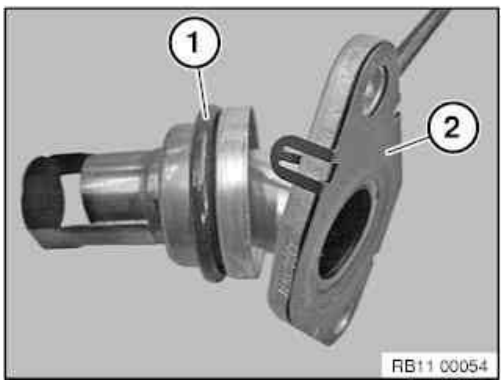
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

77 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

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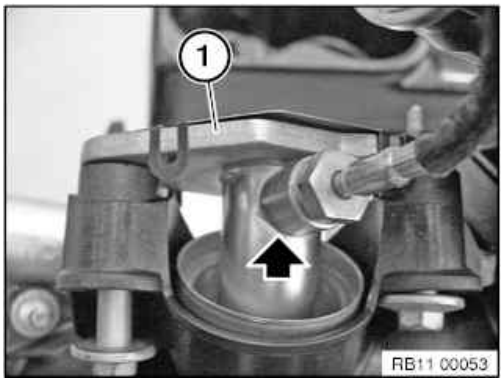
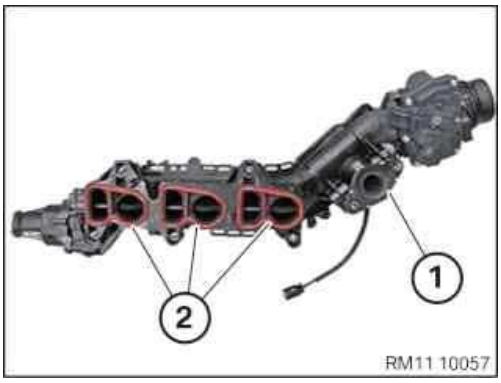
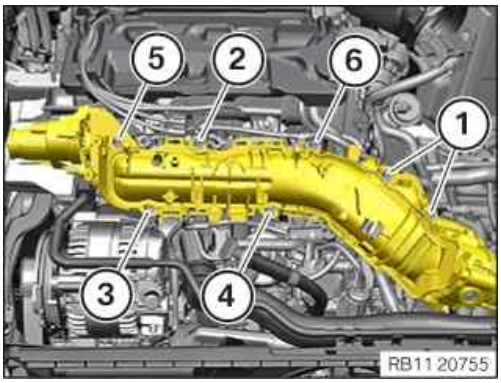


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

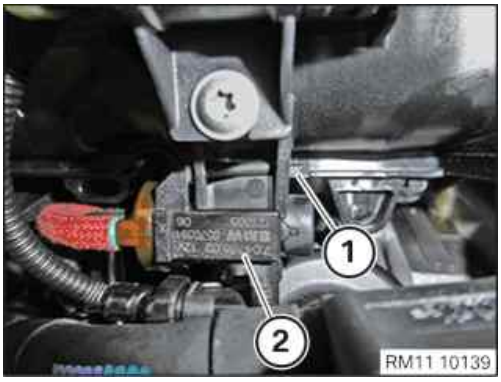
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



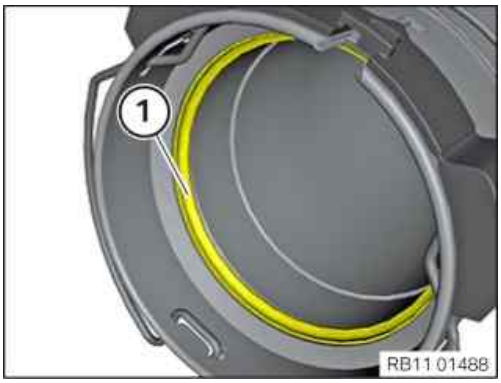
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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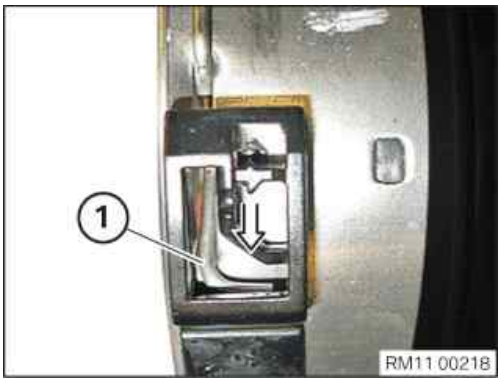
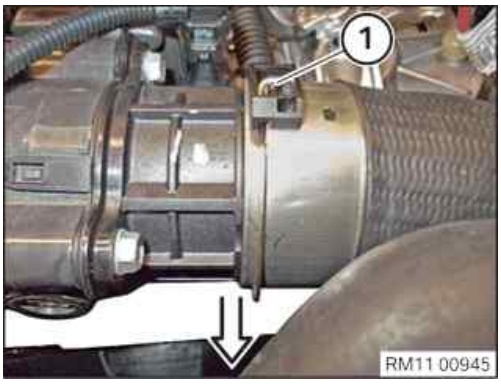


- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

78 – Remove the engine from the assembly stand

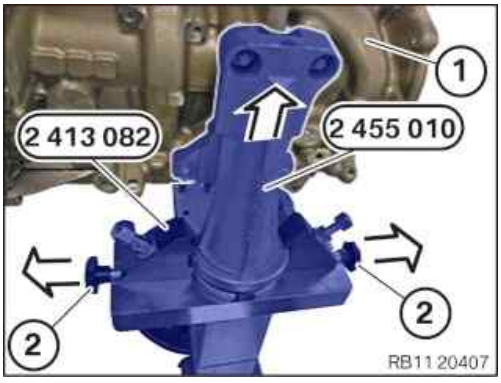
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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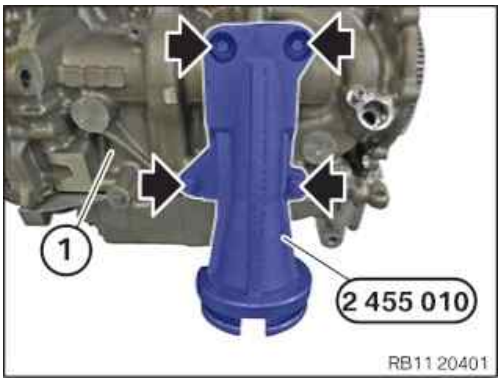
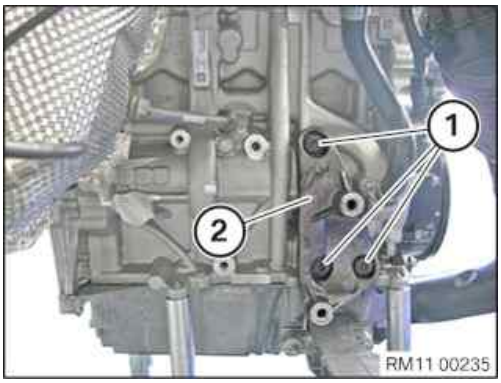


- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

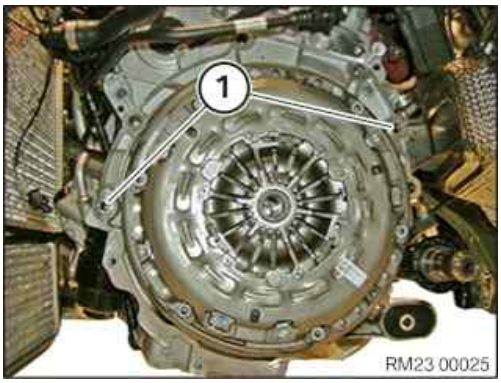
Holder to crankcase

M10		Tightening torque	38 Nm

79 – Mounting engine on manual gearbox

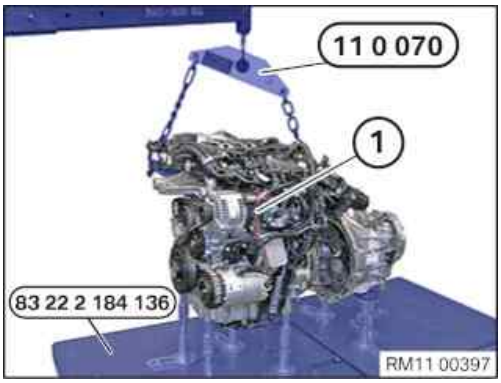
Prerequisite

Engine has been removed.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.



- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.

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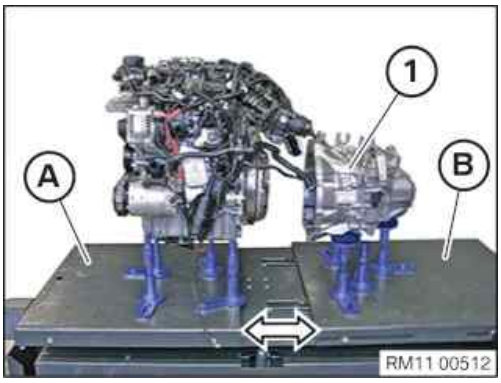
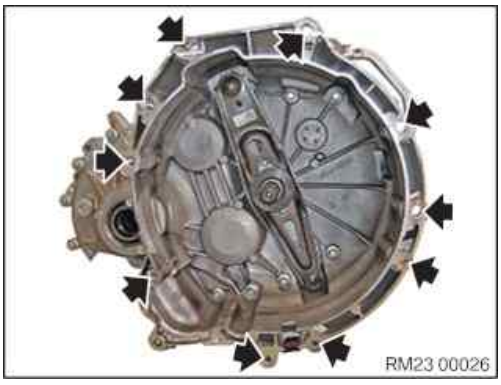


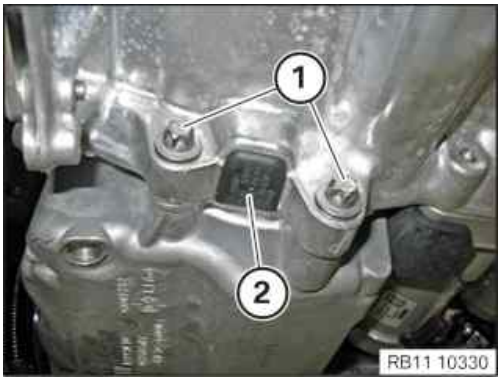
- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Tighten the screws (1).

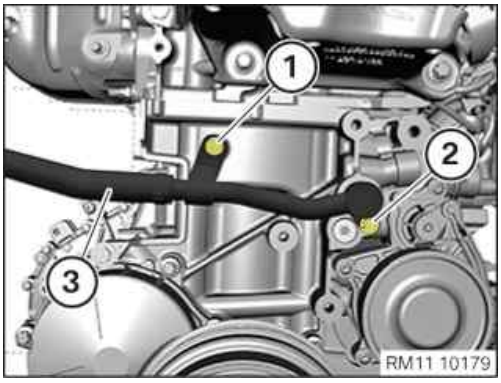
Transmission to oil sump

M8		Tightening torque	19 Nm

- Install the protective cap (2).

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

80 – Attaching assemblies (on lifting table)



- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm

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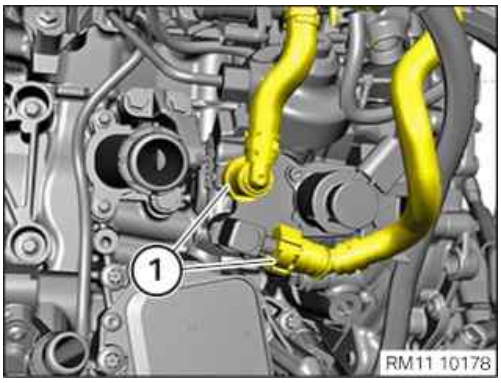


- Connect and lock fuel lines (1).

  The locks must engage audibly.

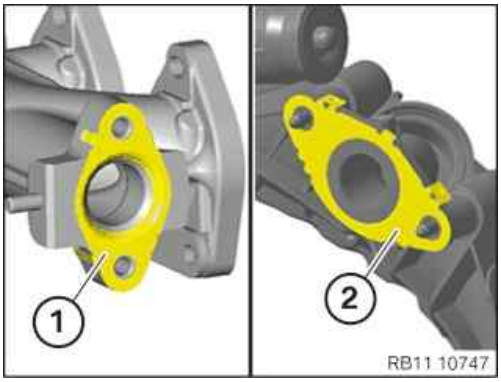
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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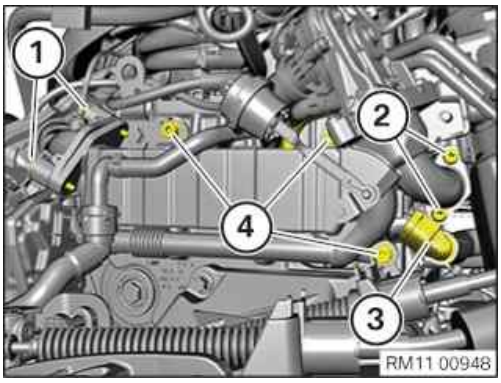


- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

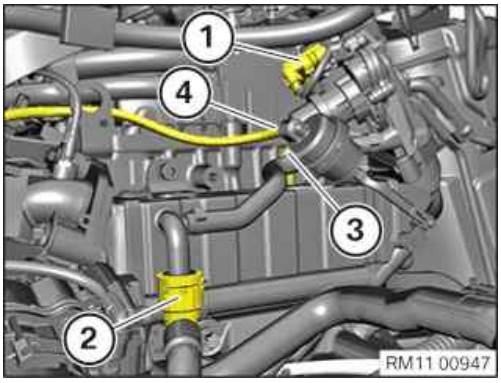
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

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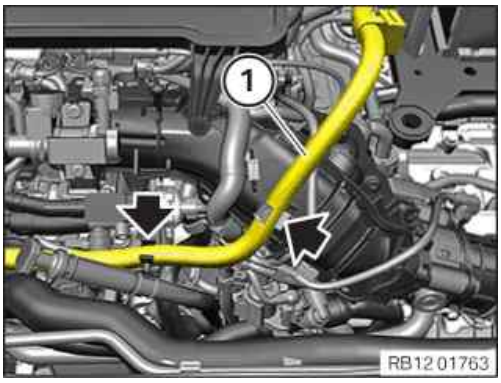


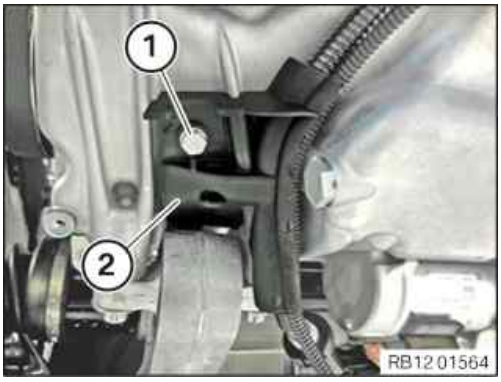
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

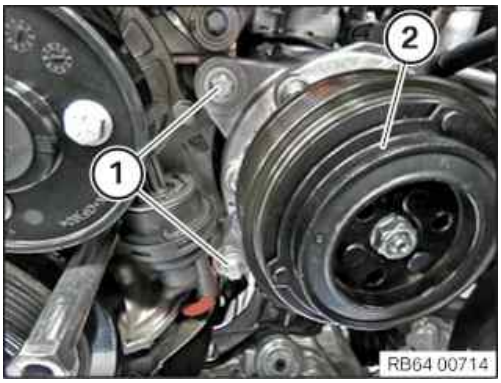
- Insert the positive battery cable (1) into the clamps (arrows).
- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

- Tighten the screws (1).

- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

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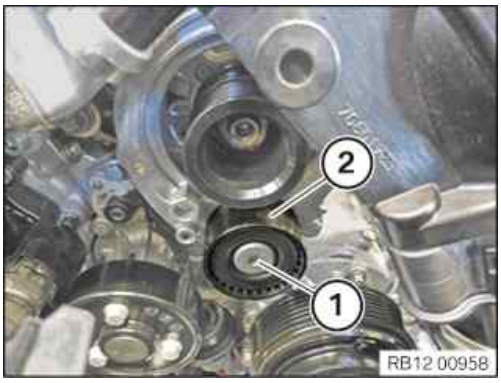
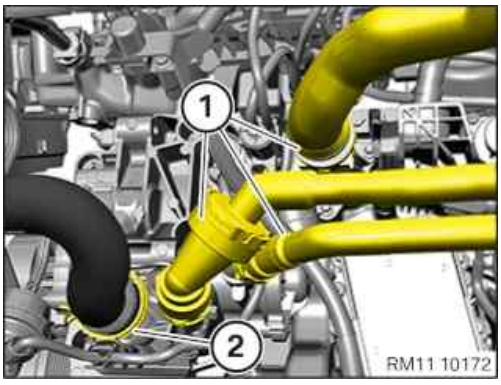


- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

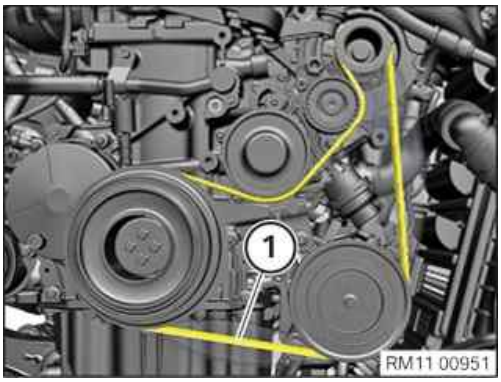
▶ **Installing the drive belt for alternator**

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▶ **Install the acoustic cover for the engine at the front**

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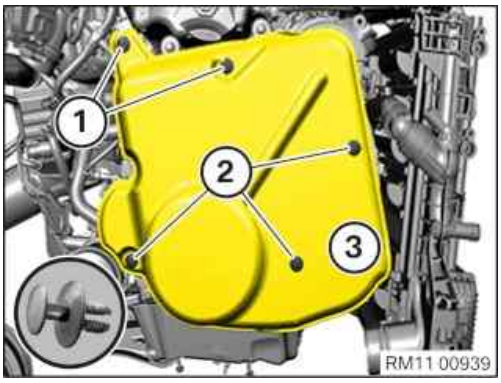
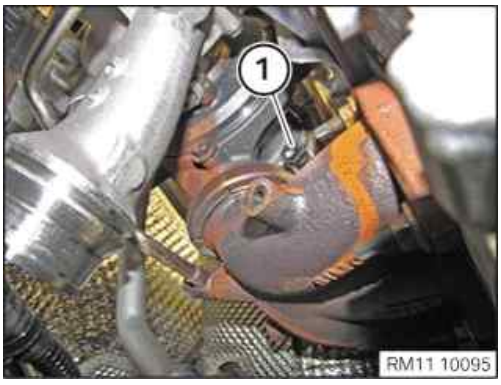


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

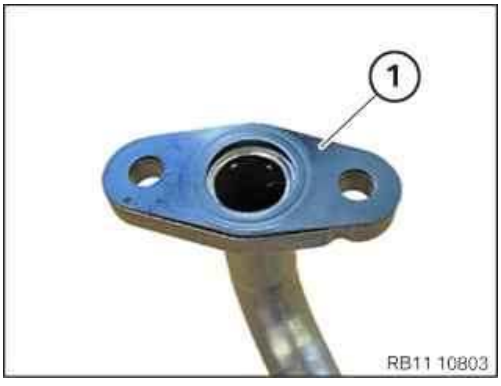
▶ **Installing the oil return line for the exhaust turbocharger**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

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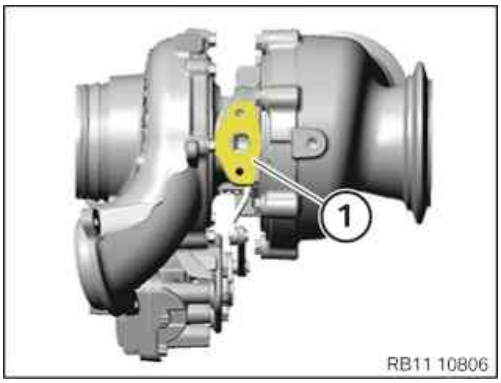
- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

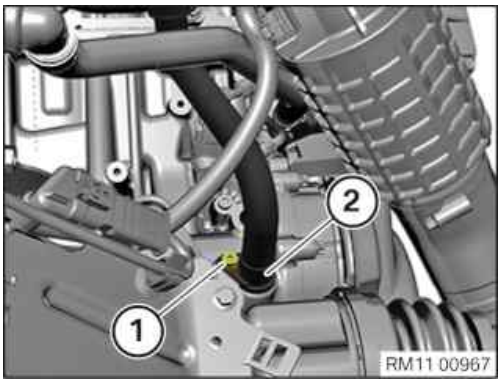
- Do not use any metal-cutting tools.

- Clean sealing surface.

- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm



- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

▸ **Install the oil feed line for the exhaust turbocharger**

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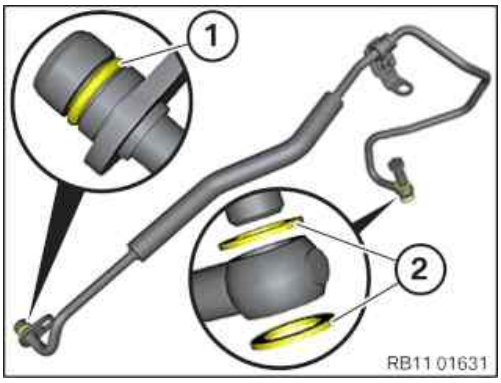
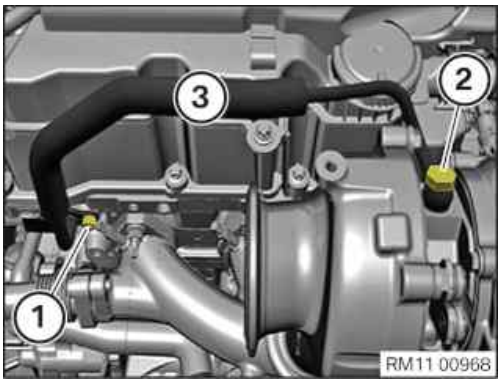


- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

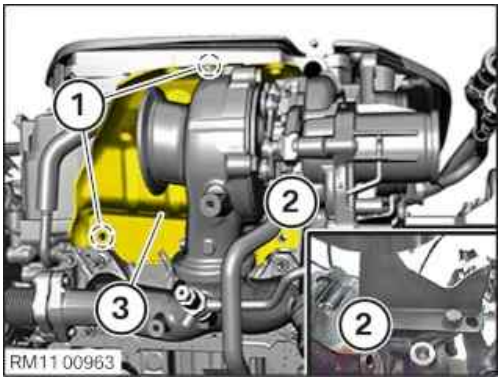
▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

▸ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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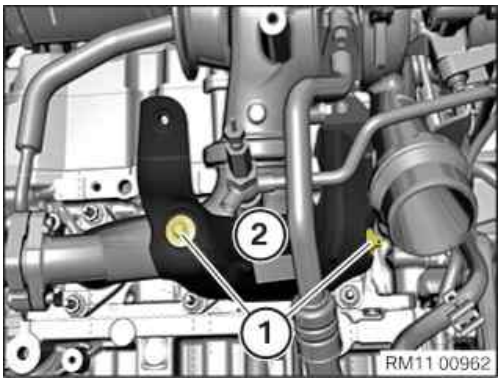


- Feed in and install the heat shield (2).
- Tighten the screws (1).

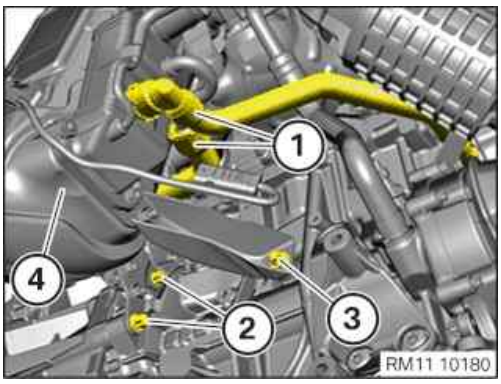
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

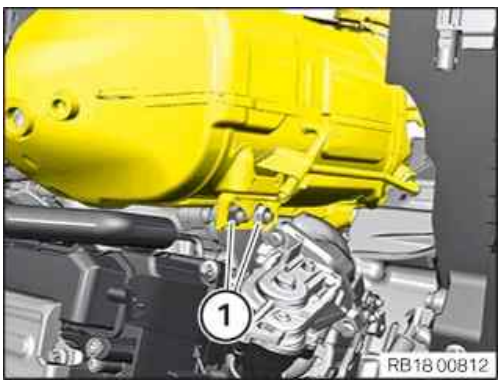
M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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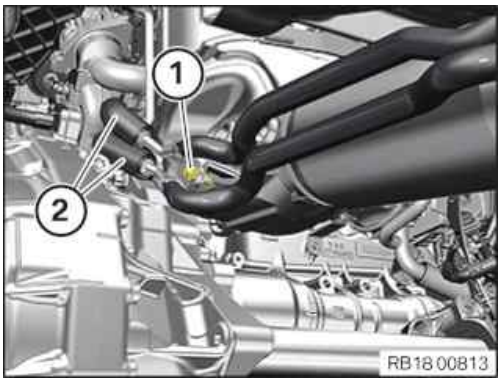


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

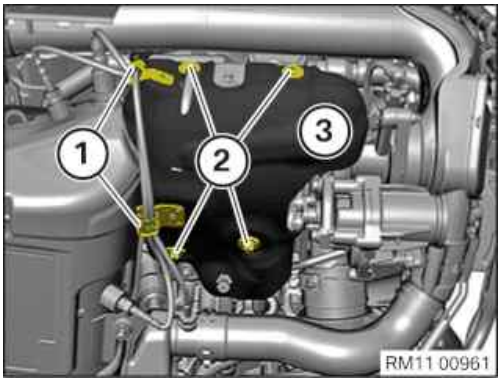
▶ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



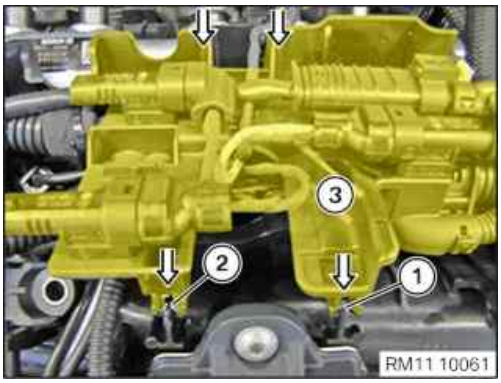
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

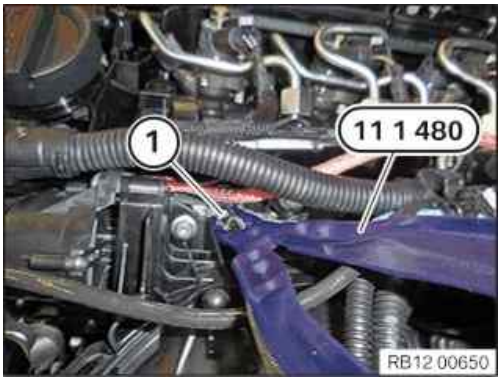
Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▶ **Installing the cable clip for the intake plenum**



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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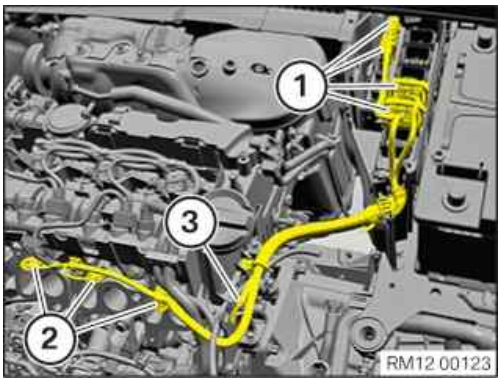
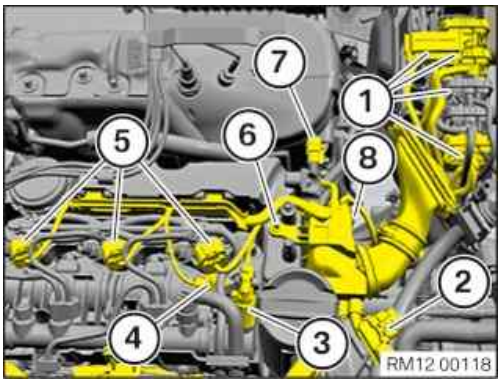


- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

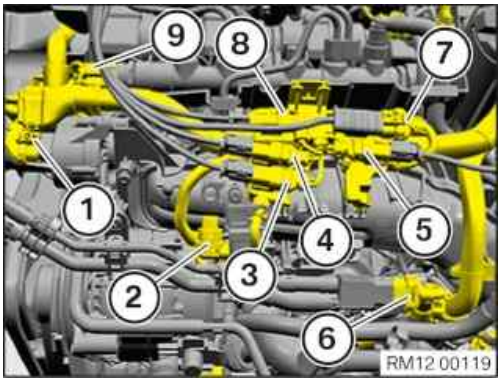


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

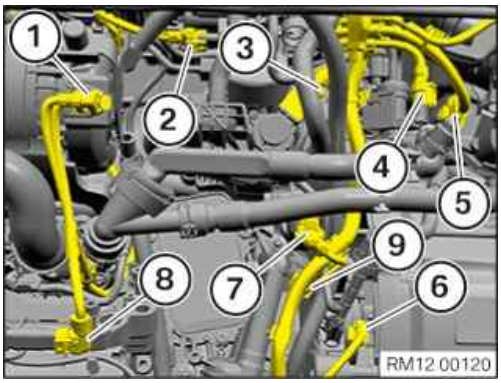
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.

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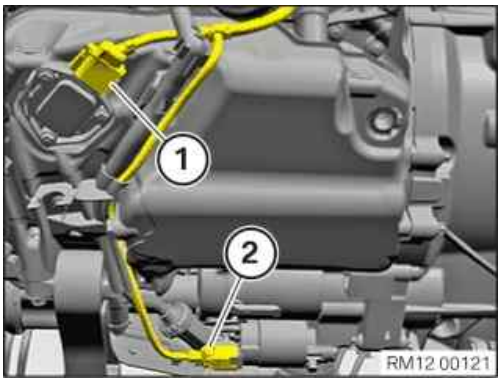
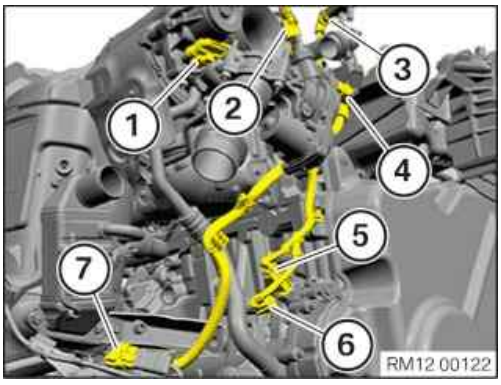
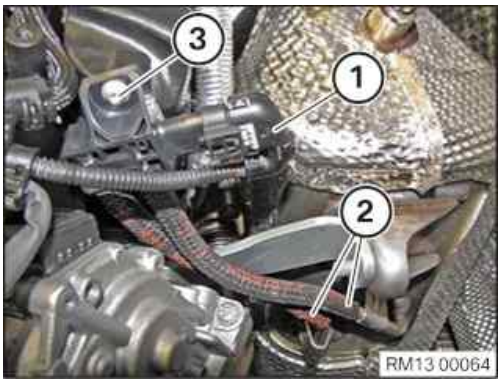


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

81 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

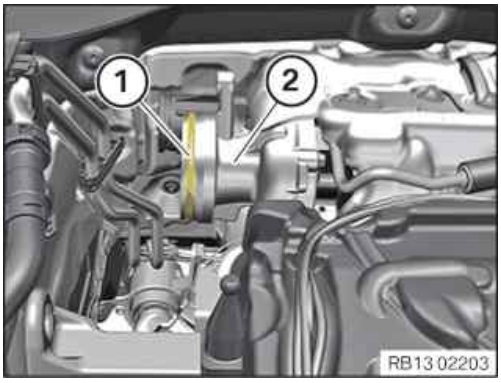
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

82 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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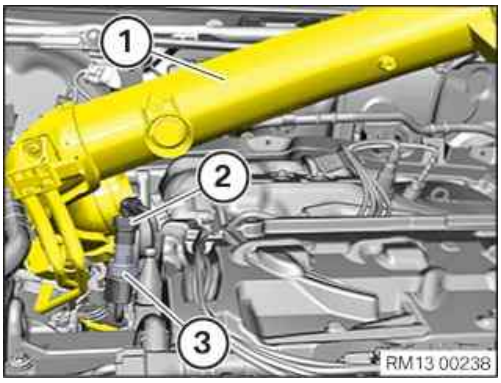


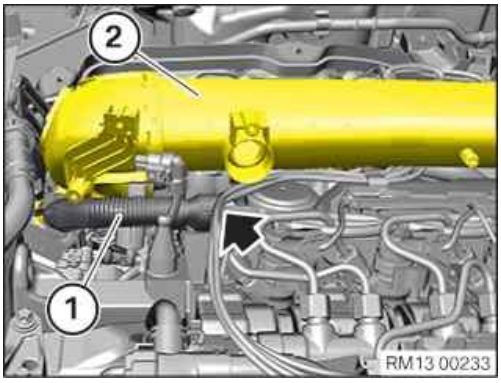
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

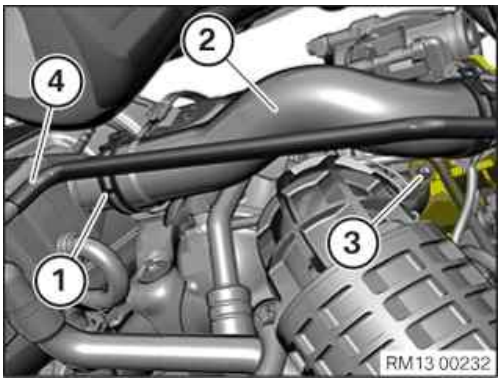
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

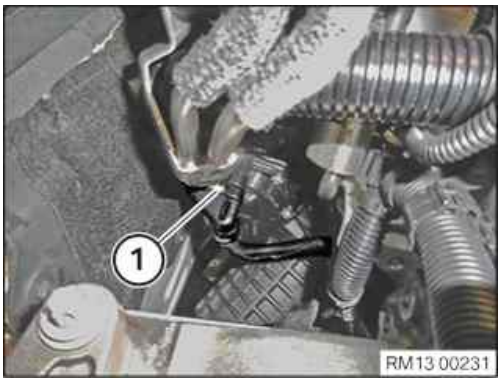
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.

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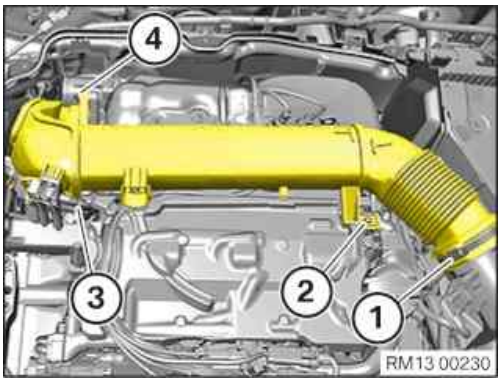


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

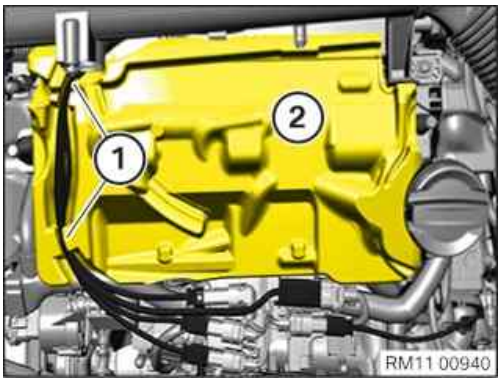
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

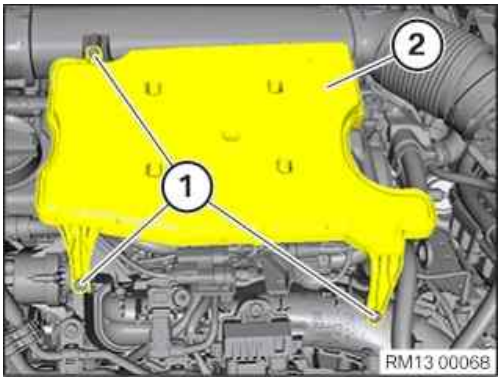
Clamp		Tightening torque	3 Nm

83 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

84 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

85 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

86 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 8

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 9

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 9

M14x35		Tightening torque	160 Nm

Rear end of front axle support to body

Used in step 24

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body

Used in step 24

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 24

Screw		Tightening torque	3 Nm

Special tool to cylinder head

Used in step 24

M8		Tightening torque	21,5 Nm

Standard screw connection M6

Used in step 33 39 46 50 68 80

M6			8 Nm

Main bearing cap to crankcase

Used in step 43

M10x85	Replace screws.	1. tightening torque	25 Nm
		2. tightening torque	50 Nm
		3. Angle of rotation	60 °
		4. Angle of rotation	60 °

Gear to counterbalance shaft

Used in step 46 50

	Renew screw.	Tightening torque	20 Nm
		Angle of rotation	60 °

Connecting rod bearing cap to connecting rod

Used in step 49

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

Bearing journal of tensioning and guide rail

Used in step 51

M8	*Replace bearing journal.*	Tightening torque	20 Nm

Chain tensioner to crankcase

Used in step 51

M6x22		Tightening torque	10 Nm

Camshaft sprocket on high pressure pump

Used in step 51

M12		Tightening torque	65 Nm

Oil deflector to crankshaft bearing cap

Used in step 52

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

Oil deflector to crankcase

Used in step 52

M8x14		Tightening torque	19 Nm

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Oil vacuum pump to crankcaseB37 — Used in step 53

M8x35	*Renew screws.*	Tightening torque	15 Nm
		Angle of rotation	45 °

Rear timing case cover to crankcase — Used in step 54

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover — Used in step 54

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase — Used in step 54 63

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 54 63

M8x40		Tightening torque	19 Nm

Oil sump to crankcase — Used in step 54 57

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump — Used in step 54 79

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine — Used in step 54

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft — Used in step 55

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel — Used in step 56

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Timing case cover, front, to crankcase — Used in step 57

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

Vibration damper with belt pulley to crankshaft — Used in step 58

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °

Transmission to oil sump — Used in step 58

M8			19 Nm

Engine support to cylinder head — Used in step 63

M10X45		Tightening torque	41 Nm

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Right engine mount to cylinder head

Used in step 63

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Glow elements to cylinder head

Used in step 63 66

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 67

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 68

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 68

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 68

M8		Tightening torque	19 Nm

Chain tensioner piston to cylinder head

Used in step 68

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 68

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 72

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 73

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 73

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 74

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 74

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 76

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 77

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 78 80

M10		Tightening torque	38 Nm

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Transmission to engine

Used in step 79 80

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 80

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 80

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 80

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 80

M8x20		Tightening torque	19 Nm

Bracket to oil sump

Used in step 80

M6		Tightening torque	8 Nm

Air conditioning compressor in component carrier

Used in step 80

M10		Tightening torque	38 Nm

Alternator to component carrier

Used in step 80

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner

Used in step 80

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold

Used in step 80

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase

Used in step 80

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger

Used in step 80

M6x12		Tightening torque	8 Nm

Oil return line to crankcase

Used in step 80

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head

Used in step 80

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger

Used in step 80

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger

Used in step 80

Torx screw BM 6x12		Tightening torque	10 Nm

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Exhaust turbocharger bracket to cylinder head — Used in step 80

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder — Used in step 80

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 80

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter — Used in step 80

Torx bolt BM6x16		Tightening torque	8 Nm

Ground cable to cylinder head — Used in step 80

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 80

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 81

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 81 82

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor — Used in step 82

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 82

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 82

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 82

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 84

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

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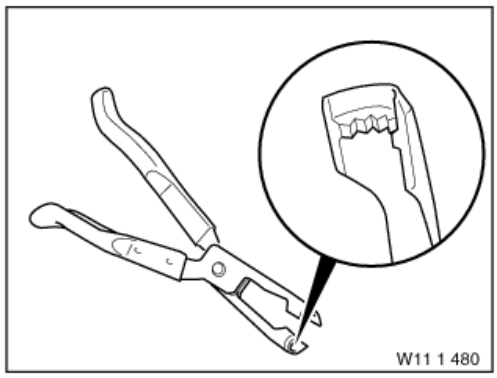
0 490 796 (11 1 480) Pliers



Common Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder

Common Used in step 8 24 63 79

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 490 579 (11 0 070) Lifting gear

Used in step 8 9 78 79

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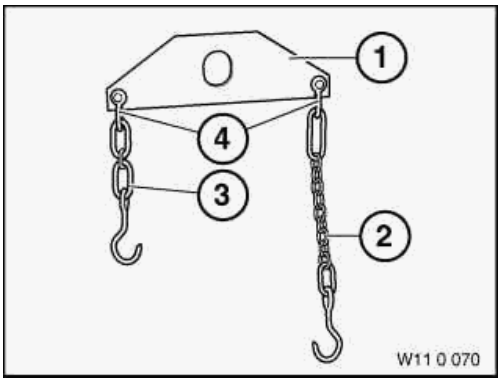

Common

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

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2 455 010 Engine support

Common Used in step 9 78

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 9

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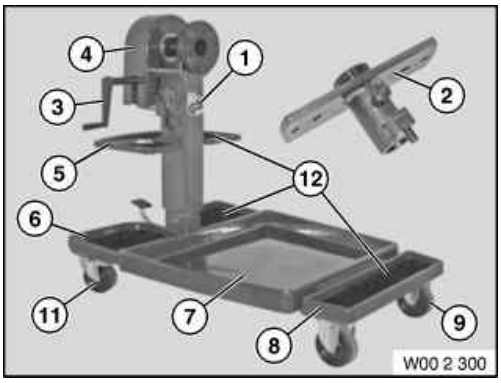

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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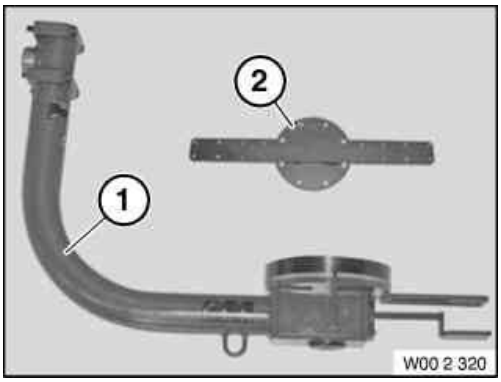
0 495 196 (00 2 320) Support arm



Common Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common Used in step 11 14 74 76

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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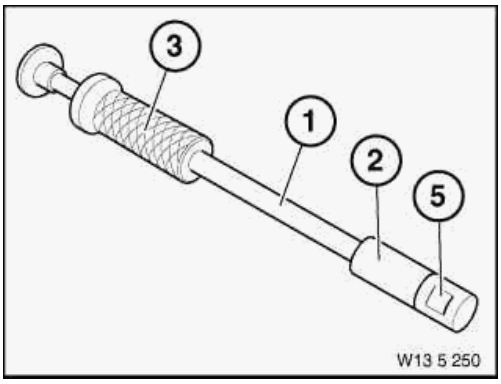
2 413 106 Fastener

Common Used in step 11 76

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush

Common Used in step 13

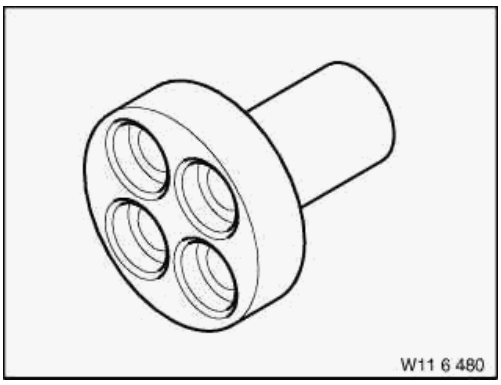
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 13

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 16 68 71

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 288 380 Locating stud

Common Used in step 16 68 69 71

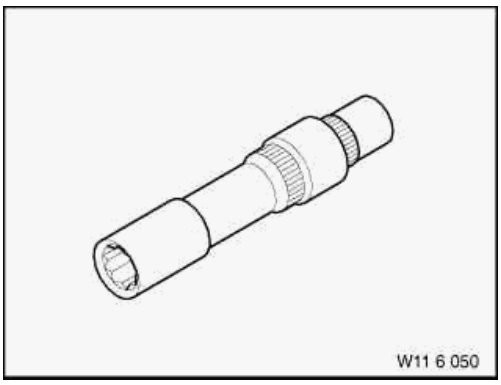
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common Used in step 16 68 70 71

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 21 24 63 66

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

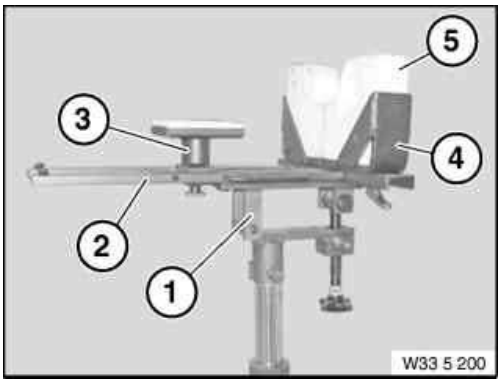
Common Used in step 22 23 68

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

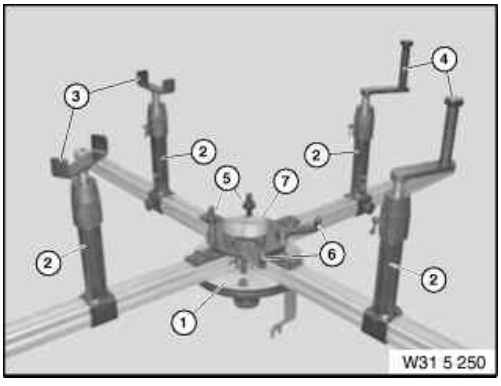
0 496 080 (33 5 206) Belt



Common Used in step 24 63

Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 817 (31 5 251) Basic body



Common Used in step 24 63

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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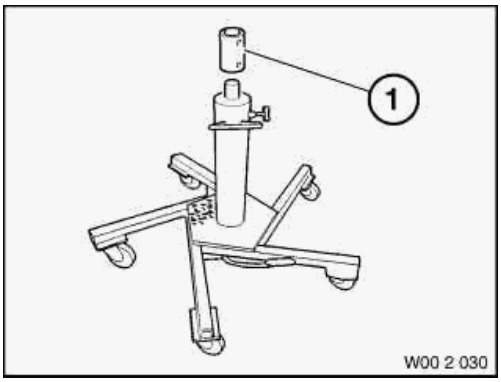
0 490 133 (00 2 030) Device



Common Used in step 24 63

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

2 414 691 Support

Common Used in step 24 63

Usage	To support the engine when the engine support is removed.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	2357071
SI-Number	01 12 16 (406)

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2 357 071 Panel

Common

Used in step 24 63

Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

0 490 561 (11 0 000) Lifting gear

Used in step 24 63

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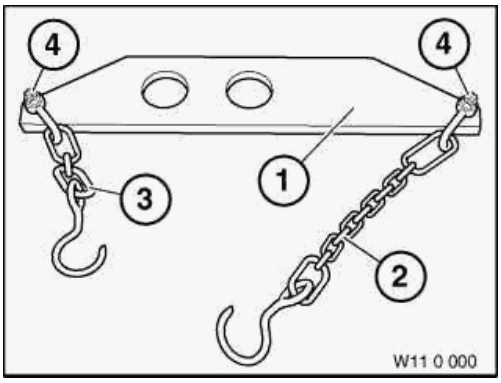

Common

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 24

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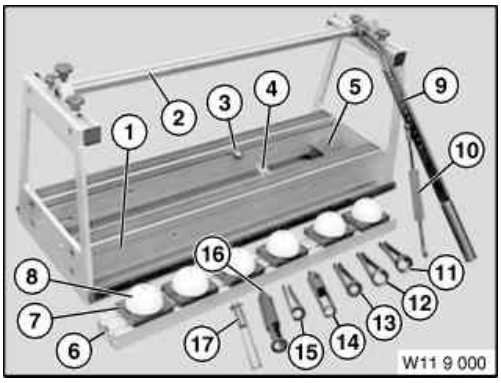

Common

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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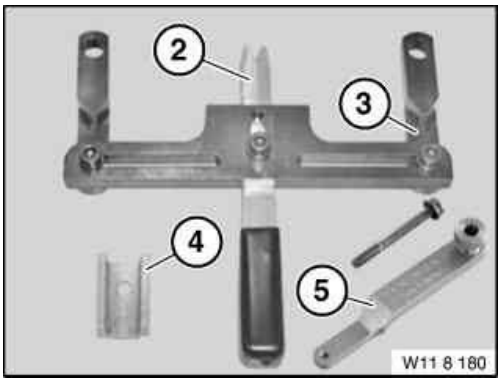
0 493 587 (11 8 180) Holder



Common

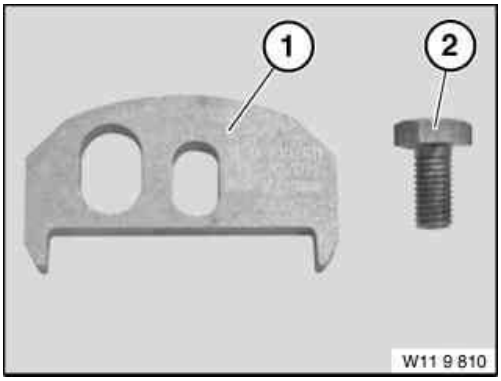
Used in step 25 58

Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

0 496 171 (11 9 811) Holder



Common

Used in step 27 28 55

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

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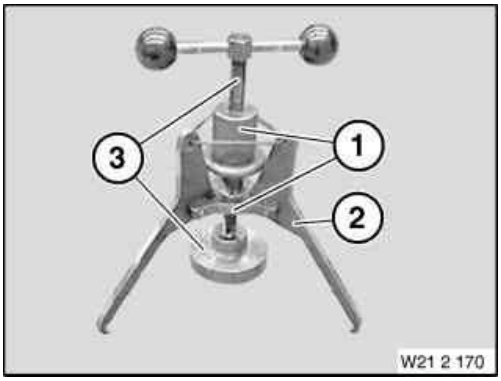
0 494 793 (11 9 265) Bush

Common Used in step 27 28 55

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

0 493 839 (21 2 170) Device



Common Used in step 27 56

Usage	(tensioning device) For resetting adjusting ring and installing self-adjusting clutch on flywheel without tension.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 00 (622)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 558 (21 2 171)		**Basic body** (Basic body) Basic body with adjusting spindle Deletion, only available via tool set	
2	0 494 559 (21 2 172)		**Claw** (Clamping claw (1 piece)) Available as part of complete tool set 0493839 only.	
3	0 494 560 (21 2 173)		**Spindle** (Pressure spindle with washer) Available as part of complete tool set 0493839 only.	

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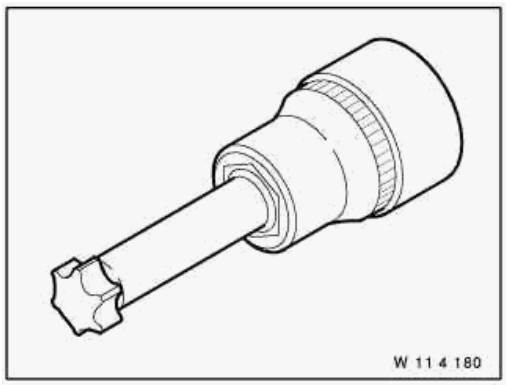
2 288 165 Synchronising key

Common Used in step 27 56

Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

0 491 018 (11 4 180) Socket WAF 46



Common Used in step 28 55

Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

2 357 904 Gauge

Common Used in step 32 51

Usage	For positioning the high pressure pump to the crankshaft . Replaced by gauge 2420824
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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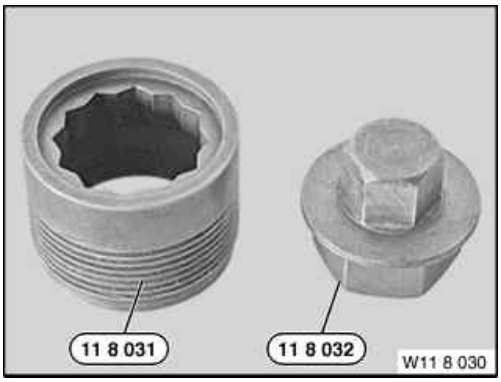
0 496 725 (11 8 030) Extractor



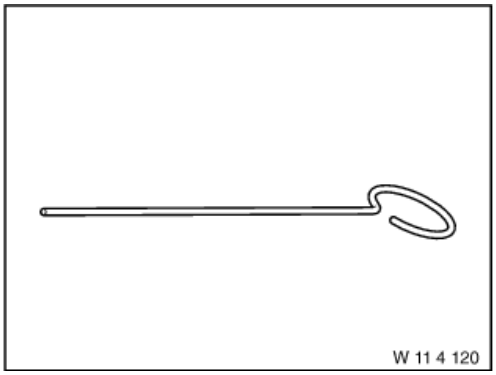
Common Used in step 32

Usage	for the disassembly of the high pressure pump (replaces SWZ 11 8 740 as of 08/2009) 11 8 740 will be replaced by 83 30 2 448 914.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 757 (11 8 031)	**2 448 914**	**Holding sleeve** Replaces SWZ11 8 741 from 08/2009, 09/2011 no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	
2	0 496 758 (11 8 032)	**2 448 914**	**Adapter** Replaces special tool 11 8 742 from 08/2009, 09/2011 remaining inventories will be sold off - no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	

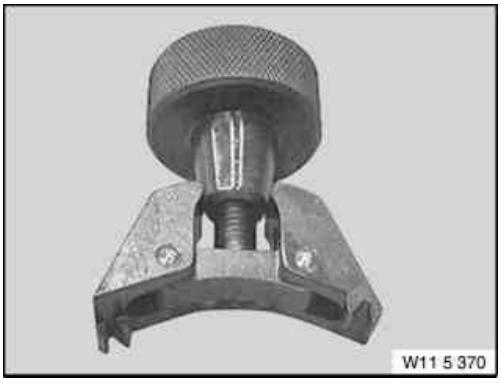
0 491 012 (11 4 120) Pin



Common Used in step 32 51

Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

0 495 131 (11 5 370) Tool



Common Used in step 33 39 46 50

Usage	(Locating tool) For VANOS exhaust camshaft gear setting.
Included in the tool or work	
Storage location	A71
Replaced by	
In connection with	
SI-Number	01 02 05 (173)

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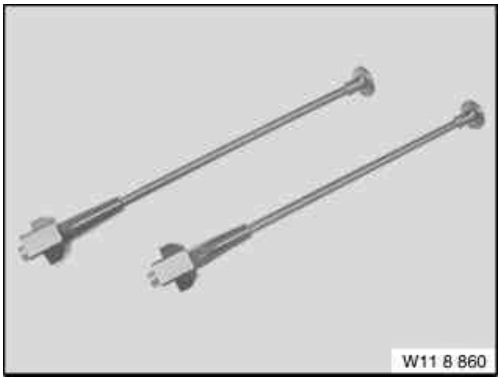
2 288 943 Striking tool

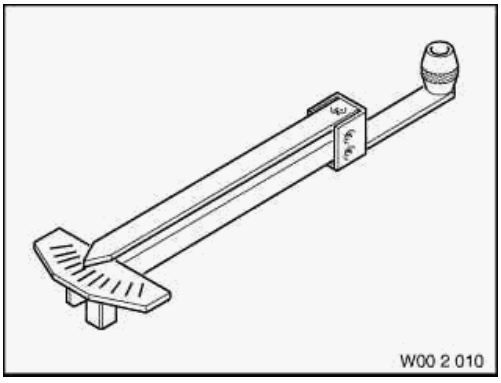
Common	Used in step 33 39
Usage	For dismantling the ring gear of the counterbalance shaft.. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 144 (11 8 860) Assembly tool



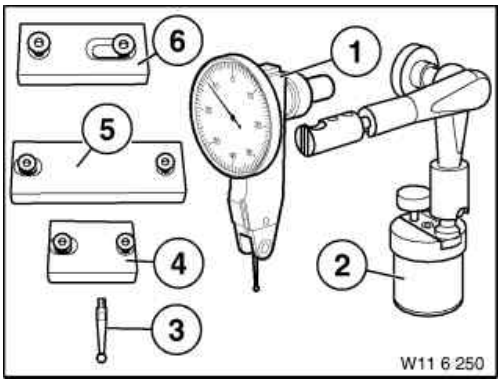
Common	Used in step 35 48
Usage	For installing piston with connecting rod in crankcase.
Included in the tool or work	
Storage location	A23
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 490 130 (00 2 010) Measurement aid



Common	Used in step 44
Usage	(Coefficient of friction meter) For adjusting the steering box (measurement possible in both directions) and for checking and adjusting the bevel pinion and crown wheel bearing in all final drives
Included in the tool or work	
Storage location	X9
Replaced by	
In connection with	
SI-Number	

0 493 144 (11 6 251) Dial gauge



Common	Used in step 45
Usage	(Dial gauge) With 0.8 mm measuring range in each direction
Included in the tool or work	0 493 143
Storage location	
Replaced by	
In connection with	
SI-Number	

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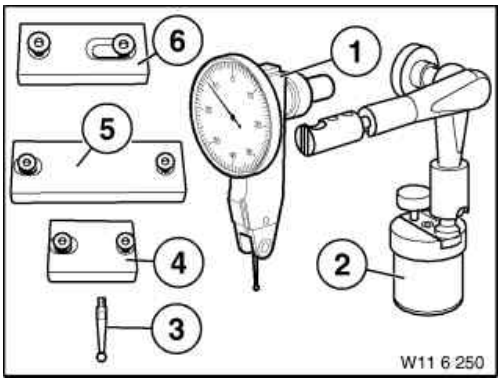
0 493 145 (11 6 252) Tripod



Common Used in step 45

Usage	(Small hydraulic tripod with magnetic base)
Included in the tool or work	0 493 143
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 582 (11 8 140) Bush

Common Used in step 48

Usage	(Assembly bushes) For installing the pistons
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 394 (11 8 141)		**Bush** Bush for piston installation 84.00 mm	
2	0 494 395 (11 8 142)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	
3	0 494 396 (11 8 143)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	

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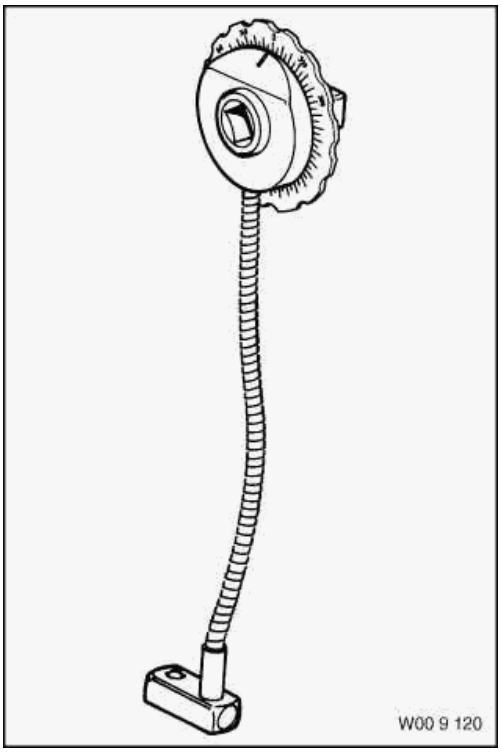
0 490 504 (00 9 120) Torque angle measuring dial



Common

Used in step 49 54 63

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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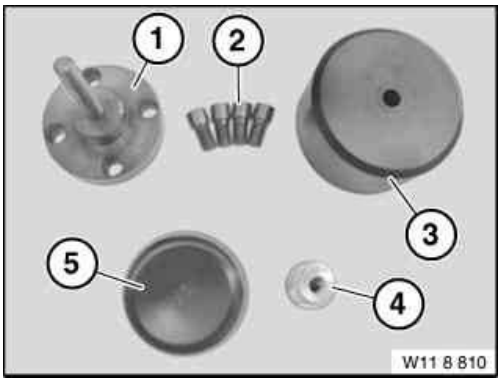
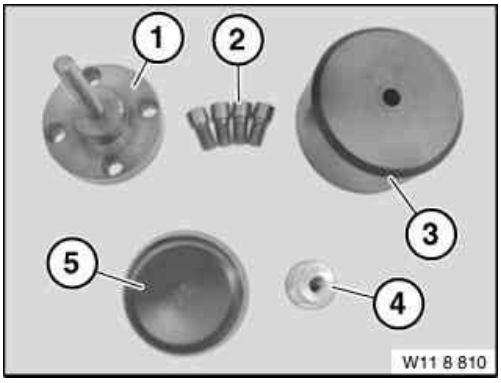
0 496 137 (11 8 815) Holding sleeve



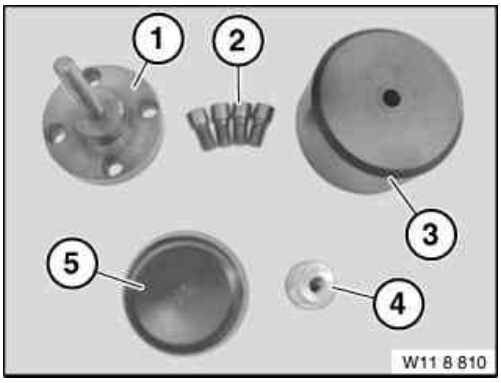
Common	Used in step 54
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body



Common	Used in step 54
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 54
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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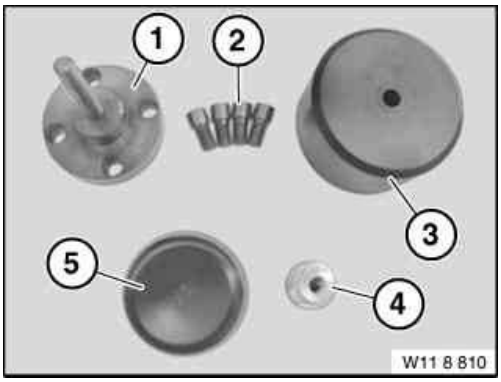
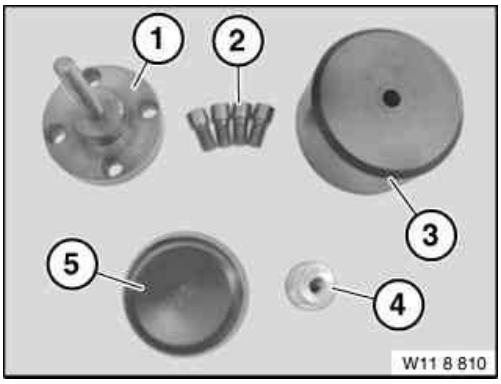
0 496 135 (11 8 813) Holding sleeve



Common	Used in step 54
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut



Common	Used in step 54
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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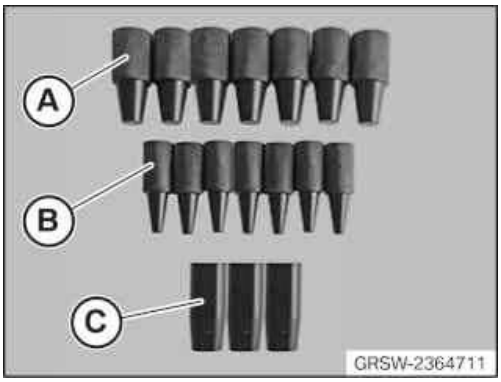
2 364 711 Plug

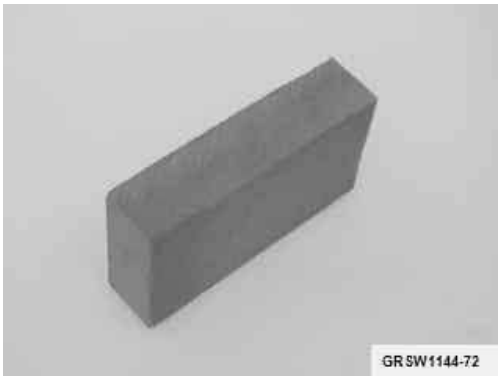


Common	Used in step 54 59
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common	Used in step 54 59
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 54 59
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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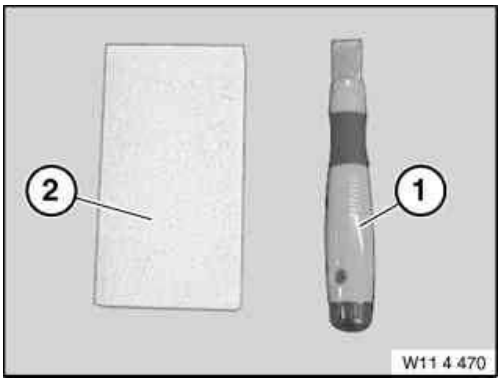
0 495 102 (11 4 470) Tool



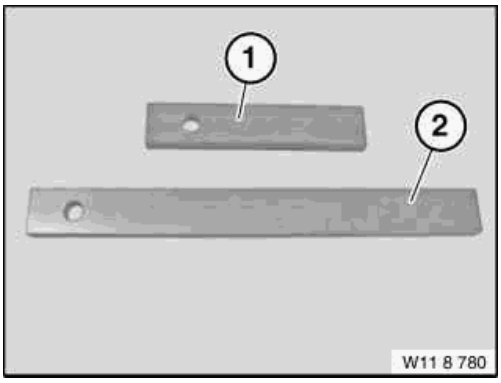
Common Used in step 54

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 496 120 (11 8 780) Plate



Common Used in step 54

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

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2 285 058 Tool set

Common	Used in step 55
Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

2 358 471 Clutch tool

Common	Used in step 56
Usage	For installation of coupling drive plate.. (Getrag transmission) . Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A55
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

2 357 900 Fitting aid

Common	Used in step 57
Usage	For installation of the front radial shaft seal incl. lid.
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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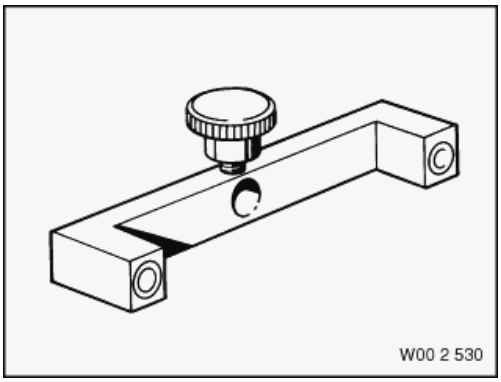
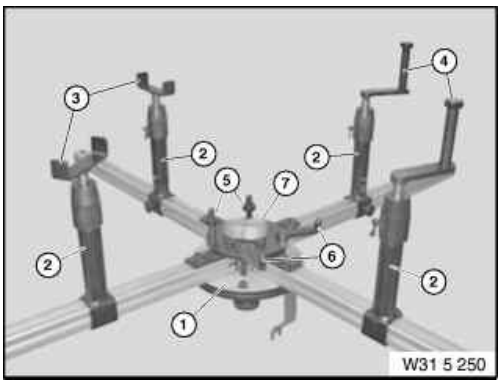
0 490 185 (00 2 530) Bridge



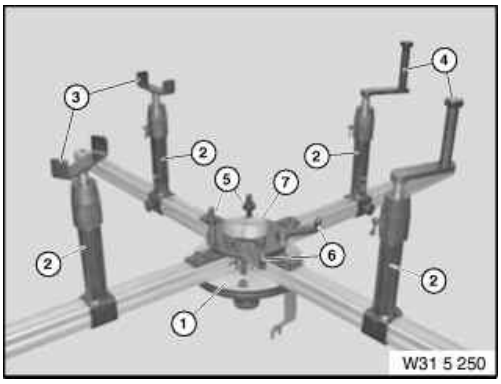
Common	Used in step 61
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

0 495 821 (31 5 255) Adapter



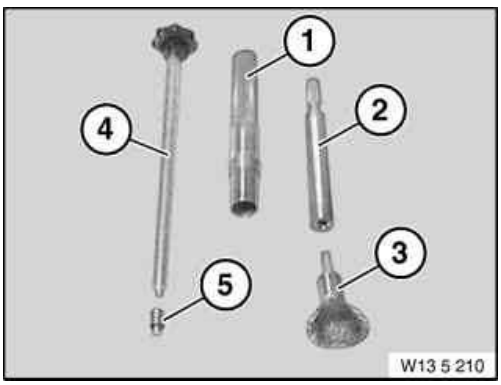
Common	Used in step 63
Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 495 819 (31 5 253) Adapter



Common	Used in step 63
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 493 763 (13 5 215) Plug



Common	Used in step 73
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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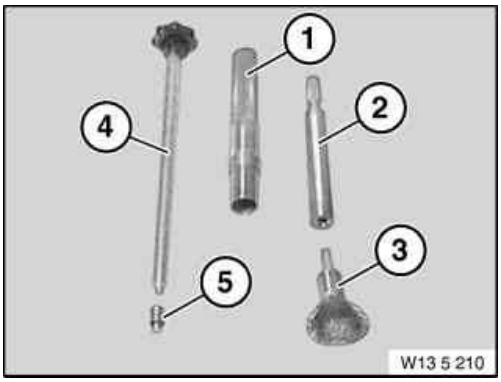
0 493 762 (13 5 214) Rod



Common

Used in step 73

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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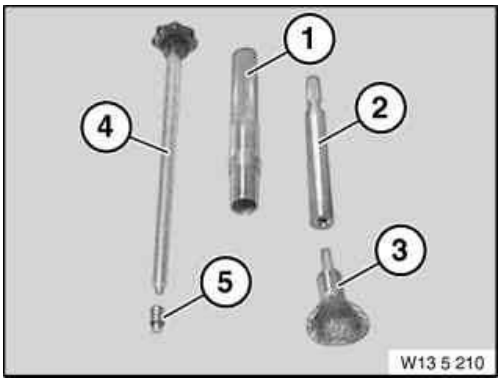
0 493 758 (13 5 210) Tool



Common

Used in step 73

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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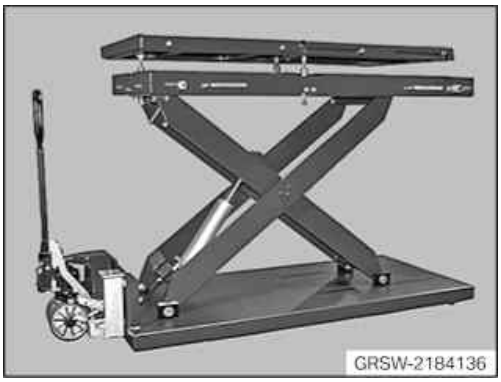
2 184 136 Mobile equipment table lift



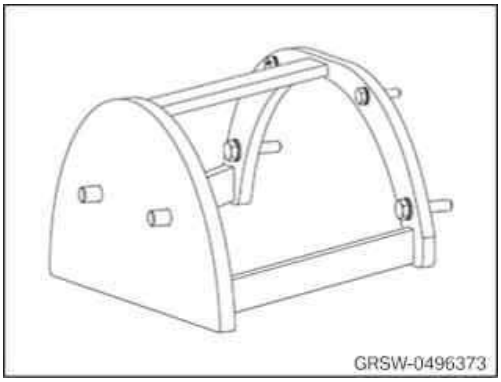
Common	Used in step 79
Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

Replacement tools:

2 299 563 Adapter

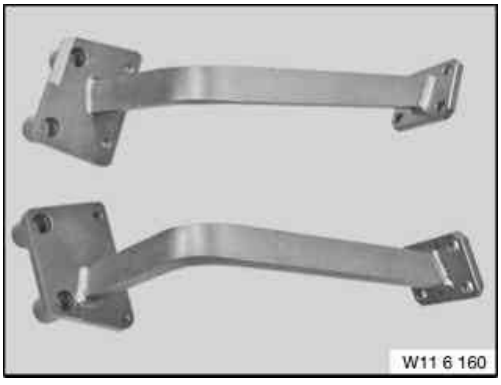
Common	Used in step 9
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 373 (11 5 420) Plate



Common	Used in step 9
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 9
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

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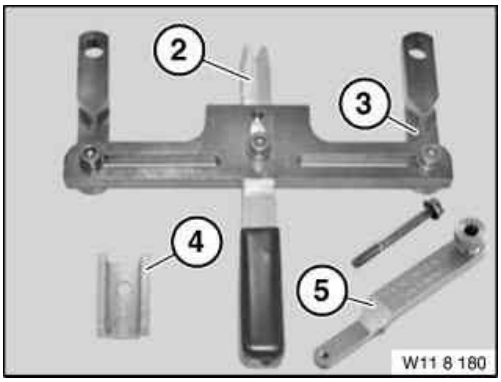
0 494 434 (11 8 183) Basic body



Common Used in step 25 58

Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

2 448 914 Extractor

Common Used in step 32

Usage	For removing and installing high pressure pump. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A49
Replaced by	
In connection with	
SI-Number	01 15 16 (411)

Overview Technical Data

Side clearance of piston rings Used in step 36

Clean all components before measuring the side clearance.

Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

Piston diameter Used in step 37

Measure the piston diameter at distance (A) from the lower end of the piston skirt.

Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Cylinder bore Used in step 38

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Axial play of crankshaft Used in step 45

	min. 0,053 mm
	max. 0,204 mm

Cylinder head flatness Used in step 60

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

Selecting the cylinder head gasket Used in step 61

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A decision is made to determine which cylinder head gasket must be used based on the measuring result of the measurement of the piston protrusion.

Cylinder head gasket with number of holes 1	0 mm ... 0,92 mm
Cylinder head gasket with number of holes 2	0,93 mm ... 1,03 mm
Cylinder head gasket with number of holes 3	1,04 mm ... 1,18 mm

Screw-in depth of thread cutter	Used in step 55
Screw-in depth	18 mm

Links

Functional descriptions	**Used in step**
Exhaust-gas recirculation control	7 80
EGR controller	7 80

General repair instructions	**Used in step**
11 00 ... Overview of consumables (Electronic Parts Catalogue)	54 57

Repair instructions	**Used in step**
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
31 10 001 Completely removing and installing front axle with engine and transmission	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
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11 00 050 Remove and install engine	1 86
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 86
11 00 050 Remove and install engine	1 86
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11 00 050 Removing and installing the engine (manual gearbox)	1 86
11 00 050 Remove and install engine (Automatic)	1 86
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11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine \PREMIUM	1 86
11 00 050 Removing and installing/replacing engine (N63)	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Removing and installing engine	1 86
11 00 050 Remove and install engine	1 86
11 00 050 Remove and install engine (Automatic)	1 86
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11 00 050 Remove and install engine (Automatic)	1 86
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11 00 050 Remove and install engine	1 86
11 00 050 Remove and install engine	1 86
11 00 050 Remove and install engine	1 86
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 86
11 00 050 Remove and install engine	1 86
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21 54
61 35 ... Notes on ESD protection (Electro Static Discharge)	54

Parts

Parts required

Designation	Used in step

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Chain tensioner piston seal on cylinder head	68
Exhaust-gas recirculation cooler seal on exhaust manifold	80
Exhaust-gas recirculation cooler seal on intake plenum	80

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This documentation refers to special tools that were not yet available when going to press.

11 21 001 Replacing crankshaft

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

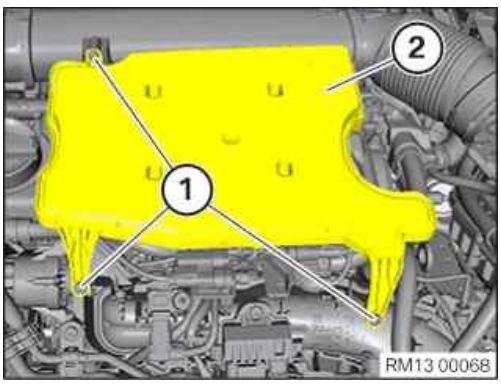
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

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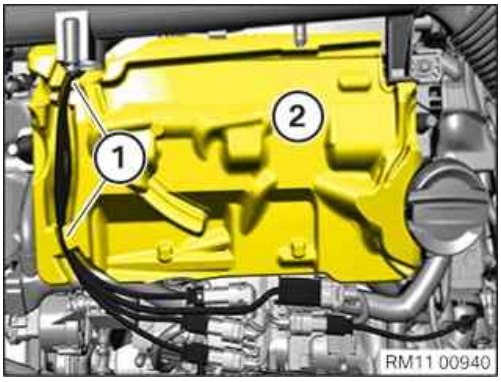
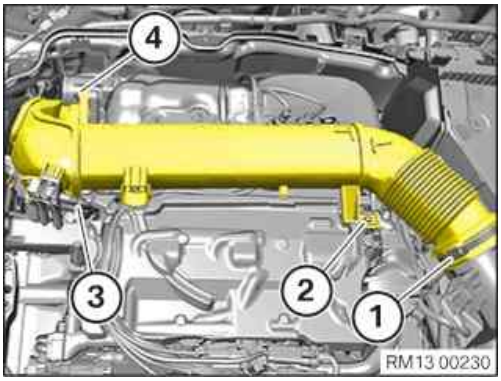
4 – Remove the acoustic cover for the injectors

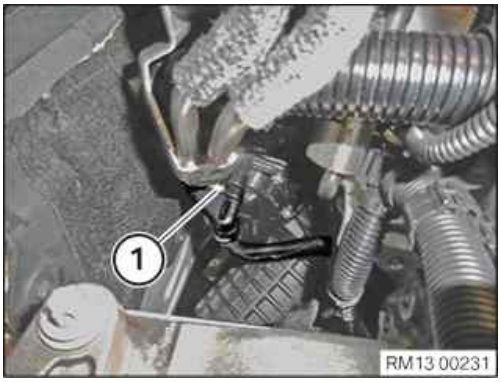


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

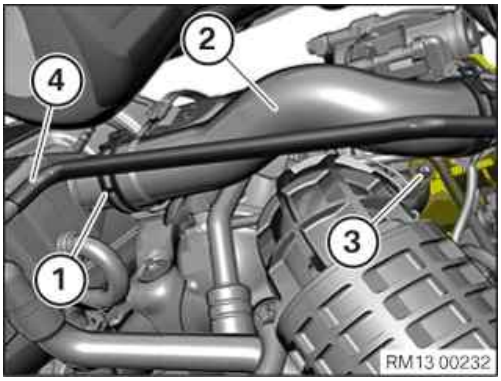
5 – Removing clean air pipe



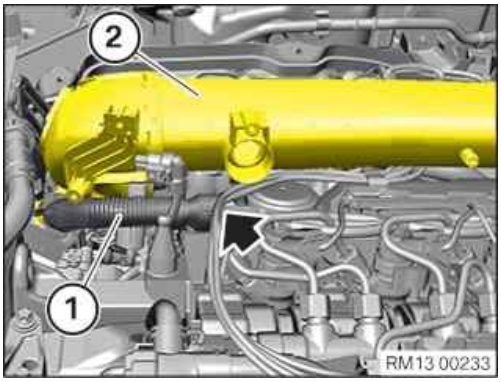
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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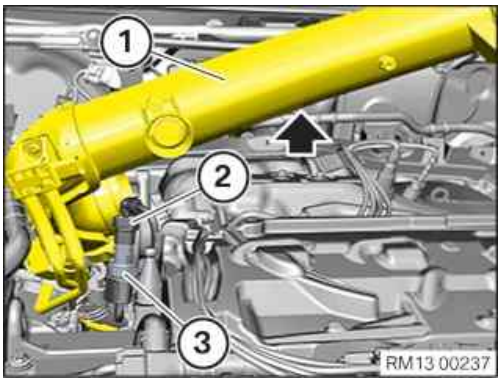


- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

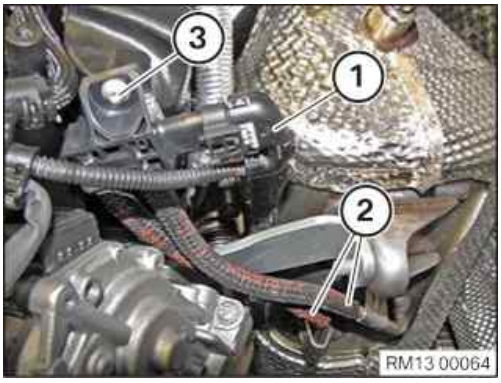
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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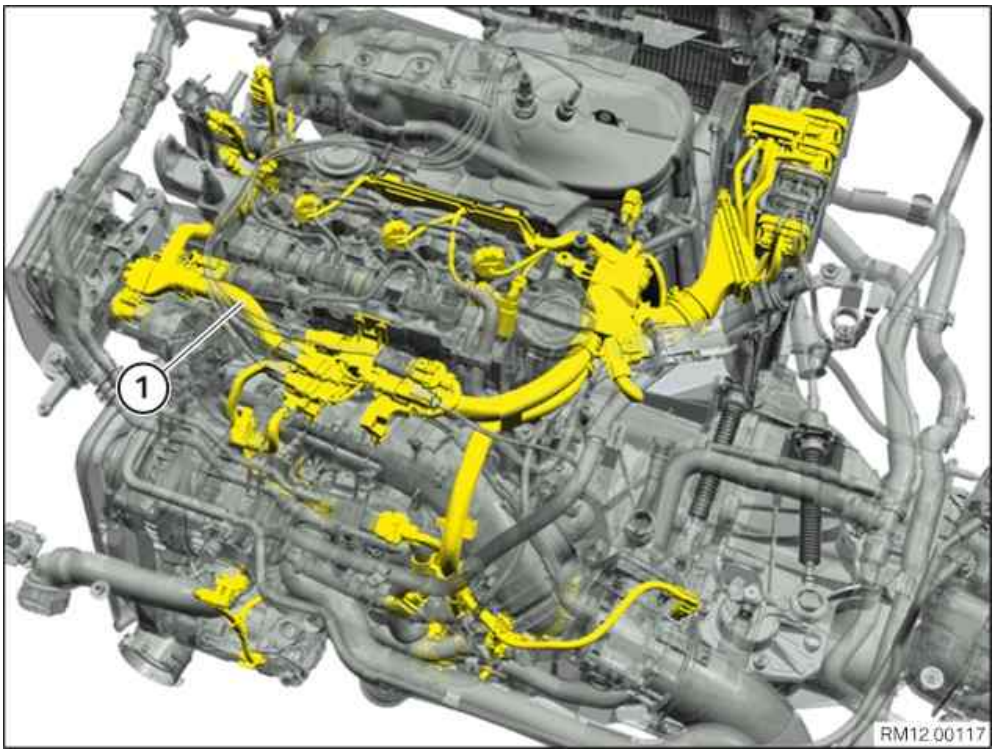
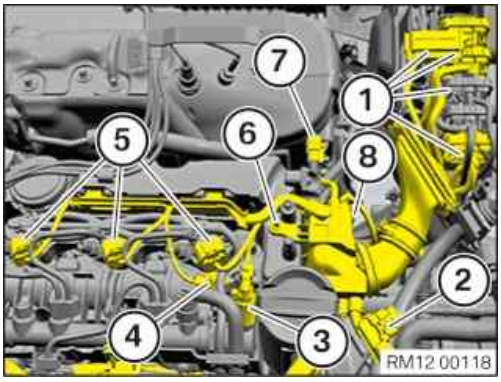
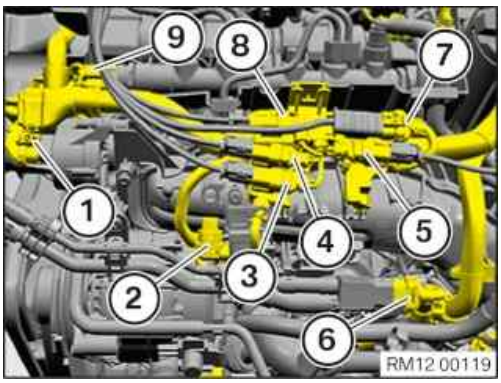
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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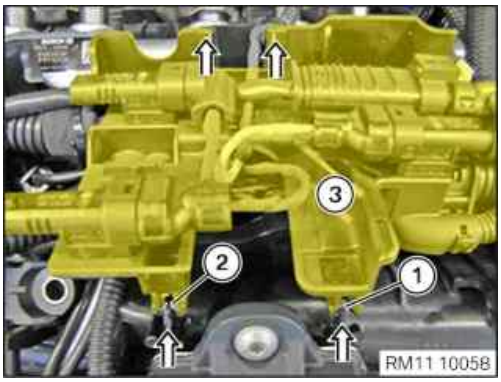
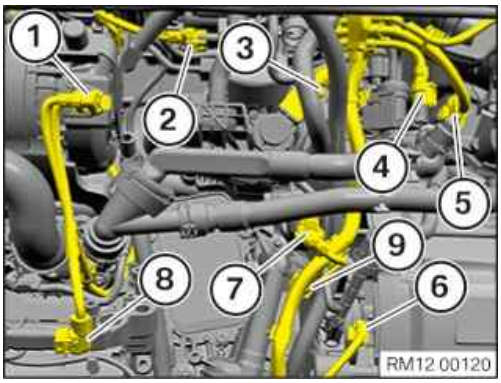
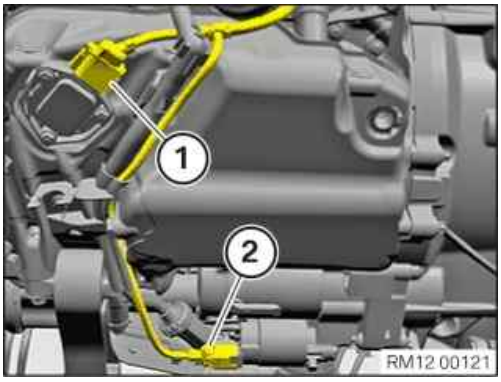


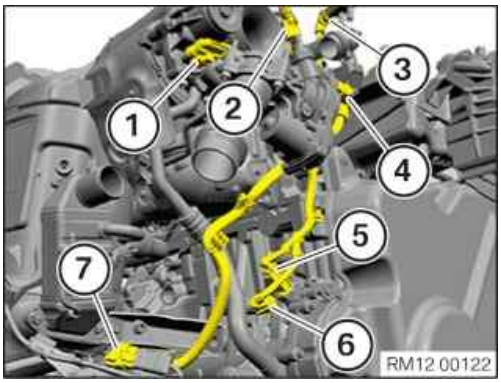
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



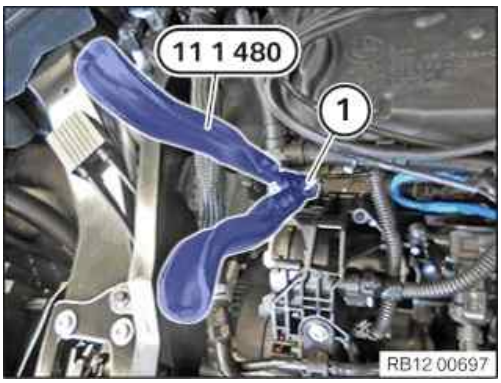
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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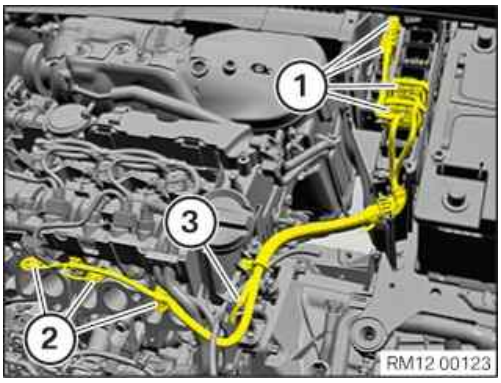


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

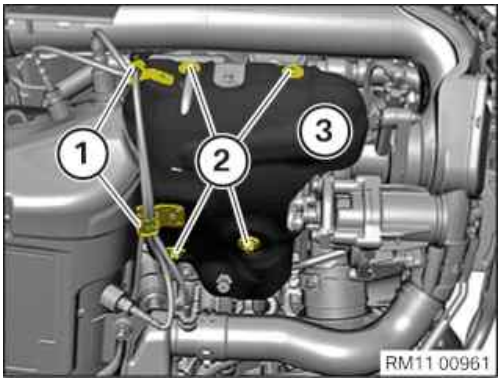
▶ Removing heat shield from top exhaust turbocharger

WARNING

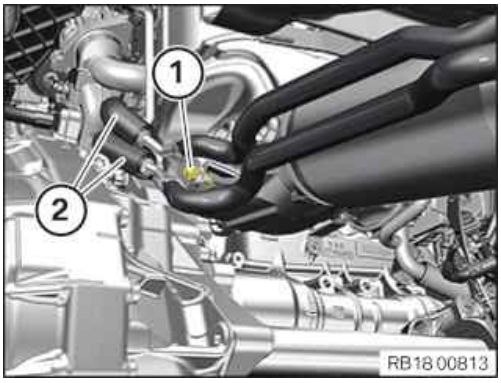
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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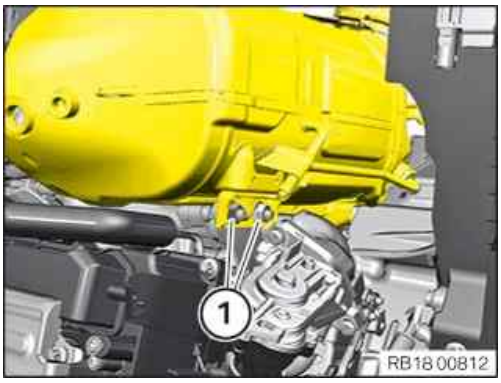
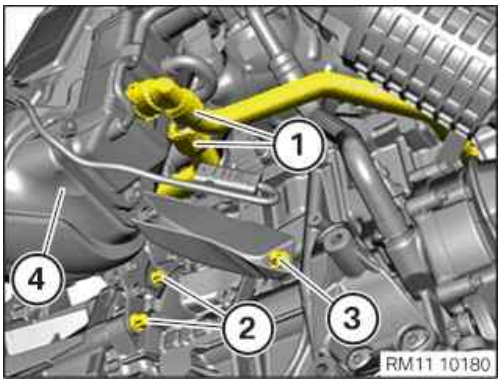


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

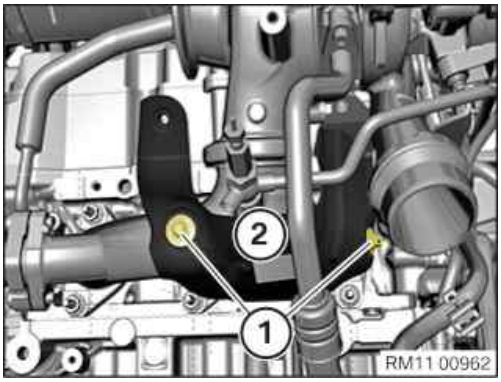
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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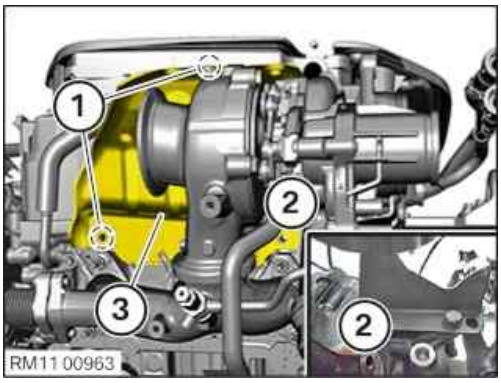


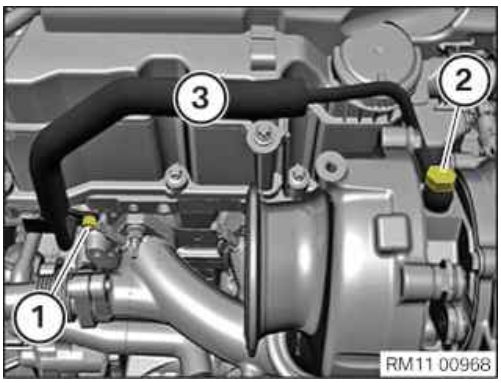
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

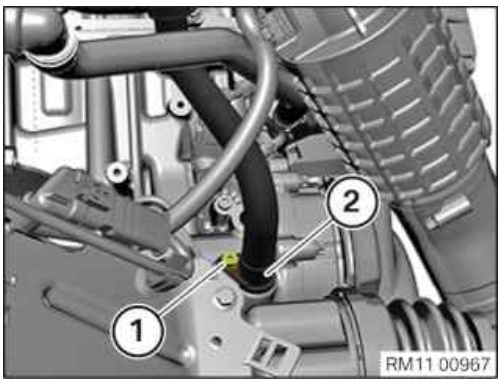
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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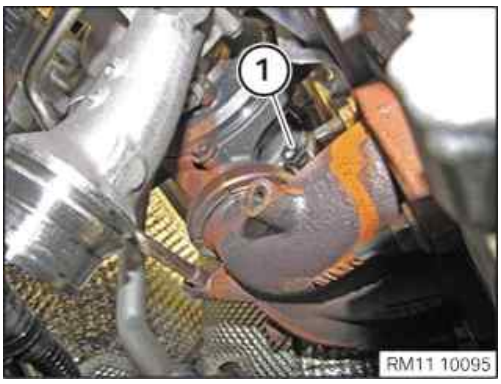
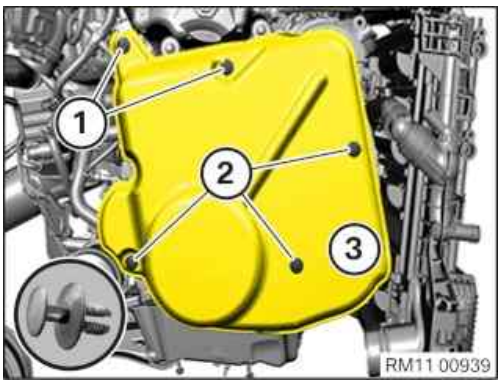
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

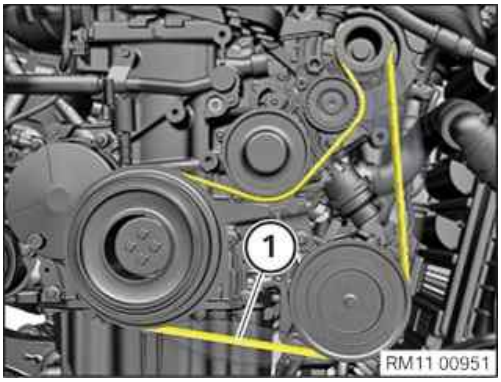
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

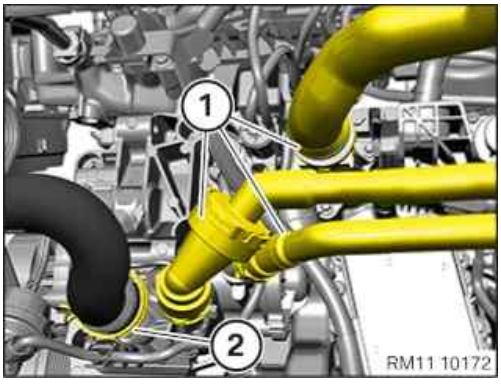
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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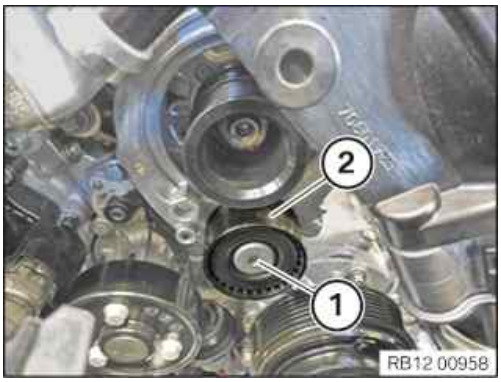
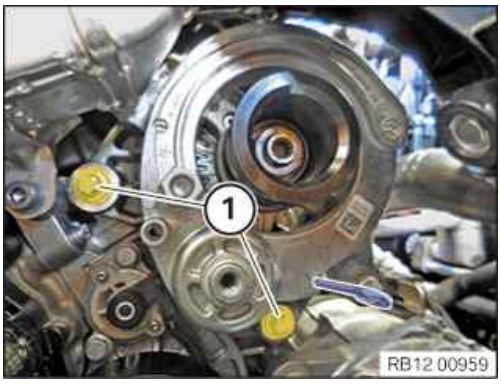
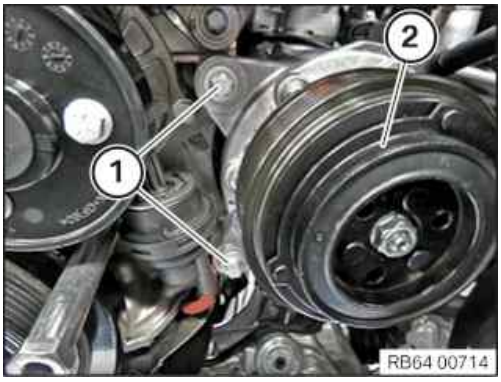


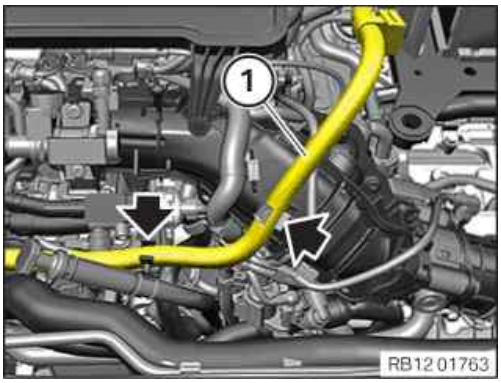
- Loosen screw (1).
- Remove the deflecting element (2).



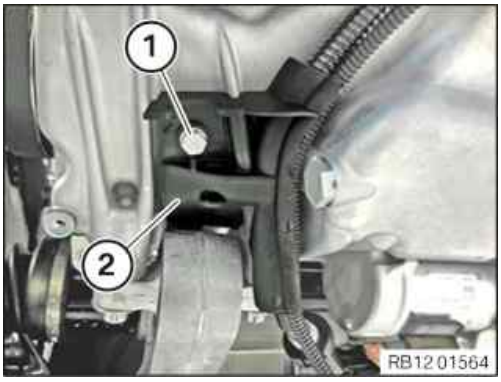
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

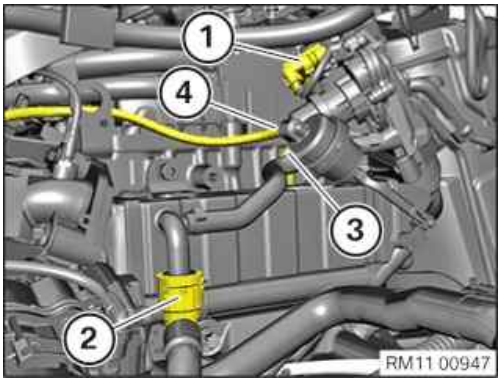
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

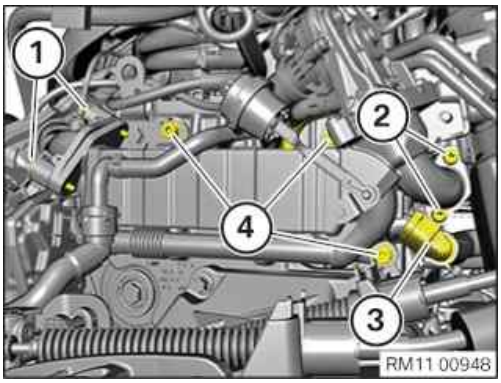
- Perform all work only on components that have cooled down.



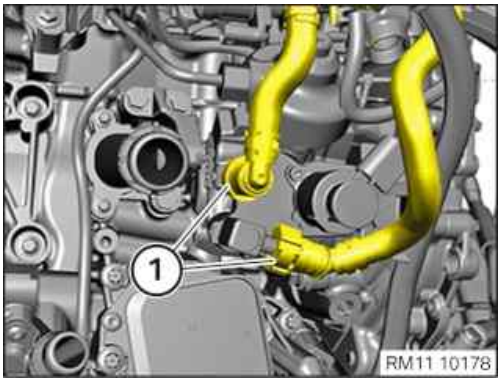
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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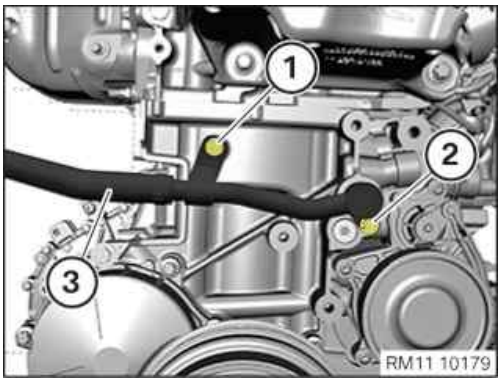


- Loosen screws (1) and (2).
- Remove coolant line (3).

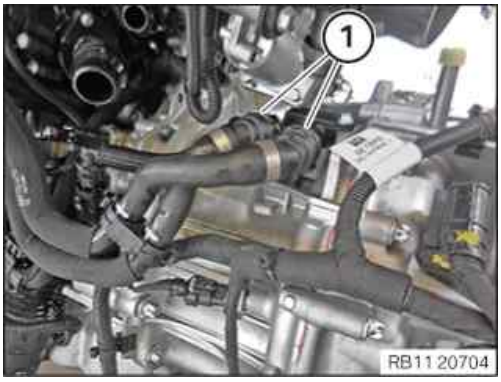
8 – Disconnect the engine from the double-clutch transmission (DKG)

RISK OF DAMAGE

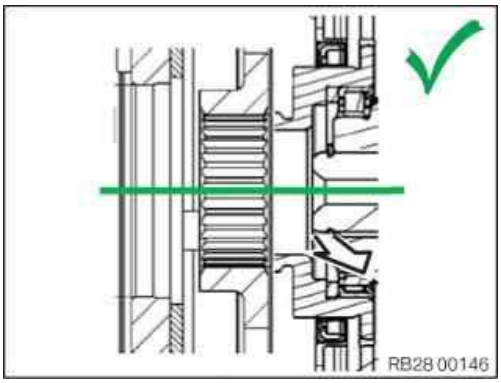
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

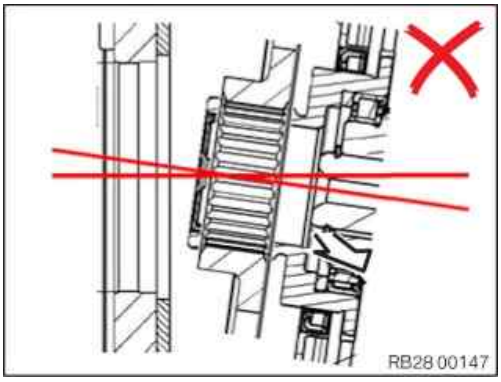
- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.



- Unlock and release coolant line (1).
- Catch and dispose of escaping coolant.



- **Correct:** Pull the double-clutch transmission (DKG) horizontally off the flywheel.



- **Wrong:** Do not pull the double-clutch transmission (DKG) off the flywheel if it is tilted.

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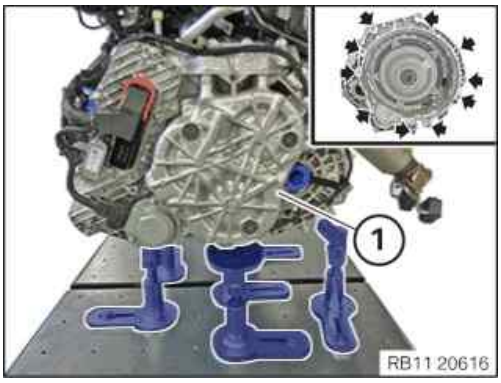
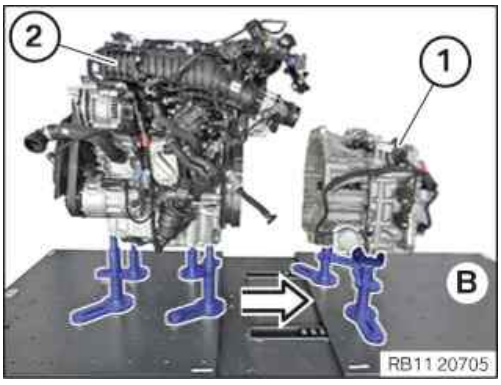


- Remove screws (arrows).
- Pull the double-clutch transmission (DKG) (1) off the flywheel when it is **absolutely** horizontal.



NOTICE

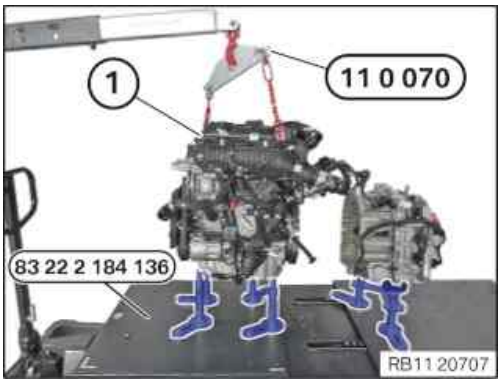
Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table top (B) in the direction of arrow and disconnect double-clutch transmission (DKG) (1) from the engine (2).

- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach the engine lifter with the special tool **0 490 579 (11 0 070)** and lift the engine (1) off the lifting table.

9 – Mount engine on assembly stand

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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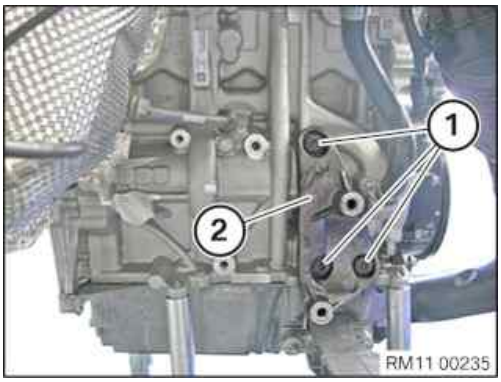
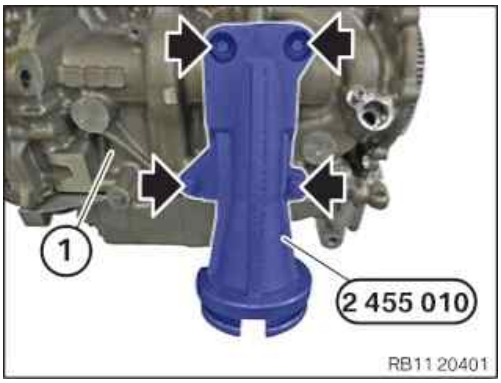


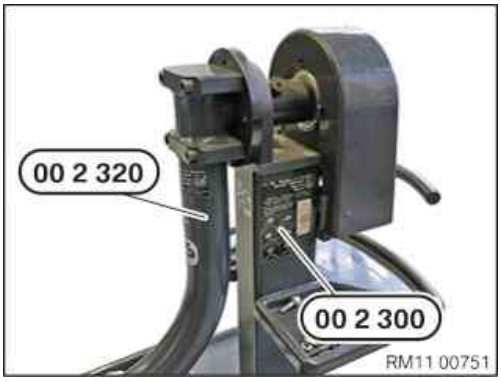
- Loosen screws (1).
- Guide out and remove holder (2).



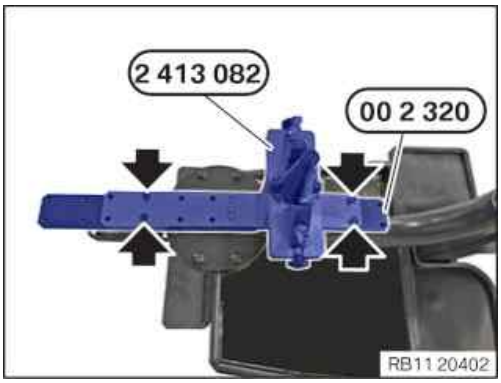
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.

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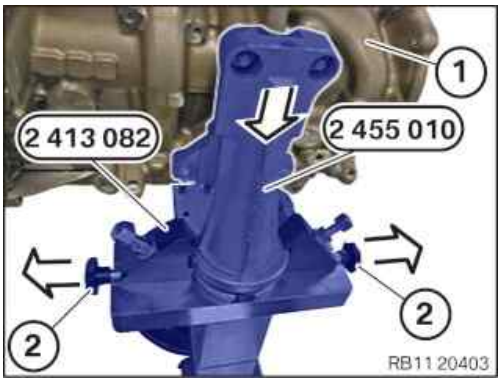
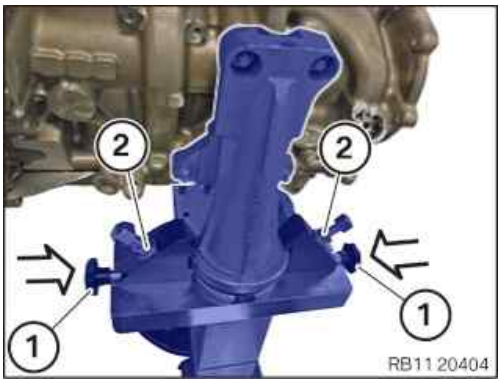


- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



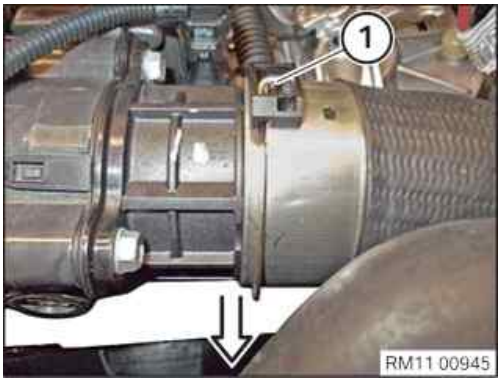
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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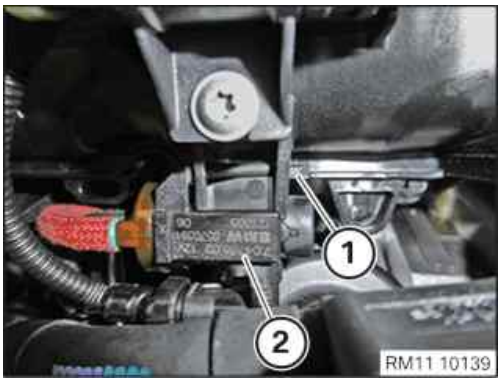
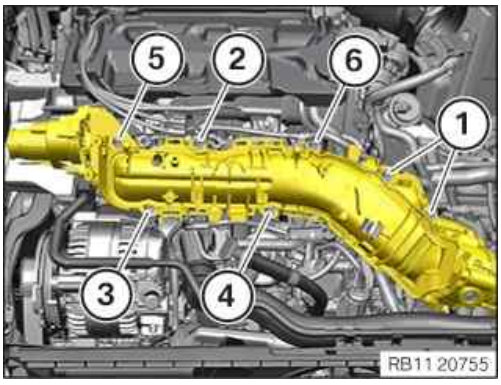
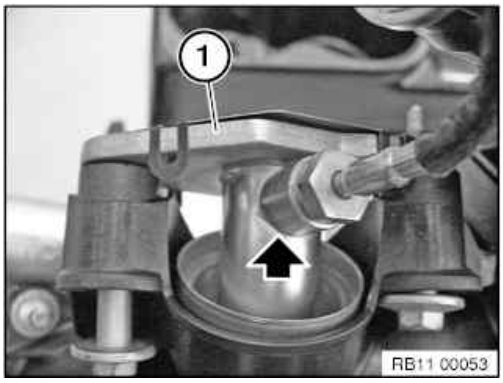


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

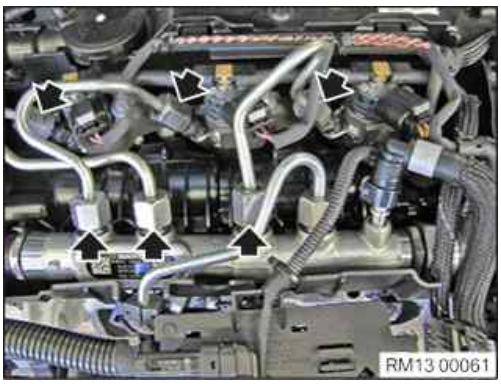
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

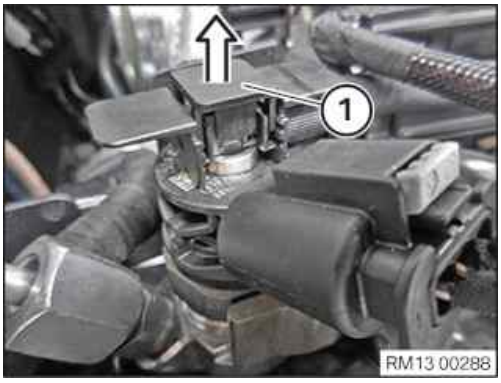
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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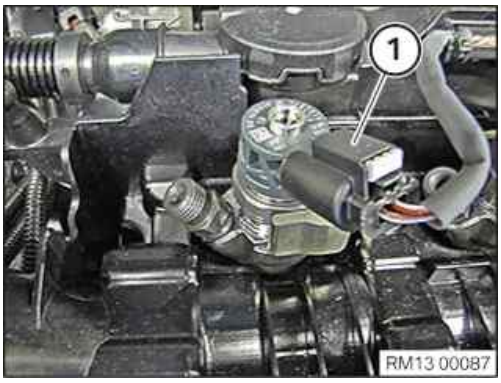
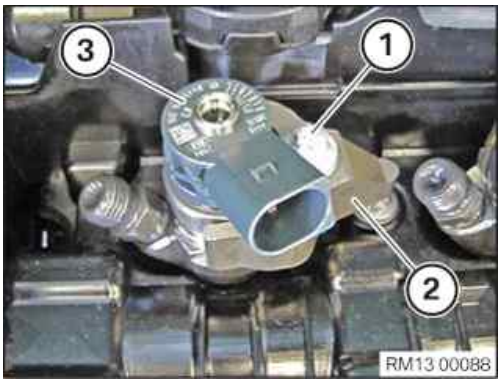


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

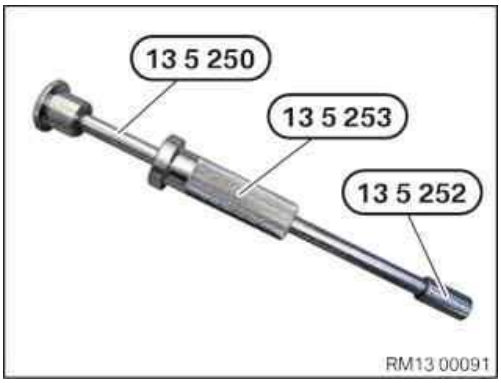
▶ **Loosen stuck injectors**

RISK OF DAMAGE

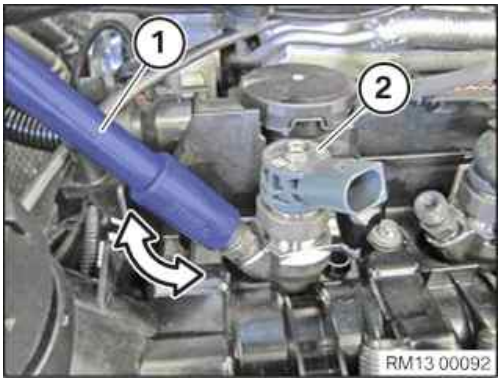
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

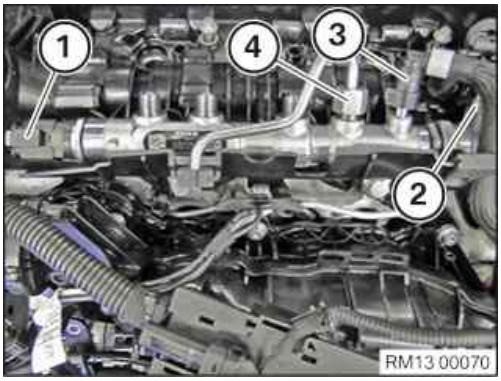
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

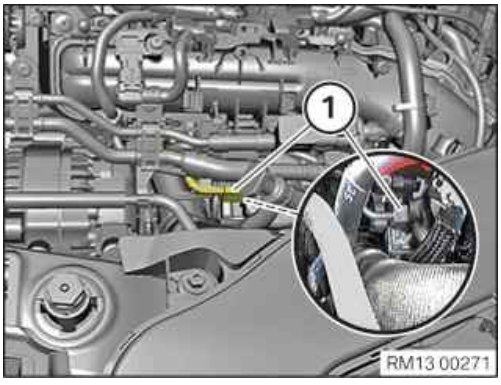
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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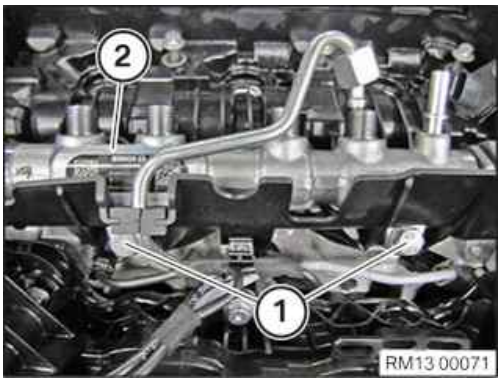
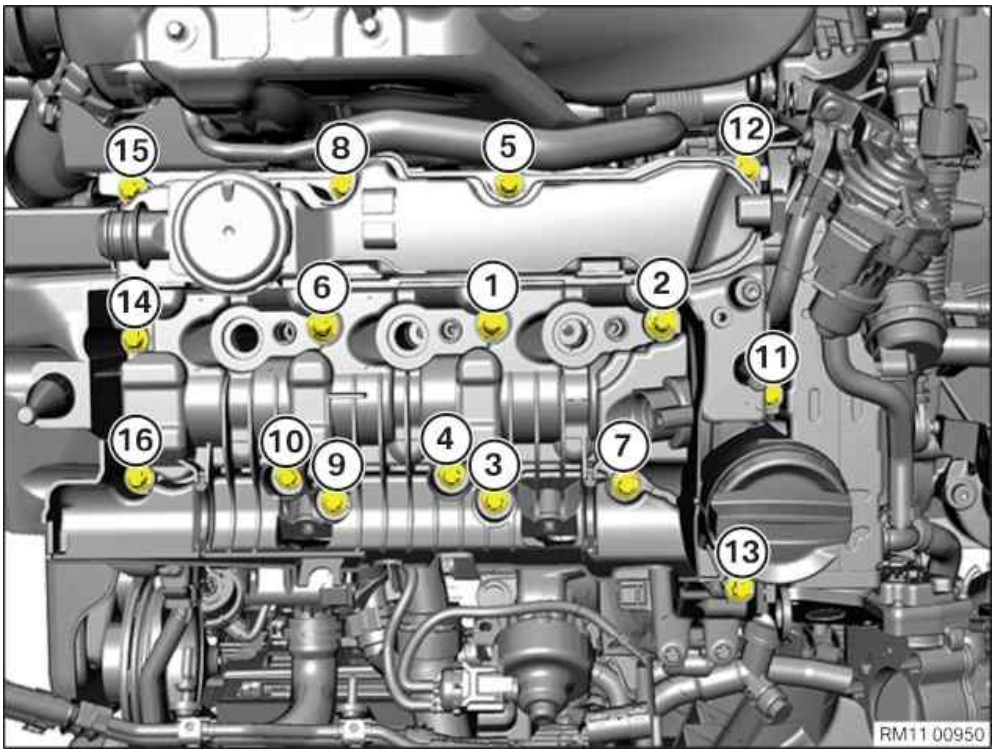


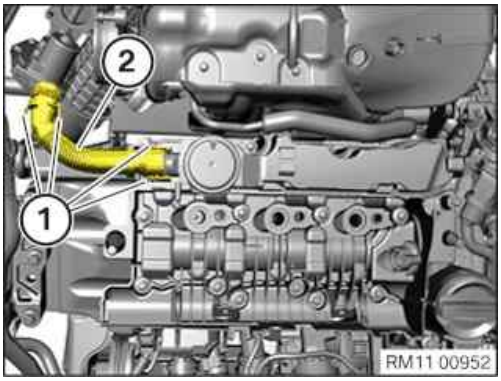
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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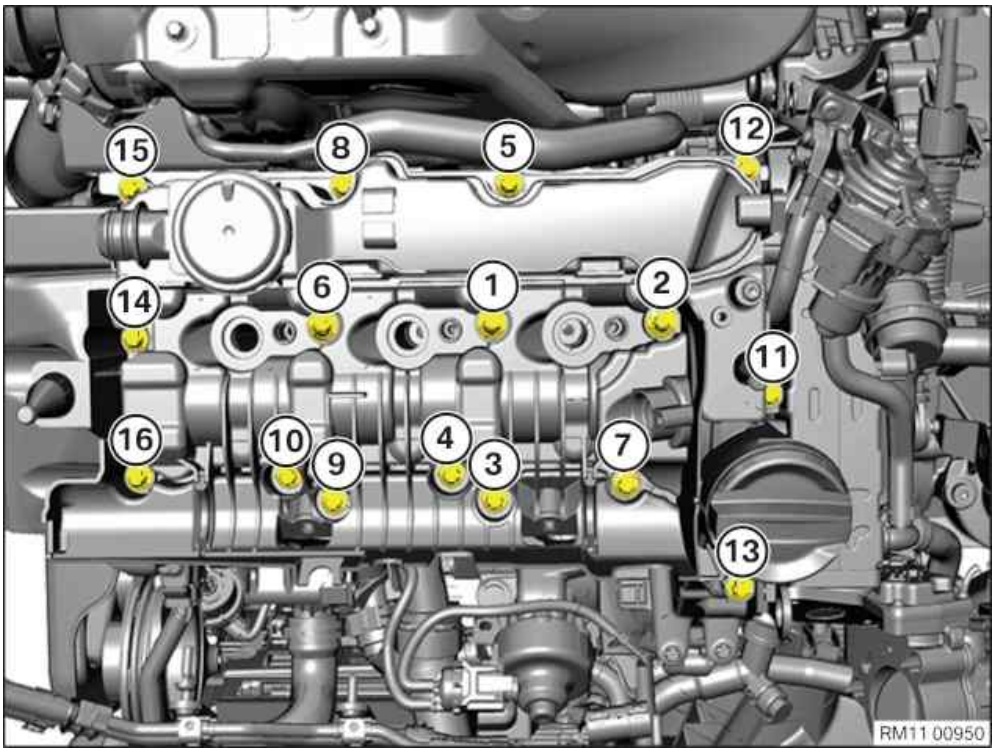

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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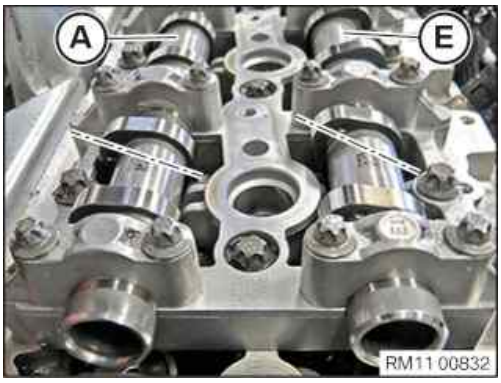
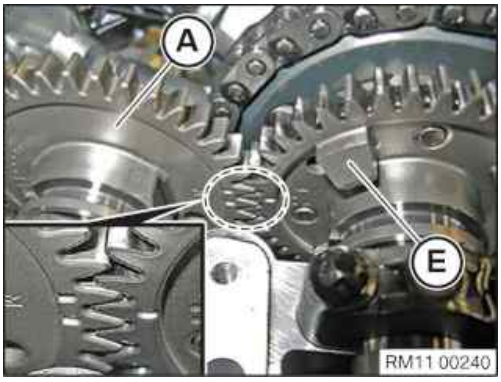


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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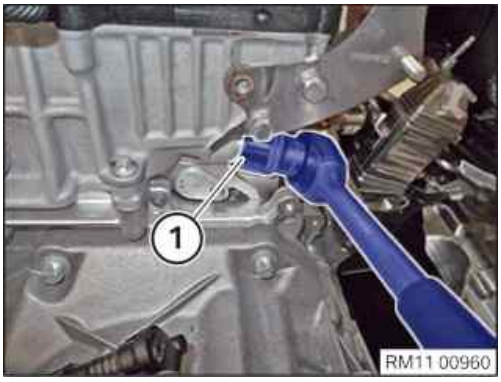
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

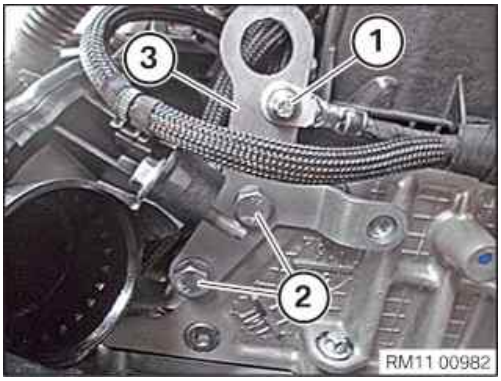


TECHNICAL INFORMATION

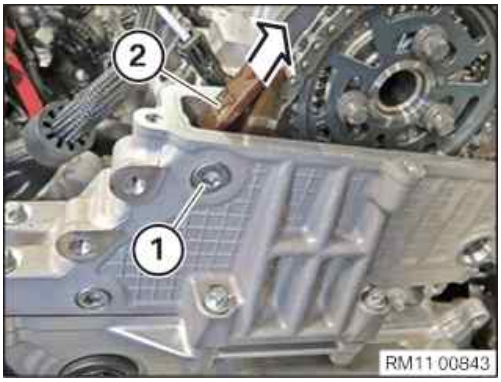
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

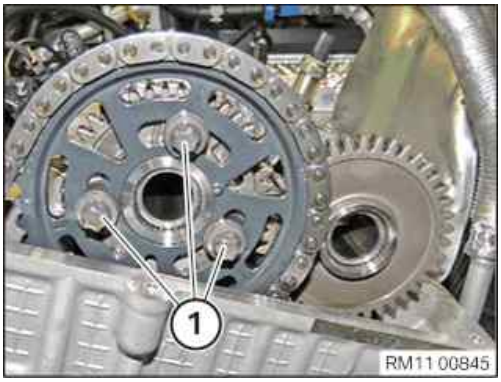


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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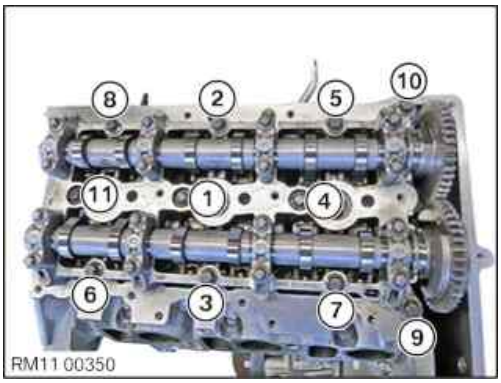
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

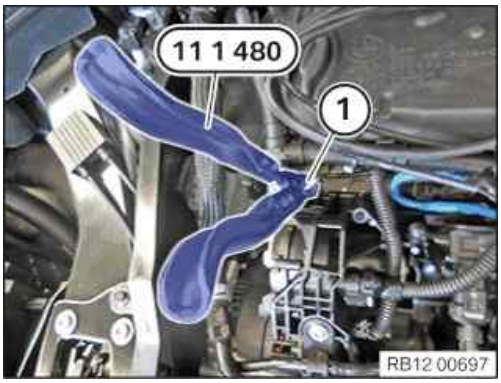
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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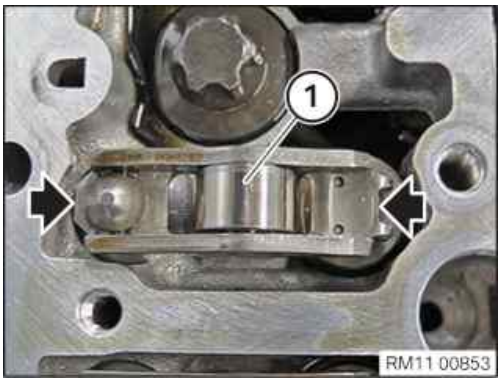


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

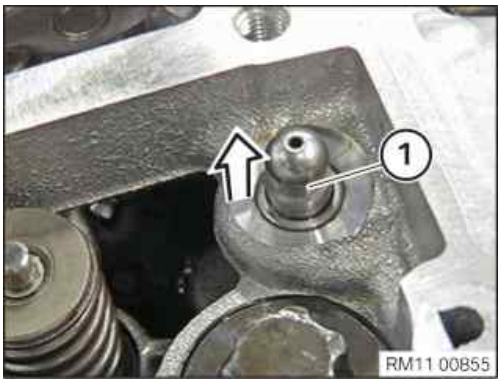
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

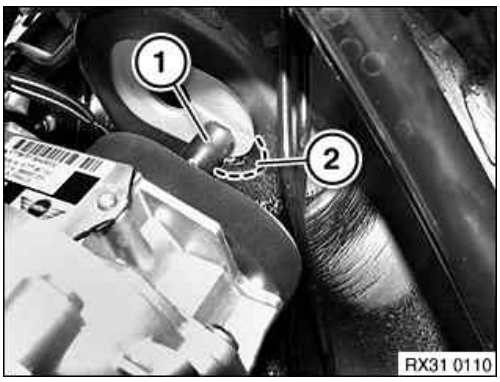
24 – Remove cylinder head.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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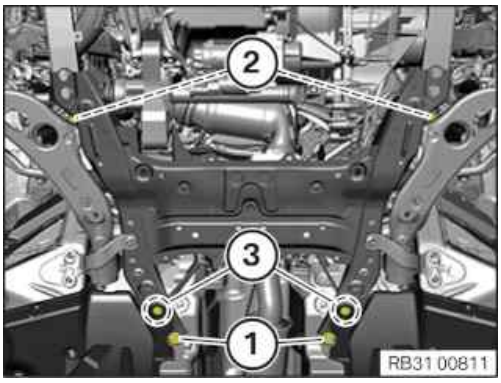


- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

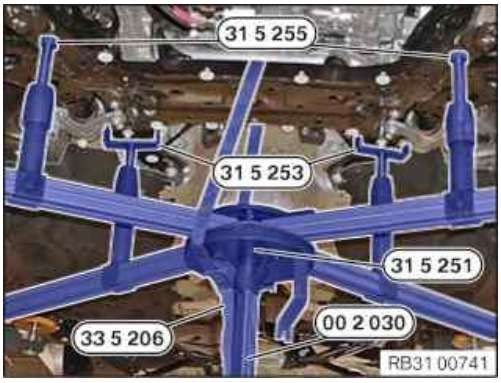
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

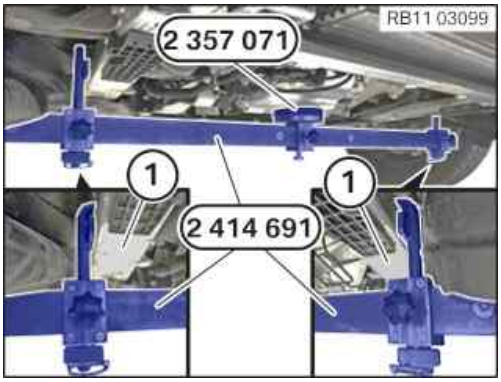
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and set it aside.



- Prepare special tool **2 414 691** together with the special tool **2 357 071**.
- Attach special tool **2 414 691** to front axle support and correctly align the special tool **2 357 071** under the oil sump and tighten.
- Turn special tool **2 414 691** at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools**2 414 691** and **2 357 071**.

- Remove all glow elements with special tool **0 491 068 (11 6 050)** or a standard tool.

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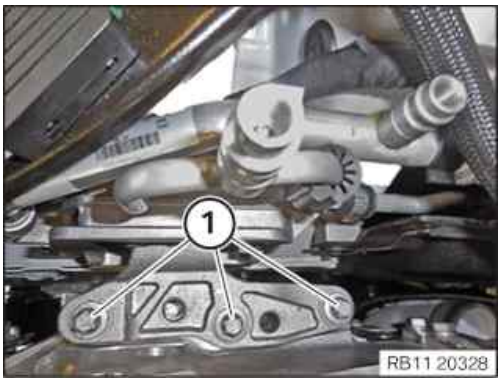
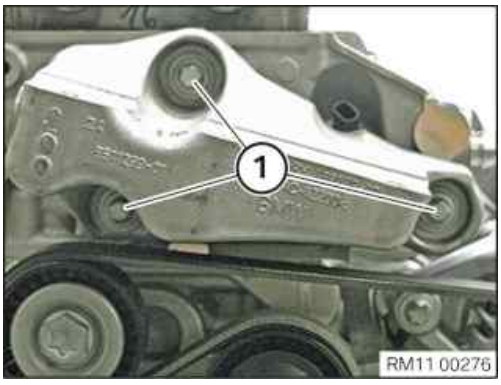


- Loosen screws (1).

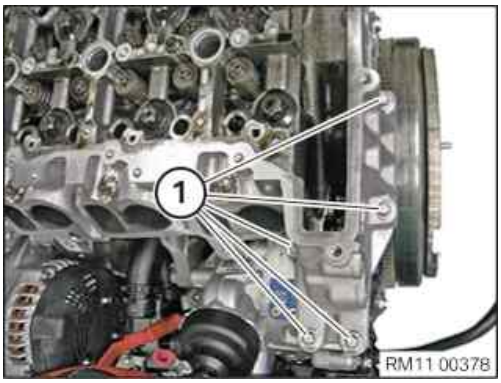


- Loosen screws (1).

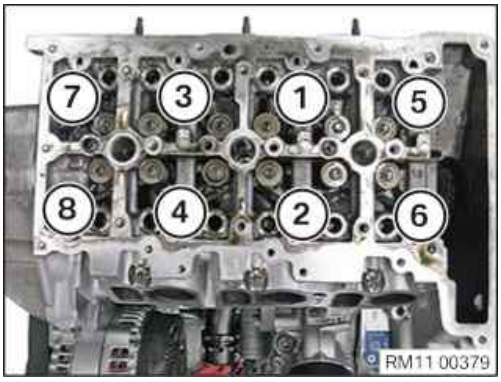
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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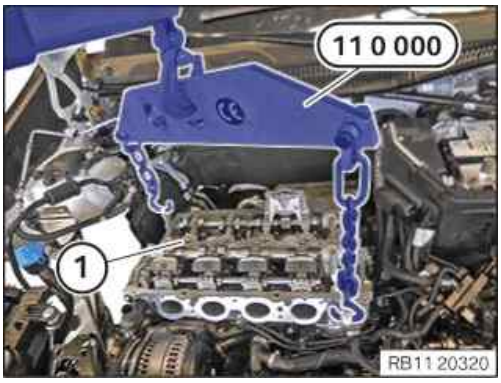


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

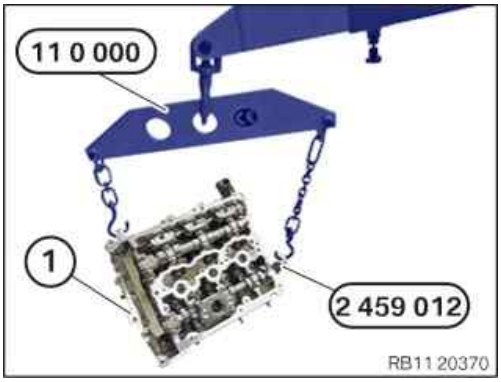
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

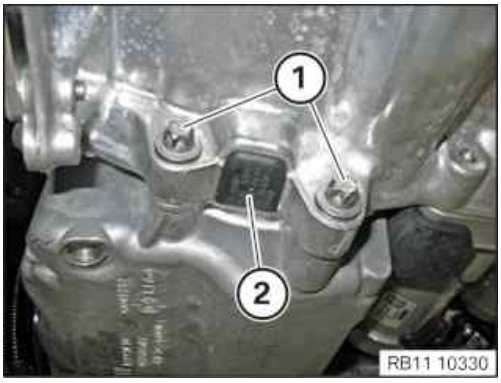
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.

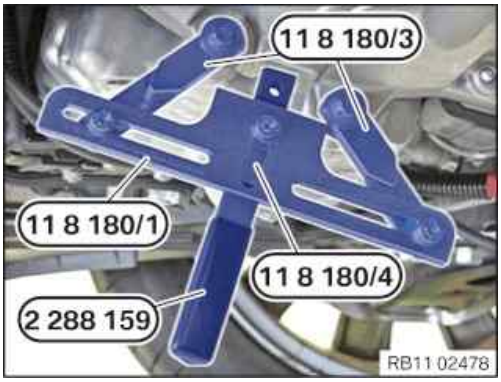


- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

25 – Removing the vibration damper



- Release the transmission bolts (1).
- Remove the protective cap (2).



- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.

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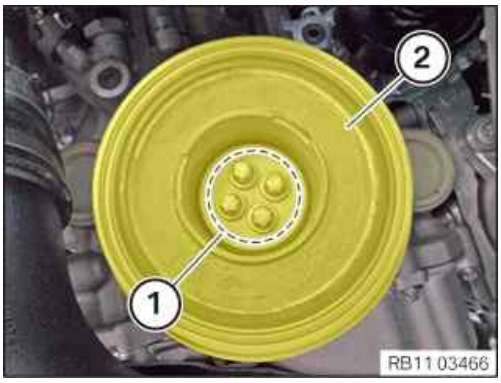
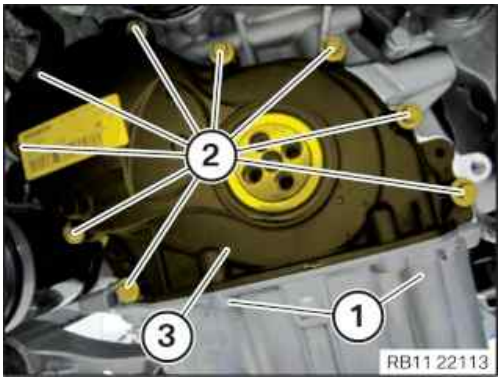


- Loosen screws in the area (1).
- Remove the vibration damper (2).

26 – Remove gear case cover



- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove timing case cover (3).

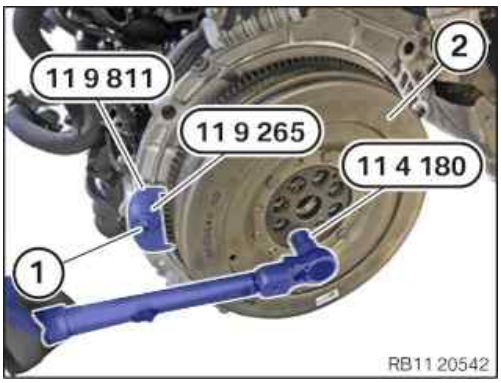
27 – Remove flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Position special tool **0 496 171 (11 9 811)** with a **standard** 5 mm thick washer between the crankcase and the flywheel.

  The 5 mm thick washer must be mounted between the crankcase and special tool **0 496 171 (11 9 811)** .
- Secure the special tool **0 494 793 (11 9 265)** with the transmission bolt (1).
- Protect the flywheel (2) from falling.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Guide out the flywheel (2) and remove.

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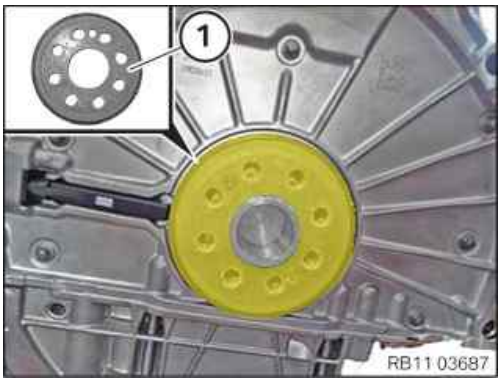


RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

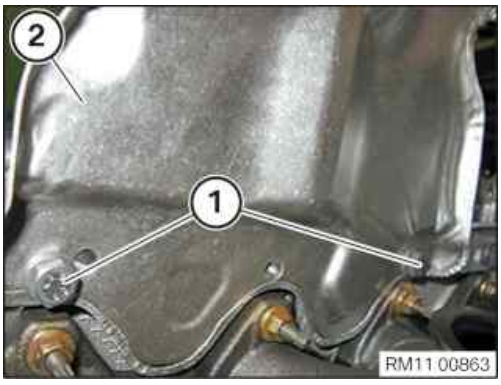
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove increment wheel (1) from the crankshaft and set it aside properly.

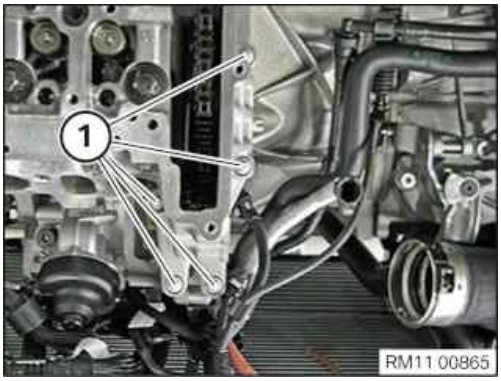
28 – Remove rear timing case cover

Prerequisite

Transmission is removed.



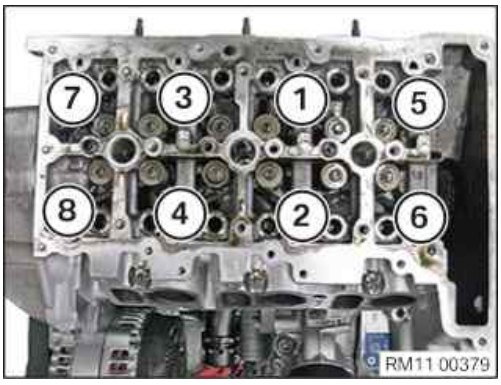
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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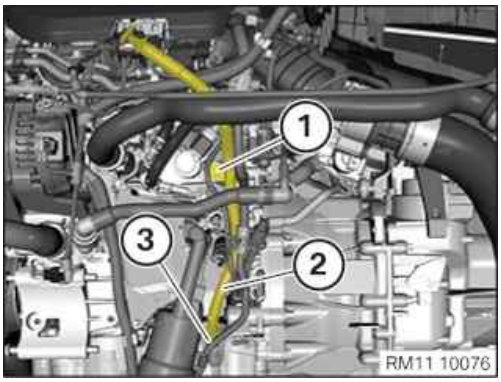
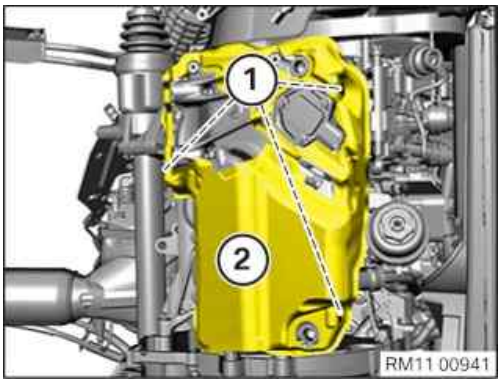
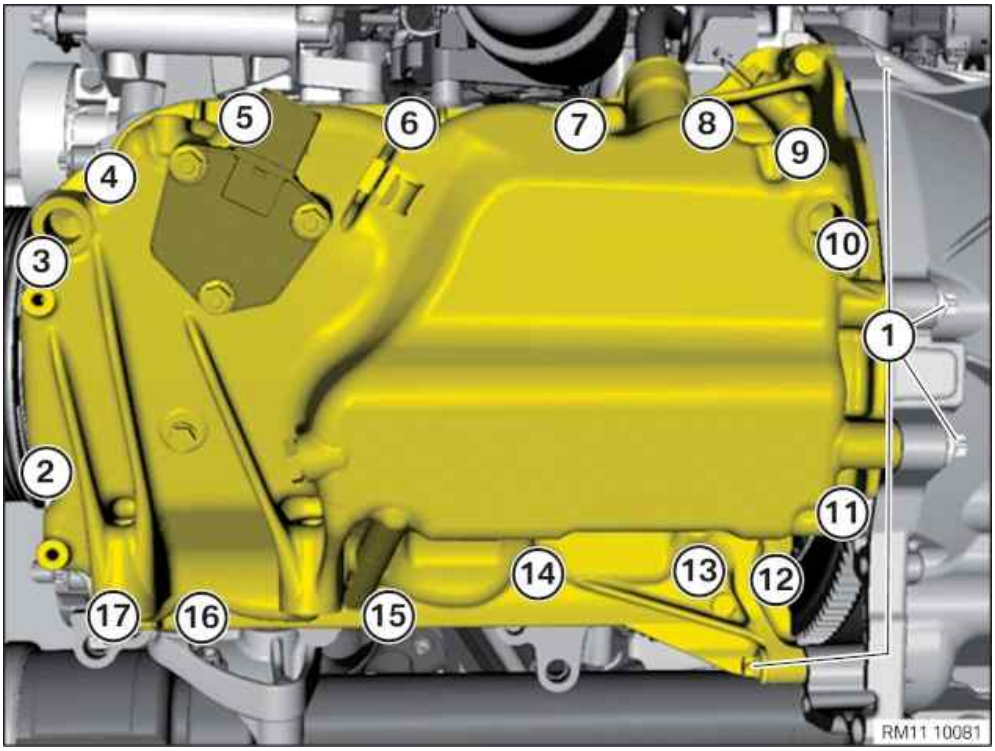


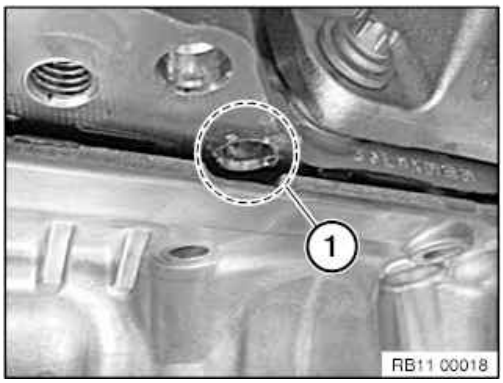
- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- If required, remove sealing ring (3) from oil sump.



- Remove the expanding rivet (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).



- Tighten the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release oil sump only in area (1).

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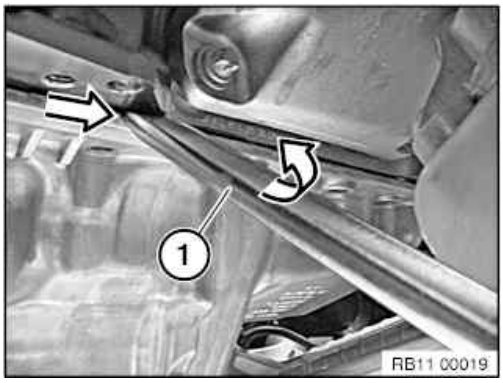
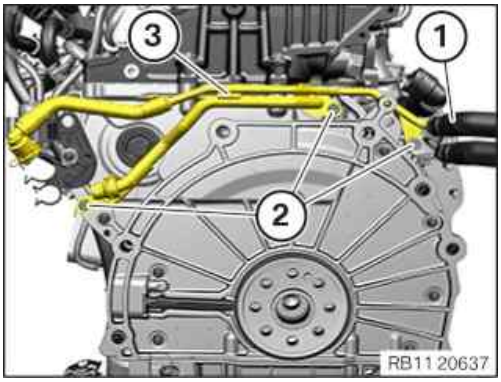
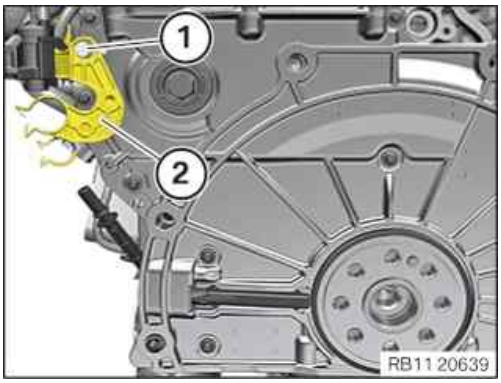


- Release the oil sump using a suitable mounting lever (1) carefully at the position intended for that.
- If required, secure the oil sump against falling.

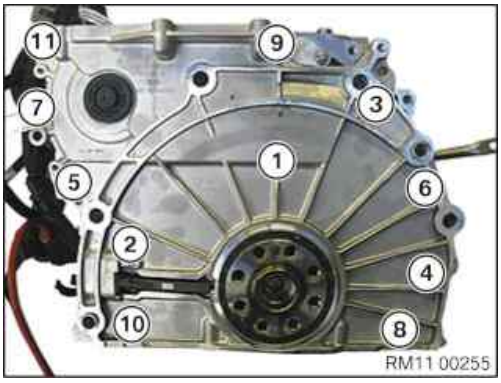
► **If installed: Remove coolant line of the SCR metering module**



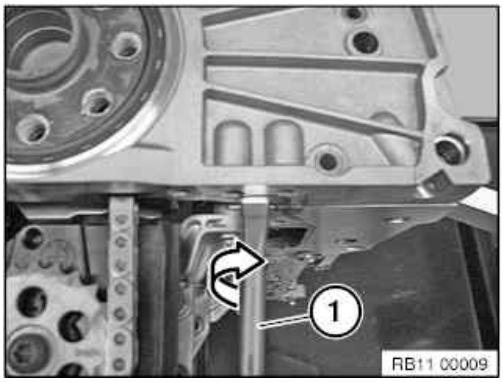
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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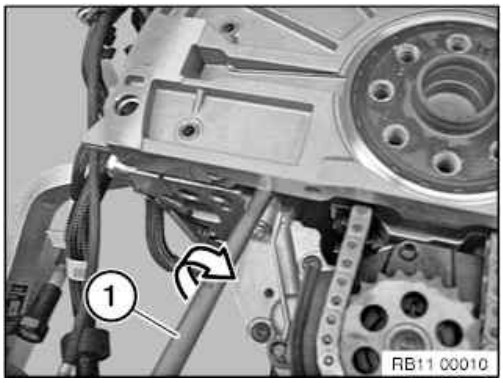


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

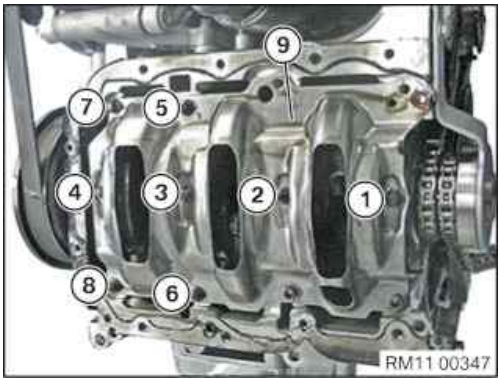
29 – Removing the oil deflector

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

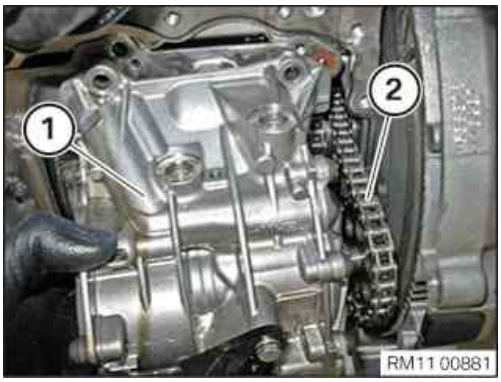
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen screws in the order (8) to (1).
- Guide out and remove the oil deflector (9).

30 – Remove the oil vacuum pump

- Loosen screws (1) of the oil vacuum pump (2).



- Remove oil vacuum pump (1) and remove from the drive chain (2).

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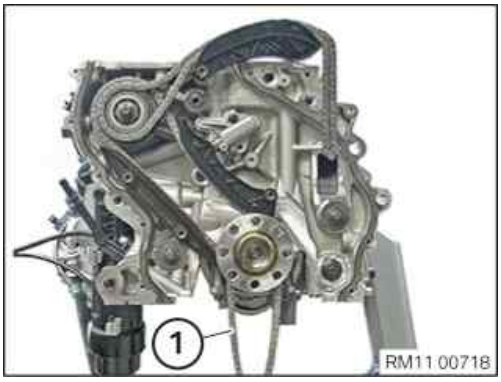
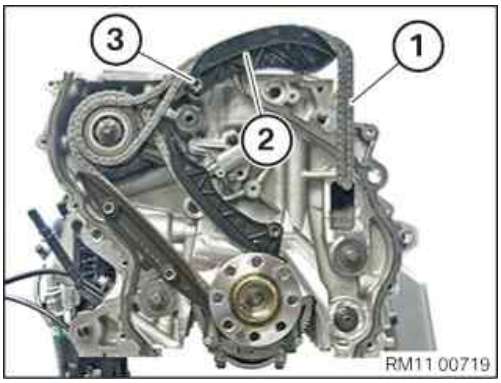
31 – Remove both timing chains

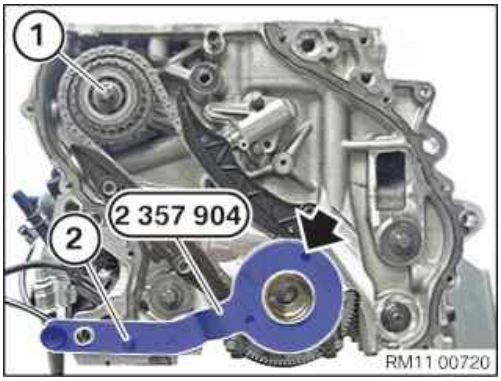


- Remove drive chain (1) for oil pump.

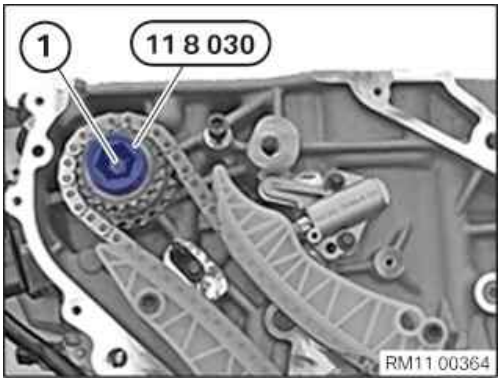


- Remove the timing chain (1) for the camshafts.
- Remove the tensioning rail (2) from the bearing journal (3).

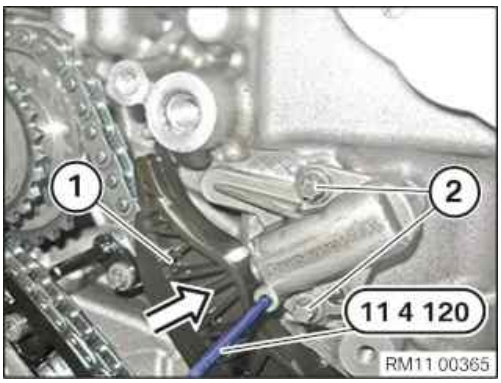
  Bearing journal (3) does not have to be disassembled.



- Secure crankshaft to release central bolt (1) of high pressure pump.
- Position crankshaft with guide pin (arrow).
- Secure special tool **2 357 904** with bolt (2) on crankcase.
- Release central bolt (1) of high pressure pump; do not remove.



- Screw special tool **0 496 725 (11 8 030)** into sprocket of high pressure pump.
- Unscrew central bolt (1) of high pressure pump until central bolt can be supported on special tool **0 496 725 (11 8 030)**.
- Continue turning central bolt (1) until camshaft sprocket is released from high pressure pump shaft.



- Press chain tensioner in with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove chain tensioner.

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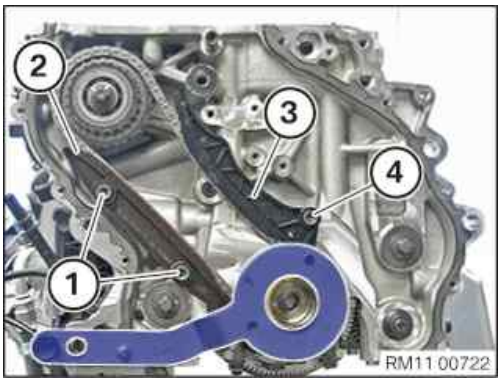
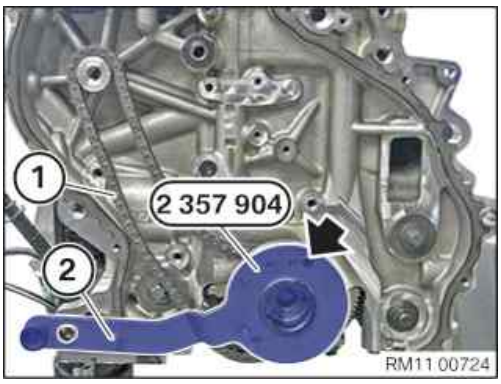


- Loosen both bearing journals (1).
- Remove the guide rail (2).
- Loosen the bearing journals (4).
- Remove the tensioning rail (3).

- Remove bolt and camshaft sprocket (1) of high pressure pump.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

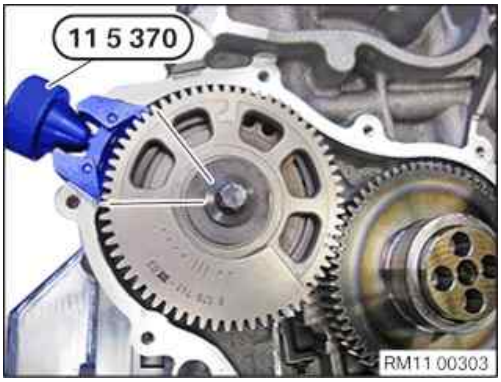
- Unscrew the bolt (2) and remove the special tool **2 357 904**.
- Remove the timing chain (1).

32 – Remove counterbalance shaft

- Fasten counterbalance shaft with special tool in the TDC position of cylinder no. 1.
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



- Ensure that the gear of the counterbalance shaft is pretensioned and blocked before removal.
- Install the special tool **0 495 131 (11 5 370)** as shown and pre-load the gear.

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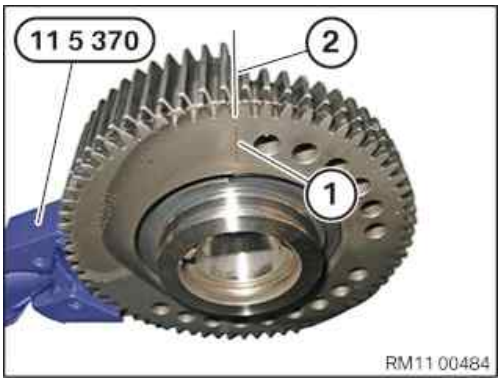
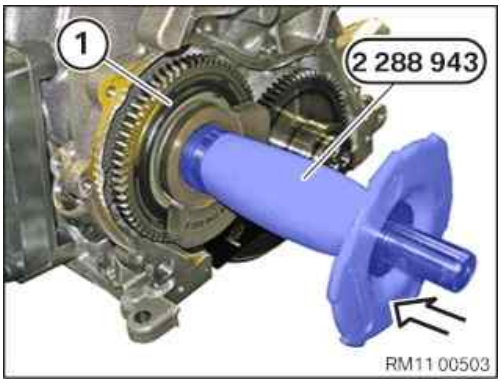


- Block gear wheels (1) and (2) until re-installation with the special tool **0 495 131 (11 5 370)**.

- Check whether the marks on the counterbalance shaft gear are aligned with the marks on the crankshaft gear.
- Loosen screw (1).

- Loosen screws (1).
- Remove special tool .



- Screw the special tool **2 288 943** far as it will go into the counterbalance shaft.
- Secure counterbalance shaft and gear against falling down!
- By means of targeted hammer blows on the special tool **2 288 943** in the direction of the arrow, loosen the counterbalance shaft from gear (1) .
- Remove special tool **2 288 943**.

- Remove the counterbalance shaft gear in the direction of the arrow.

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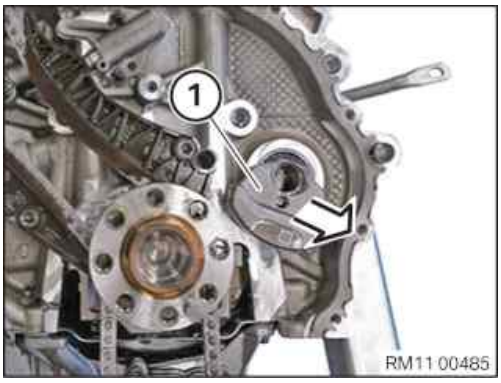


- Remove counterbalance shaft (1) in direction of arrow.

33 – Remove the connecting rod bearing cap

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

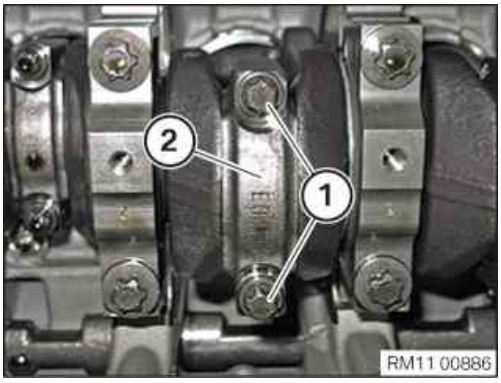
- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

- Turn the crankshaft until the connecting rod bearing journal (1) reaches a vertical position.



- Unscrew the connecting rod bolts (1).

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing cap (2) and put to one side in the correct order.

34 – Removing the piston with connecting rod

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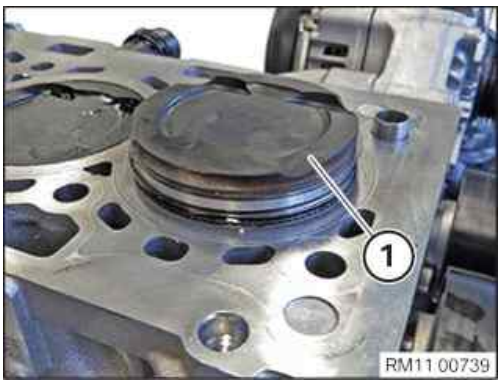
TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Screw special tool **0 496 144 (11 8 860)** in at large connecting rod eye.



RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Remove the piston (1) and connecting rod.

35 – Remove the connecting rod bearing shells

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod (1) and store it properly.

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TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod bearing cap (1) and store it properly.

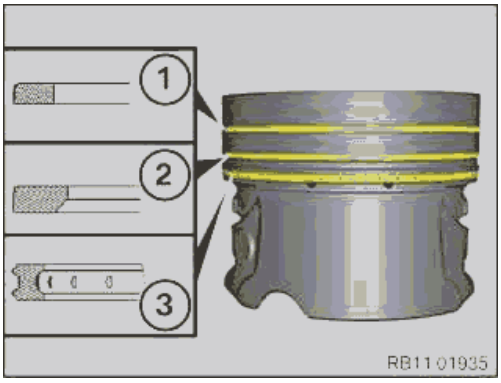
36 – Measure side clearance of piston rings

RISK OF DAMAGE

Damage to the piston rings.

Piston rings can bend or break due to large applications of force.

- Handle piston rings carefully.
- Only bend piston ring up lightly.



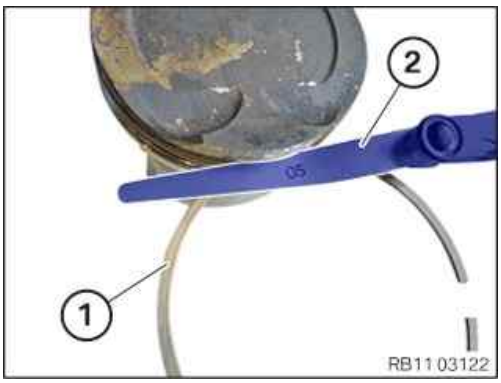
TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

- Mounting orientation of the piston rings

Position number	Description
1	1. Piston ring (plain rectangular compression ring)
2	2. Piston ring (taper faced piston ring)
3	3. Piston ring (oil scraper ring with spiral expander)

Check



- Install all piston rings (1) consecutively as shown in the piston ring groove. Measure the side clearance with a feeler gauge (2).

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desired state

- The side clearance of the piston rings is within the tolerance.

Side clearance of piston rings

Clean all components before measuring the side clearance.	
Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

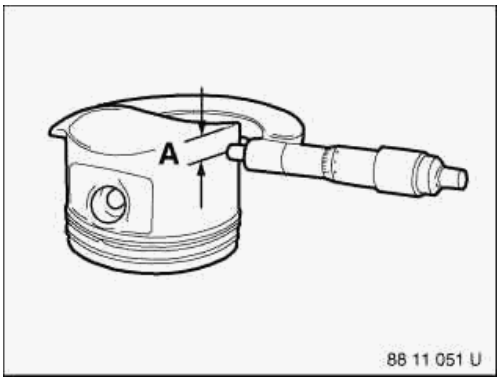
Result

» The side clearance of the piston rings is outside of the tolerance.

Measure

- Renew the piston ring.

37 – Measure the piston diameter



Check

- Position the measuring bolt in the area (A) and measure the piston installation clearance 90 ° transversely to the gudgeon pin.

Piston diameter

Measure the piston diameter at distance (A) from the lower end of the piston skirt.	
Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Result

» The piston does not correspond to the specifications.

Measure

- Renew the piston.

38 – Measure the cylinder bores

Prerequisite

Cylinder barrel is cleaned.

Check

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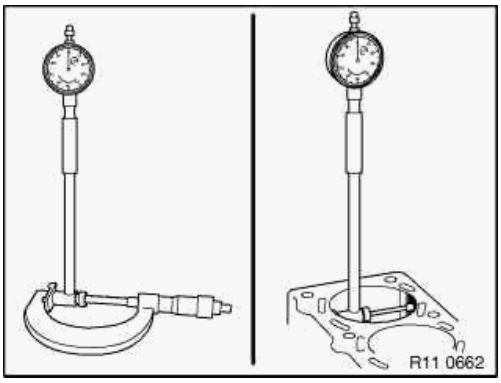


- Adjusting measuring screw to nominal dimension of cylinder bore.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

- Insert internal measuring device into measuring screw and set to zero.
- With the internal measuring device, measure the cylinder at the following points. Check the deviations from the nominal dimension.
  - Lower third of the cylinder bore in direction of travel,
  - Lower third of the cylinder bore transversely to direction of travel,
  - Middle third of the cylinder bore in direction of travel,
  - Middle third of the cylinder bore transversely to direction of travel,
  - Upper third of the cylinder bore in direction of travel,
  - Upper third of the cylinder bore transversely to direction of travel.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Result

» Cylinder does not correspond to the specifications.

Measure

- Replace motor.

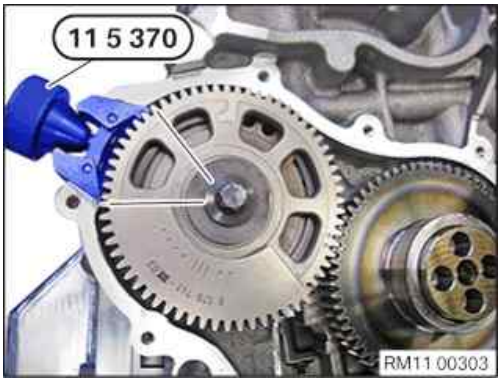
  Parts: Engine

39 – Remove counterbalance shaft

- Fasten counterbalance shaft with special tool in the TDC position of cylinder no. 1.
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



- Ensure that the gear of the counterbalance shaft is pretensioned and blocked before removal.
- Install the special tool **0 495 131 (11 5 370)** as shown and pre-load the gear.

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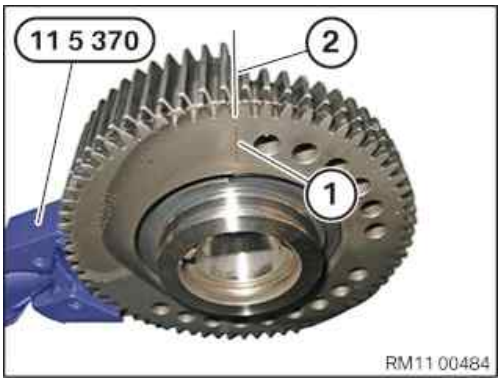
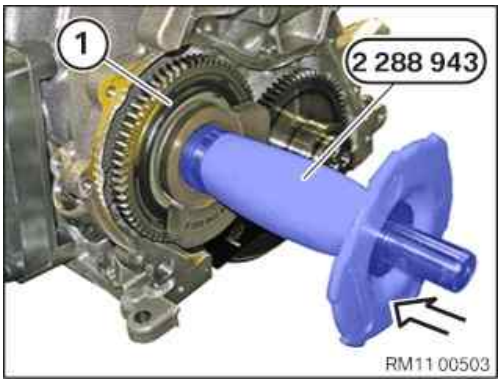


- Block gear wheels (1) and (2) until re-installation with the special tool **0 495 131 (11 5 370)**.

- Check whether the marks on the counterbalance shaft gear are aligned with the marks on the crankshaft gear.
- Loosen screw (1).

- Loosen screws (1).
- Remove special tool .



- Screw the special tool **2 288 943** far as it will go into the counterbalance shaft.
- Secure counterbalance shaft and gear against falling down!
- By means of targeted hammer blows on the special tool **2 288 943** in the direction of the arrow, loosen the counterbalance shaft from gear (1) .
- Remove special tool **2 288 943**.

- Remove the counterbalance shaft gear in the direction of the arrow.

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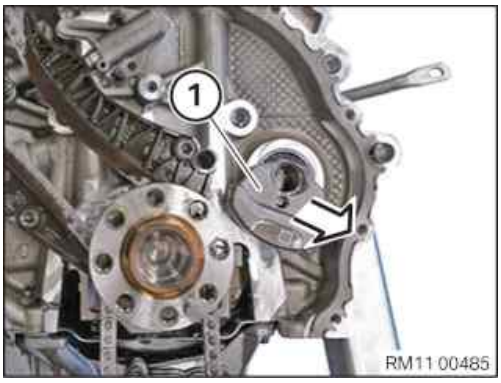
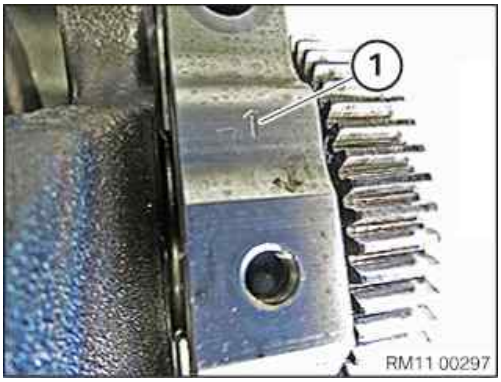


- Remove counterbalance shaft (1) in direction of arrow.

MAIN WORK

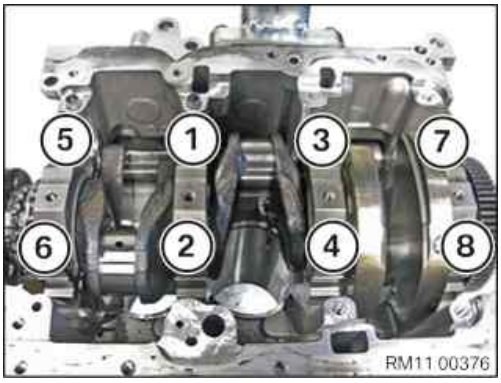
40 – Remove crankshaft



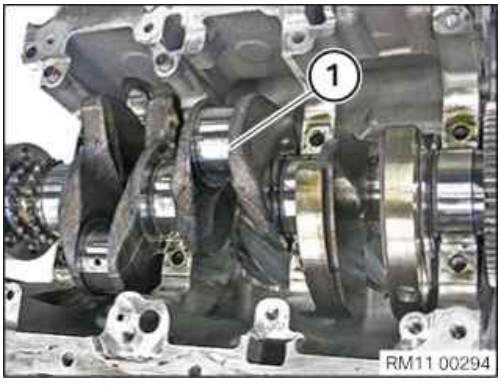
- Observe the marks on the main bearing caps.

  All main bearing caps (1) are numbered according to their installation location (cylinders 1 to 4).

  Main bearing cap number 3 is installed as a thrust bearing.



- Loosen screws in the order (8) to (1).
- Remove all main bearing caps and store them properly.



- Remove the crankshaft (1) with a second person and carefully set it aside.

41 – Determine the classification of the main bearing shells and the guide bearing shells

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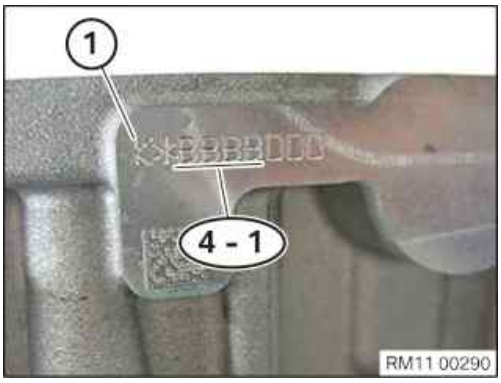

- Position (1) K = clutch side
- Item numbers (4) to (1) describe the bearing seats 7 to 1 (key performance indicator on each of the crankshaft bearing caps).
- Enter the code letter on the crankcase in the table.

- K = Clutch side
- Item numbers (1) to (4) describe the bearing seats 1 to 4 (coefficient on each of the crankshaft bearing caps).
- Enter the identification numbers on the crankshaft in the table.

- Enter the code letters and coefficients of the crankcase and the crankshaft.

	Code letter on the crankcase	**Key performance indicator** on the crankshaft
Bearing seat 1		
Bearing seat 2		
Bearing seat 3		
Bearing seat 4		
Bearing seat 5		
Bearing seat 6		
Bearing seat 7		

- The main bearing shells and guide bearing shells are identified by **colour or by number**.
- Use the table below to determine the colours of the main bearing shells and the guide bearing shells in the **crankcase**:

	1	2	3
A	Blue = 1	Blue = 1	Blue = 1
B	Green = 2	Green = 2	Green = 2
C	Brown = 3	Brown = 3	Brown = 3

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- Use the table below to determine the colours of the main bearing shells and the guide bearing shells in the **crankshaft bearing caps**:

	1	2	3
A	Blue = 1	Green = 2	Brown = 3
B	Blue = 1	Green = 2	Brown = 3
C	Blue = 1	Green = 2	Brown = 3

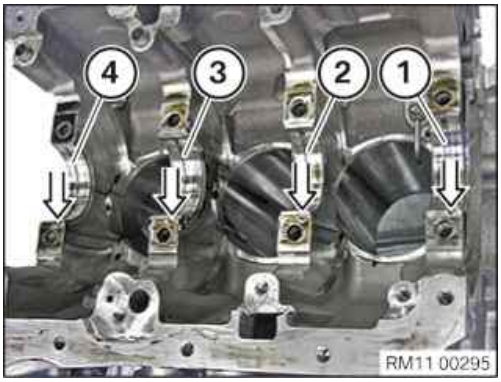
42 – Renewing main bearing shells and guide bearing shells

RISK OF DAMAGE

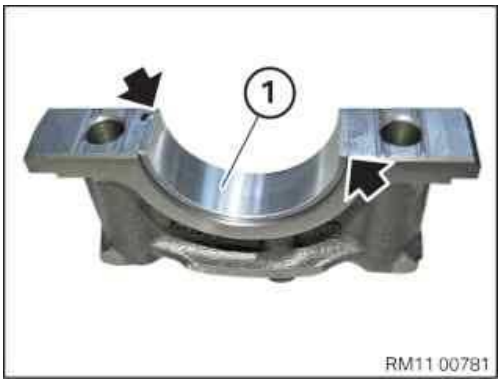
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

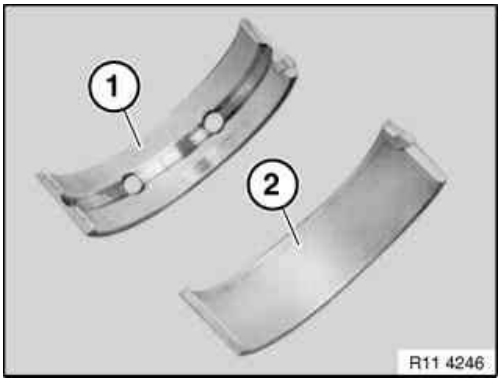
- Always install all bearing shells and bearing supports in the same position from which they were removed.



- Guide the main bearing shells with the lubricating groove (1) and (2) and also (4) out of the crankcase and remove them.
- Feed out and remove the guide bearing shell (3) (with lubricating groove) from the crankcase.



- Feed out and remove the main bearing shells (1) from the crankshaft bearing caps (1), (2) and (4).
- Feed out and remove the guide bearing shell (1) from the crankshaft bearing cap (3).



- Replace main bearing shells with lubricating groove (1) and the main bearing shells (2).

  Parts: Main bearing shells

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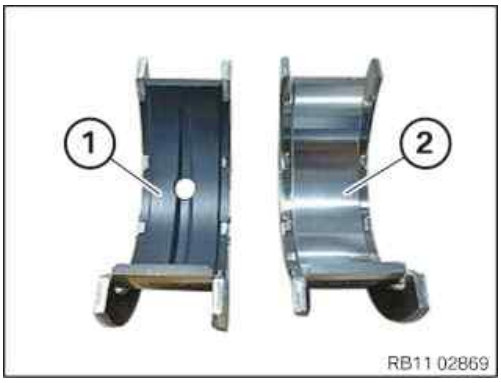


- Replace guide bearing shells with lubricating groove (1) and guide bearing shells (2).

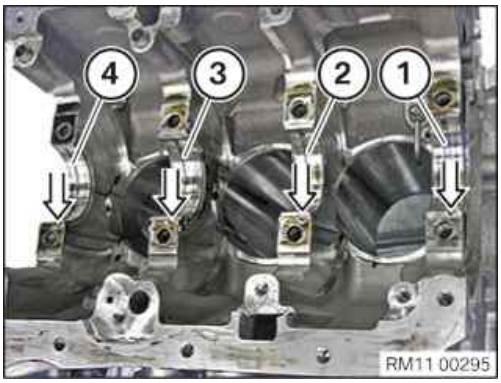
  Parts: Guide bearing shells

- Make sure the guide bearing shells and main bearing shells with lubricating groove (1) are correctly positioned in the crankcase.

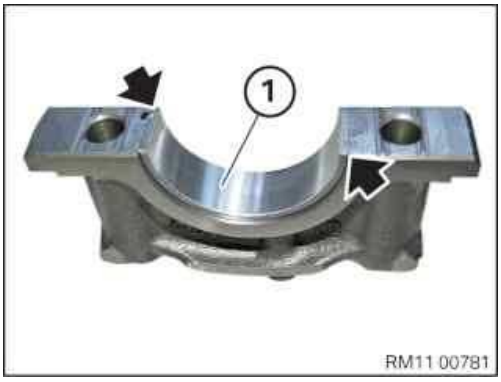
  All guide bearing shells and main bearing shell with lubricating groove (1) in the crankcase are protected against incorrect assembly (mark).

- Make sure the guide bearing shells and main bearing shells (1) are correctly positioned in the crankshaft bearing cap.

  All guide bearing shells and the main bearing shells (1) in the crankshaft bearing caps have protection against incorrect assembly (mark).



- Guide the main bearing shell with the lubricating groove (1) and (2) and (4) into the crankcase and install it.
- Oil the main bearing shell with the lubricating groove (1) and (2) and (4) .
- Insert and install the guide bearing shell (3) (with lubricating groove) in the crankcase.
- Oil guide bearing shell with lubricating groove (3).



- Guide the main bearing shells (1) into the crankshaft bearing caps (1) and (2) and (4) and install them.
- Oil the main bearing shells (1) and (2) and (4) .
- Insert and install the guide bearing shell (3) in the crankshaft bearing cap.
- Oil the guide bearing shell (3).

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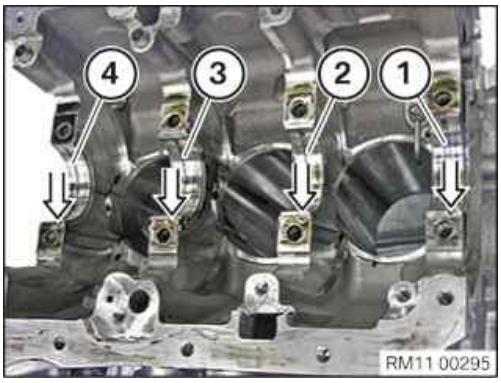
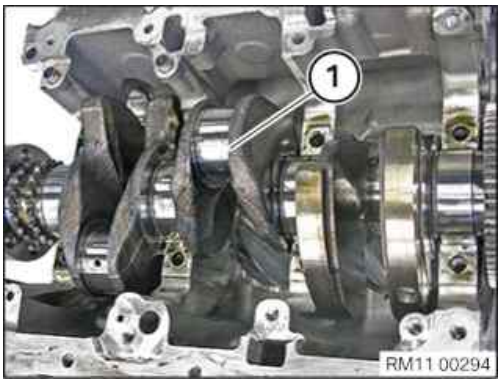


- Ensure correct installation of the main bearing shells 1 to 4 with the guide lug (arrows).



CAUTION

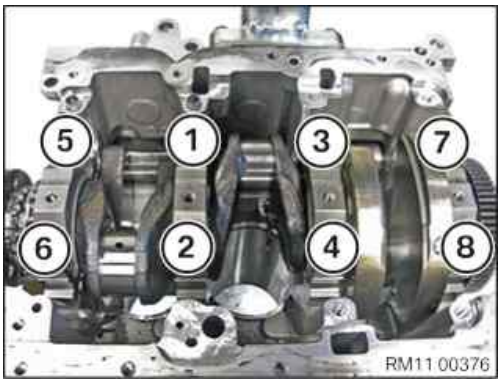
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Install the crankshaft (1).

  Parts: Crankshaft



- Observe the assignment and numbering 1 to 4 of the main bearing caps.

  Assign the main bearing caps according to the order of the cylinders.
- Do not install the main bearing cap in an incorrect position.
- Do not install the main bearing cap in a position twisted by 180 degrees!

  Main bearing caps are coded to prevent incorrect assembly.
- Align main bearing caps exactly.
- Replace main bearing bolts.

  Parts: Bolts
- Tighten the main bearing bolts in the sequence (1) to (8).

Main bearing cap to crankcase

M10x85	Replace screws.	1. tightening torque	25 Nm
		2. tightening torque	50 Nm
		3. Angle of rotation	60 °
		4. Angle of rotation	60 °

POSTPROCESSES

44 – Check the coefficient of friction for the crankshaft

Check

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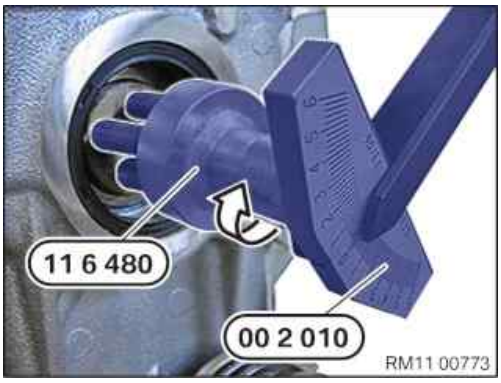


- Turn the crankshaft clockwise with the special tool **0 490 130 (00 2 010)** and compare the reading on the scale to the maximum permitted torque.

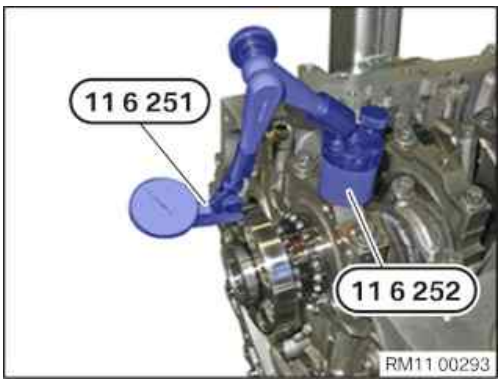
Result

» The maximum permitted torque is exceeded.

Measure

- Correct the radial clearance.

45 – Checking the crankshaft side clearance



Check

- Attach the dial gauge **0 493 144 (11 6 251)** with the tripod **0 493 145 (11 6 252)** to the engine.

Axial play of crankshaft

	min. 0,053 mm
	max. 0,204 mm

Result

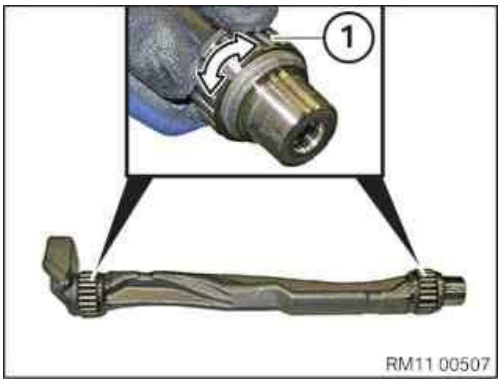
» The side clearance has been exceeded.

Measure

- Renew worn components.

46 – Install counterbalance shaft

- If a new gear is installed, the ring gear must remain blocked until installation using the factory-mounted fixation (1) .



- Check both needle bearings (1) of counterbalance shaft for damage.
- Pull off damaged needle bearing (1) from the counterbalance shaft and renew it.

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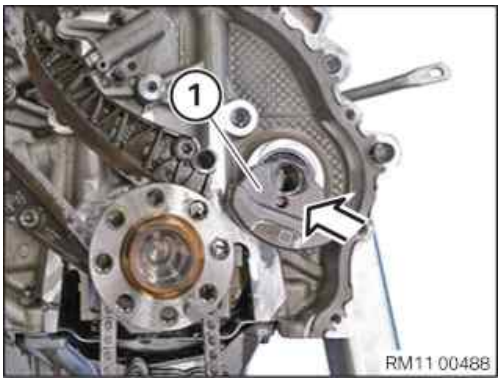
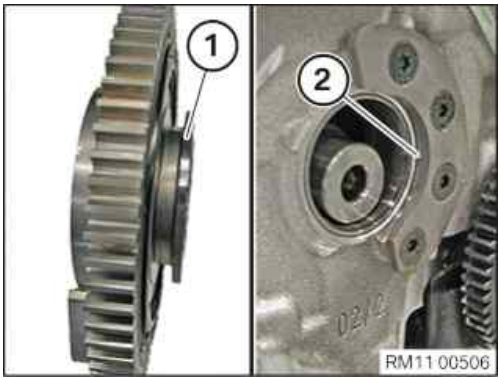


- Install counterbalance shaft (1) in direction of arrow into crankcase.

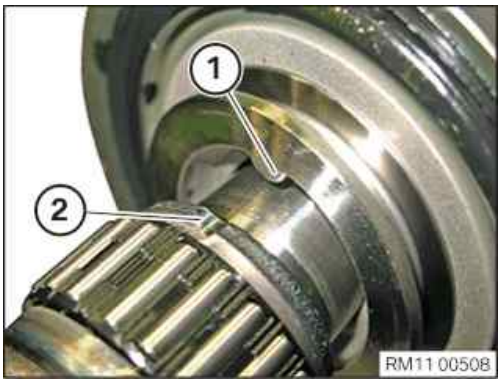
- Fix the counterbalance shaft in the TDC setting of the first cylinder using the special tool .
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



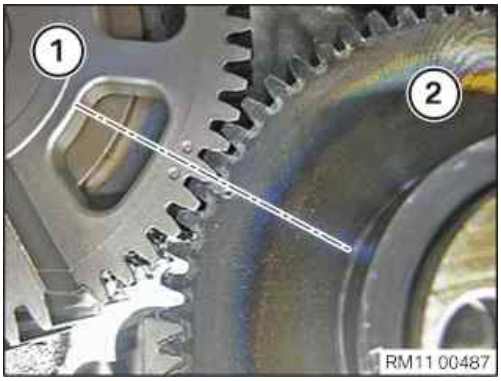
- On installation, make sure that ring (1) of gear is guided in crankcase (2).



NOTICE

For a better overview the removed condition is shown here.

- On installation of counterbalance shaft in gear, make sure that lug (1) on gear is inserted into groove (2) of counterbalance shaft.



- Bring gear (1) of counterbalance shaft into contact in correct installation position (mark) relative to crankshaft (2).

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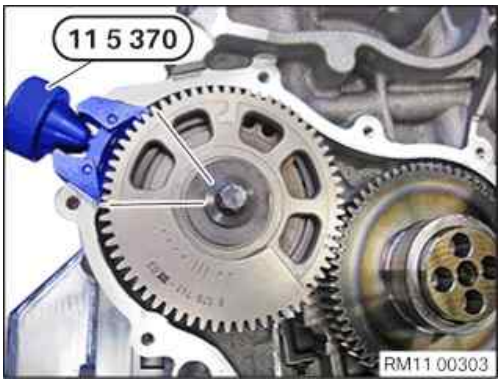
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Gear to counterbalance shaft

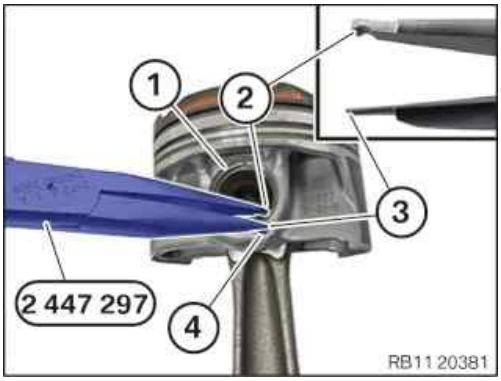
	Renew screw.	Tightening torque	20 Nm
		Angle of rotation	60 °



- Remove special tool **0 495 131 (11 5 370)**.

- Loosen screws (1).
- Remove special tool .

47 – If necessary: Renew the piston



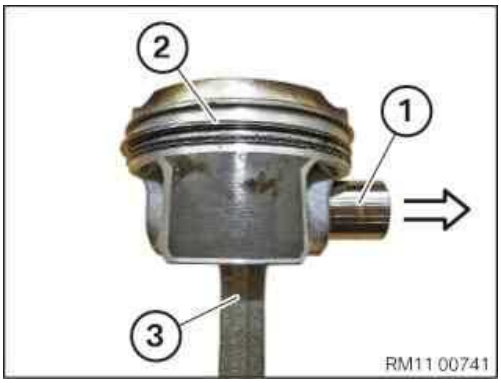
CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

- Use special tool to remove the gudgeon pin circlip.
- Insert the flat side (3) of special tool into the groove (4).
- Grab and remove the gudgeon pin circlip (1) with the arched side (2).



TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Remove the gudgeon pin (1) in the direction of arrow.
- Remove piston (2) from connecting rod (3).

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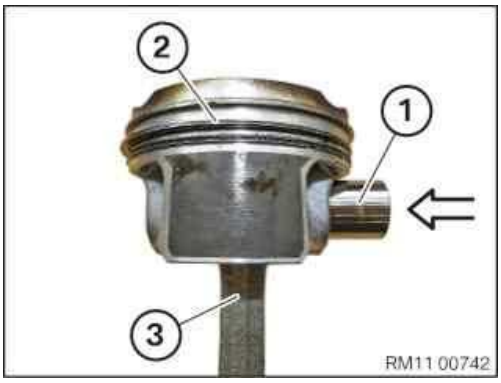


- Renew piston with gudgeon pin.

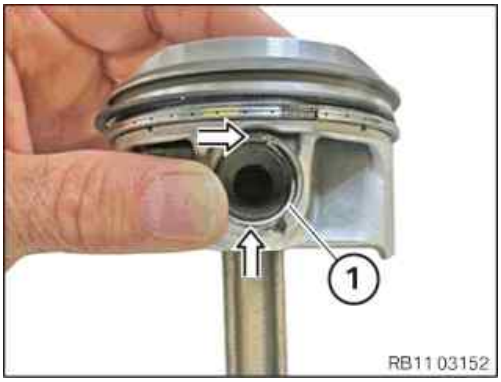
  Parts: Pistons

TECHNICAL INFORMATION

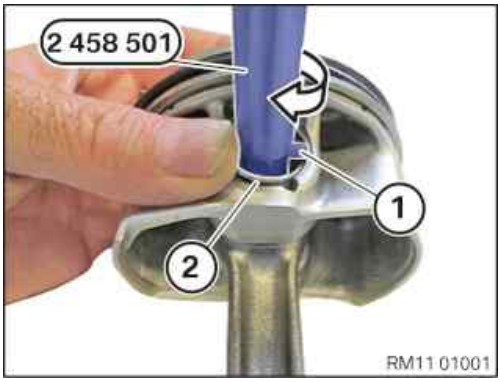
Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Position piston (2) on the connecting rod (3).
- Install the gudgeon pin (1) in the direction of arrow.
- You must be able to install the gudgeon pin (1) without major effort.
- Gudgeon pin (1) must be free of play in piston and connecting rod.

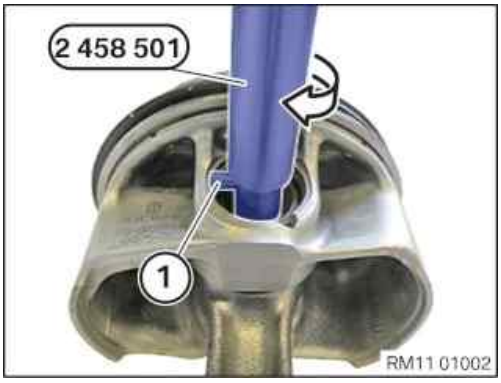
- Prepare special tool on the fitting aid .



- Insert the gudgeon pin circlip (1) into the groove on the piston (see arrows).



- Screw in the positioned gudgeon pin circlip (2)with and with the guide pin (1) in the direction of the arrow.



- Screw the gudgeon pin circlip with guide pin (1) into the groove of the piston in the direction of the arrow.

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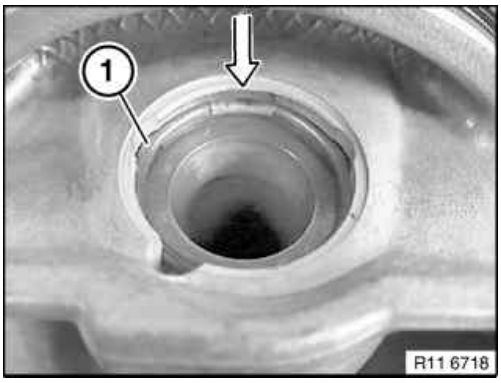


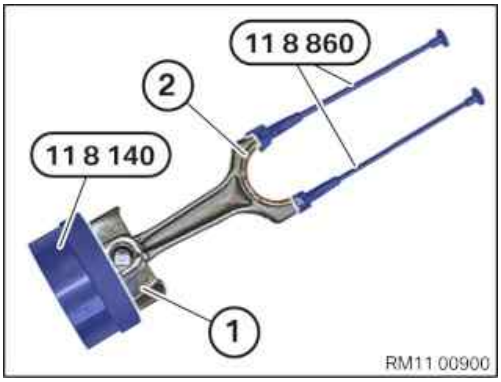
- Gudgeon pin circlip (1) must be fitted correctly in the groove (arrow).

48 – Installing piston with connecting rod

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Coat the pistons (1) and piston rings lightly with oil.
- Mount the special tool **0 493 582 (11 8 140)** on the piston (1).
- Screw the special tool **0 496 144 (11 8 860)** in on the large connecting rod eye (2).

- Insert the piston with the special tool **0 493 582 (11 8 140)** with the arrow pointing to cylinder 1.

RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.
- Install the piston in the crankcase.
- Remove special tool **0 496 144 (11 8 860)** from large connecting rod eye.

49 – Install the connecting rod bearing cap

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RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

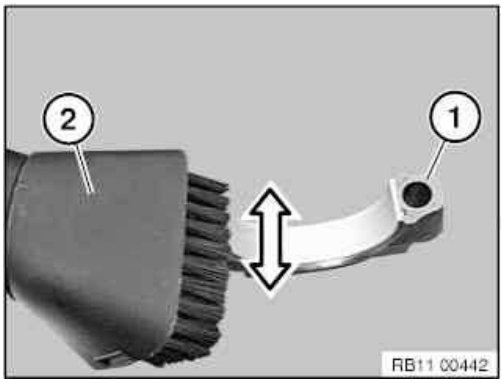
Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

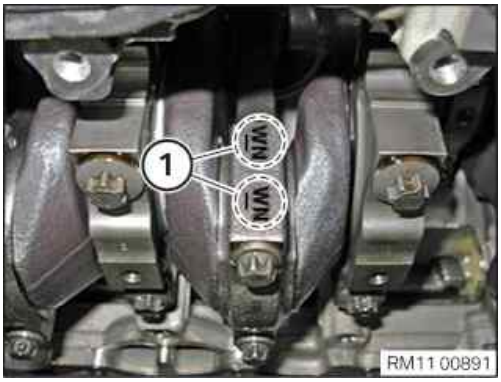
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



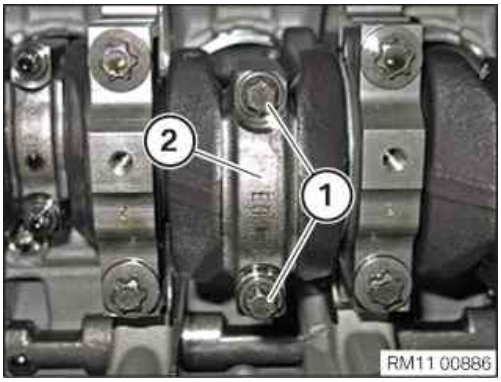
- Attach the connecting rod bearing caps to the connecting rod until the designations (1) match.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Make sure that the connecting rod bearing is attached to the same connecting rod that it was detached from.



- Position the connecting rod bearing cap (2).
- Tighten the bolts (1) with the special tool **0 490 504 (00 9 120)**.

Connecting rod bearing cap to connecting rod

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

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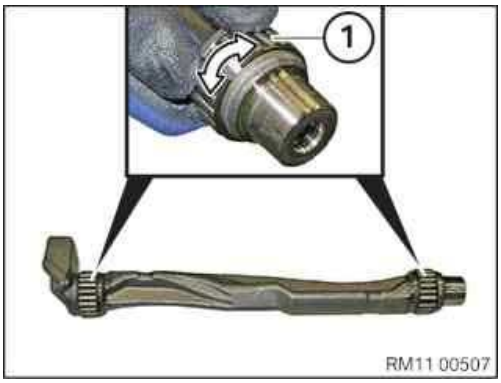
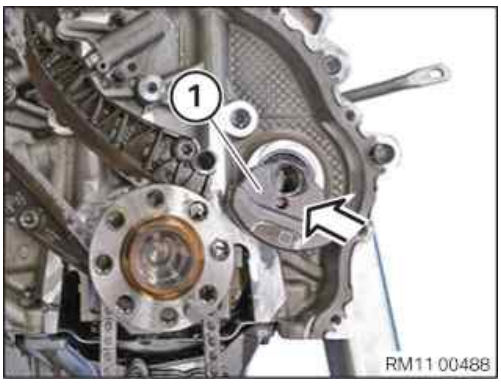
- If a new gear is installed, the ring gear must remain blocked until installation using the factory-mounted fixation (1) .



- Check both needle bearings (1) of counterbalance shaft for damage.
- Pull off damaged needle bearing (1) from the counterbalance shaft and renew it.

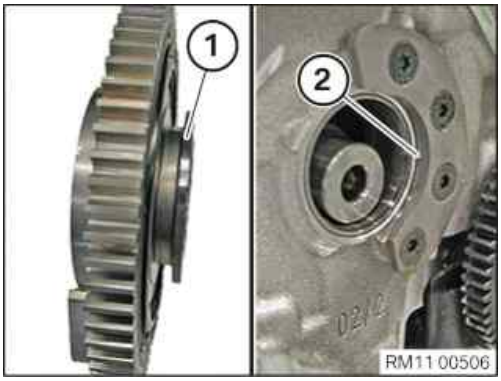


- Install counterbalance shaft (1) in direction of arrow into crankcase.

- Fix the counterbalance shaft in the TDC setting of the first cylinder using the special tool .
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



- On installation, make sure that ring (1) of gear is guided in crankcase (2).

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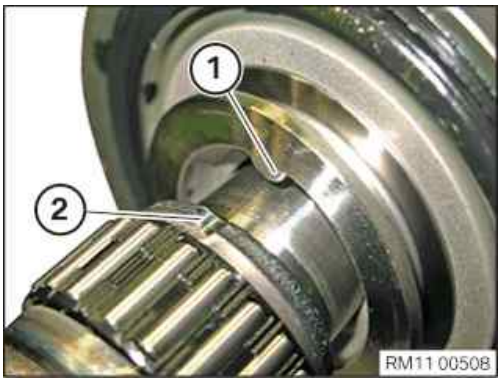
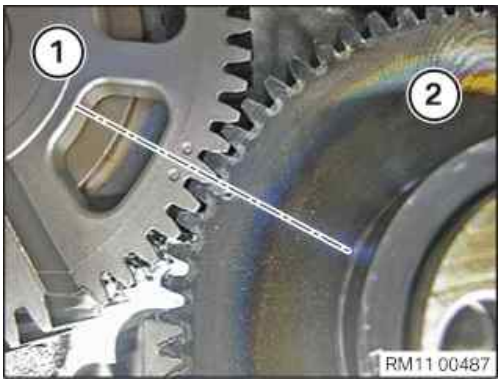


NOTICE

For a better overview the removed condition is shown here.

- On installation of counterbalance shaft in gear, make sure that lug (1) on gear is inserted into groove (2) of counterbalance shaft.



- Bring gear (1) of counterbalance shaft into contact in correct installation position (mark) relative to crankshaft (2).

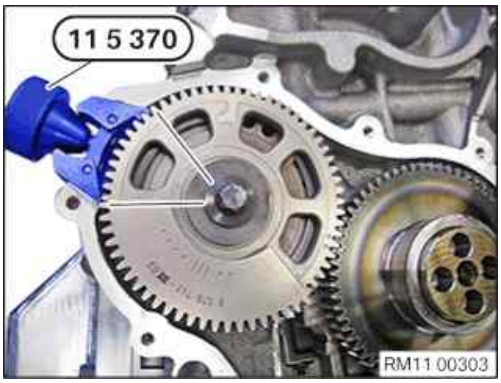
- Renew the screw (1).

  Parts: Screw

- Tighten down screw (1).

Gear to counterbalance shaft

	Renew screw.	Tightening torque	20 Nm
		Angle of rotation	60 °



- Remove special tool **0 495 131 (11 5 370)**.

- Loosen screws (1).
- Remove special tool .

51 – Install both timing chains

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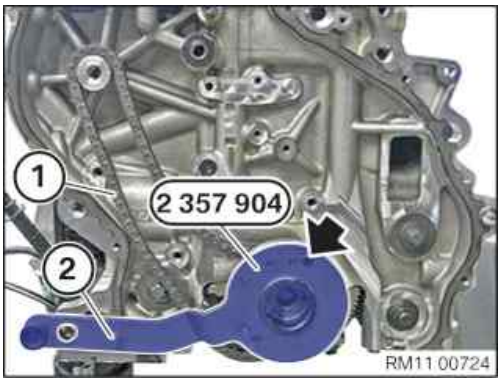
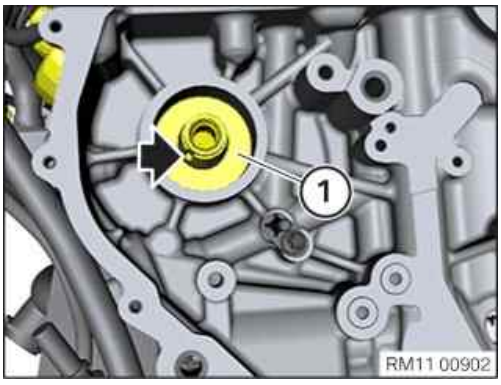


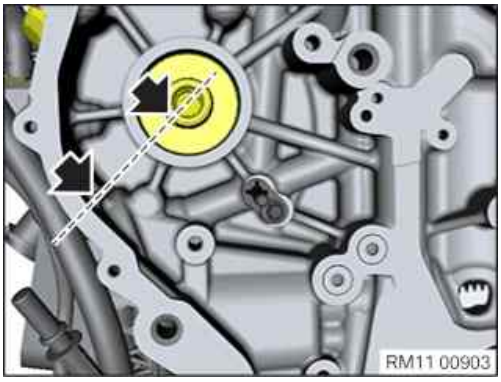
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

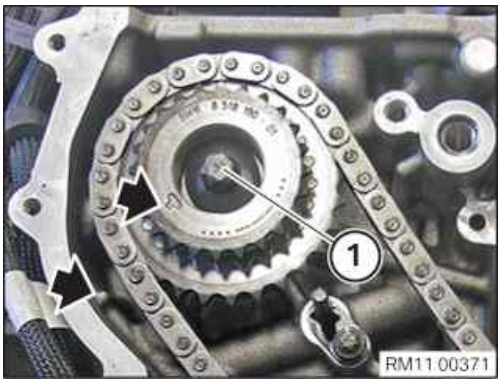
- Position the timing chain (1).
- Secure crankshaft with special tool **2 357 904**.
- Secure special tool **2 357 904** with bolt (2) on crankcase.



- Note spline groove on high pressure pump (1).



- Mark and groove (arrows) on high pressure pump and crankcase must align.



- Position the impeller with timing chain on the high pressure pump.
- Screw in and fasten central bolt (1) of high pressure pump.
- Mark and cast lug (arrows) must align.

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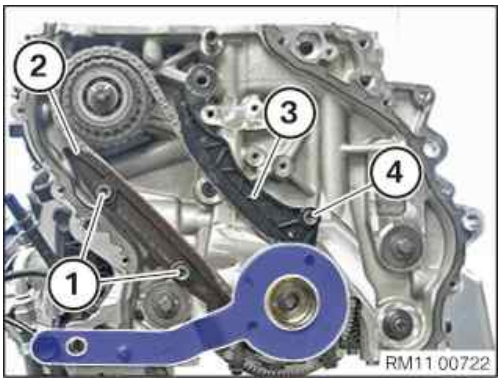


- Position tensioning rail (3).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten the bearing journals (4).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

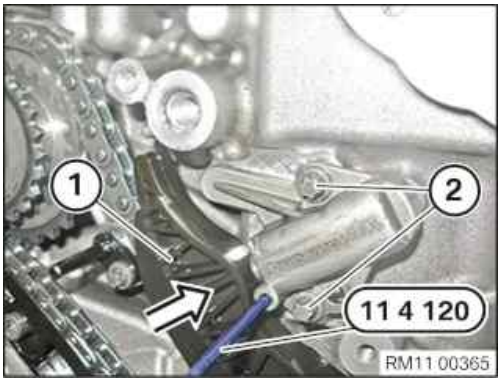
- Position the guide rail (2).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten both bearing journals (1).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

- Clean sealing surfaces (1) with compressed air.

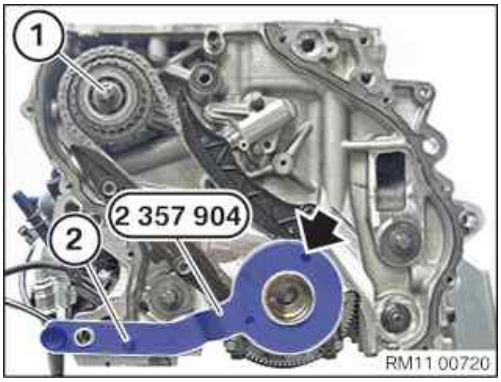


- Position hydraulic chain tensioner.
- Tighten down screws (2).

Chain tensioner to crankcase

M6x22		Tightening torque	10 Nm

- Press chain tensioner in by hand with tensioning rail (1) in direction of arrow until special tool **0 491 012 (11 4 120)** can be removed.



- To fasten central bolt (1) of high pressure pump, crankshaft must remain secured with special tool **2 357 904** and bolt (2).
- Renew central bolt (1).

  Parts: Central bolt
- Tighten central bolt (1).

Camshaft sprocket on high pressure pump

M12		Tightening torque	65 Nm

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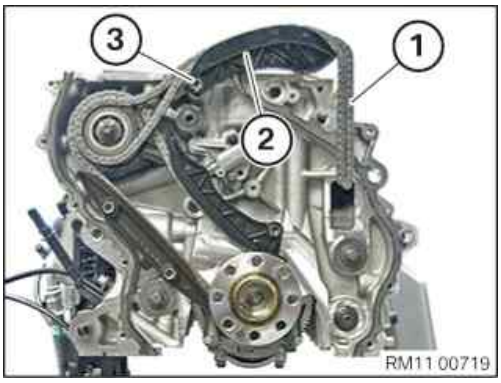
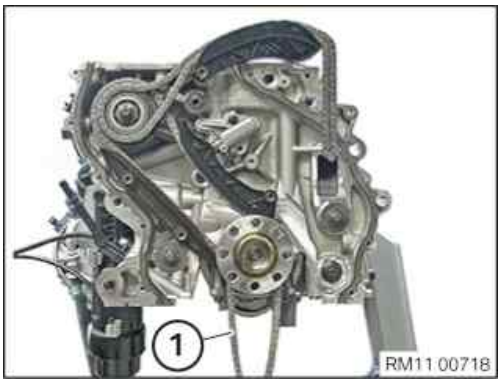
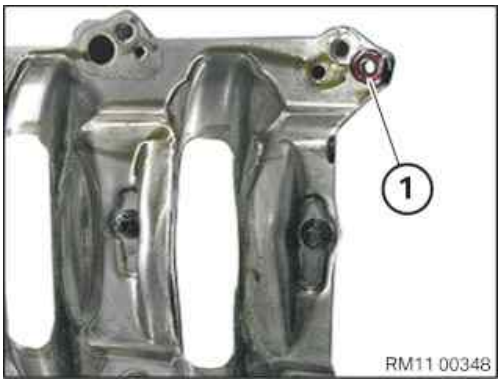


- Position tensioning rail (2) on bearing journal (3).
- Position camshaft timing chain (1).

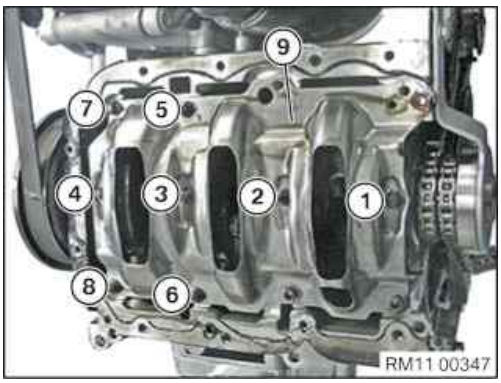


- Mount drive chain (1) for oil pump on crankshaft.

52 – Installing the oil deflector



- Check sealing ring (1) for damage and replace oil deflector if necessary.



- Insert and install the oil deflector (9).
- Renew screws (1) to (4).

  Parts: Bolts
- Hand-tighten the bolts (1) to (4).
-
- Tighten the screws (1) to (8).

Oil deflector to crankshaft bearing cap

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

- Tighten the screws (5) to (8).

Oil deflector to crankcase

M8x14		Tightening torque	19 Nm

53 – Install the oil vacuum pump

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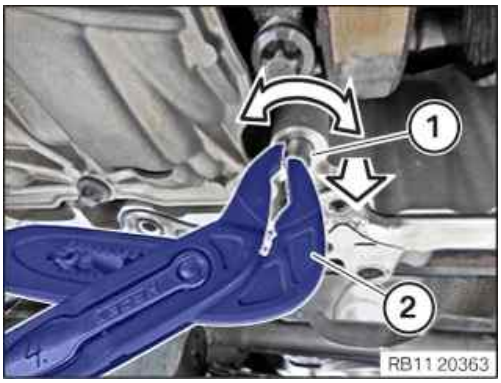
RISK OF DAMAGE

Contaminant or foreign body.

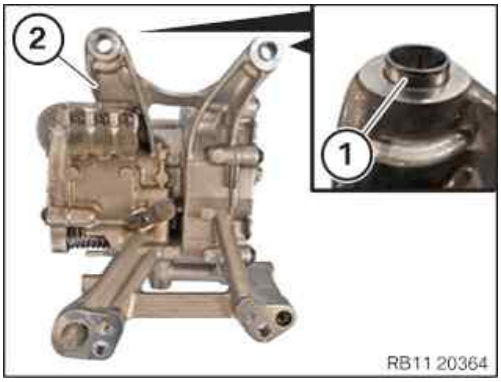
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

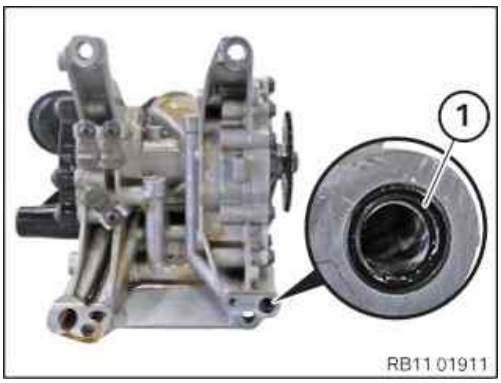


- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

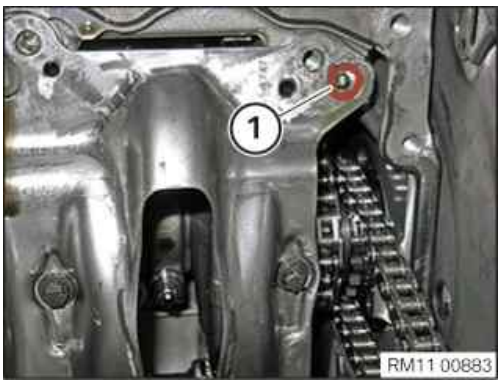
  Parts: Centring sleeves



- Install centering sleeves (1) in the oil vacuum pump (2).



- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector

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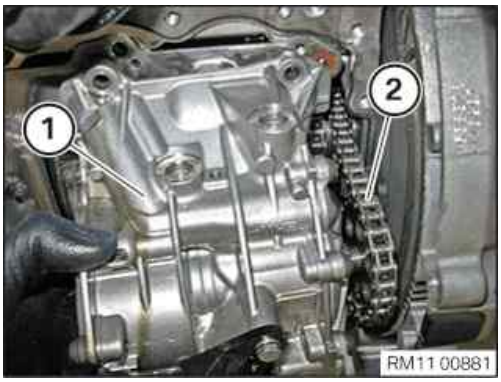


- Insert oil vacuum pump (1) into the drive chain (2).

- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1) of the oil vacuum pump (2).

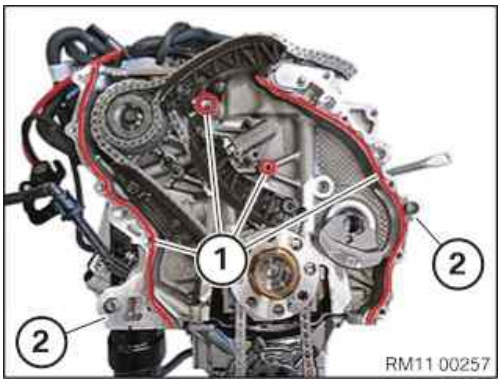
Oil vacuum pump to crankcaseB37

M8x35	*Renew screws.*	Tightening torque	15 Nm
		Angle of rotation	45 °

54 – Install the rear timing case cover

Prerequisite

Transmission is removed.



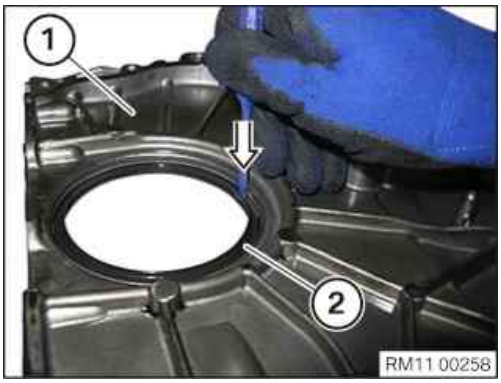
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.

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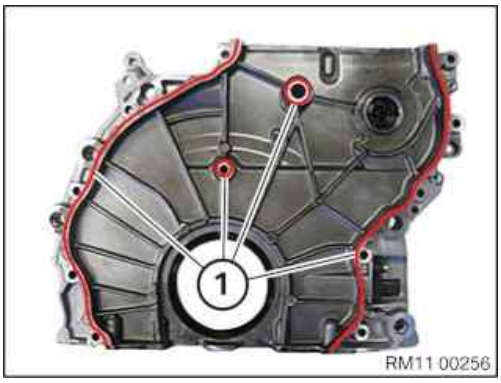
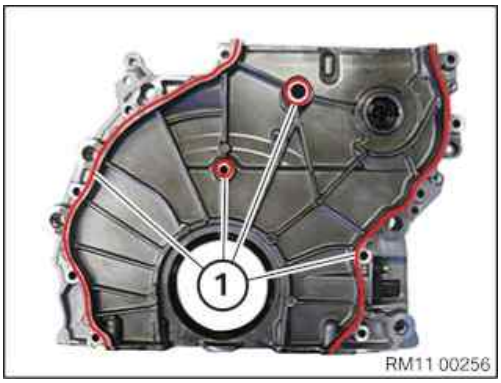


- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

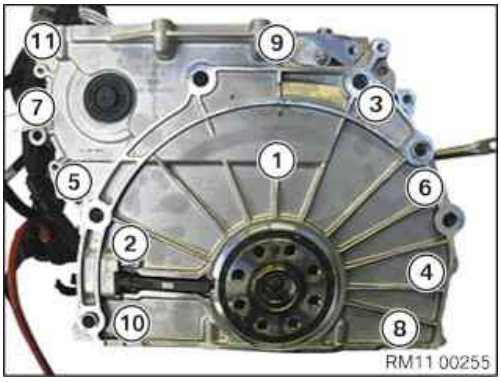


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

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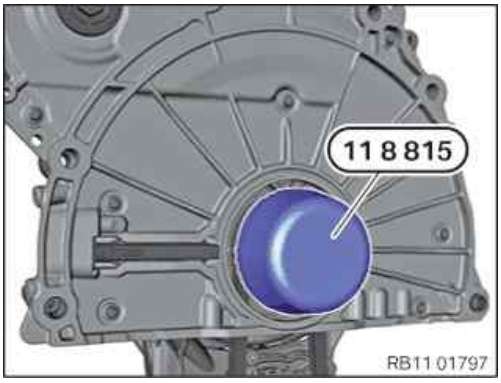
RISK OF DAMAGE

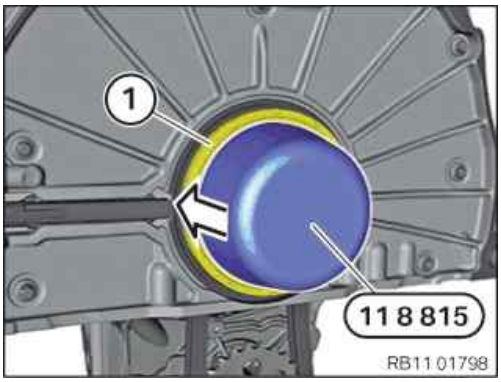
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

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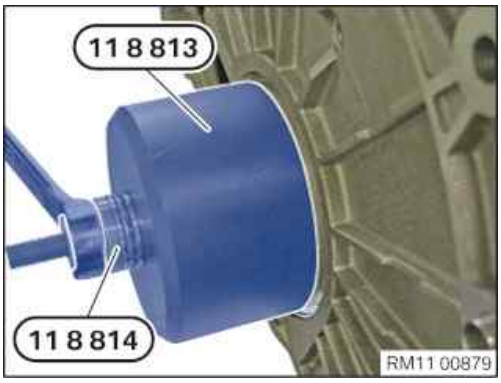
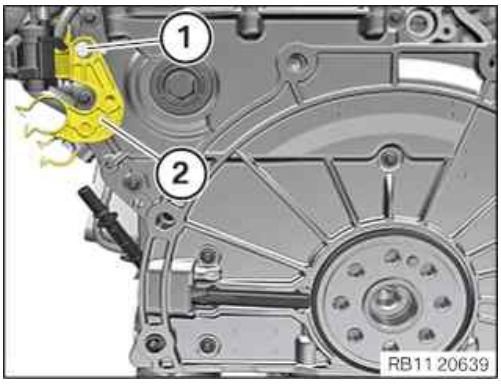
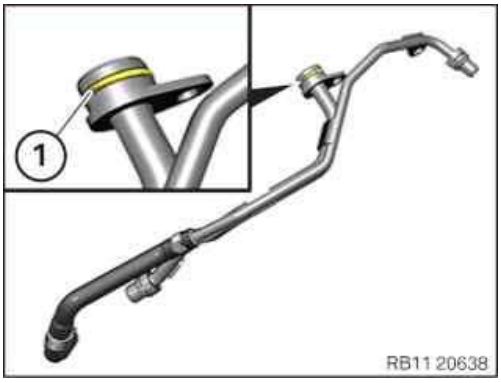


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



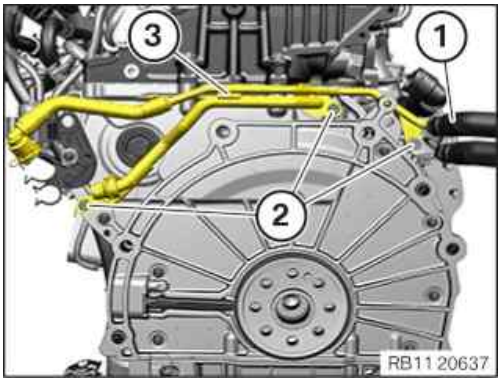
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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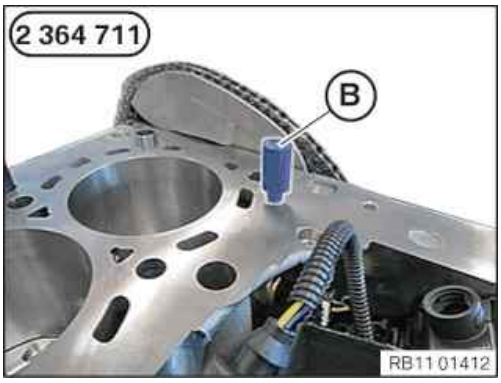


- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

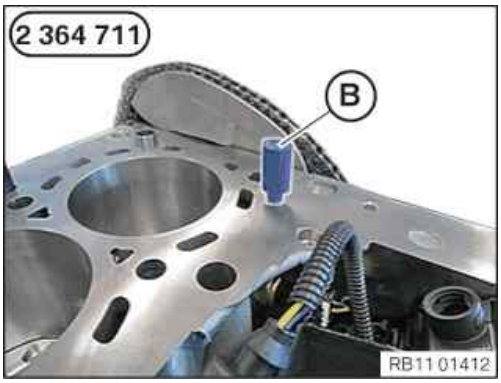
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

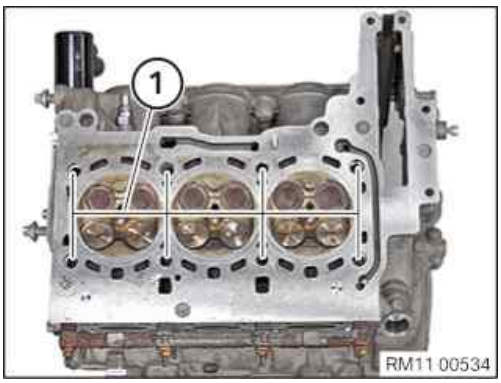
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ Renewing the cylinder head gasket



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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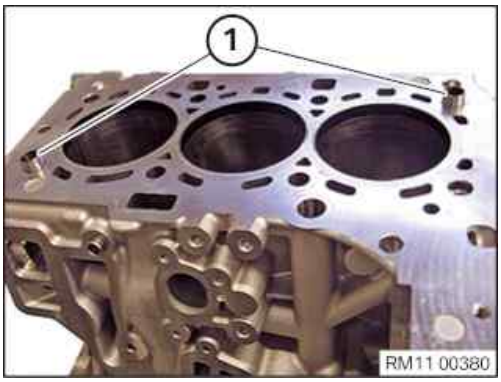
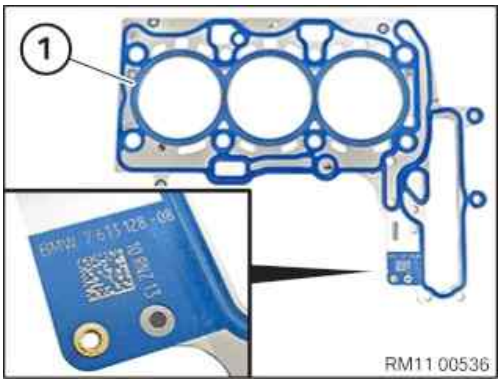
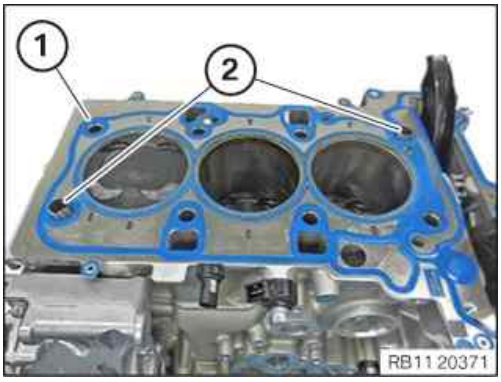


- Check the fitting sleeves (1) for secure fit and damage.

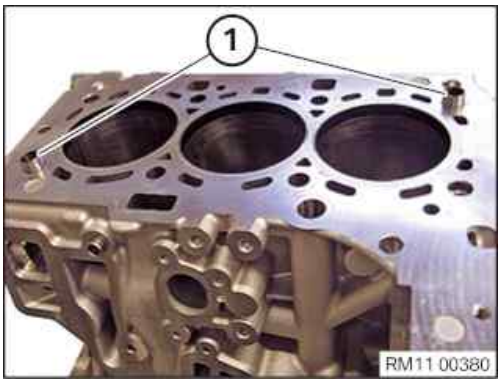


- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.

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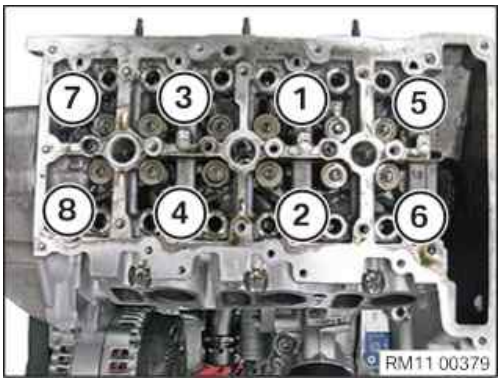


- Fit new cylinder head screws.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

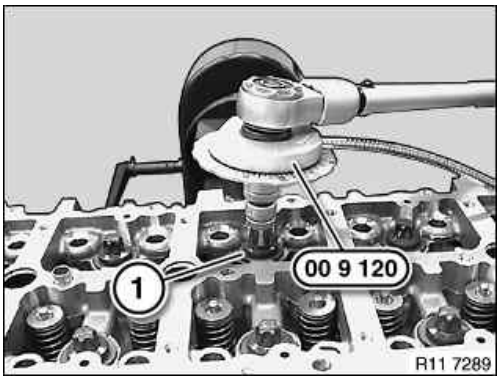
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

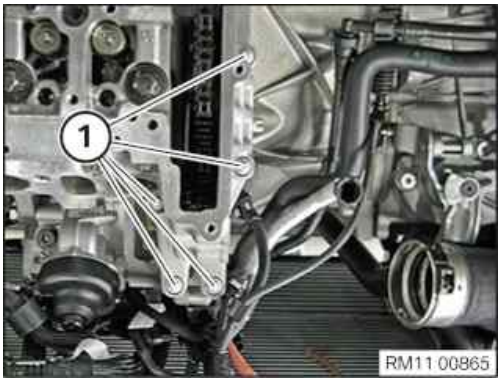
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolts in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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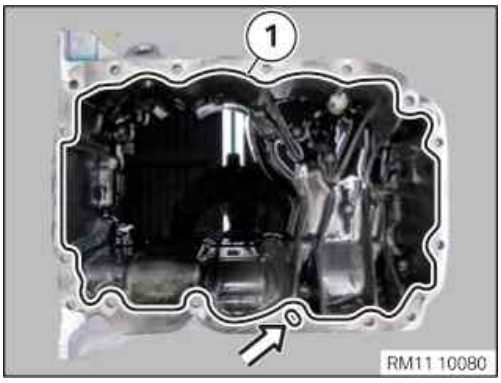


TECHNICAL INFORMATION

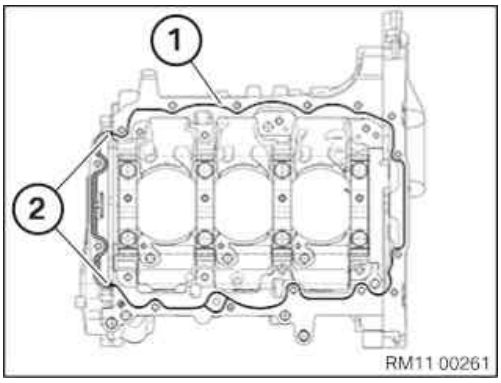
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

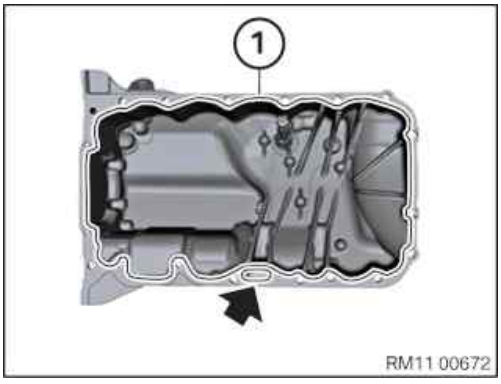
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

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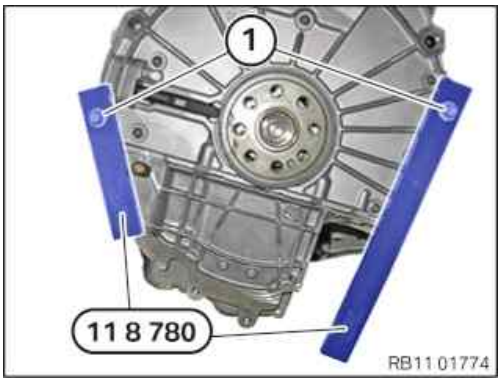
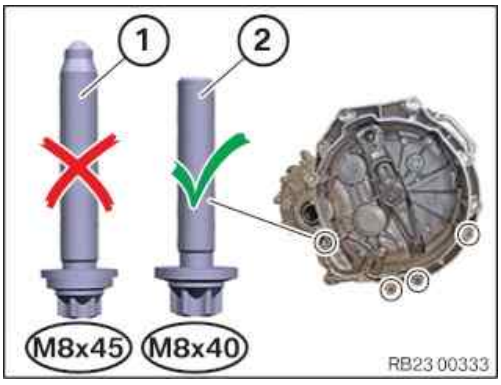


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

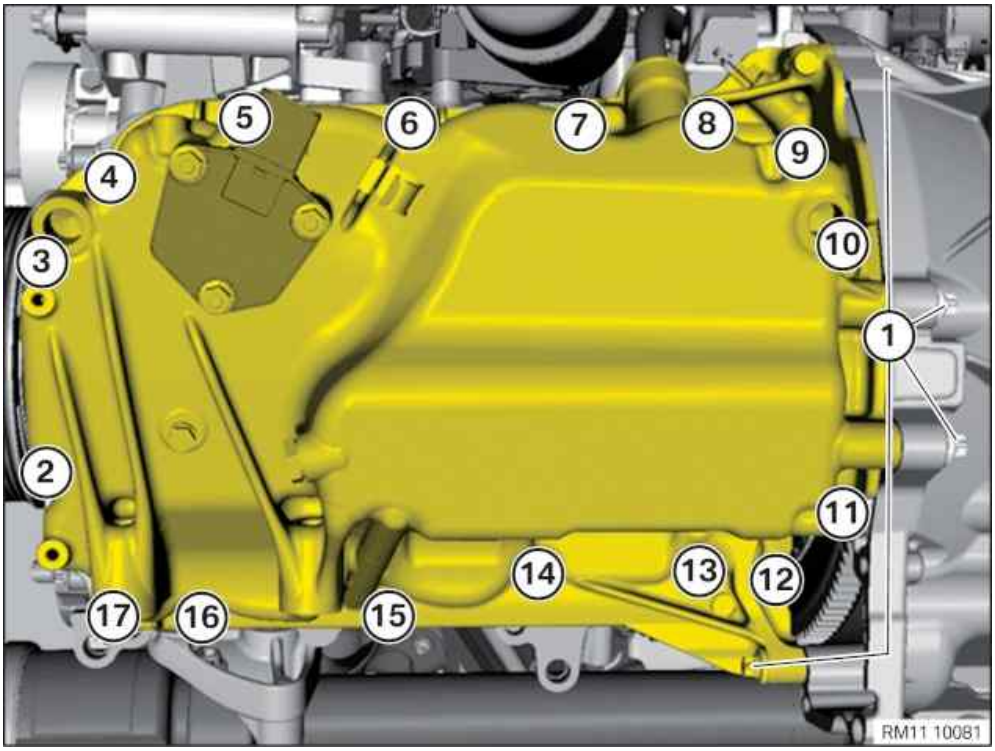
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Hand tighten the screws of oil sump (2) to (17) , but do **not** tighten completely yet.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

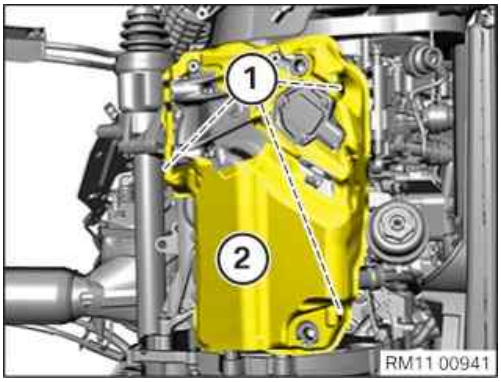
Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

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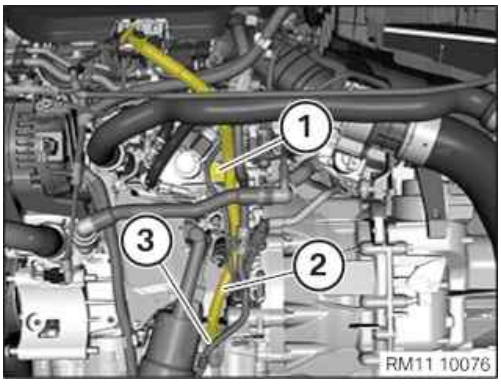
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

55 – Installing the flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all the screw threads (1).

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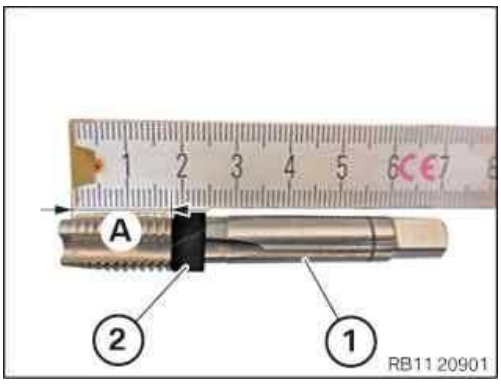
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

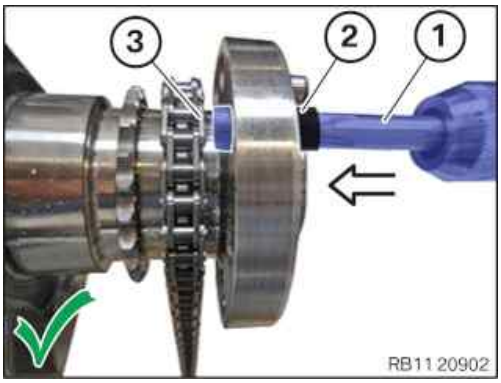
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the depth of insertion (A) on the thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

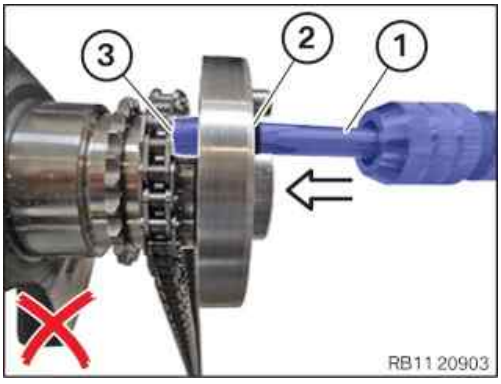
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).



TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the depth of insertion (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).

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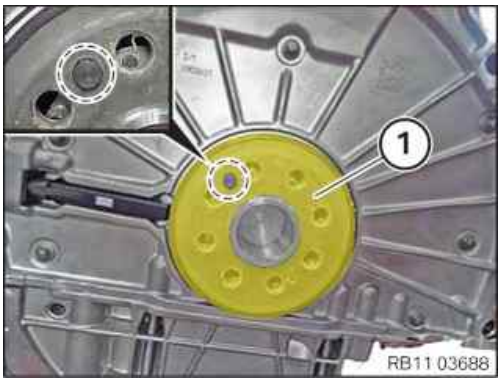
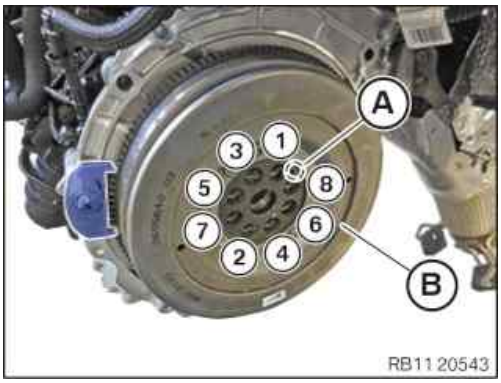


- It is essential to observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

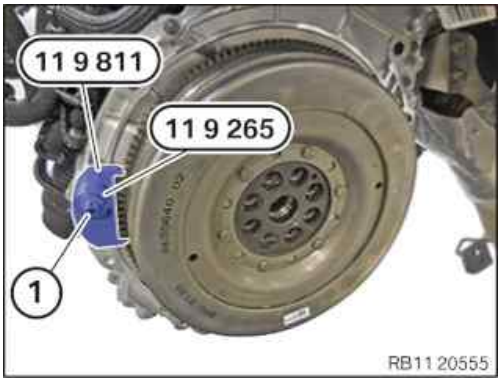


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Thread out special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)** remove.
- Ensure that the washer (5 mm) is removed.

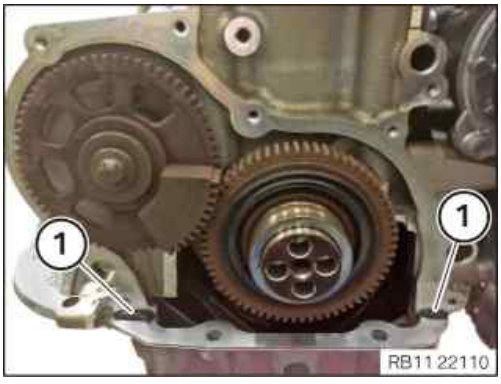
56 – Installing the timing case cover

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply sealing compound (1) approx. **5 mm** as shown.

  The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.

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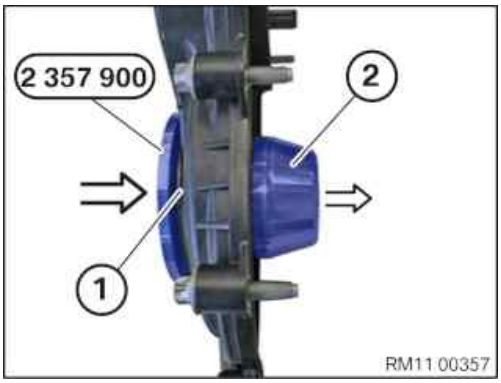
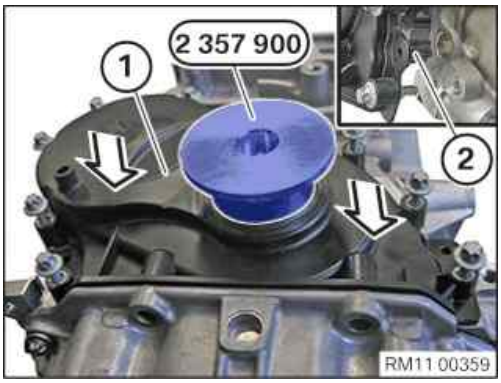
- Assemble special tool **2 357 900** as shown.
- Please note that no greases or lubricants may be used on the special tool **2 357 900**.



- Carefully slide the special tool **2 357 900** in the direction of the arrow through the sealing ring into the timing case cover (1).
- Make sure that the special tool **2 357 900** rests flat against the timing case cover (1).
- Remove the fitting aid (2).

- Connect special tool **2 357 900** to the timing case cover (1) on the hub of the crankshaft (2).



- Feed in and install timing case cover (1) in the direction of the arrow.
- Ensure the guide pins (2) are fitted correctly.
- Tighten screws hand-tight.
- Remove special tool **2 357 900**.

- Make sure that the air guide (1) faces out.

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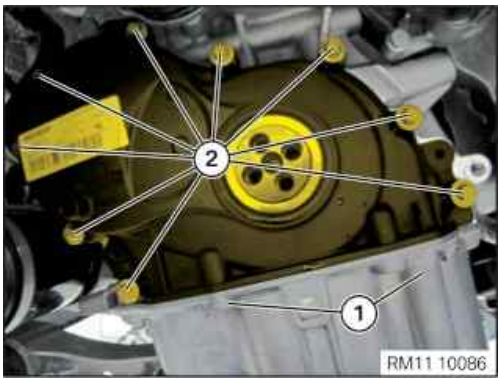


- Hand-tighten the bolts (1).
- Tighten the screws (2) in a crosswise sequence with a tightening torque.

Timing case cover, front, to crankcase

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

- Tighten the screws (1).

Oil sump to crankcase

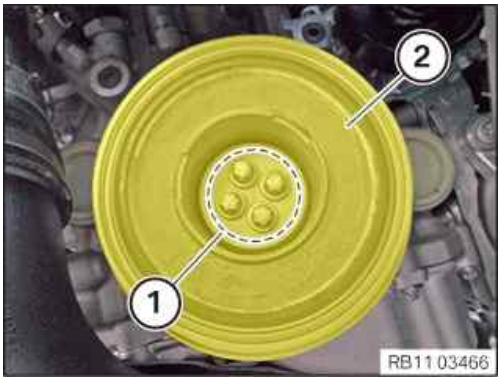
M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

- Tighten the screws (2) in a crosswise sequence with an angle of rotation.

Timing case cover, front, to crankcase

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

57 – Installing the vibration damper

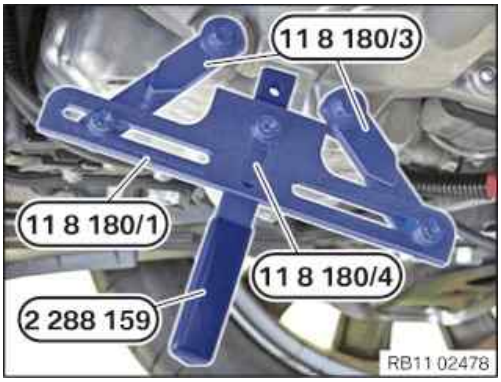


- Position vibration damper (2).
- Renew screws (1).

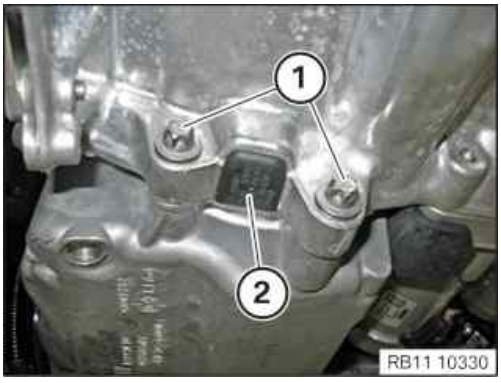
  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

Vibration damper with belt pulley to crankshaft

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.



- Tighten transmission screws (1).

Transmission to oil sump

M8			19 Nm

- Install protective cap (2).

58 – Cleaning the sealing surface

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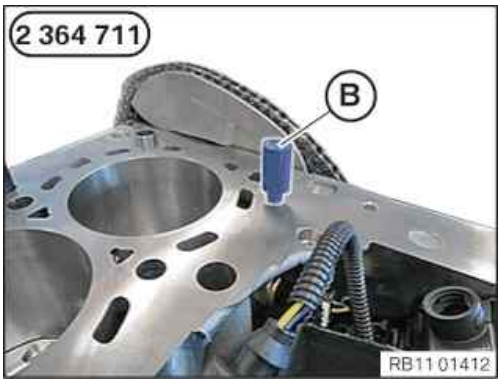
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

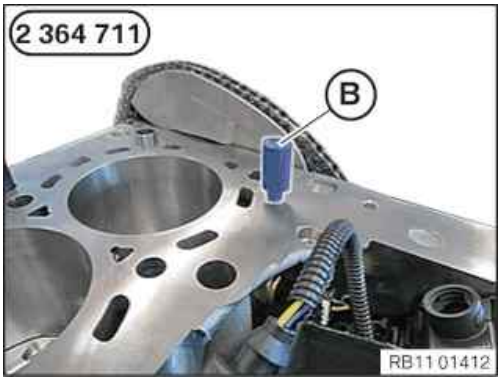
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

59 – Check the flatness of the cylinder head

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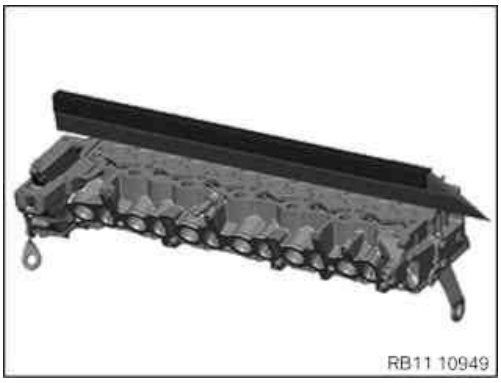
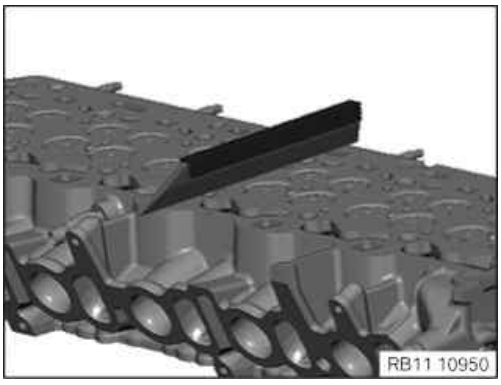


- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm



- Check the flatness of the cylinder head crosswise using a straightedge.

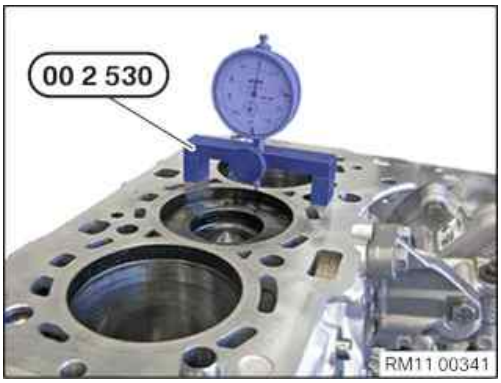
Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

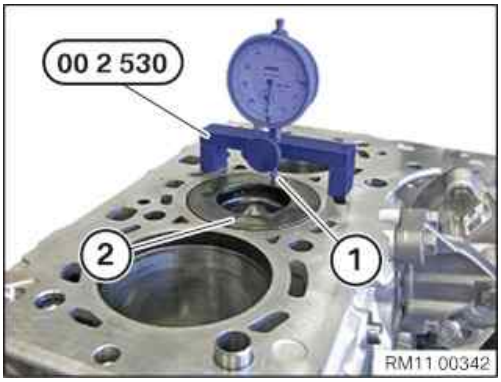
60 – Determining the thickness of the cylinder head gasket

TECHNICAL INFORMATION

The highest piston protrusion on both measuring points of all pistons determines the strength of the cylinder head gasket.



- For measuring the piston protrusion: position special tool **0 490 185 (00 2 530)** including the dial gauge on the cleaned cylinder head lower face.
- Set dial gauge to zero under preload.



- Clean the pistons at the measuring points (1) and (2).
- Place the dial gauge onto the cleaned piston at measuring points (1) and (2).
- Determine highest point by turning crankshaft.
- Measure and record the piston protrusion at measuring points (1) and (2) on all pistons.

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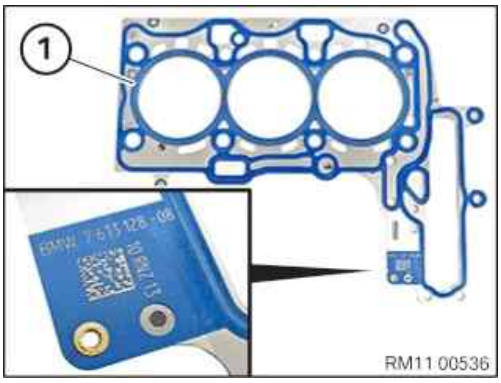


- Renew cylinder head gasket.

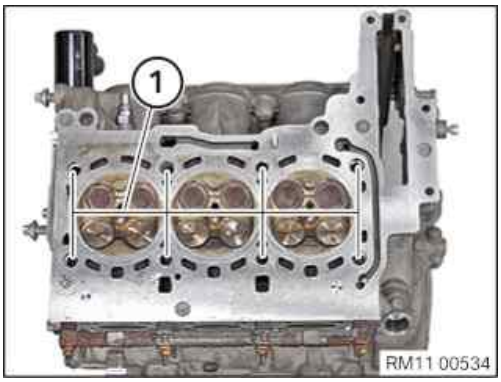
  Parts: Cylinder head gasket

Selecting the cylinder head gasket

A decision is made to determine which cylinder head gasket must be used based on the measuring result of the measurement of the piston protrusion.

Cylinder head gasket with number of holes 1	0 mm ... 0,92 mm
Cylinder head gasket with number of holes 2	0,93 mm ... 1,03 mm
Cylinder head gasket with number of holes 3	1,04 mm ... 1,18 mm

61 – Renewing the cylinder head gasket



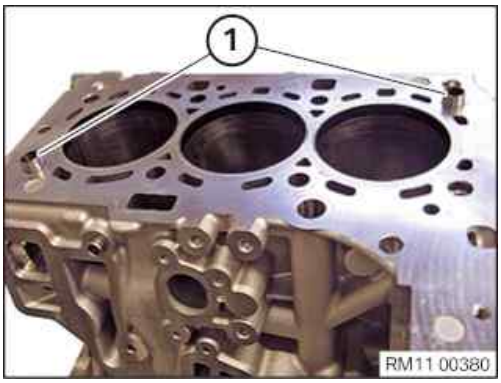
RISK OF DAMAGE

Damage to the surface.

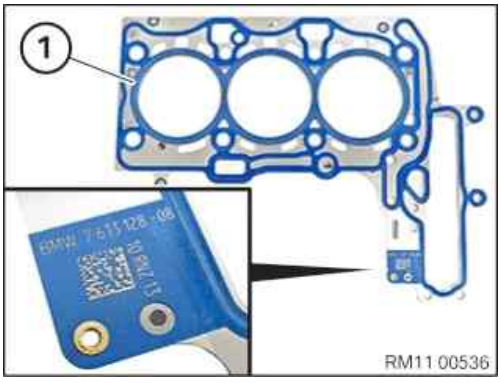
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

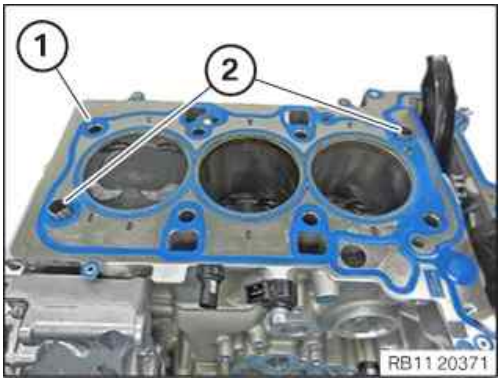
- Remove oil and dirt residue from the blind holes (1).



- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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62 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

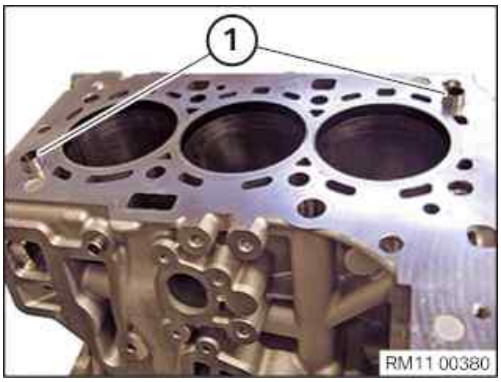
Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

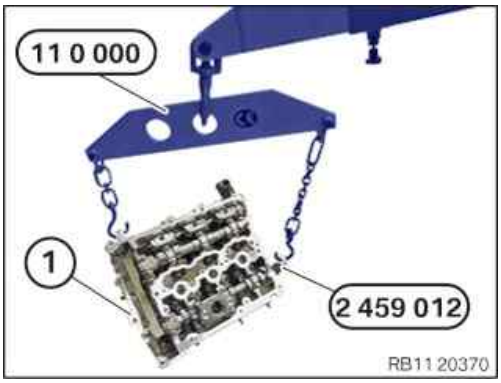
Do not remove bolt coating.



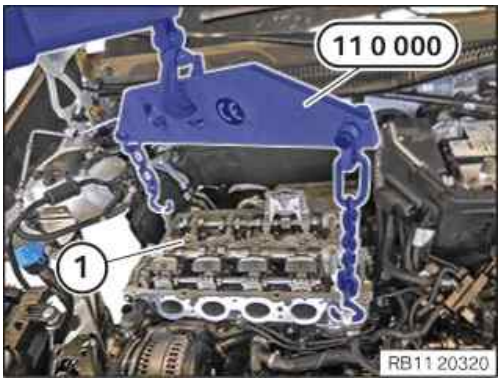
- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.

- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.

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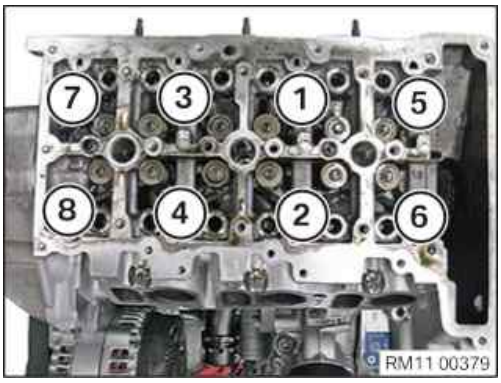


- Fit new cylinder head bolts.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

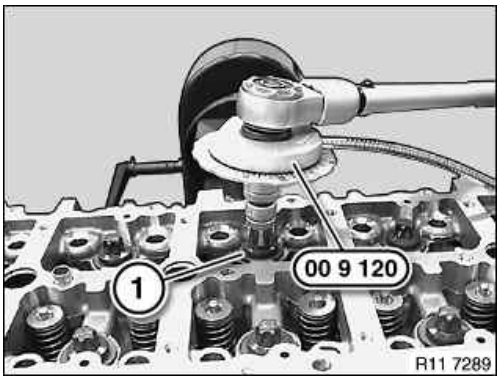
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

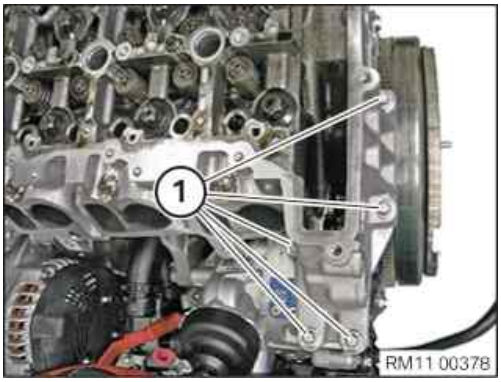
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

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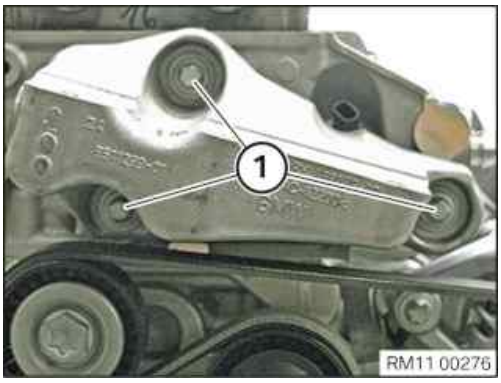
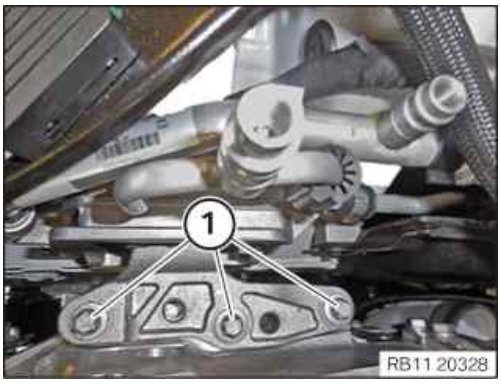


- Tighten the screws (1).

Engine support to cylinder head

M10X45		Tightening torque	41 Nm



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

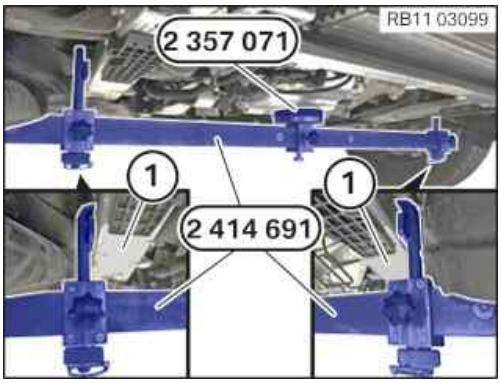
Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

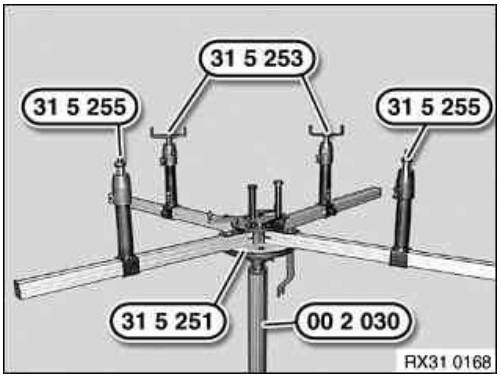
- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Disassemble special tool **2 414 691** using special tool **2 357 071**.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

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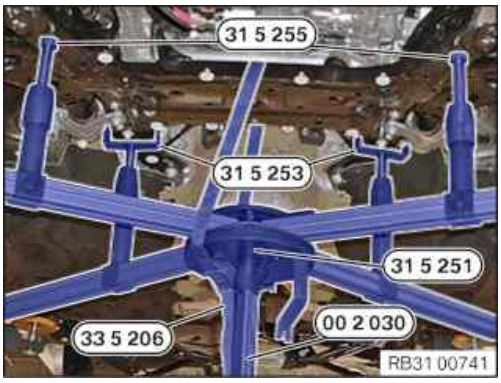
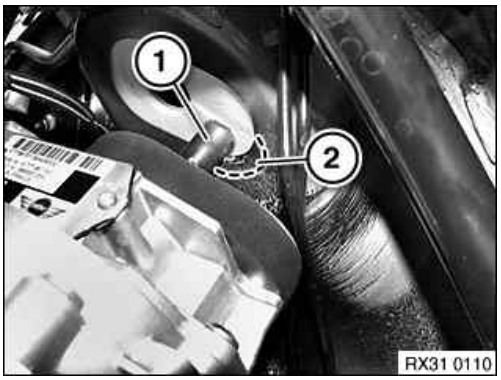


- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

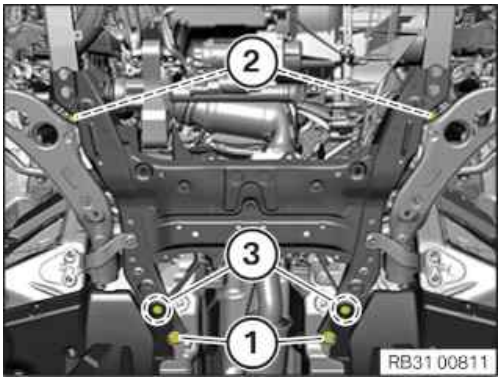


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

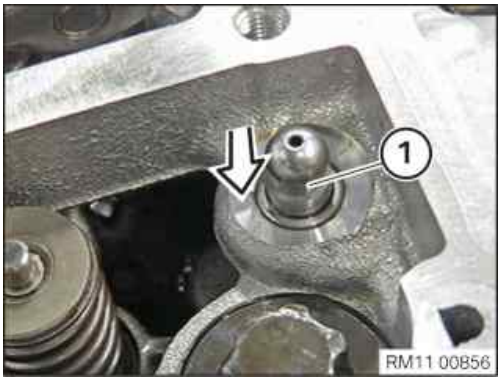
63 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

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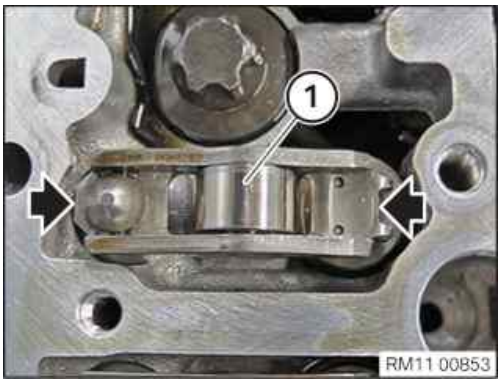
64 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

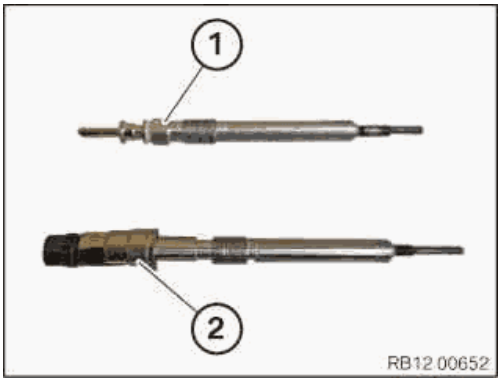


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

65 – Install glow elements

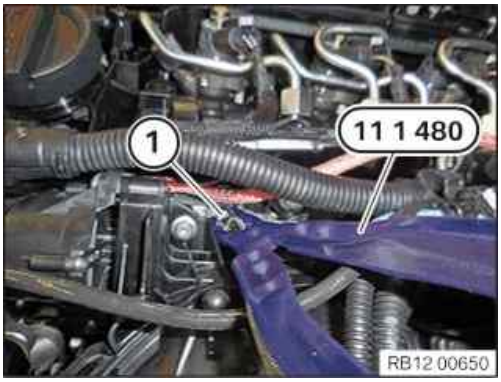


- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

66 – Installing the camshaft support

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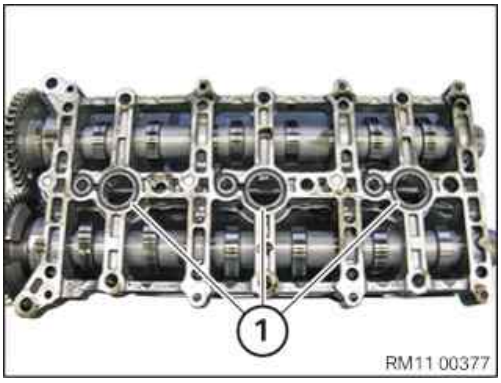
RISK OF DAMAGE

Damage of the engine and mounted parts.

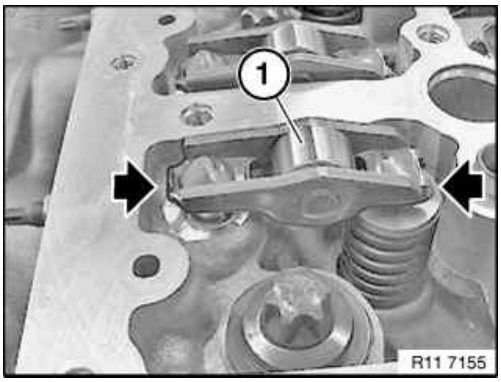
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

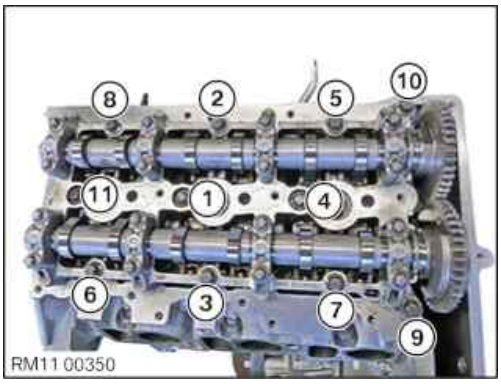


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

67 – Adjusting the timing of the camshafts

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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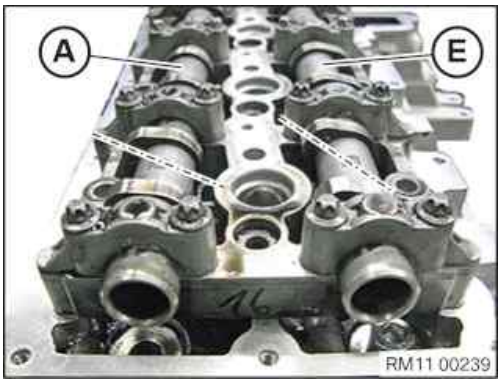
- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

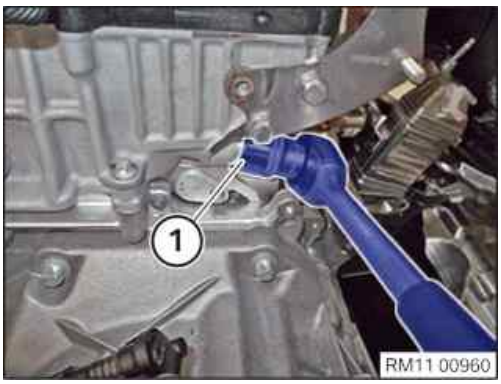
▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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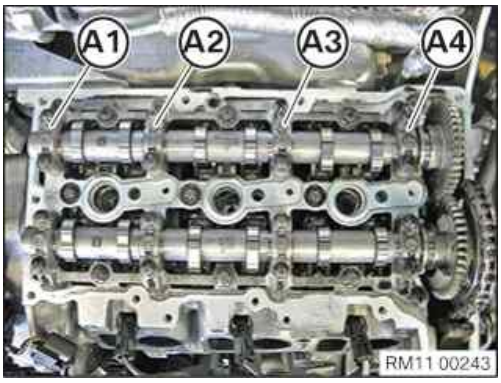
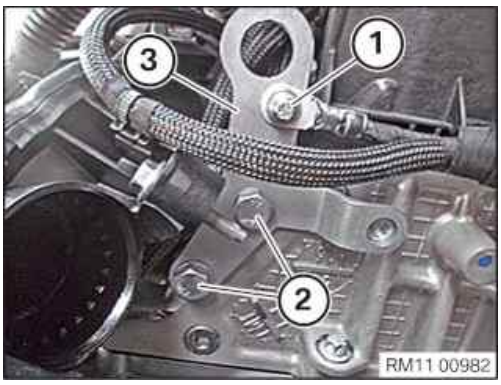


TECHNICAL INFORMATION

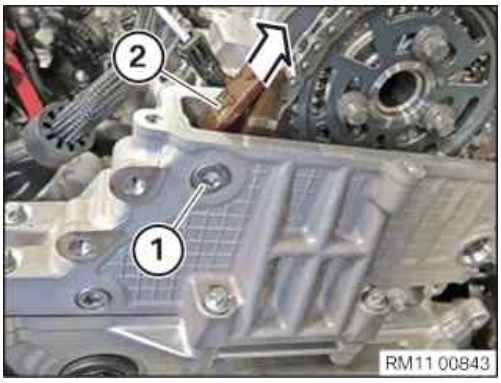
The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▸ **Remove the timing chain guide rail**

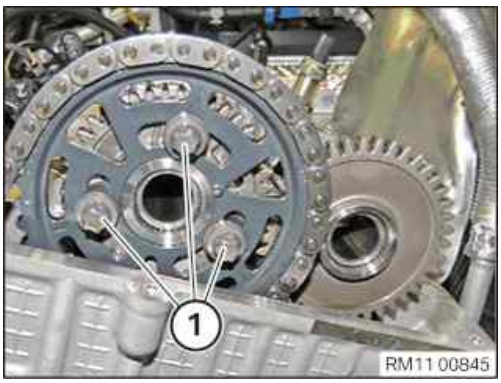


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▸ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▸ **Installing exhaust camshaft**

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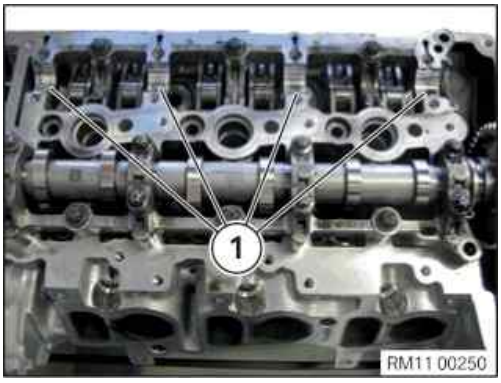
RISK OF DAMAGE

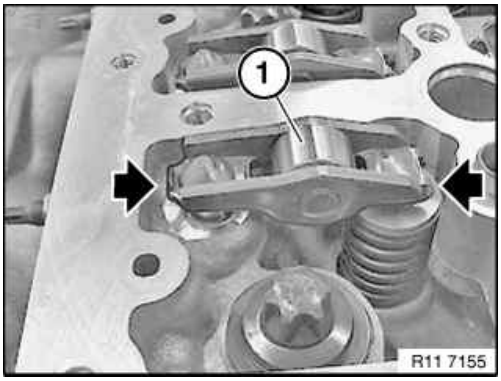
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

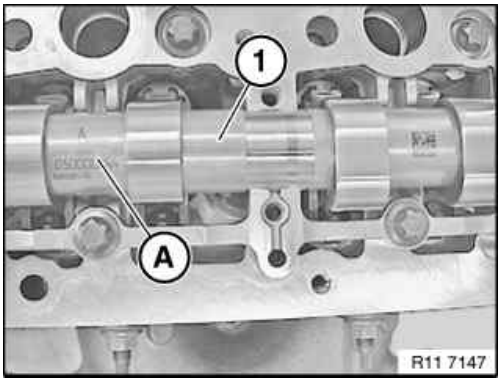
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



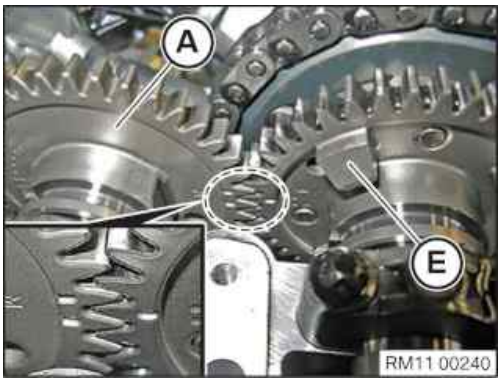
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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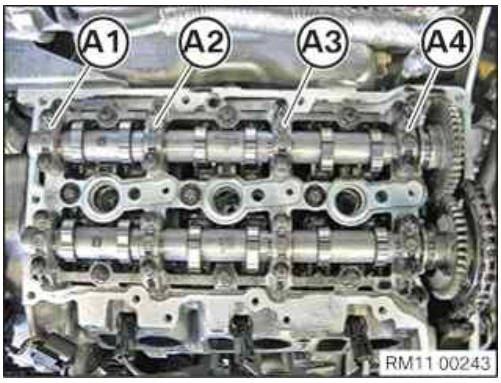


- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

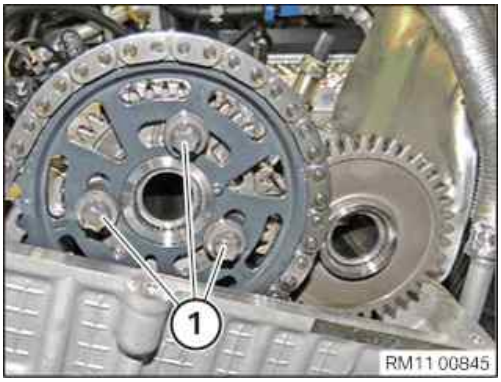
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

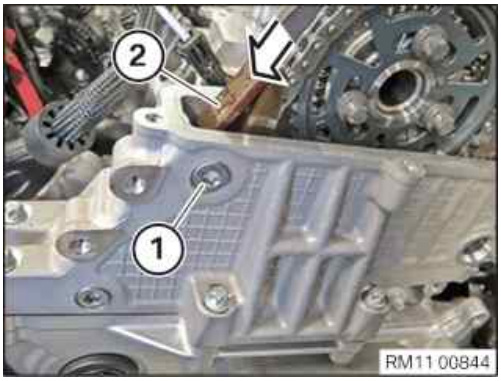
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



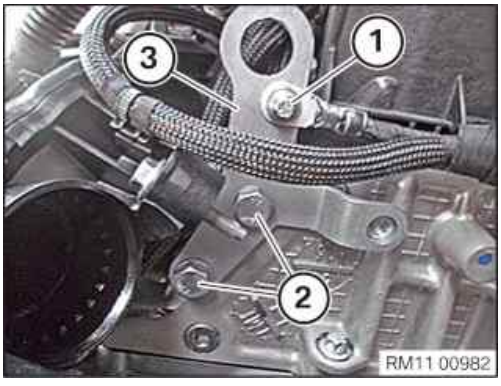
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

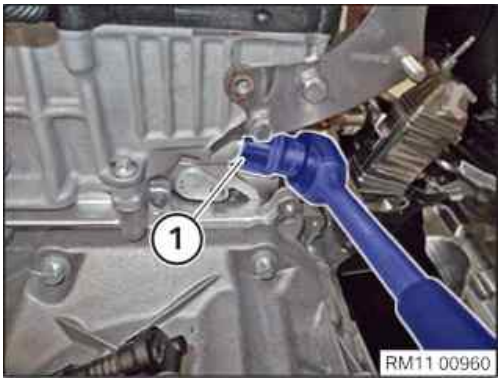
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

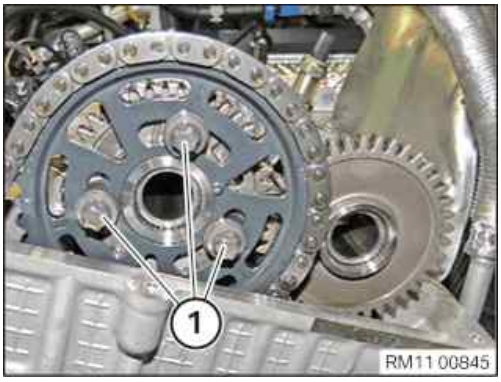


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

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- Remove special tool **2 288 380**.

69 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

70 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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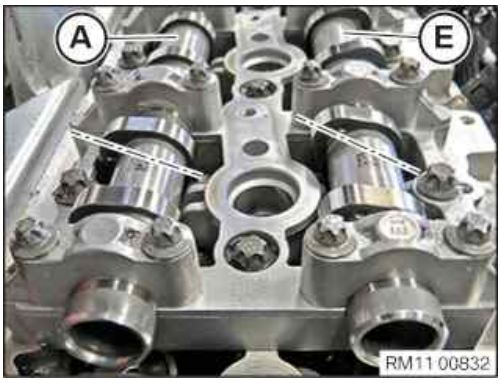
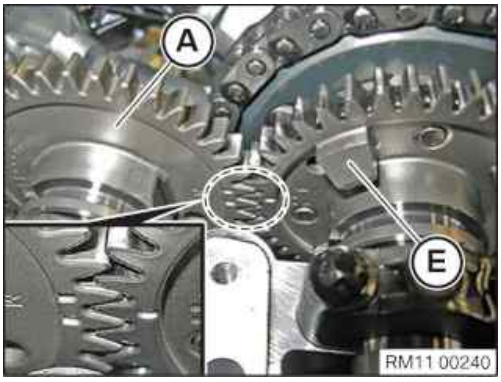


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

71 – Installing cylinder head cover

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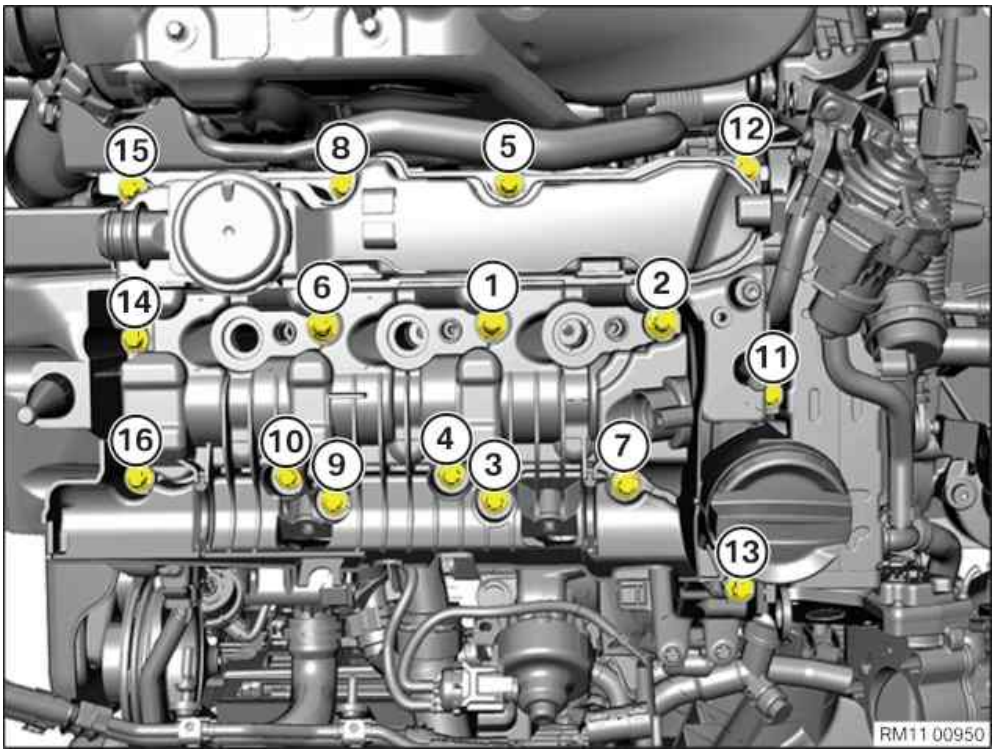
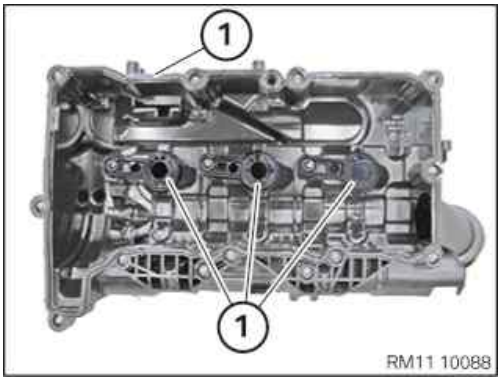
Overview: Screw connection of the cylinder head cover

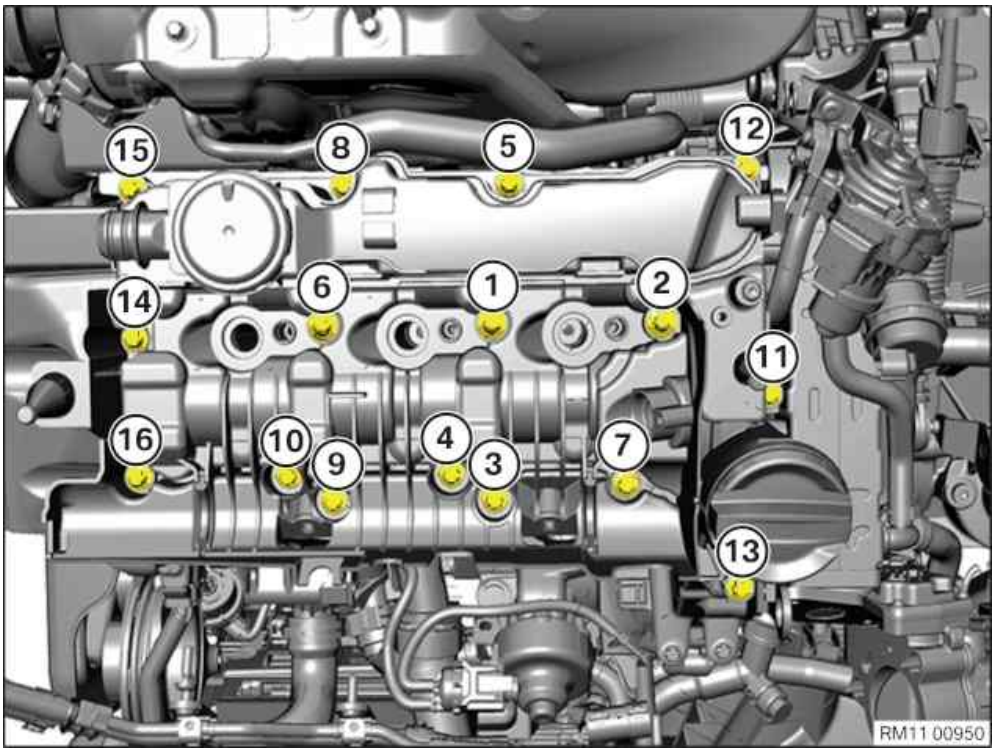


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nm

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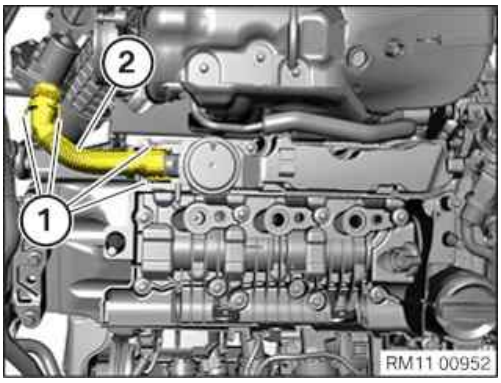


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

72 – Installing injectors of injection system

▶ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

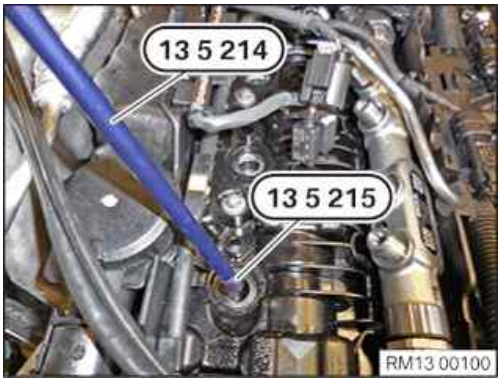
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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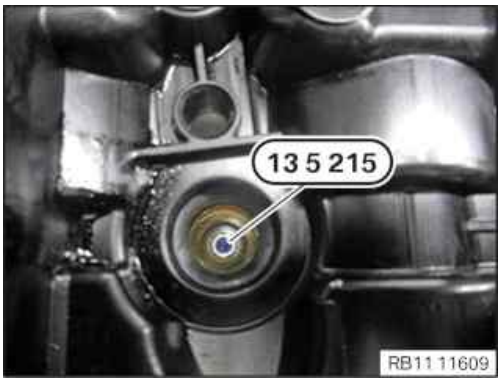
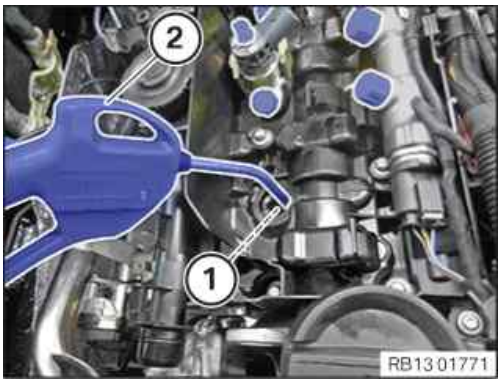


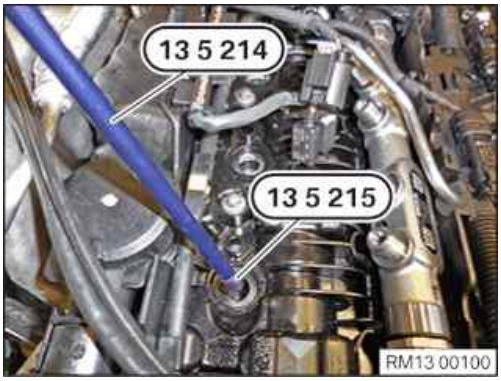
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

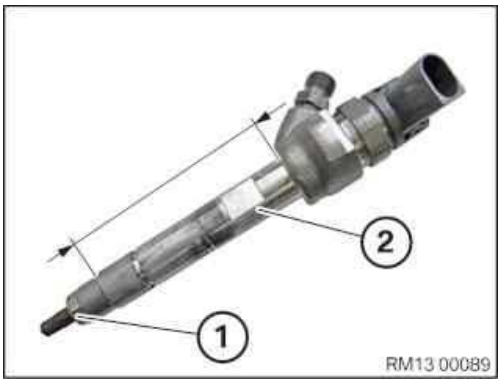
▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

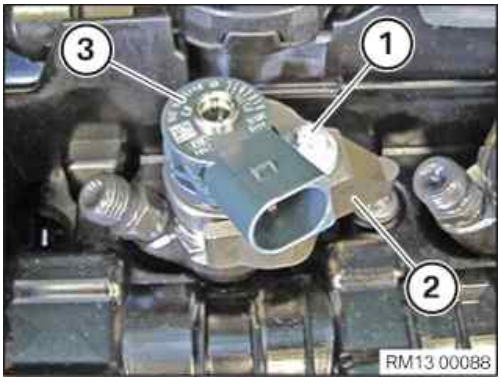


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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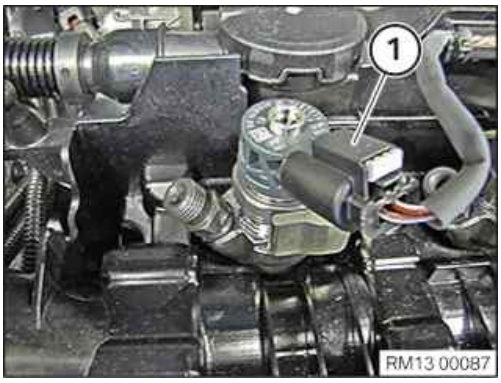


- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

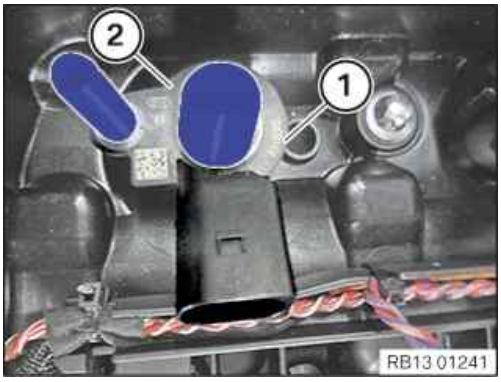
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

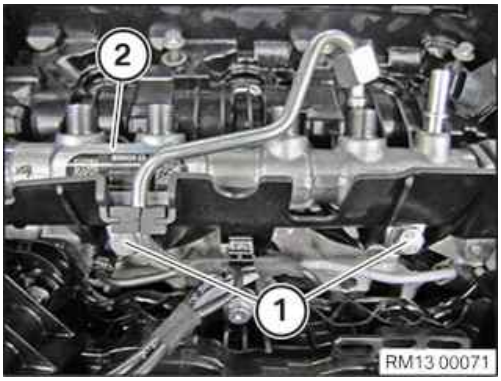
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

73 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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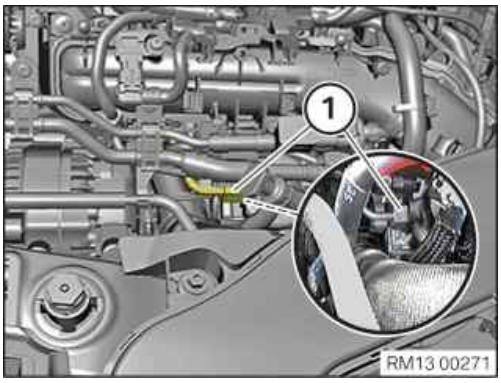


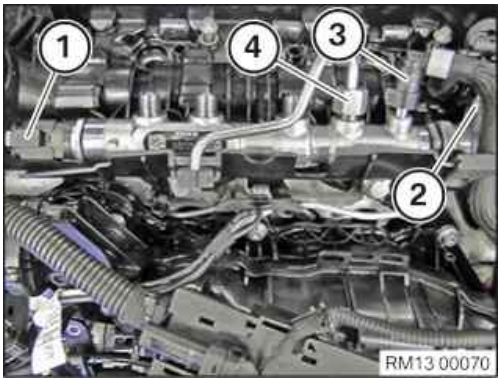
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

74 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

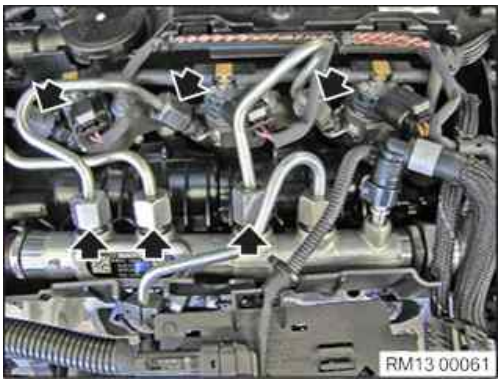
75 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

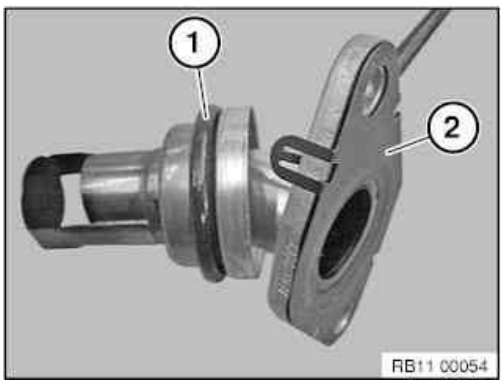
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

76 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

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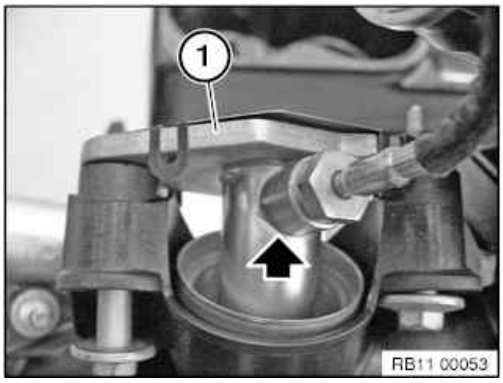
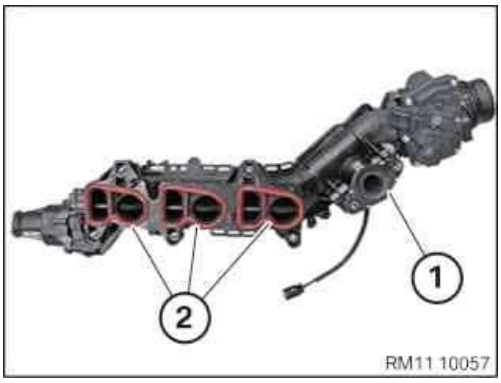
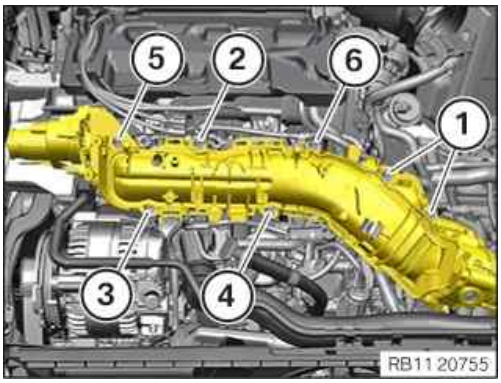


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

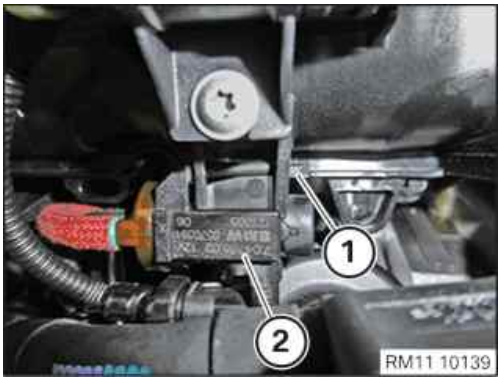
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



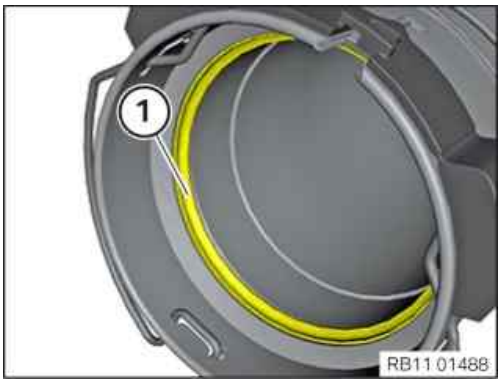
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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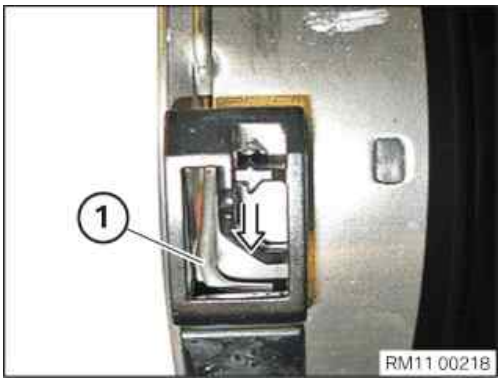
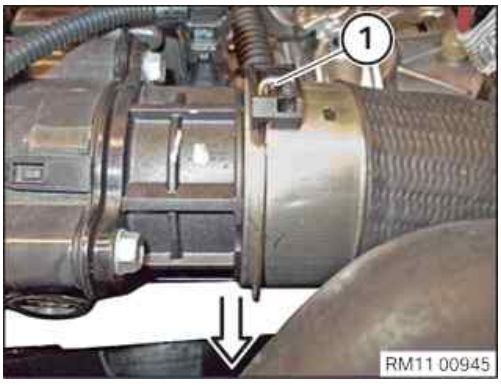


- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

77 – Remove the engine from the assembly stand

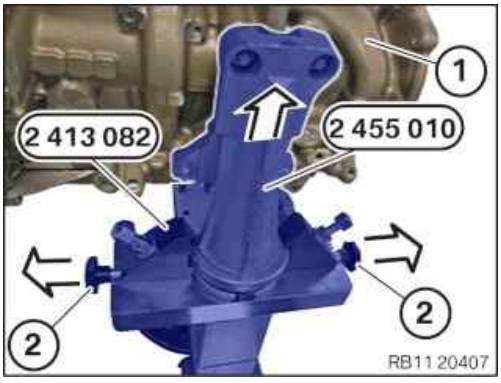
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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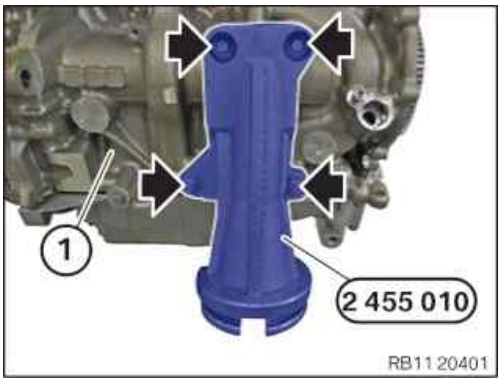
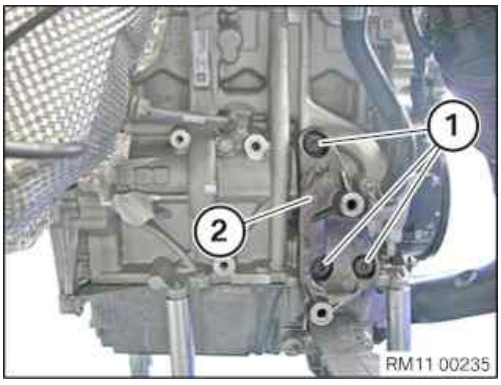


- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

M10		Tightening torque	38 Nm

78 – Install the engine on the double-clutch transmission (DKG)

RISK OF DAMAGE

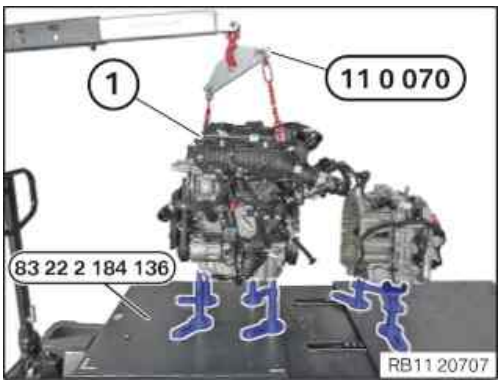
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.

TECHNICAL INFORMATION

Transmission oil temperature 20 °C up to a maximum 40 °C!
Carry out the "Transmission oil adjustment" service function with the diagnosis system.
The double clutch also needs to be replaced if you exceed the oil change interval by more than 3000 km!
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox (DKG).



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.

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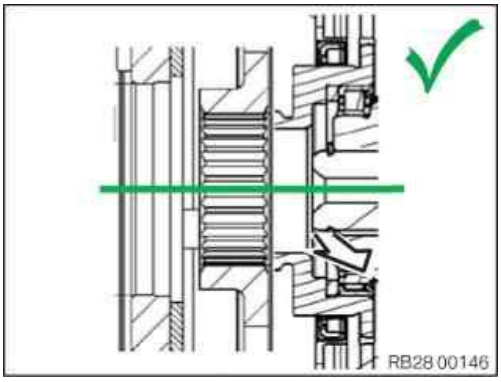
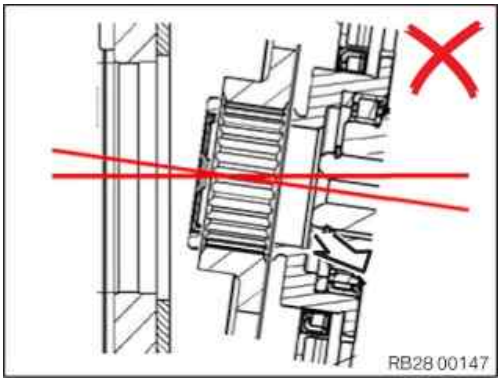
- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Clean the gearing (1) of the drive shaft.
- Coat the gearing (1) with MI-Setral-43N grease (BMW part number 83 23 2 152 082).

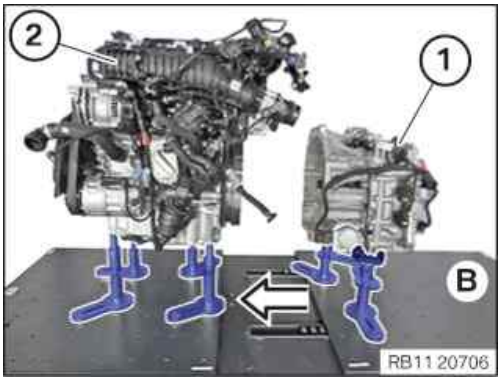
  Tooth gaps must be filled with grease up to tooth height!



- **Correct:** Insert the double-clutch transmission (DKG) horizontally into the flywheel.



- **Wrong:** Do not tilt the double-clutch transmission (DKG) when inserting it into the flywheel.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table plate (B) in the direction of the arrow and position double-clutch transmission (DKG) (1) **carefully** on the engine (2).

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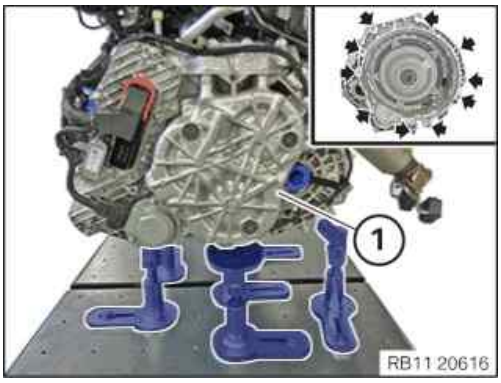
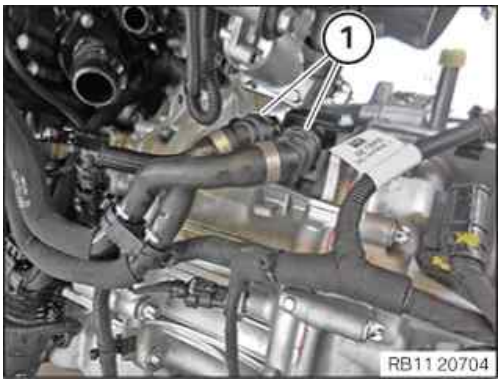


- Flange-mount the double-clutch transmission (DKG) to the engine so that it is **absolutely** horizontal.
- Tighten screws (arrows).

Transmission to engine

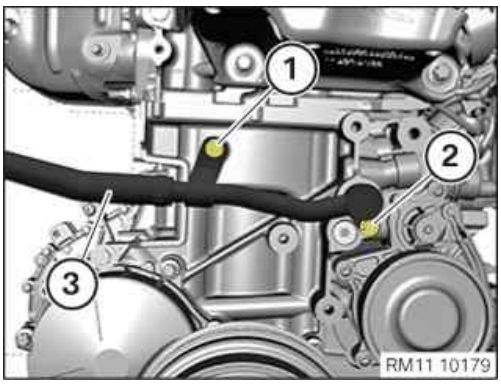
M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Connect and lock the coolant lines (1).
- Make sure that you can hear the coolant lines (1) engage.

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

79 – Attaching assemblies (on lifting table)

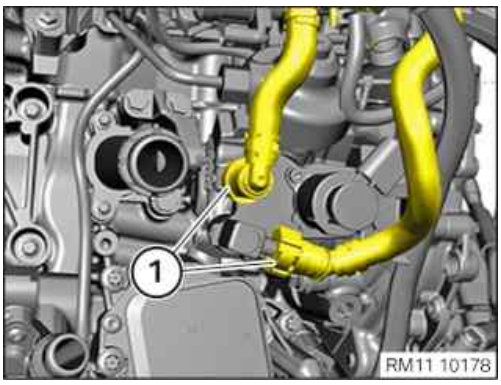


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The locks must engage audibly.

► **Installing the exhaust-gas recirculation cooler**

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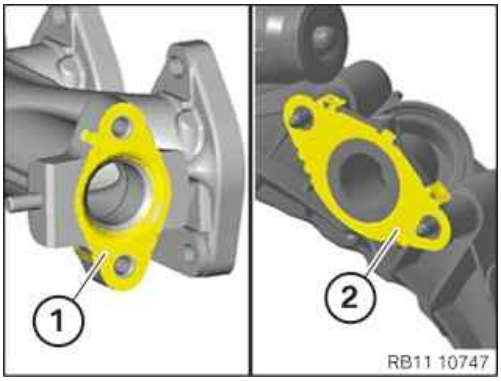
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

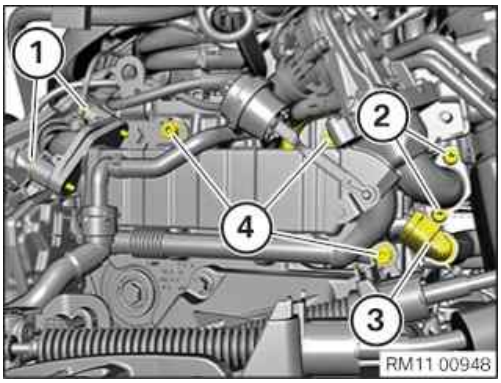


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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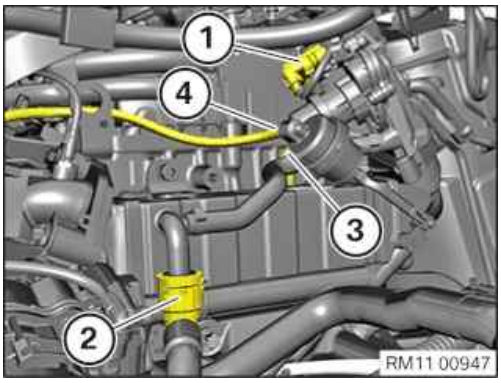
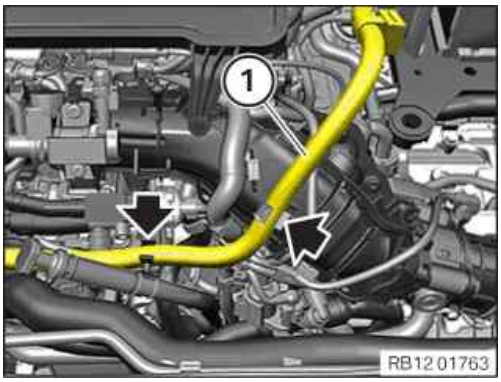


TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.



CAUTION

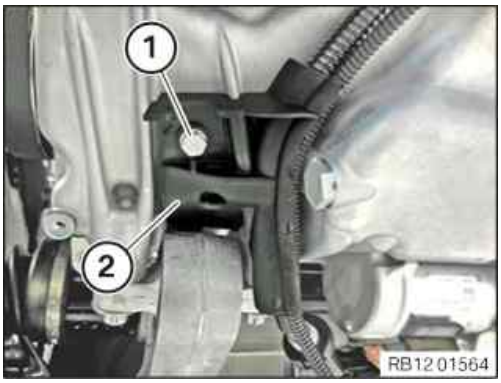
Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).

- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

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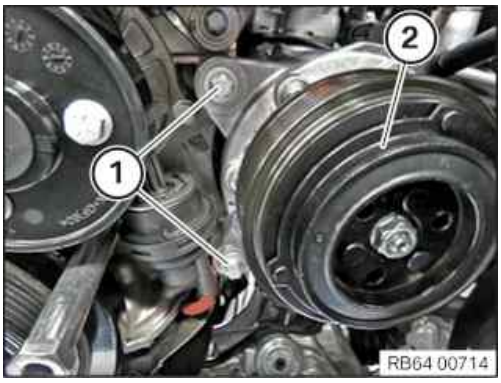
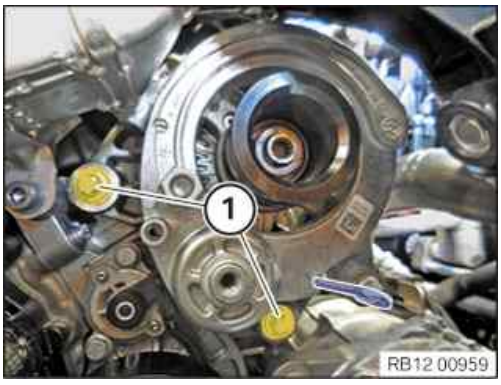


- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

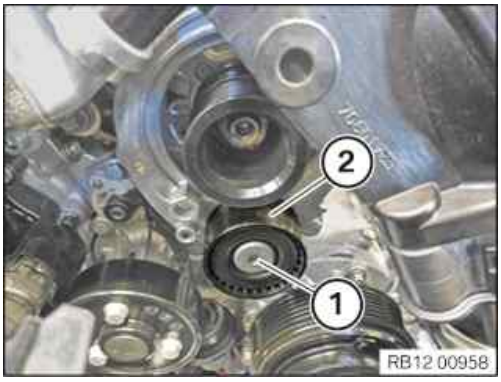
- Tighten the screws (1).



- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

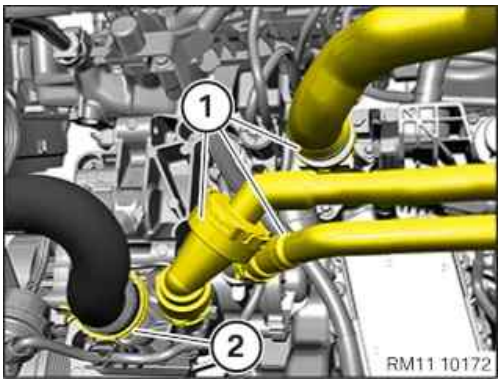
M10x75 / M10x125		Tightening torque	38 Nm



- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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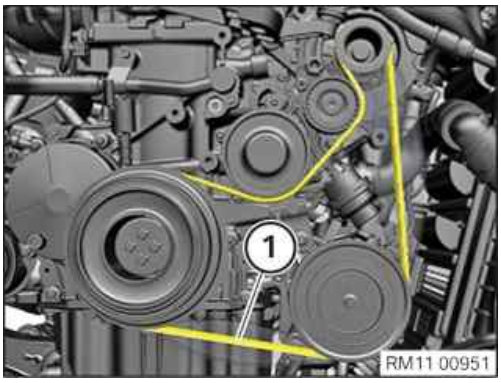
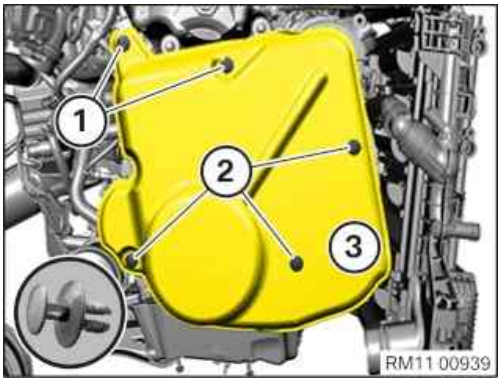


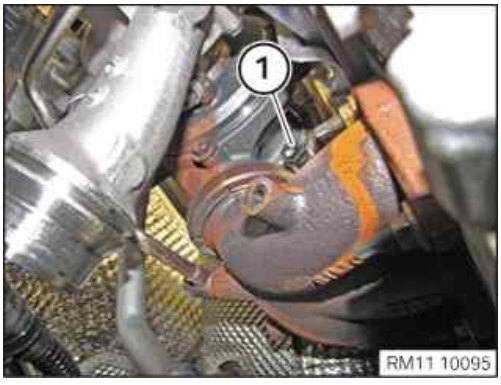
- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ **Install the acoustic cover for the engine at the front**



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

▸ **Installing the oil return line for the exhaust turbocharger**

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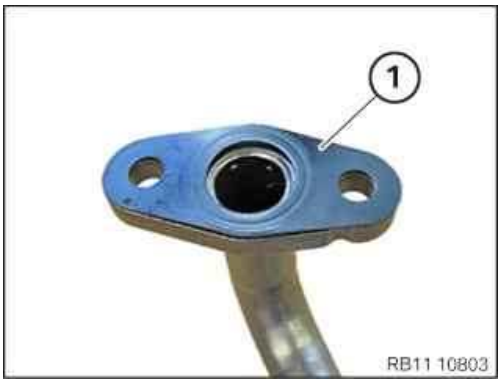
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

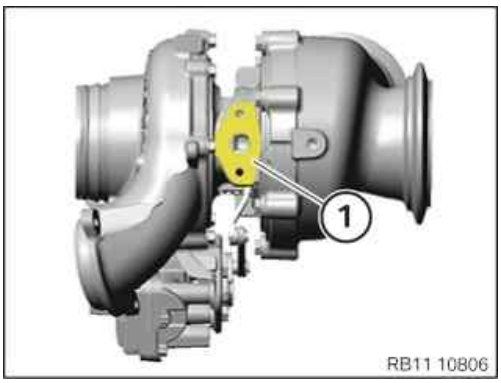
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface.

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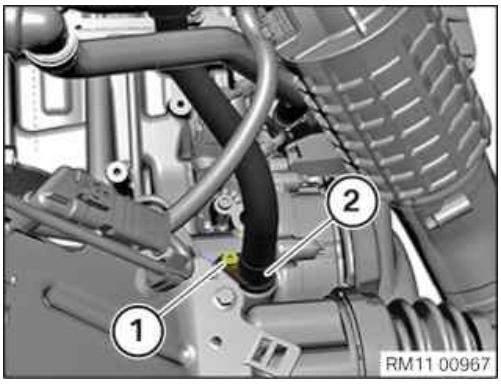
- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

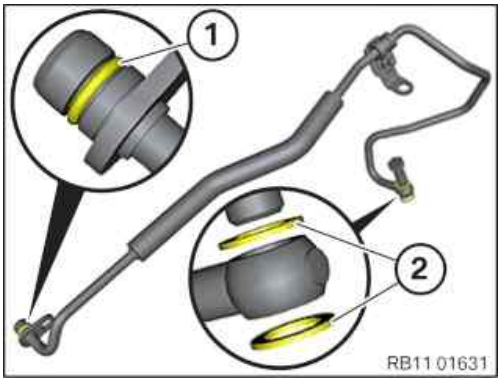


- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

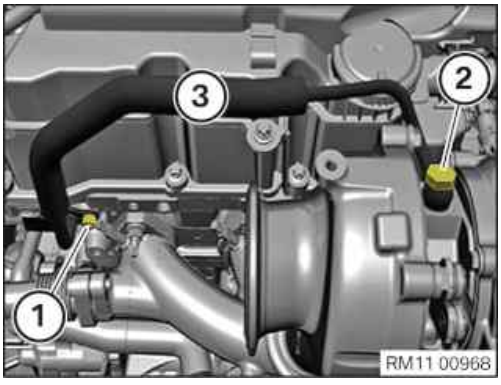
▸ **Install the oil feed line for the exhaust turbocharger**



- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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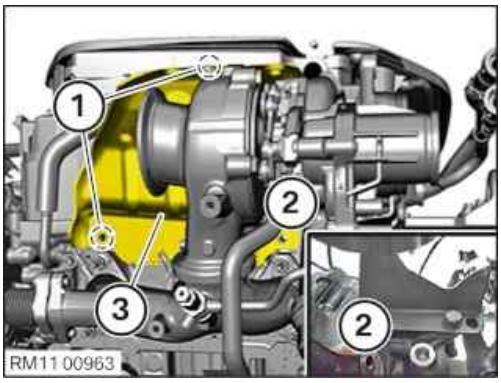


- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

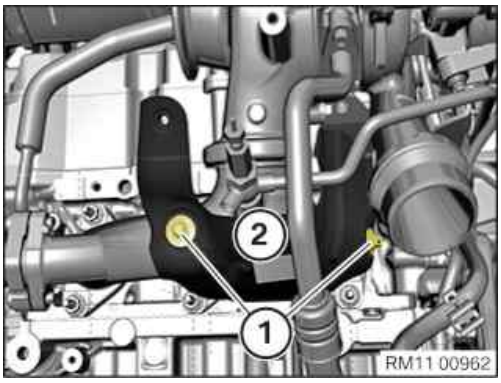
▶ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

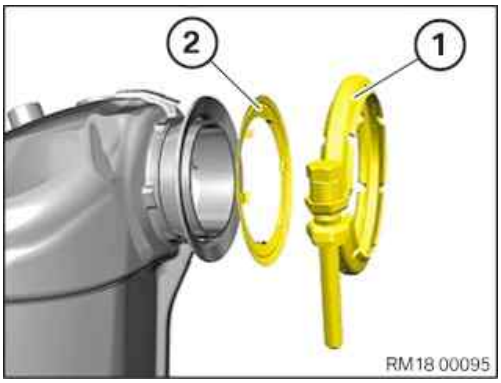
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

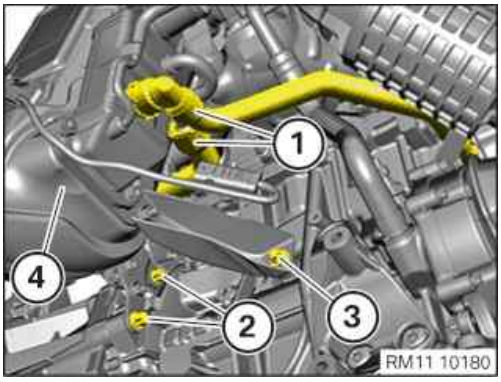
Torx screw BM 6x12		Tightening torque	10 Nm



- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).

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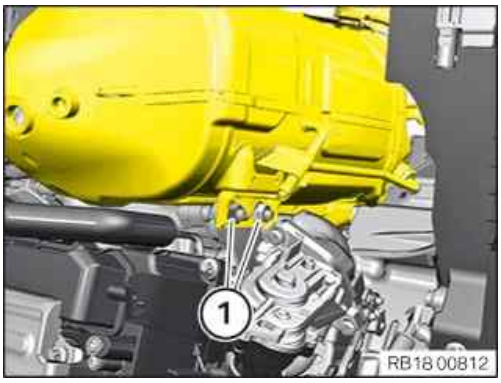


- Tighten nuts (1).

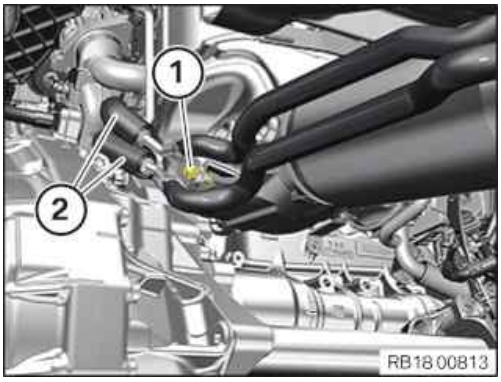
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

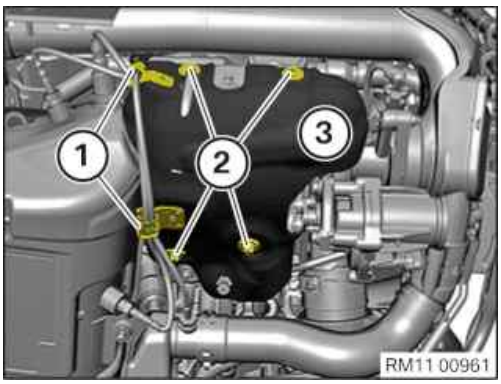
▶ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▶ **Installing the cable clip for the intake plenum**

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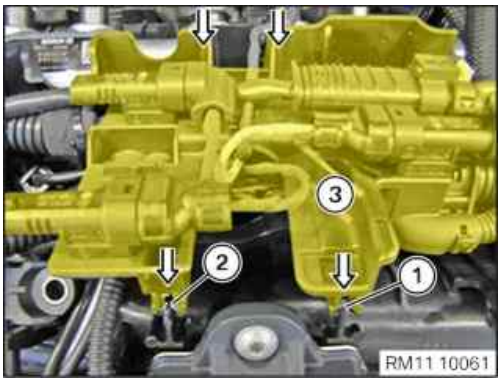
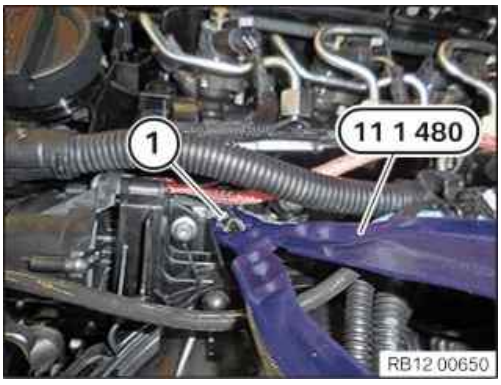
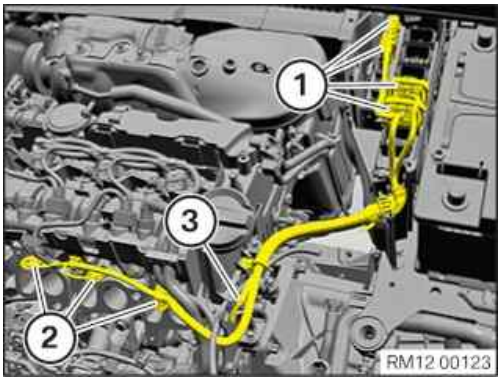


- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

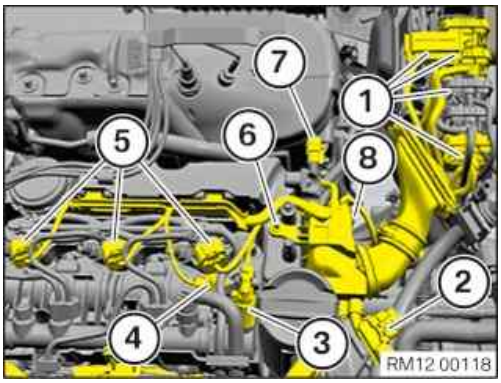
  The connector (1) must engage audibly.



- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm



- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.

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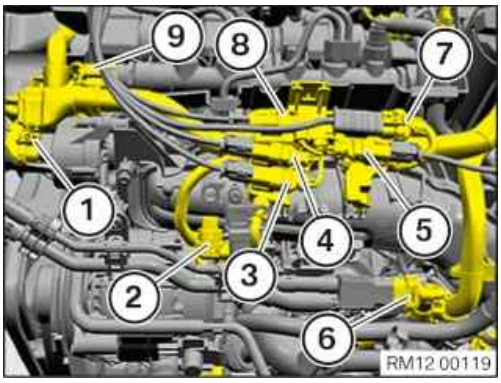
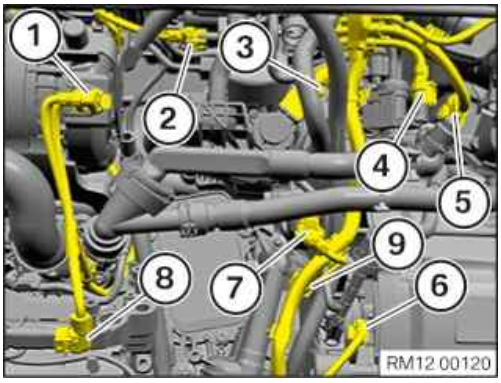
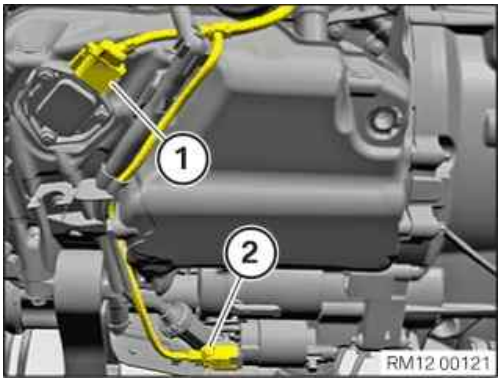


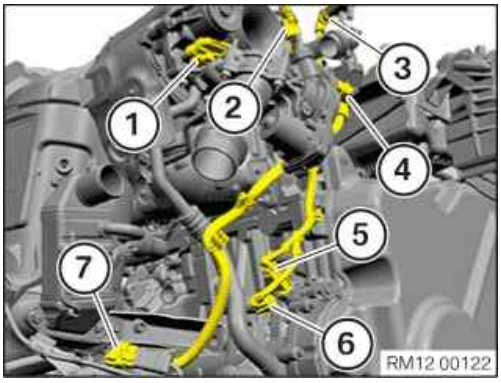
- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.



- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

80 – Installing differential pressure sensor

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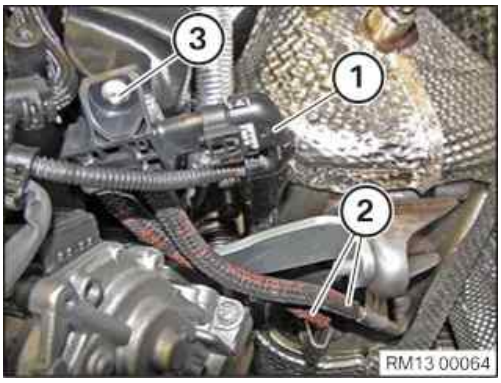


- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

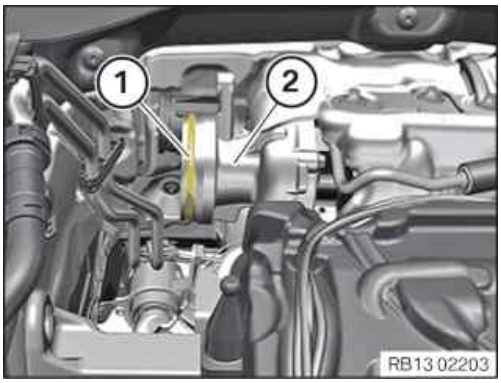
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

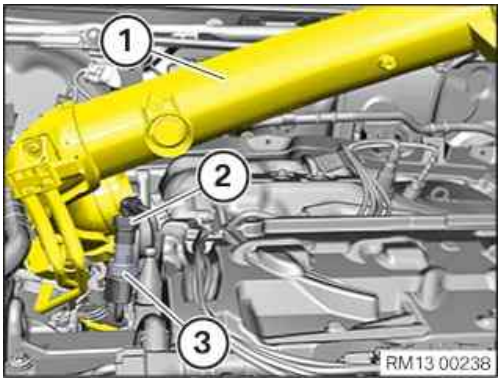
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

81 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



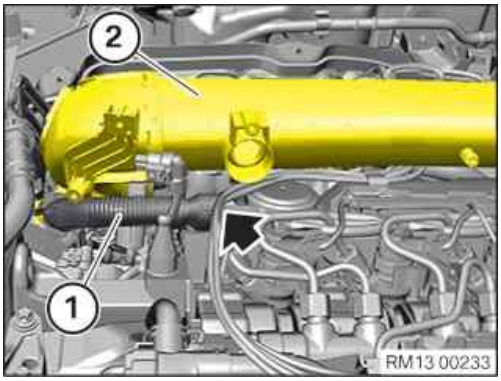
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.

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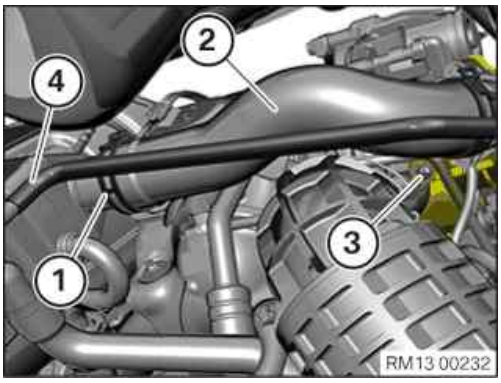


- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

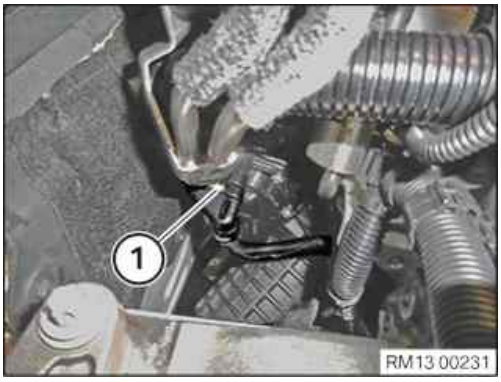
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

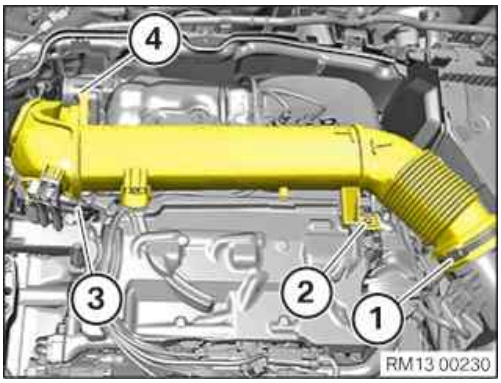
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

82 – Install the acoustic cover for the injectors

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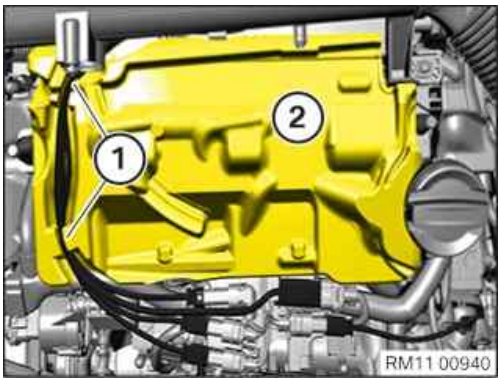
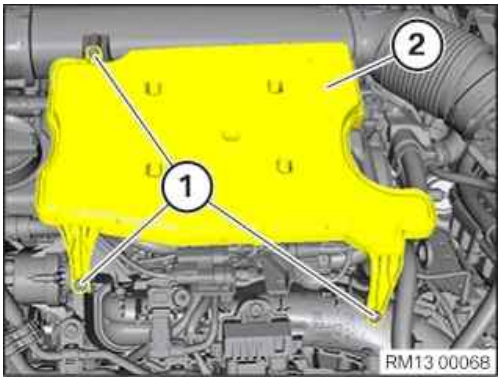


- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

83 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

84 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

85 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head			Used in step 8
M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase			Used in step 9
M10x30		Tightening torque	38 Nm

Special tool 11 8 930 to special tool 00 2 320			Used in step 9
M14x35		Tightening torque	160 Nm

Rear end of front axle support to body			Used in step 24
M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body			Used in step 24
M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body			Used in step 24
Screw		Tightening torque	3 Nm

Special tool to cylinder head			Used in step 24
M8		Tightening torque	21,5 Nm

Standard screw connection M6			Used in step 32 39 46 50 67 79
M6			8 Nm

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Main bearing cap to crankcase — Used in step 43

M10x85	Replace screws.	1. tightening torque	25 Nm
		2. tightening torque	50 Nm
		3. Angle of rotation	60 °
		4. Angle of rotation	60 °

Gear to counterbalance shaft — Used in step 46 50

	Renew screw.	Tightening torque	20 Nm
		Angle of rotation	60 °

Connecting rod bearing cap to connecting rod — Used in step 49

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

Bearing journal of tensioning and guide rail — Used in step 51

M8	*Replace bearing journal.*	Tightening torque	20 Nm

Chain tensioner to crankcase — Used in step 51

M6x22		Tightening torque	10 Nm

Camshaft sprocket on high pressure pump — Used in step 51

M12		Tightening torque	65 Nm

Oil deflector to crankshaft bearing cap — Used in step 52

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

Oil deflector to crankcase — Used in step 52

M8x14		Tightening torque	19 Nm

Oil vacuum pump to crankcaseB37 — Used in step 53

M8x35	*Renewscrews.*	Tightening torque	15 Nm
		Angle of rotation	45 °

Rear timing case cover to crankcase — Used in step 54

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover — Used in step 54

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase — Used in step 54 62

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 54 62

M8x40		Tightening torque	19 Nm

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Oil sump to crankcase — Used in step 54 56

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump — Used in step 54

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine — Used in step 54

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft — Used in step 55

M12x1.5	Renew screws.	Tightening torque	120 Nm

Timing case cover, front, to crankcase — Used in step 56

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

Vibration damper with belt pulley to crankshaft — Used in step 57

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °

Transmission to oil sump — Used in step 57

M8			19 Nm

Engine support to cylinder head — Used in step 62

M10X45		Tightening torque	41 Nm

Right engine mount to cylinder head — Used in step 62

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Glow elements to cylinder head — Used in step 62 65

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head — Used in step 66

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support — Used in step 67

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head — Used in step 67

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8 — Used in step 67

M8		Tightening torque	19 Nm

Chain tensioner piston to cylinder head — Used in step 67

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

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Camshaft sprocket to camshaft

Used in step 67

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 71

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 72

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 72

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 73

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 73

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 75

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 76

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 77 79

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 78 79

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 79

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 79

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 79

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 79

M8x20		Tightening torque	19 Nm

Bracket to oil sump

Used in step 79

M6		Tightening torque	8 Nm

Air conditioning compressor in component carrier

Used in step 79

M10		Tightening torque	38 Nm

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Alternator to component carrier — Used in step 79

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner — Used in step 79

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold — Used in step 79

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase — Used in step 79

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger — Used in step 79

M6x12		Tightening torque	8 Nm

Oil return line to crankcase — Used in step 79

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head — Used in step 79

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger — Used in step 79

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger — Used in step 79

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 79

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder — Used in step 79

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 79

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter — Used in step 79

Torx bolt BM6x16		Tightening torque	8 Nm

Ground cable to cylinder head — Used in step 79

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 79

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 80

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 80 81

Clamp 15–19mm		Tightening torque	3 Nm

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Exhaust gas pressure sensor

Used in step 81

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger

Used in step 81

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover

Used in step 81

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 81

Clamp		Tightening torque	3 Nm

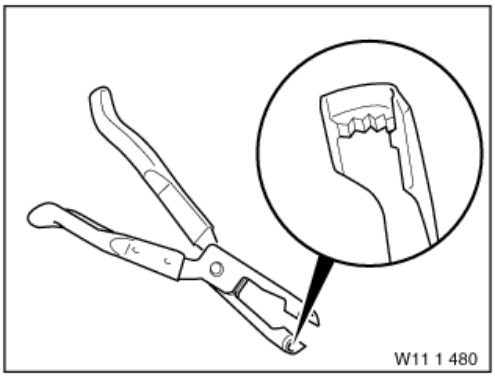
Resonator to manifold and clean air pipe

Used in step 83

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder

Common Used in step 8 24 62 78

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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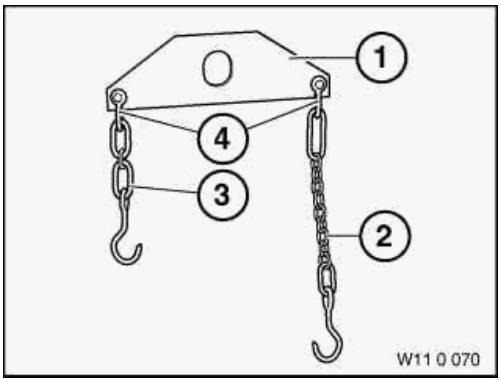
0 490 579 (11 0 070) Lifting gear



Common

Used in step 8 9 77 78

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

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2 455 010 Engine support

Common Used in step 9 77

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 9

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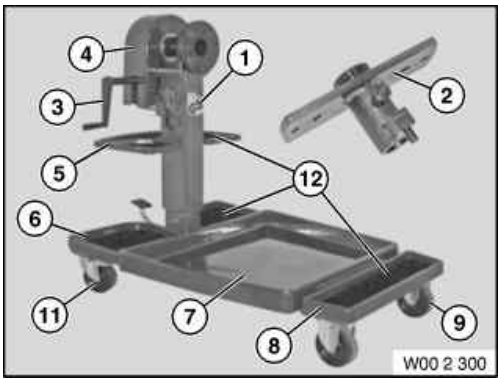

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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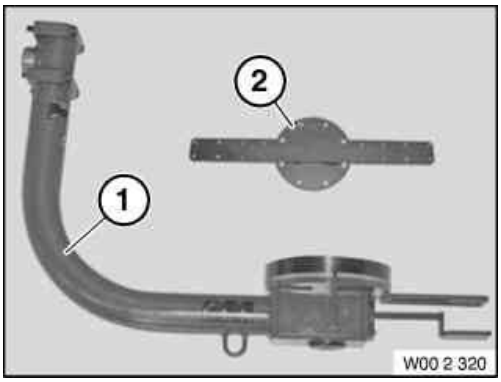
0 495 196 (00 2 320) Support arm



Common

Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common

Used in step 11 14 73 75

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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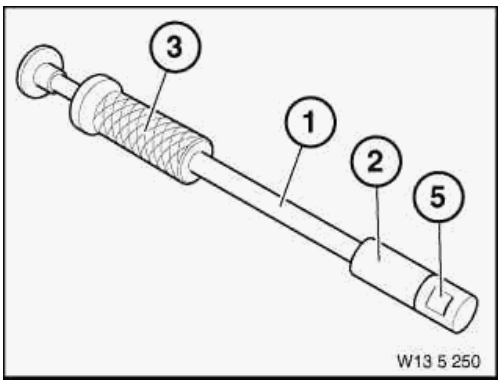
2 413 106 Fastener

Common Used in step 11 75

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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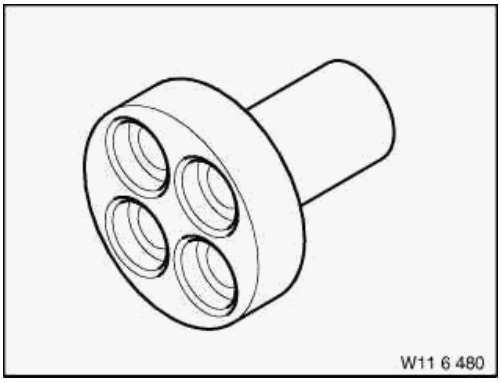
0 493 339 (13 5 252) Bush

Common	Used in step 13
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common	Used in step 13
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 16 67 70
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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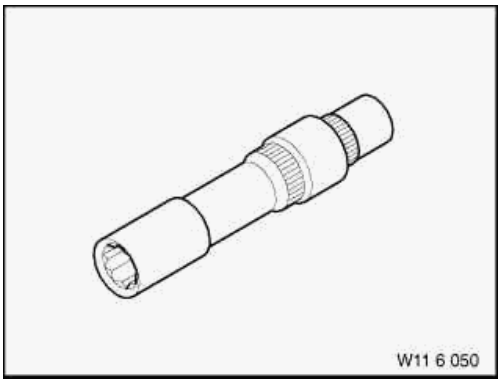
2 288 380 Locating stud

Common	Used in step 16 67 68 70
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common	Used in step 16 67 69 70
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common	Used in step 21 24 62 65
Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 22 23 67

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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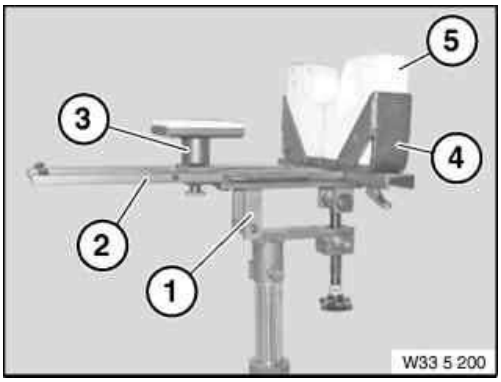
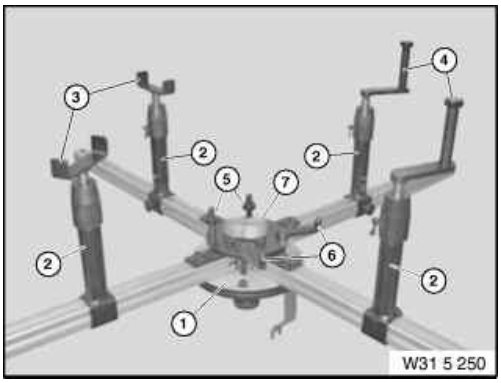
0 496 080 (33 5 206) Belt



Common	Used in step 24 62
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 817 (31 5 251) Basic body



Common	Used in step 24 62
Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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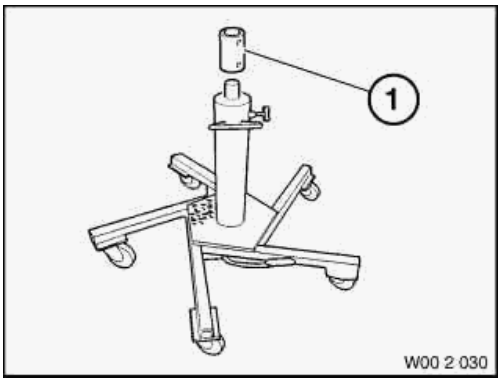
0 490 133 (00 2 030) Device



Common Used in step 24 62

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

2 414 691 Support

Common Used in step 24 62

Usage	To support the engine when the engine support is removed.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	2357071
SI-Number	01 12 16 (406)

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2 357 071 Panel

Common

Used in step 24 62

Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

0 490 561 (11 0 000) Lifting gear

Used in step 24 62

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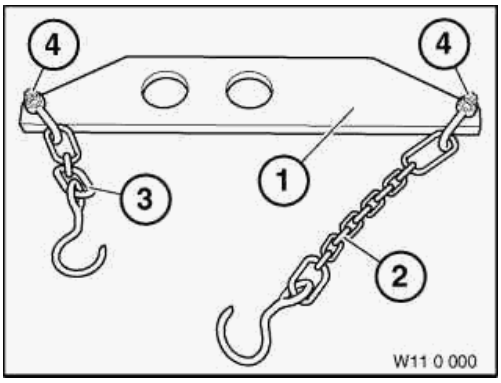

Common

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 24

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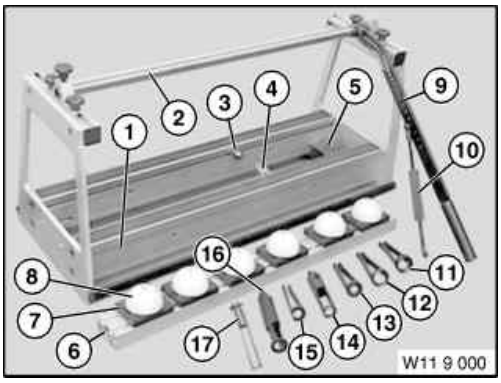

Common

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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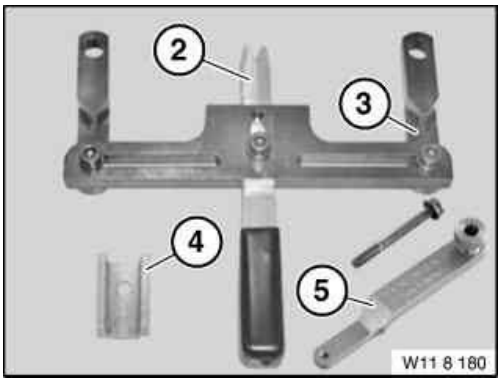
0 493 587 (11 8 180) Holder



Common

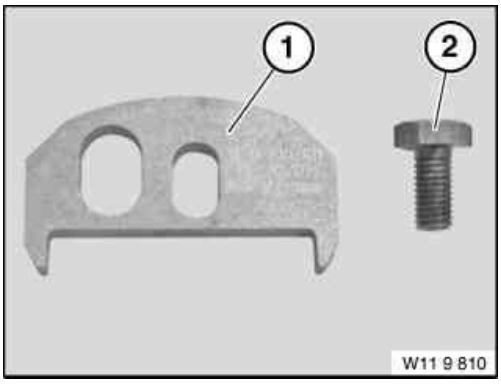
Used in step 25 57

Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

0 496 171 (11 9 811) Holder



Common

Used in step 27 55

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush

Common

Used in step 27 55

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

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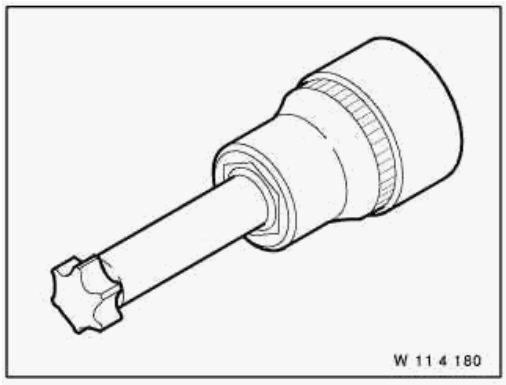
0 491 018 (11 4 180) Socket WAF 46



Common Used in step 27 55

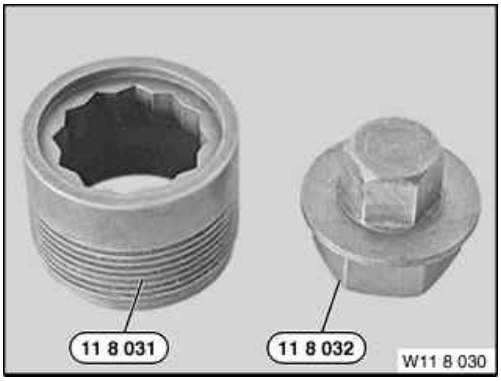
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

2 357 904 Gauge

Common Used in step 31 51

Usage	For positioning the high pressure pump to the crankshaft . Replaced by gauge 2420824
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 725 (11 8 030) Extractor



Common Used in step 31

Usage	for the disassembly of the high pressure pump (replaces SWZ 11 8 740 as of 08/2009) 11 8 740 will be replaced by 83 30 2 448 914.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 757 (11 8 031)	**2 448 914**	**Holding sleeve** Replaces SWZ11 8 741 from 08/2009, 09/2011 no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	
2	0 496 758 (11 8 032)	**2 448 914**	**Adapter** Replaces special tool 11 8 742 from 08/2009, 09/2011 remaining inventories will be sold off - no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	

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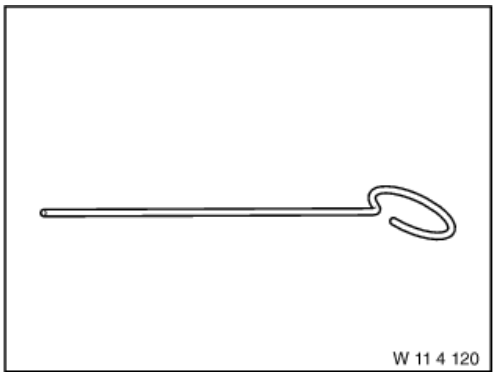
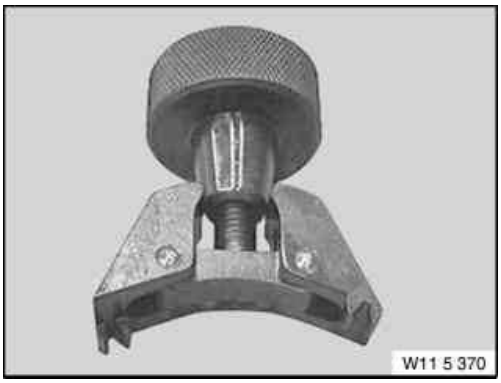
0 491 012 (11 4 120) Pin



Common	Used in step 31 51
Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

0 495 131 (11 5 370) Tool

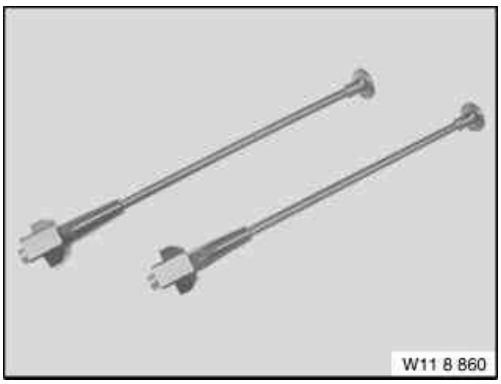


Common	Used in step 32 39 46 50
Usage	(Locating tool) For VANOS exhaust camshaft gear setting.
Included in the tool or work	
Storage location	A71
Replaced by	
In connection with	
SI-Number	01 02 05 (173)

2 288 943 Striking tool

Common	Used in step 32 39
Usage	For dismantling the ring gear of the counterbalance shaft.. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 144 (11 8 860) Assembly tool



Common	Used in step 34 48
Usage	For installing piston with connecting rod in crankcase.
Included in the tool or work	
Storage location	A23
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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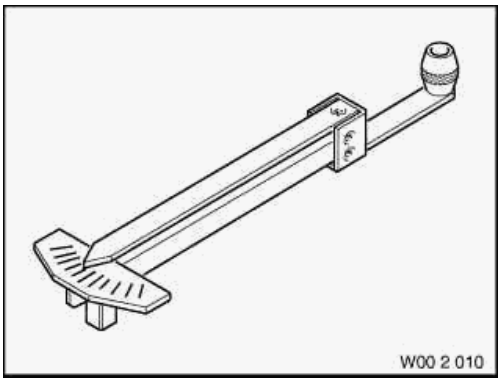
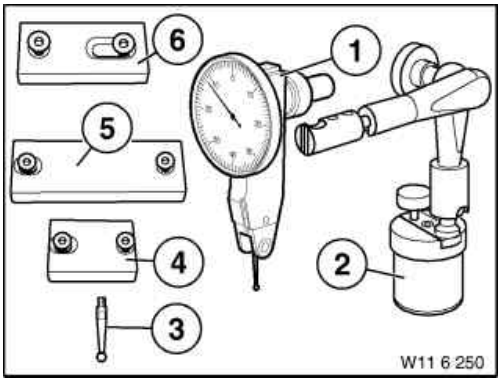
0 490 130 (00 2 010) Measurement aid



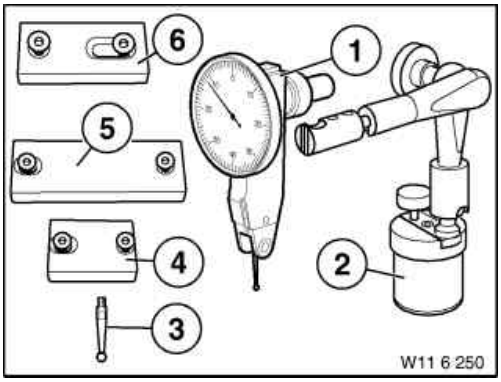
Common	Used in step 44
Usage	(Coefficient of friction meter) For adjusting the steering box (measurement possible in both directions) and for checking and adjusting the bevel pinion and crown wheel bearing in all final drives
Included in the tool or work	
Storage location	X9
Replaced by	
In connection with	
SI-Number	

0 493 144 (11 6 251) Dial gauge



Common	Used in step 45
Usage	(Dial gauge) With 0.8 mm measuring range in each direction
Included in the tool or work	0 493 143
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 145 (11 6 252) Tripod



Common	Used in step 45
Usage	(Small hydraulic tripod with magnetic base)
Included in the tool or work	0 493 143
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 493 582 (11 8 140) Bush

Common

Used in step 48

Usage	(Assembly bushes) For installing the pistons
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 394 (11 8 141)		**Bush** Bush for piston installation 84.00 mm	
2	0 494 395 (11 8 142)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	
3	0 494 396 (11 8 143)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	

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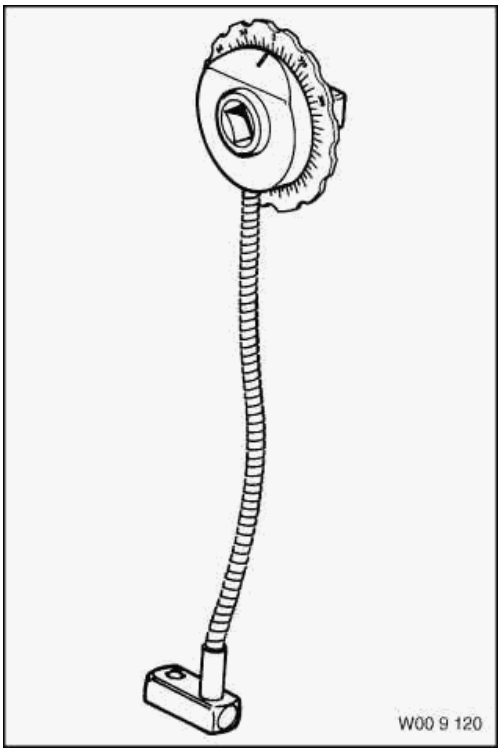
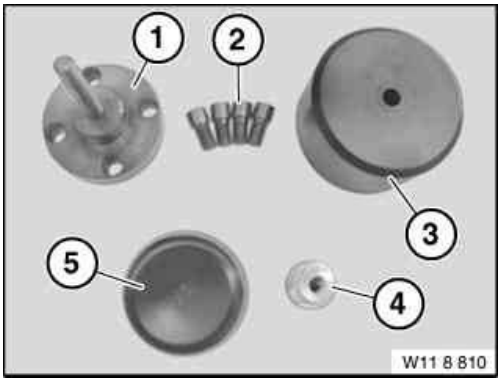
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 49 54 62

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

0 496 137 (11 8 815) Holding sleeve



Common Used in step 54

Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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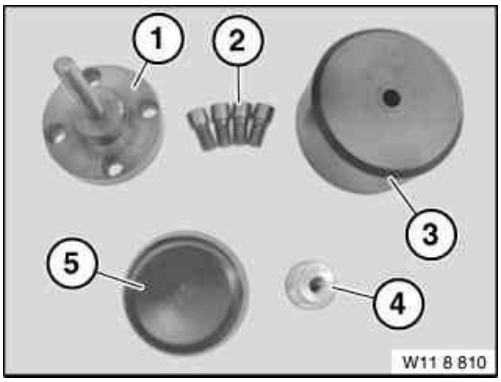
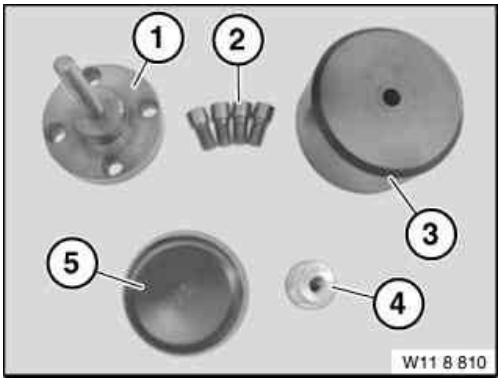
0 496 133 (11 8 811) Basic body



Common Used in step 54

Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

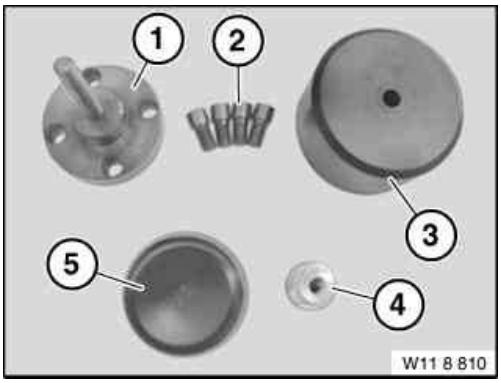
0 496 134 (11 8 812) Screw



Common Used in step 54

Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve



Common Used in step 54

Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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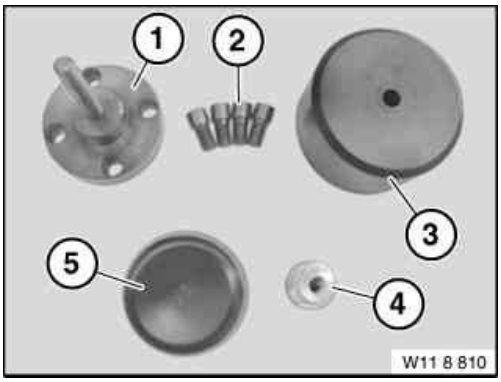
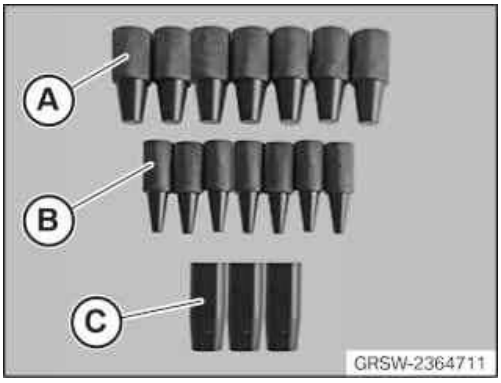
0 496 136 (11 8 814) Nut



Common	Used in step 54
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common	Used in step 54 58
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common	Used in step 54 58
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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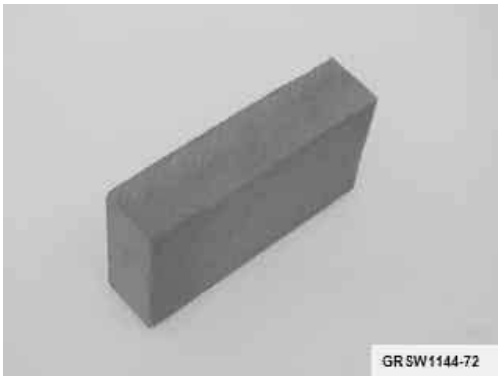
0 495 104 (11 4 472) Extractor

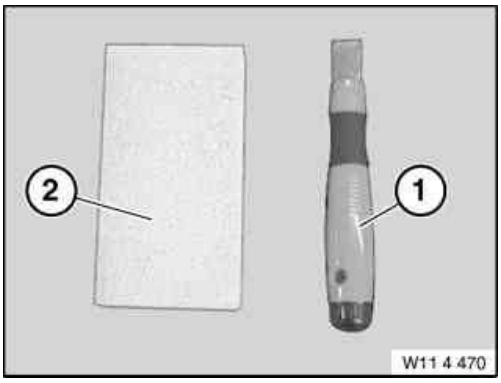


Common

Used in step 54 58

Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 102 (11 4 470) Tool



Common

Used in step 54

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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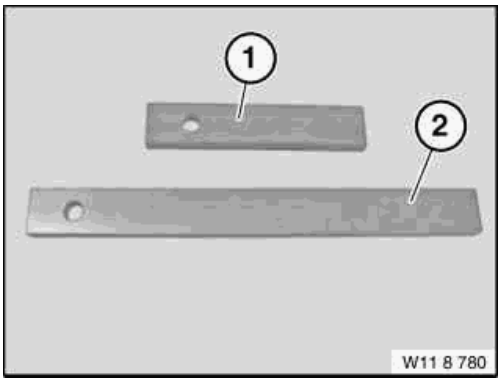
0 496 120 (11 8 780) Plate



Common Used in step 54

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set

Common Used in step 55

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

2 357 900 Fitting aid

Common Used in step 56

Usage	For installation of the front radial shaft seal incl. lid.
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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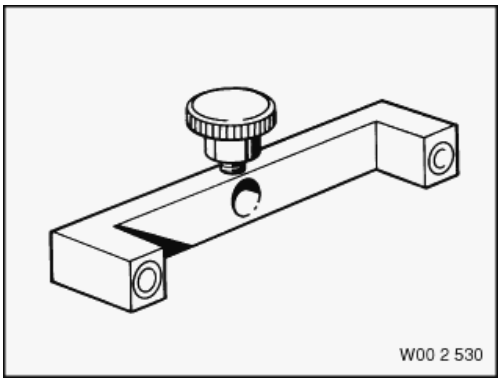
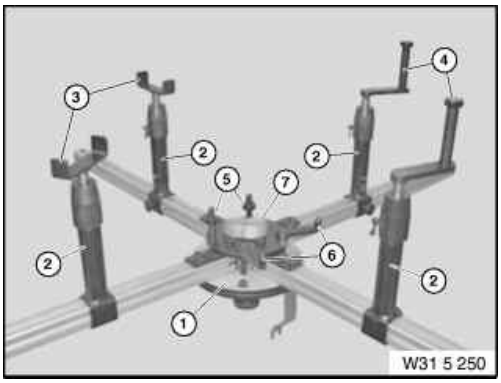
0 490 185 (00 2 530) Bridge



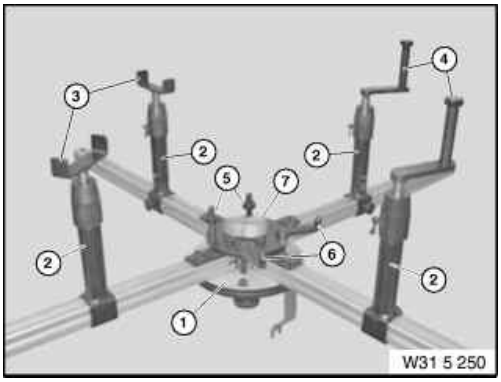
Common	Used in step 60
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

0 495 821 (31 5 255) Adapter



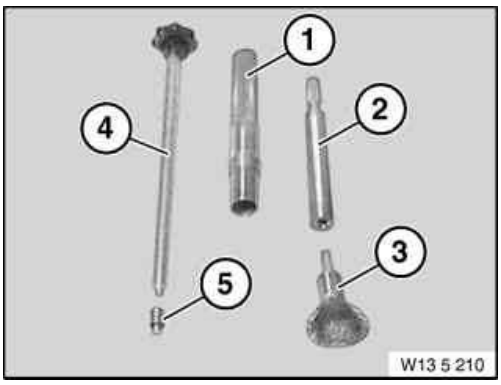
Common	Used in step 62
Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 495 819 (31 5 253) Adapter



Common	Used in step 62
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 493 763 (13 5 215) Plug



Common	Used in step 72
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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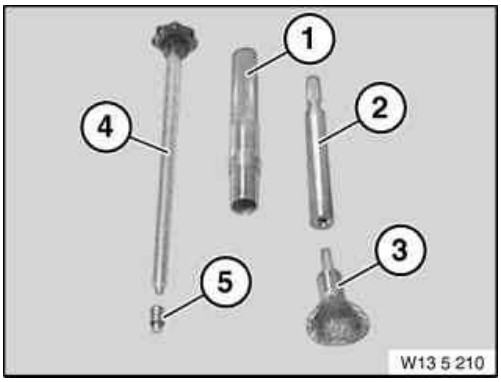
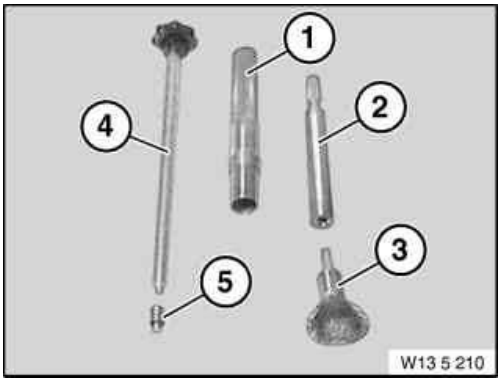
0 493 762 (13 5 214) Rod



Common	Used in step 72
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



Common	Used in step 72
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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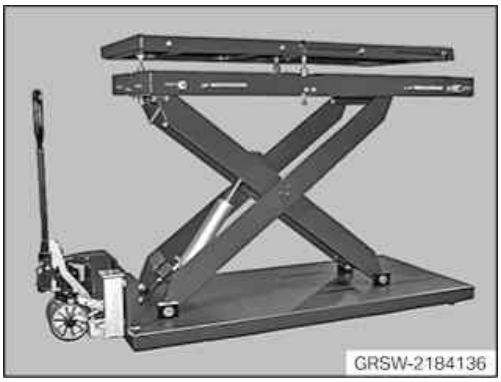
2 184 136 Mobile equipment table lift



Common	Used in step 78
Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

Replacement tools:

2 299 563 Adapter

Common	Used in step 9
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

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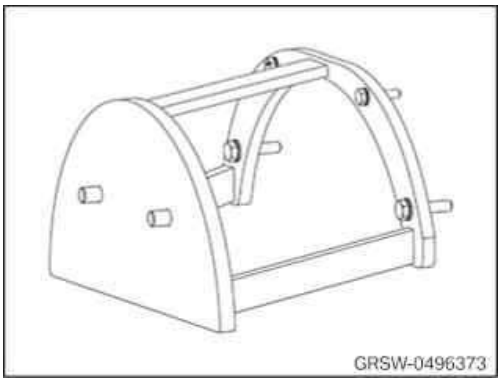
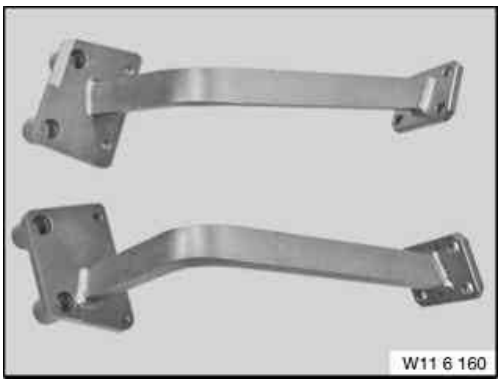
0 496 373 (11 5 420) Plate



Common Used in step 9

Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

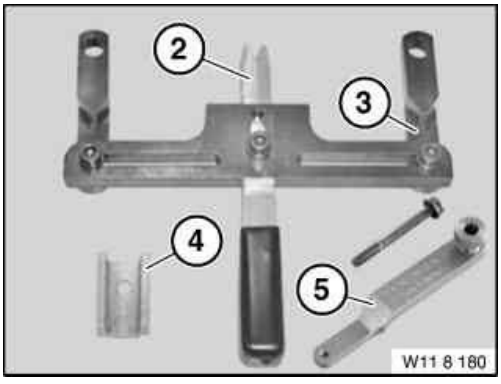
0 496 680 (11 6 160) Support



Common Used in step 9

Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

0 494 434 (11 8 183) Basic body



Common Used in step 25 57

Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

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2 448 914 Extractor

Common	Used in step 31
Usage	For removing and installing high pressure pump. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A49
Replaced by	
In connection with	
SI-Number	01 15 16 (411)

Overview Technical Data

Side clearance of piston rings	Used in step 36
Clean all components before measuring the side clearance.	
Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

Piston diameter	Used in step 37
Measure the piston diameter at distance (A) from the lower end of the piston skirt.	
Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Cylinder bore	Used in step 38
Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Axial play of crankshaft	Used in step 45
	min. 0,053 mm
	max. 0,204 mm

Cylinder head flatness	Used in step 59
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

Selecting the cylinder head gasket	Used in step 60
A decision is made to determine which cylinder head gasket must be used based on the measuring result of the measurement of the piston protrusion.	
Cylinder head gasket with number of holes 1	0 mm ... 0,92 mm
Cylinder head gasket with number of holes 2	0,93 mm ... 1,03 mm
Cylinder head gasket with number of holes 3	1,04 mm ... 1,18 mm

Screw-in depth of thread cutter	Used in step 55
Screw-in depth	18 mm

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Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 79
EGR controller	7 79

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	54 56

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
31 10 001 Completely removing and installing front axle with engine and transmission	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
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11 00 050 Removing and installing engine	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Removing and installing the engine (manual gearbox)	1 85
11 00 050 Remove and install engine (Automatic)	1 85
11 00 050 Remove and install engine	1 85

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11 00 050 Remove and install engine	1 85
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11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine \PREMIUM	1 85
11 00 050 Removing and installing/replacing engine (N63)	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Removing and installing engine	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Remove and install engine (Automatic)	1 85
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11 00 050 Remove and install engine (Automatic)	1 85
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11 00 050 Remove and install engine	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Remove and install engine	1 85
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 85
11 00 050 Remove and install engine	1 85
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21 54
61 35 ... Notes on ESD protection (Electro Static Discharge)	54

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	67
Exhaust-gas recirculation cooler seal on exhaust manifold	79
Exhaust-gas recirculation cooler seal on intake plenum	79

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11 21 001 Replacing crankshaft (B37C)

Special tools required:

- 11 6 250
- 00 2 010
- 11 6 480

Important!

Renew main bearing and connecting rod bolts.

When replacing the crankshaft, the main bearing shells and connecting rod bearing shells must be replaced.

There must be no oil in the blind holes **(risk of cracking)**.

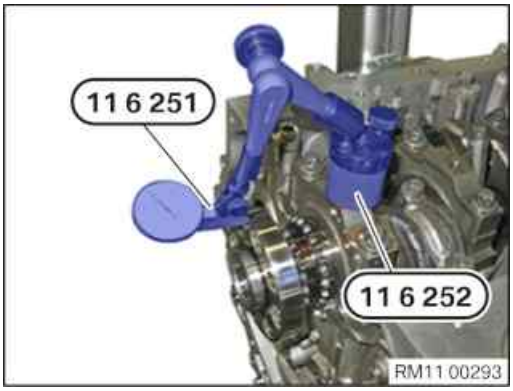
Do not wash off bolt coating.

Incorrect assembly of the crankshaft bearing caps will result in damage to the crankcase.

Necessary preliminary tasks:

- Remove both timing chains.
- Remove front, lower timing case cover.
- Remove all pistons.
- Remove counterbalance shaft.

Removal:



Check crankshaft side clearance.

Fit special tool 11 6 250 .

If the permitted side clearance is exceeded:

- Check crankshaft and guide bearing shells.
- Replace worn components.

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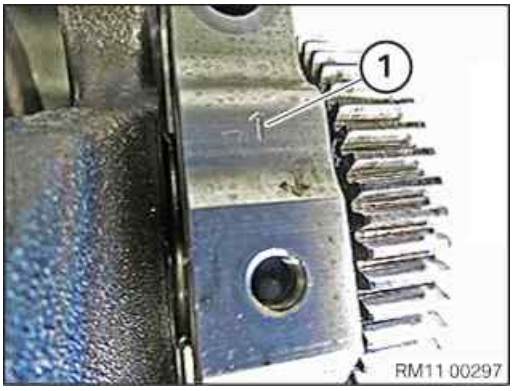


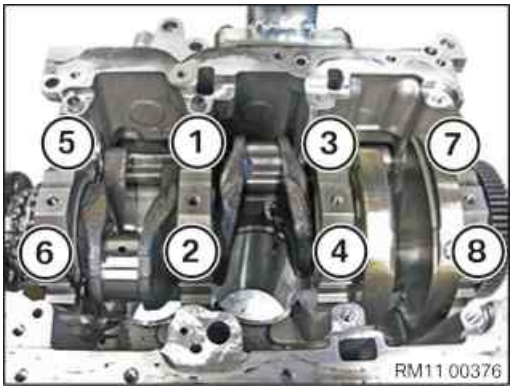
Note:

All crankshaft bearing caps (1) are labelled (bearing positions 1 to 4).

Installation position must be maintained.

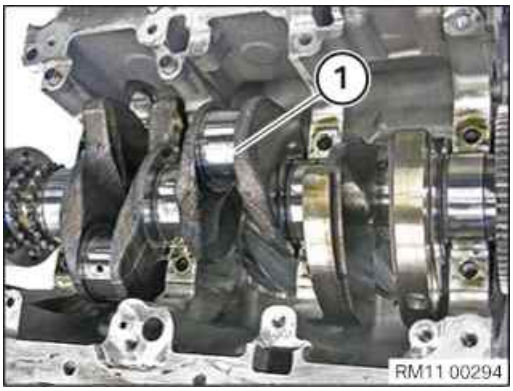
Crankshaft bearing cap 3 is installed as a thrust bearing.

Note:
Graphic on bearing seat 1.



Release main bearing cap screw connections in the sequence **8 - 1**.

Remove main bearing caps 1 - 4.



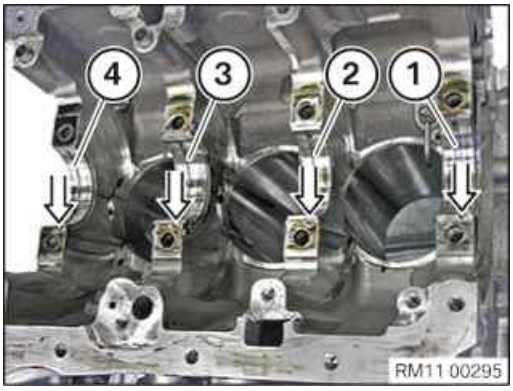
Important!

With the assistance of a second person, remove crankshaft and carefully place to one side.

Pay attention to oil hole in bearing shell.

Pay attention to installation position of crankshaft main bearing shells.

Installation:



For new crankshaft replace crankshaft main bearing shells.

Oil bearing shells (1 - 4).

Both locating grooves of bearing shells in crankcase and on crankshaft bearing cap must be mounted on one side.

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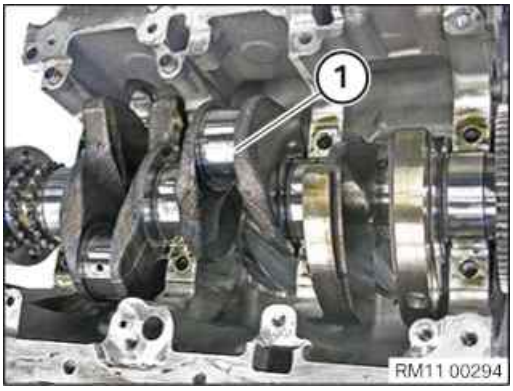
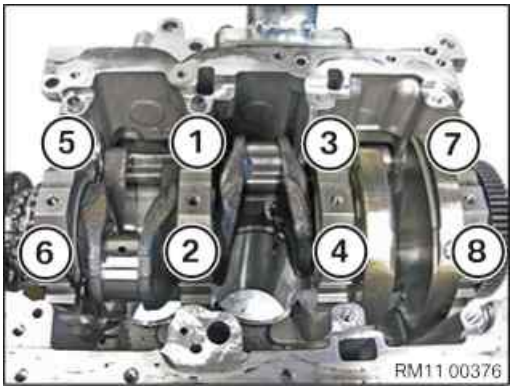


Insert crankshaft (1).



Important!

Do not fit crankshaft bearing cap in incorrect position.

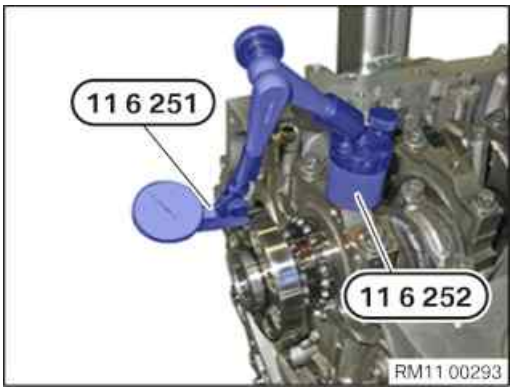
Risk of damage to moulding on crankcase.

Align crankshaft bearing cap exactly.

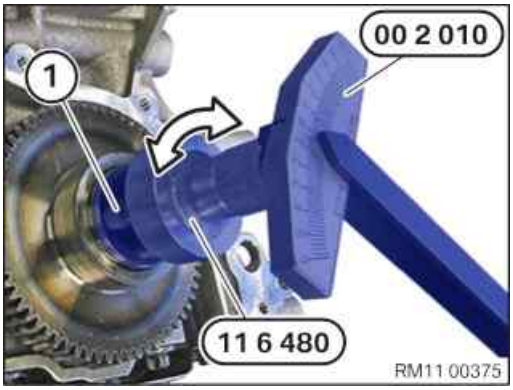
Fit main bearing bolts.

Tighten main bearing bolts in sequence **1 - 8** (comply with tightening specifications).

Tightening torque: 11 11 1AZ



Check side clearance.



Coefficient of friction of crankshaft.

Screw in all screws of vibration damper by hand.

Turn crankshaft evenly with special tool 00 2 010 and special tool 11 6 480 .

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Required follow-up work:

- Install counterbalance shaft.
- Install all pistons.
- Install lower front timing case cover.
- Install both timing chains.
- Assemble engine.

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11 22 000 Removing and installing/replacing flywheel (B37C)

Special tools required:

- 11 9 811
- 11 9 265
- 11 4 180

Necessary preliminary tasks:

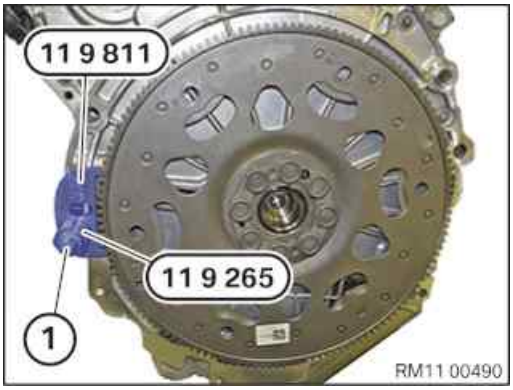
- Remove transmission.
- For manual gearbox:
  Remove clutch.

REMOVAL:

Manual gearbox.

Secure flywheel with Torx screw (1) and special tools 11 9 811 and 11 9 265 .

Release flywheel studs with special tool 11 4 180 /



Automatic transmission.

Secure flywheel with transmission bolt (1) and special tool 11 9 811 / 11 9 265 .

Unfasten flywheel bolts.

INSTALLATION:

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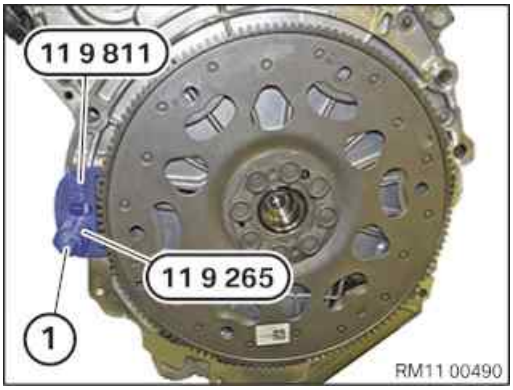
Manual gearbox.

Parts: Replace screws.

Secure flywheel with Torx screw (1) and special tools 11 9 811 and 11 9 265 .

Tighten flywheel bolts with special tool 11 4 180 .

Tightening torque: 11 22 1AZ.



Automatic transmission.

Parts: Replace screws.

Secure flywheel with transmission bolt (1) and special tool 11 9 811 / 11 9 265 .

Unfasten flywheel bolts.

Tightening torque: 11 22 1AZ.

Concluding tasks:

- Install clutch.
- Install transmission.

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11 22 000 Removing and installing/replacing the flywheel

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

PRELIMINARY WORK

1 – Remove vehicle battery

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WARNING

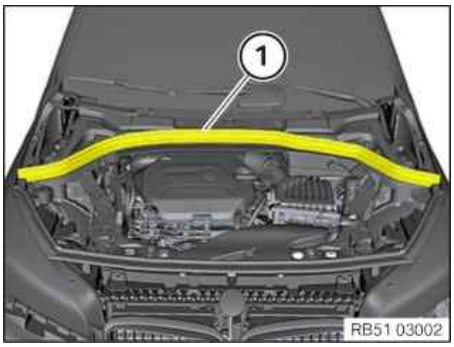
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

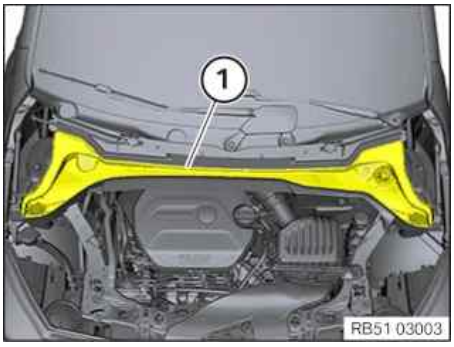
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

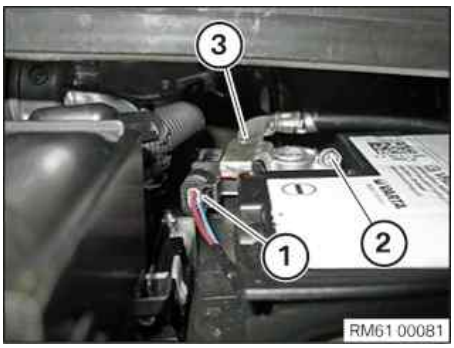
For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



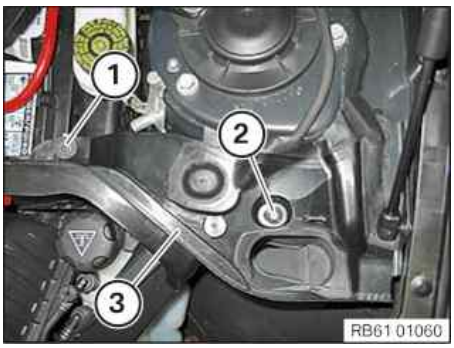
- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

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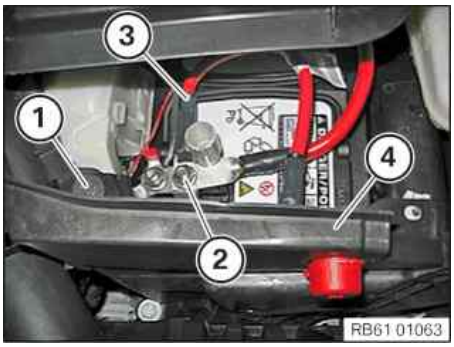
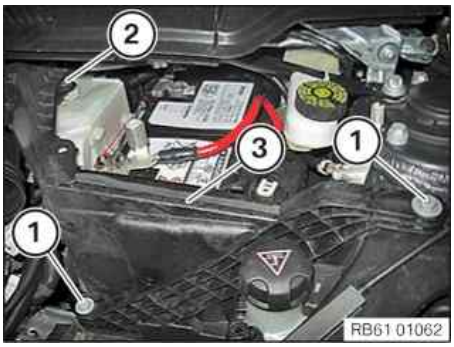
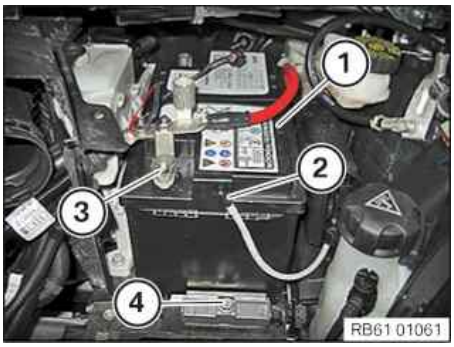


- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

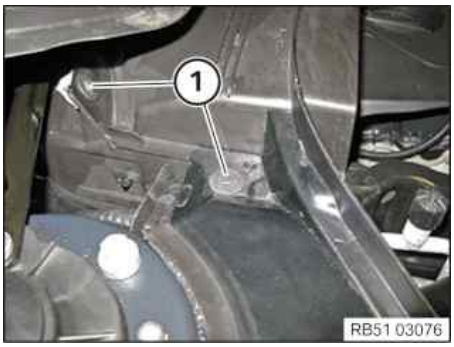
Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).

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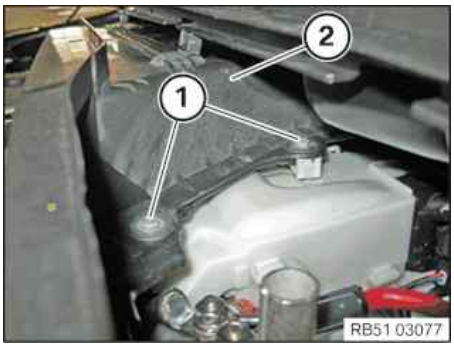
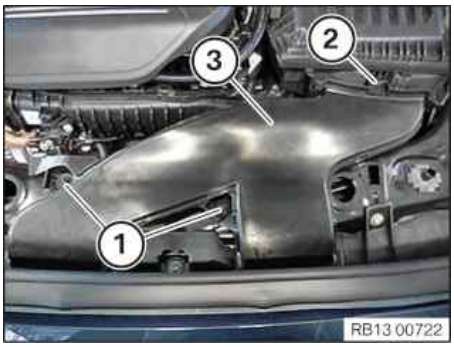


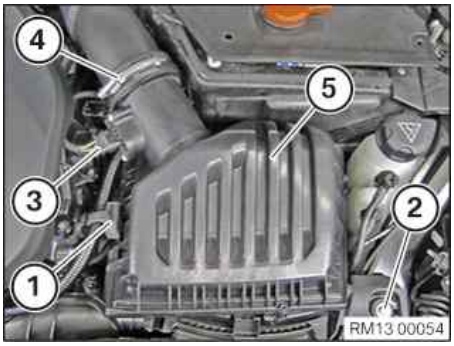
- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

5 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

6 – Install the engine bridge

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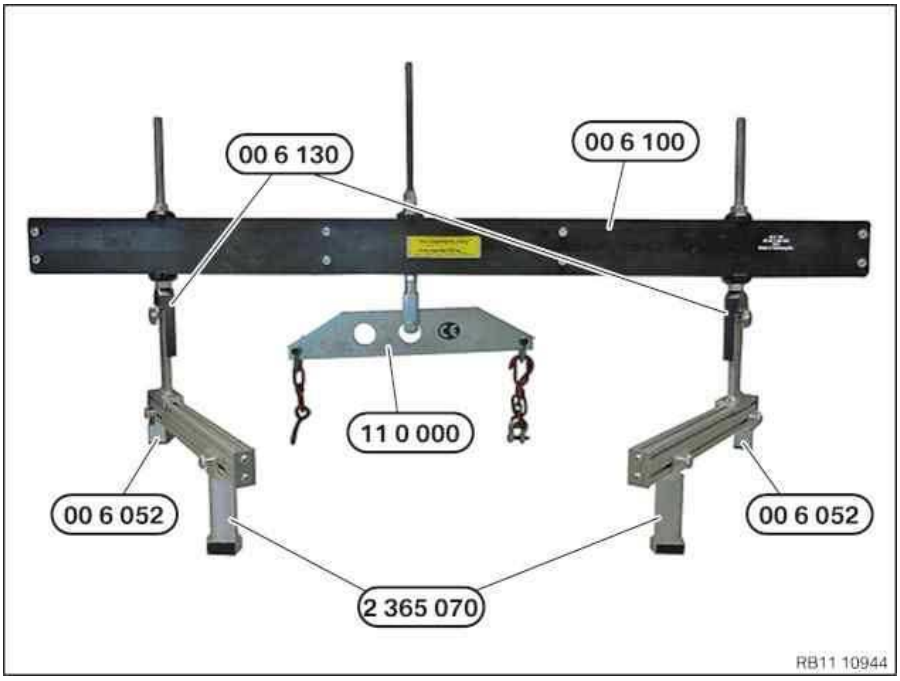
Overview: Prepared engine bridge



Prerequisite

Front compartment lid is in service position.

CAUTION

Components connected to the engine joint or cross member.

Danger of injury!

- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.

- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm

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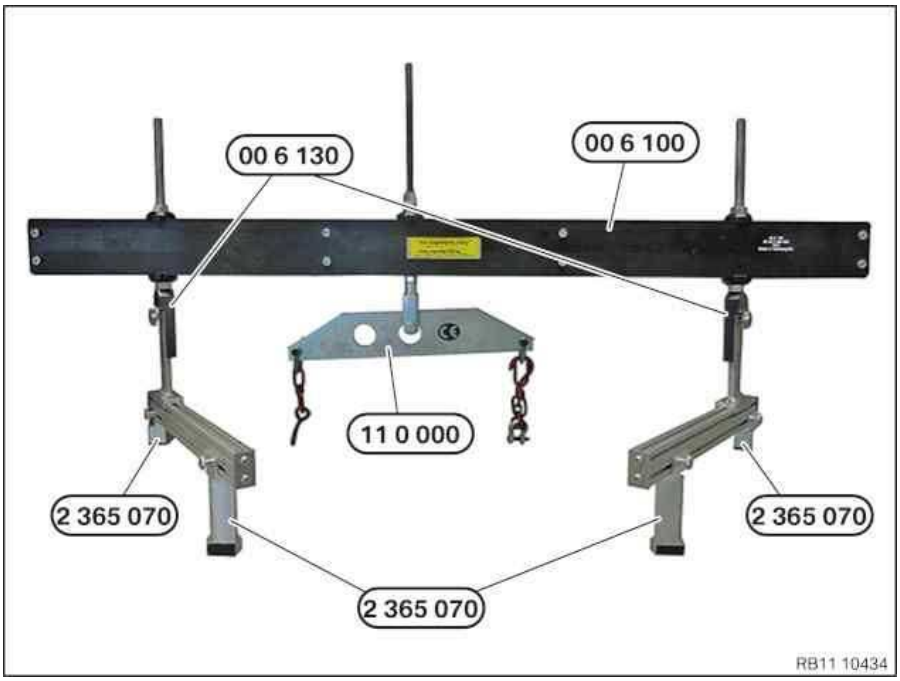


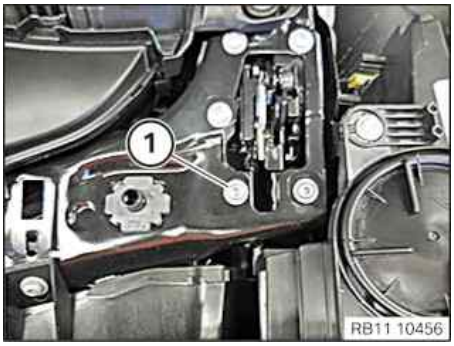
CAUTION

Heavy component.

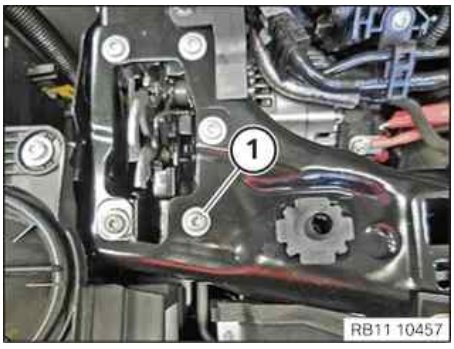
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

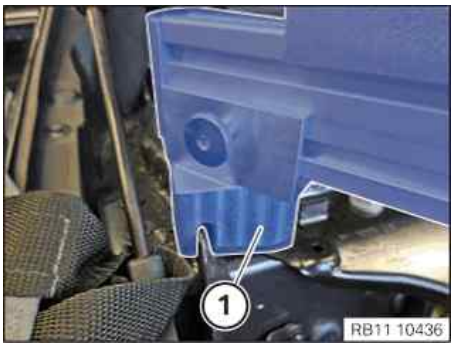
- Set entire cross member **0 496 852 (00 6 100)** on the vehicle and position with the help of an auxiliary person.



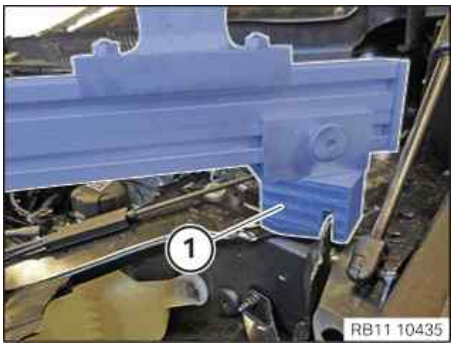
- Loosen screw (1) of the left bonnet catch.



- Loosen screw (1) of the right bonnet catch.



- Position special tool **2 365 070** to the rear mounting point (1) at the right.



- Position special tool **2 365 070** to the rear mounting point (1) at the left.

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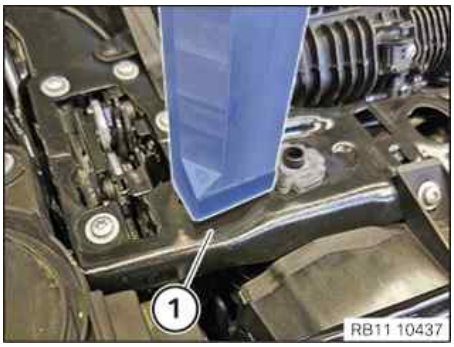
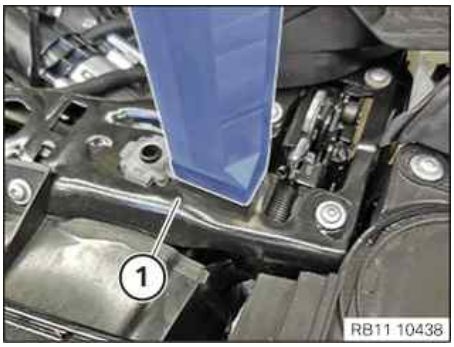
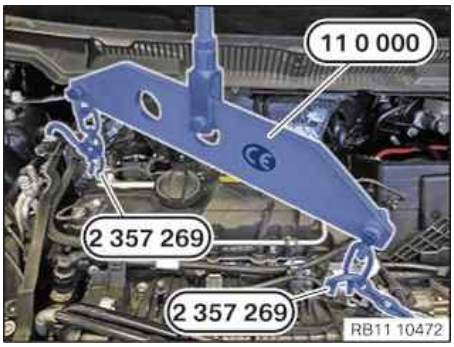


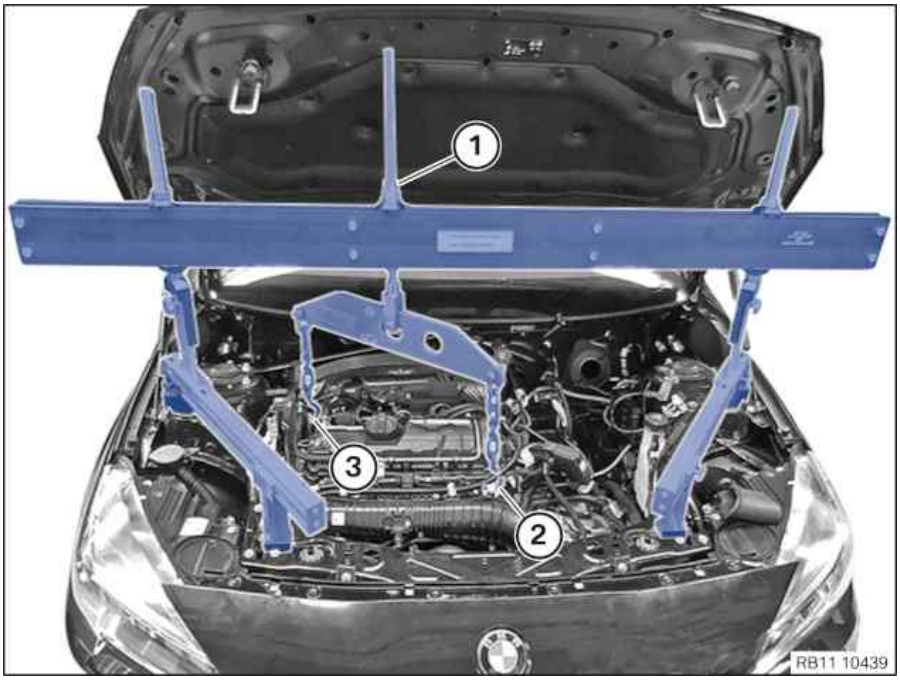
- Position special tool **2 365 070** to the front mounting point (1) at the right.



- Position special tool **2 365 070** to the front mounting point (1) at the left.



- Position special tool **0 490 561 (11 0 000)** above the engine.
- Attach special tools **2 357 269** to the mounting lugs of the engine.



- Tighten side screws (2) and (3).
- Slightly pretension the spindle screw (1) of the engine support beams.
- Tighten down all adjusting screws, knurled screws and nuts on cross member **0 496 852 (00 6 100)** and on special tool .

7 – Securing radiator on left and right

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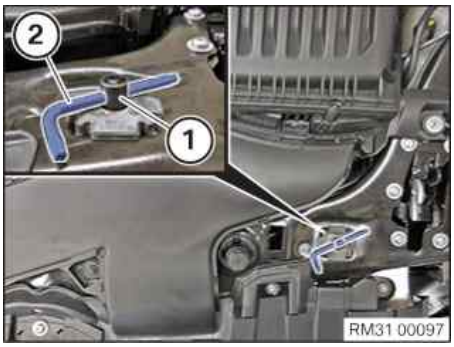
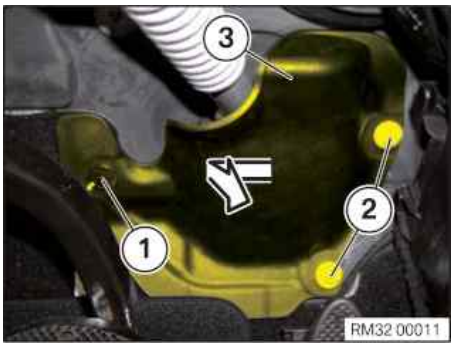


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

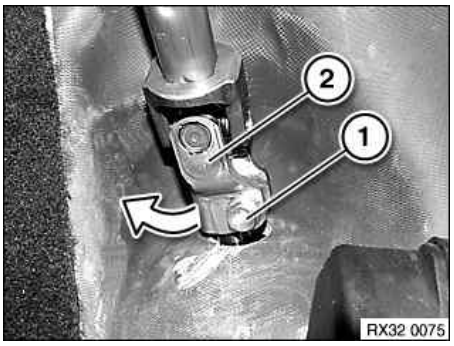
8 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

9 – Remove the front left and right wheel

▸ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

10 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Remove front wheel arch cover**

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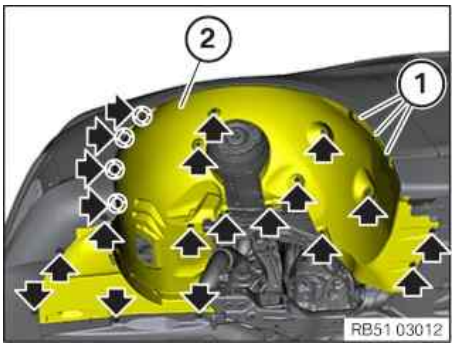
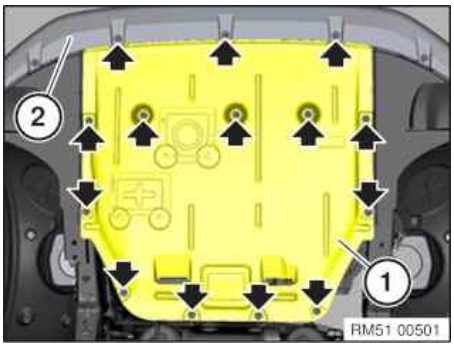


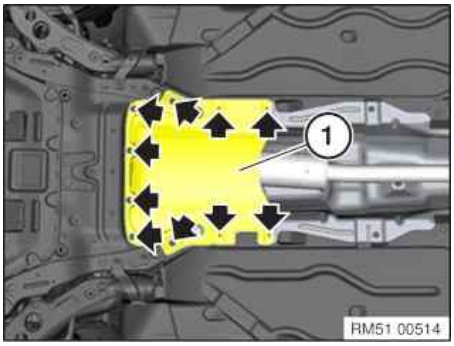
- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

11 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

12 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

13 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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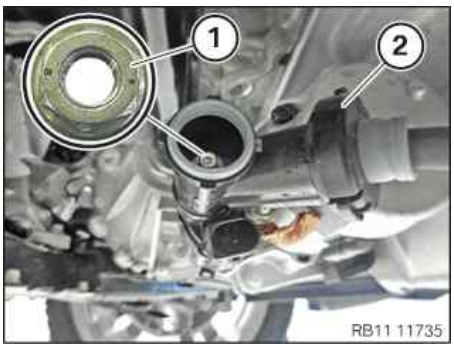
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

- Loosen screws (1).
- Feed out starter motor and remove.

14 – Draining the oil level in the manual gearbox (GS6-58BG, GS6-59DG)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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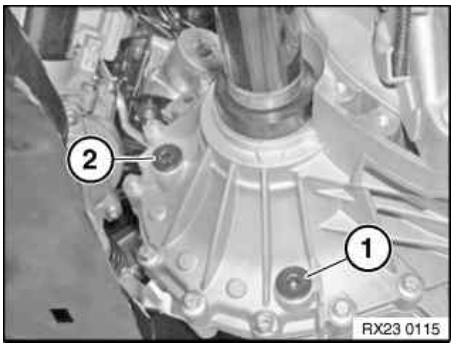
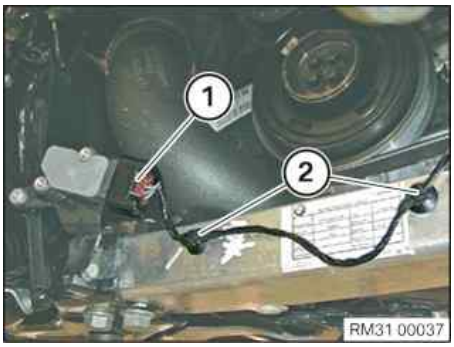


- Draining transmission oil:
  - Release oil drain plug (1) and oil filler plug (2).
  - Clean oil drain plug (1) and screw in.

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

15 – With right installation: Detaching ride height sensor cable



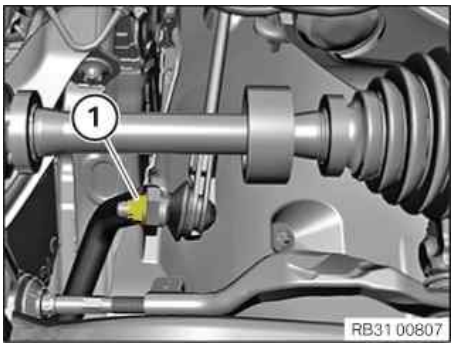
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

16 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Detach the anti-roll bar from the anti-roll bar link**

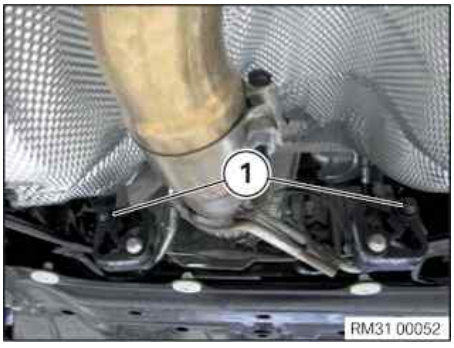


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

17 – Detaching rubber mount from front axle support



- Spray rubber mount (1) with lubricant and release from holder on front axle support.

18 – Disconnecting plug connections from steering gear

▸ **If installed: Detach connectors from the front axle carrier**

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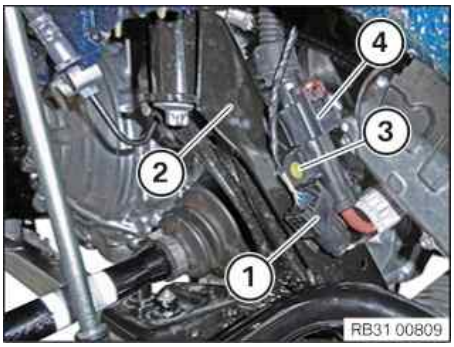
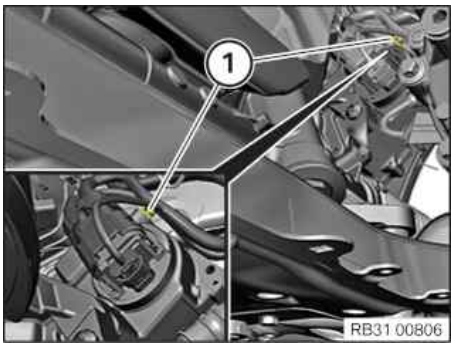


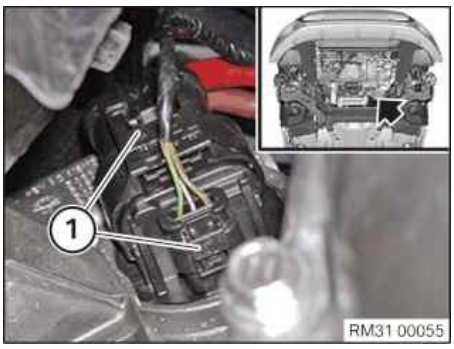
- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



- Disconnect wiring harness (1) from steering gear.

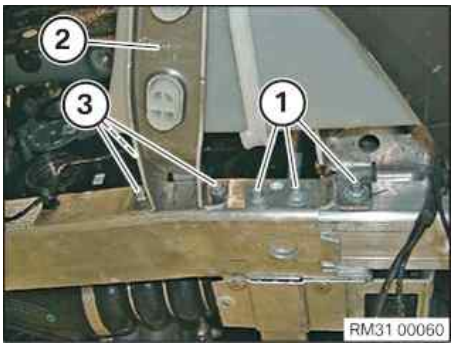
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

19 – Releasing the mounted part from the front axle support



- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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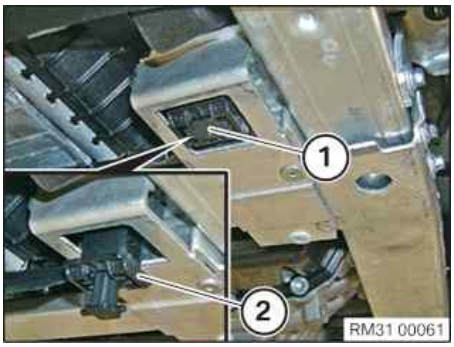
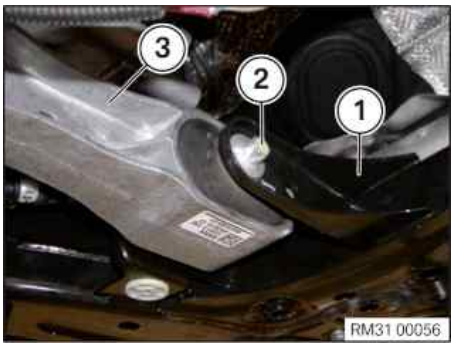


NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



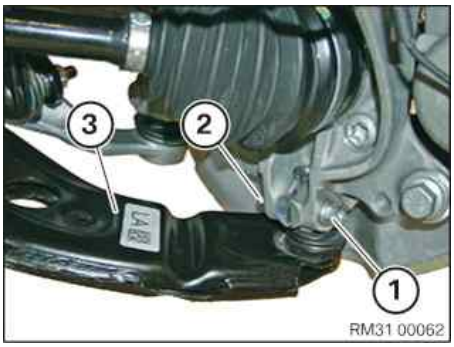
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

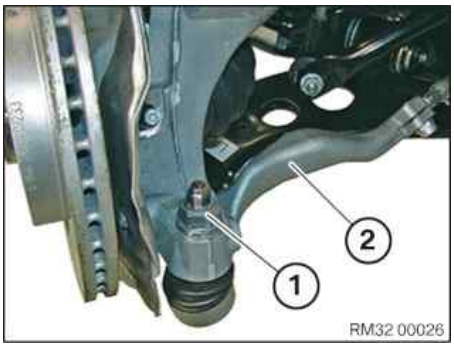
20 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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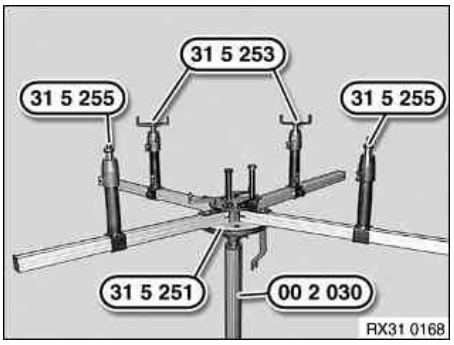
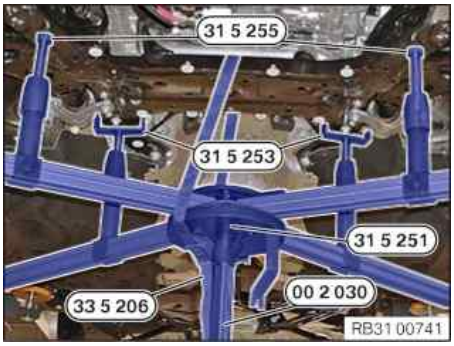


- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

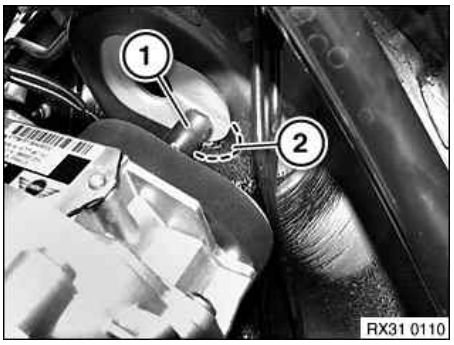
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

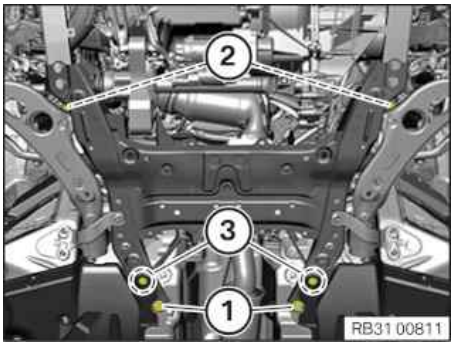


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



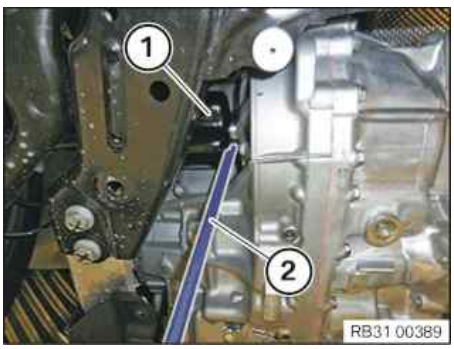
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

21 – Partially removing the left output shaft



- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Tie up output shaft (1).

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▸ **Remove the left/right radial shaft seal on the differential (manual gearbox)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

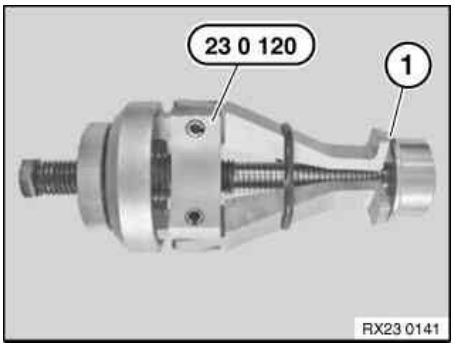
- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the transmission.

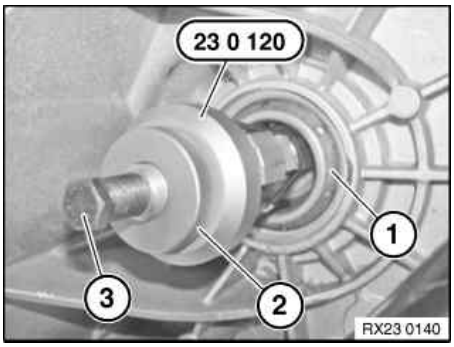
Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



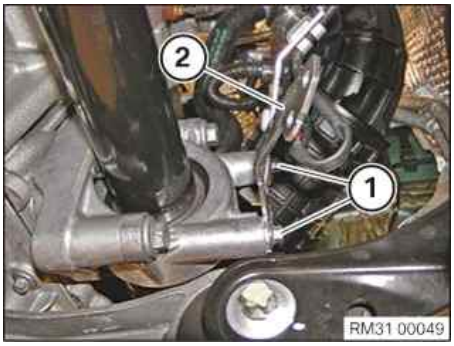
- Prepare special tool **0 496 698 (23 0 120)**.

  The distance (1) must be < 1 mm.



- Insert special tool **0 496 698 (23 0 120)** in the radial shaft seal (1) up to the limit position.
- Spread out the claws by turning the nut (2).
- Screw in screw (3) and pull off the radial shaft seal.

22 – Removing right output shaft partially



- If necessary, unscrew the bolts (1) and remove the holder (heat shield) (2).

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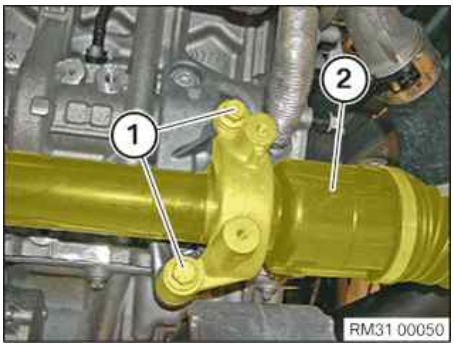


- Loosen screws (1).
- Pull out the output shaft (2) from the transmission.
- Tie up output shaft (1).

▸ **Remove the left/right radial shaft seal on the differential (manual gearbox)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

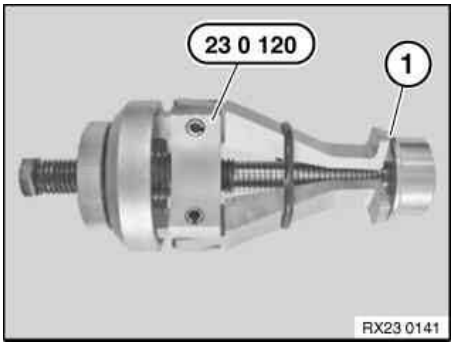
- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the transmission.

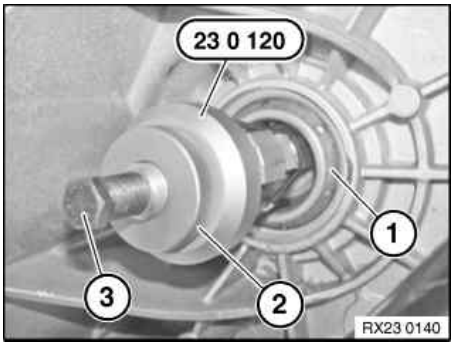
Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Prepare special tool **0 496 698 (23 0 120)**.

  The distance (1) must be < 1 mm.



- Insert special tool **0 496 698 (23 0 120)** in the radial shaft seal (1) up to the limit position.
- Spread out the claws by turning the nut (2).
- Screw in screw (3) and pull off the radial shaft seal.

23 – Release transmission-side bolting connection oil sump

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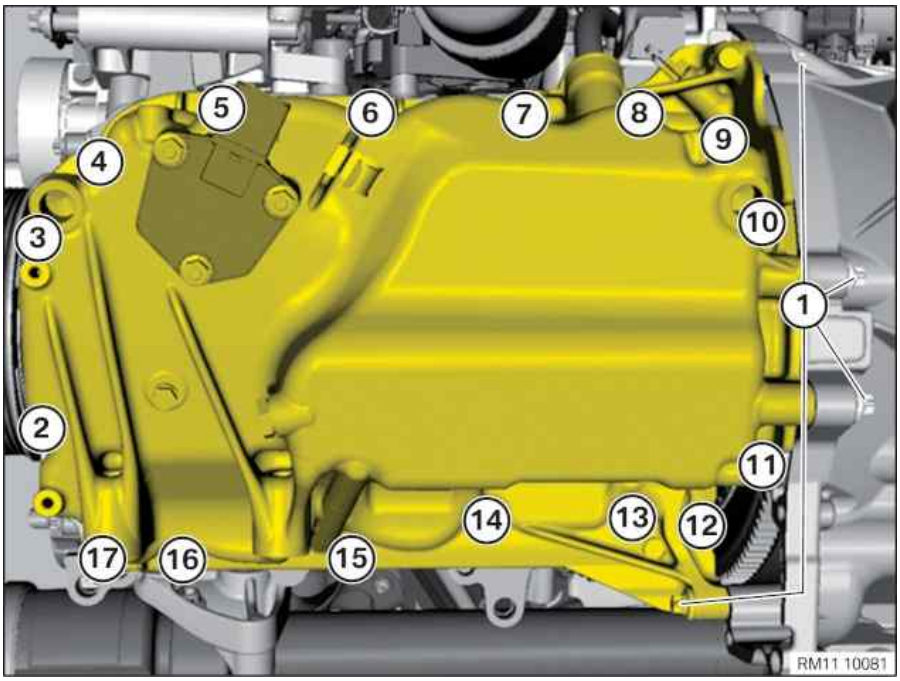

- Unscrew the bolts (1) from the transmission.

24 – Removing the manual gearbox (GS6-59DG, GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the engine block.

Damaged and corroded bolts will lead to major damage in the engine block and the transmission.

- It is imperative that protruding threads of the transmission bolts are checked for corrosion and damage prior to removal.
- It is imperative that all rust is removed from corroded threads and that they are cleaned prior to removal.
- Renew rusted and damaged bolts.

▸ **Remove electronics box**

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

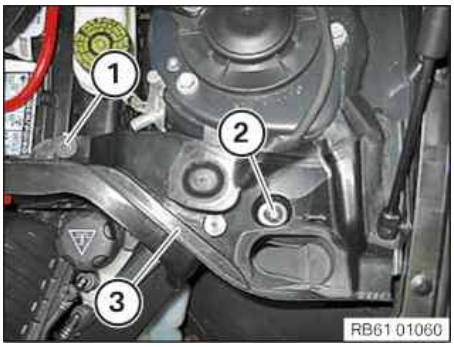
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

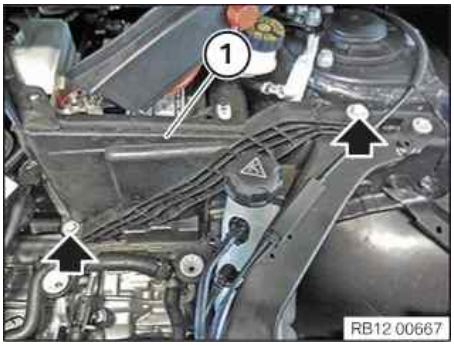
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

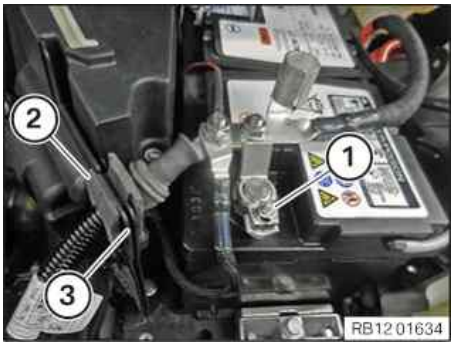


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

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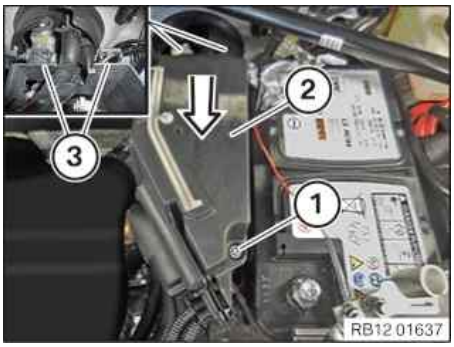
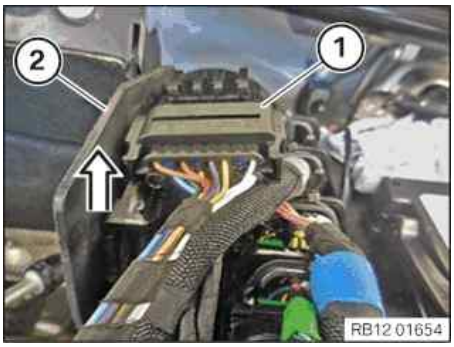
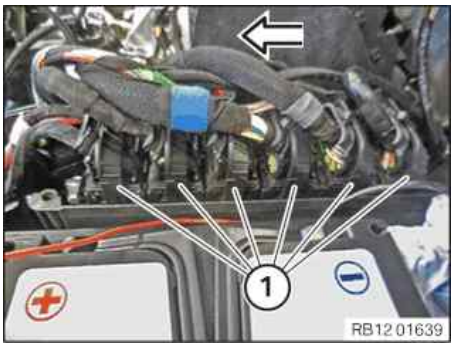


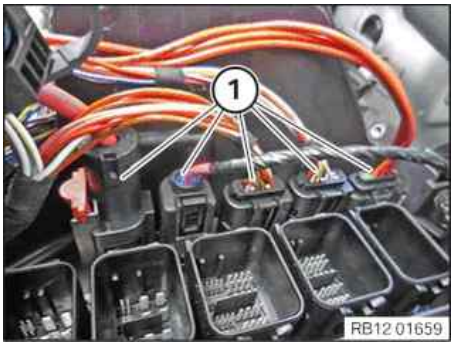
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



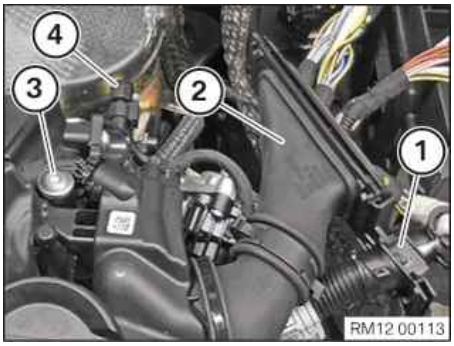
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



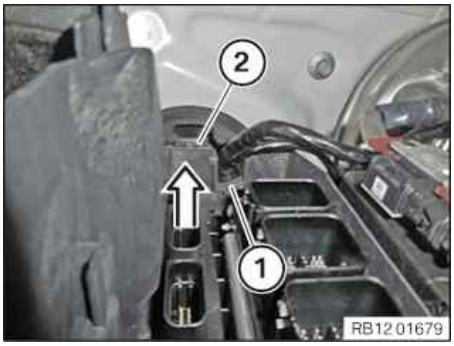
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

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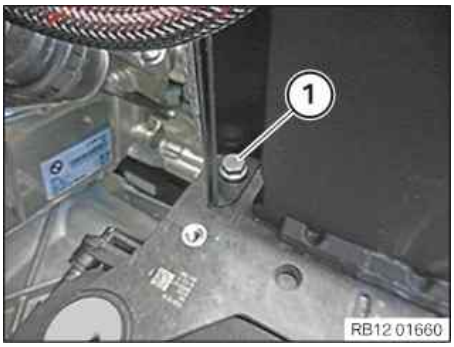
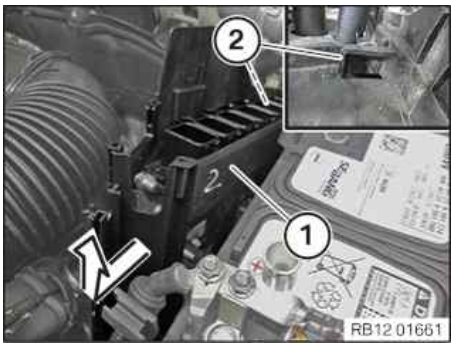
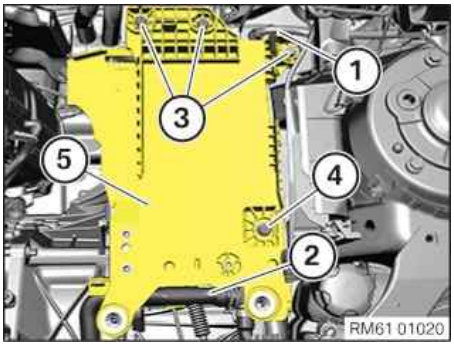


- Loosen screw (1).

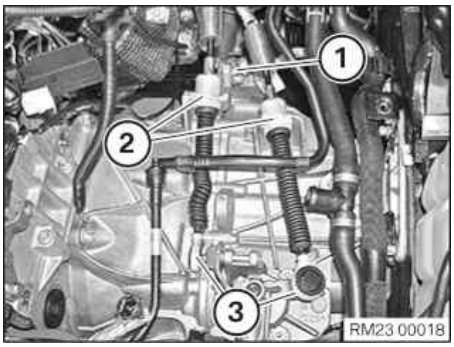


- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

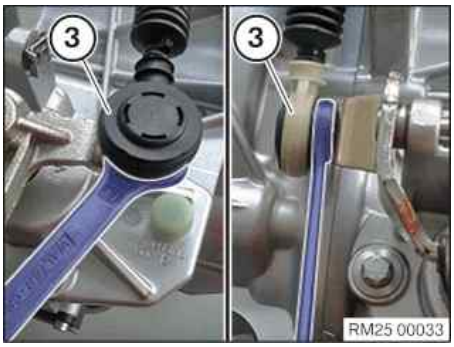
▸ **Remove battery holder**



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).



- Release the clip on the limit position/bracket (2) and bend the tabs slightly away from the limit position/bracket (2).
- Unscrew the bolt (1) and detach the ground strap from the transmission.



- Lever the fixtures (3) of the selector lever cables away from the ball joints with an open-end spanner SW13.

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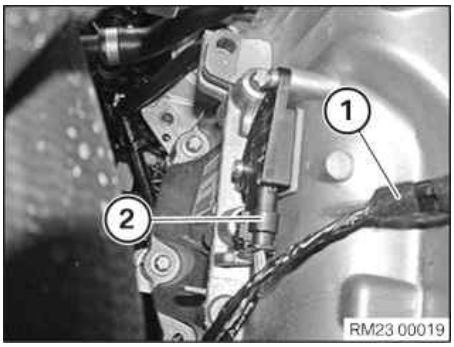
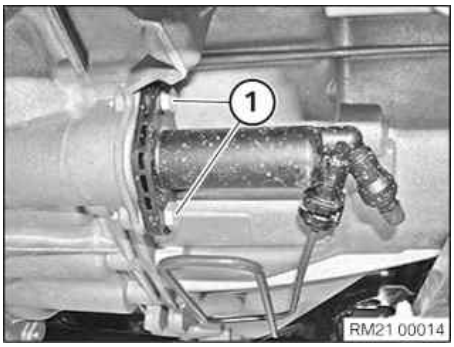
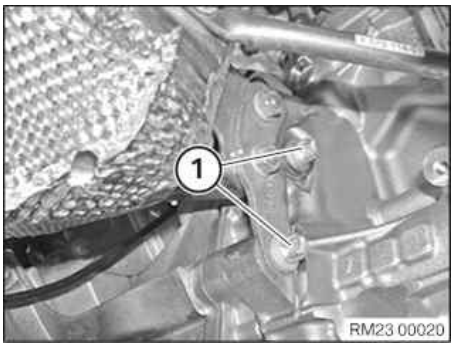


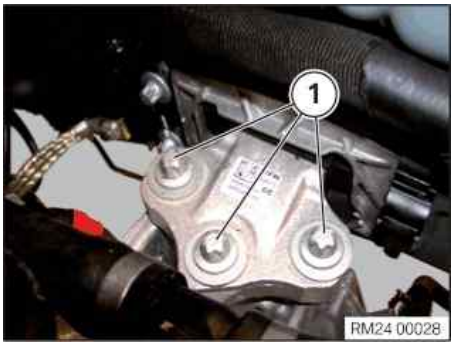
- Disconnect the plug connection (2) of the gear sensor.
- Detach the cable (1) with the holder from the transmission.



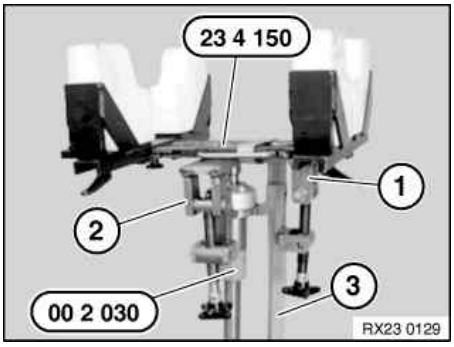
- Relieve tension on clutch slave cylinder slowly; otherwise air will be drawn in through sealing cup. Pressure line of clutch slave cylinder remains connected.
- Unscrew the bolts (1) and remove the clutch slave cylinder.



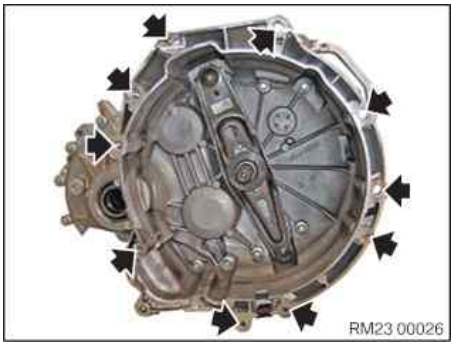
- Loosen screws (1).



- Loosen screws (1).



- Support the transmission with special tool **0 490 133 (00 2 030)** and .
- Secure the transmission with the tensioning strap (3).



- Remove screws (arrows).
- Pull transmission downwards and remove.

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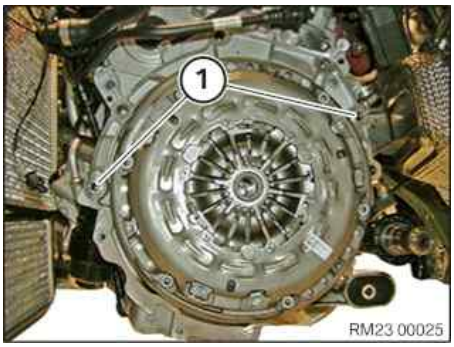


- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check clutch disc for frictional corrosion in gearing and replace if necessary.

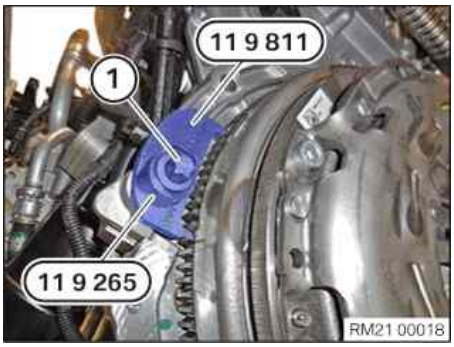
25 – Remove clutch

CAUTION

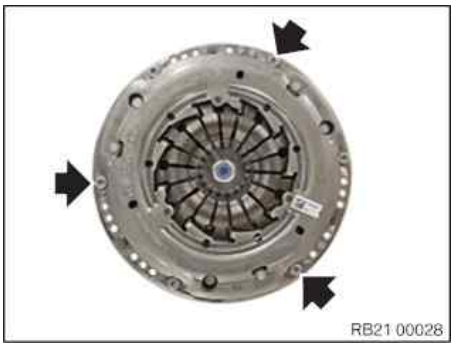
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.



- Detach 3 screws to attach special tool **0 493 839 (21 2 170)** and **2 288 165**.

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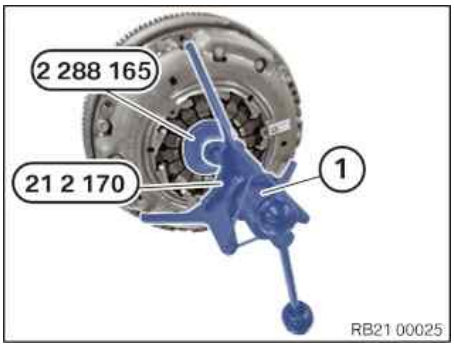
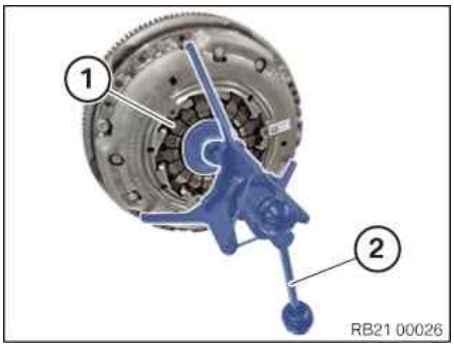
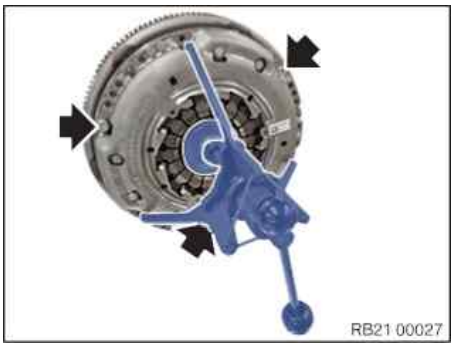


- Position special tool **0 493 839 (21 2 170)** and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

MAIN WORK

26 – Removing flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.

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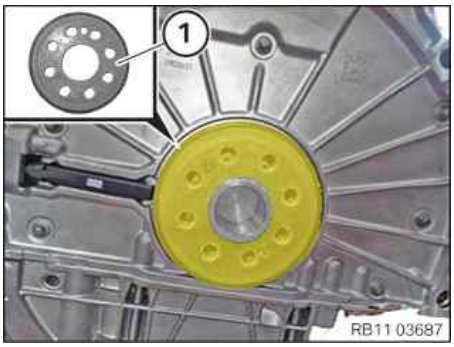

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

27 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
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- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).

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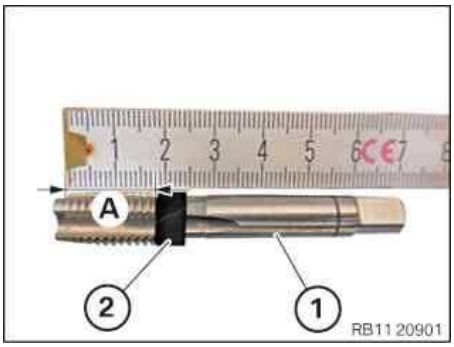
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

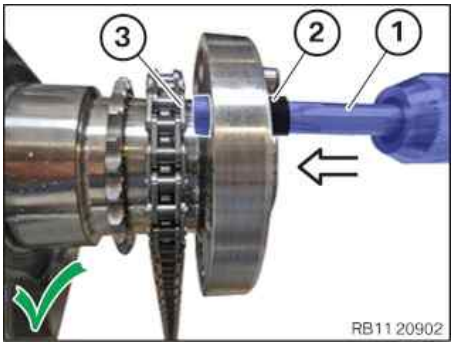
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

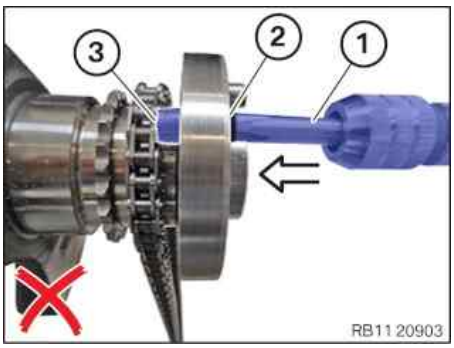
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).



TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).

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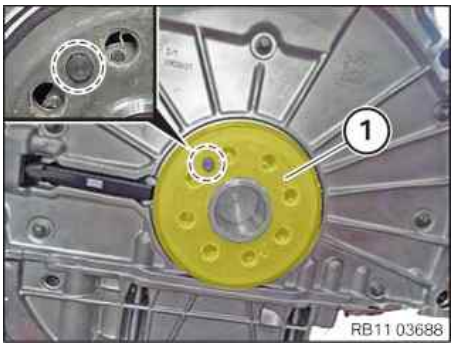
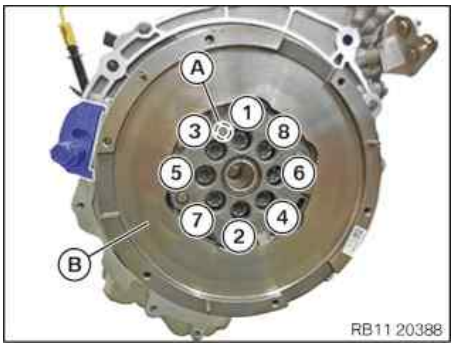


- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

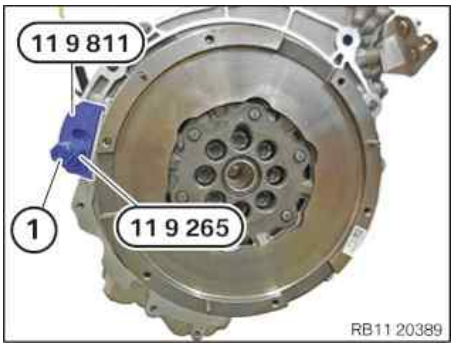


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

POSTPROCESSES

28 – Install clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.

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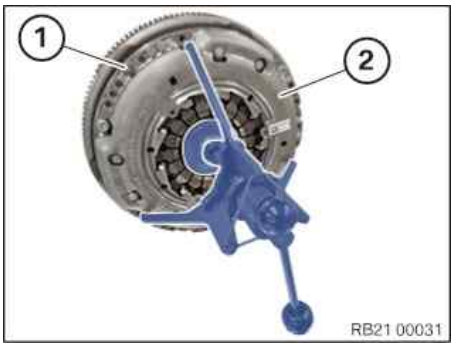
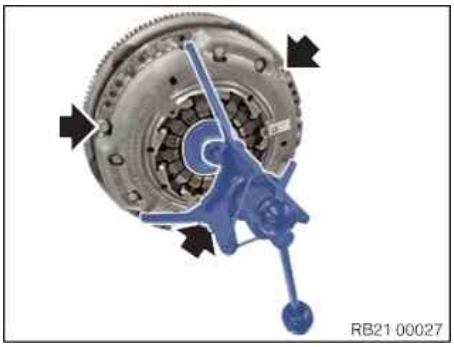
- Centre the clutch disc (1) using special tool **2 358 471**.



- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

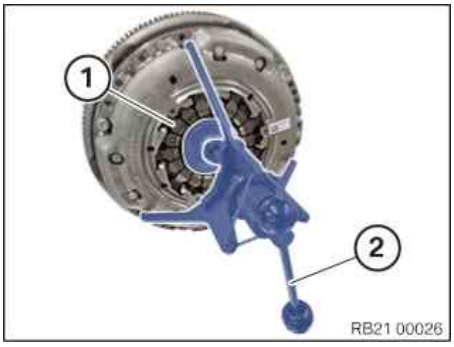


- Renew the bolts (arrows).

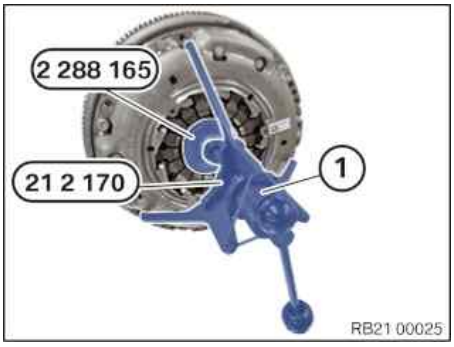
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

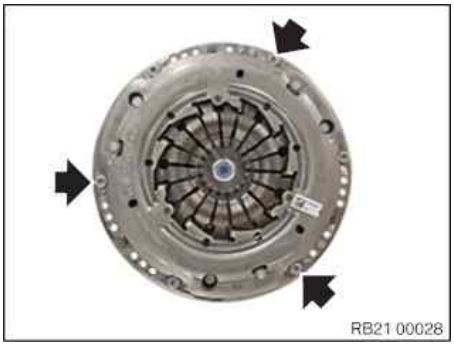
M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool **0 493 839 (21 2 170)** with **2 288 165** from the clutch.



- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

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- Withdraw special tool **2 358 471** from clutch disc with aid of accompanying screw.

29 – Installing the manual gearbox (GS6-59DG, GS6X60DA)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

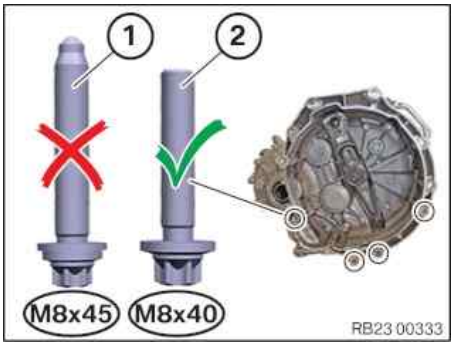
- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the engine block.

Damaged and corroded bolts will lead to major damage in the engine block and the transmission.

- It is imperative that protruding threads of the transmission bolts are checked for corrosion and damage prior to removal.
- It is imperative that all rust is removed from corroded threads and that they are cleaned prior to removal.
- Renew rusted and damaged bolts.



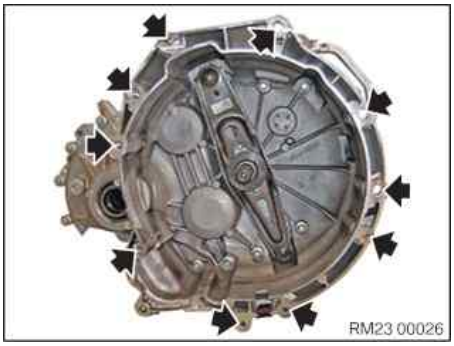
RISK OF DAMAGE

Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- **Wrong:** The screw (1) (starter motor screw connection) must **not** be used for the bottom screw connection of the transmission.
- **Correct:** It is imperative to use the bolt (2) (M8x40) for the lower screw connection of the transmission and flange-mount the transmission.



- Tighten screws (arrows).

Transmission to engine

M8x40		Tightening torque	19 Nm
M12x75		Tightening torque	66 Nm

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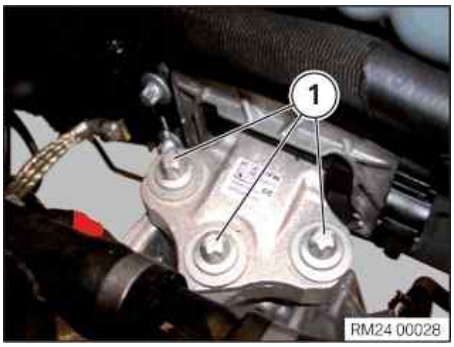
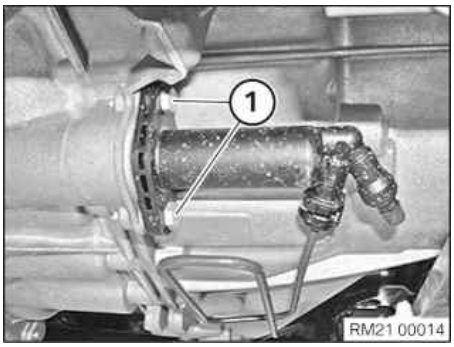


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Transmission mounting

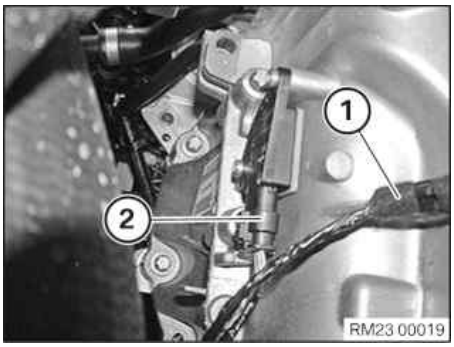
M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °



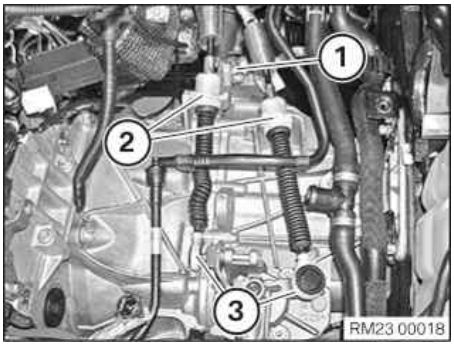
- Install clutch slave cylinder.
- Tighten the screws (1).

Clutch slave cylinder to transmission housing

M8		Tightening torque	19 Nm

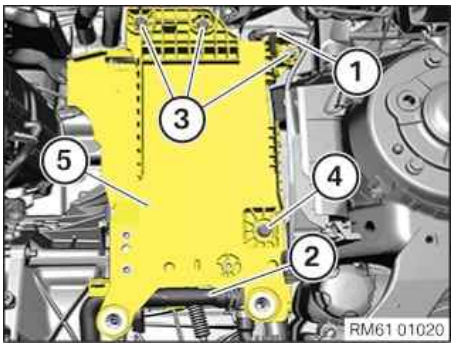


- Connect the plug connection (2) of the gear sensor.
- Clamp the cable (1) with the holder to the transmission.



- Tighten the ground strap on the transmission with the screw (1).
- Clip in the clip on the stop/holder (2).
- Attach the selector lever cables (3) on the ball joints.

▸ **Install the battery holder**



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

▸ **Partially install vehicle battery**

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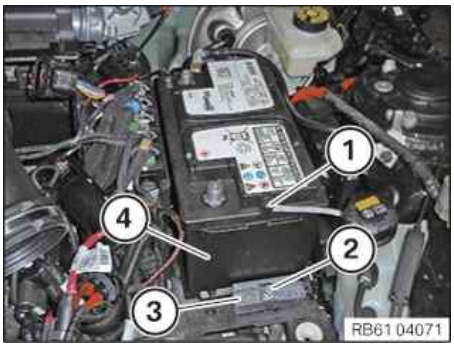


- Install vehicle battery (4).
- Correctly position the holder (3).
- Tighten down screw (2).

Battery terminal rail to battery tray

M8		19 Nm

- Fit and clip the vent hose (1) in.

▷ **Check the vent holes of the battery**

WARNING

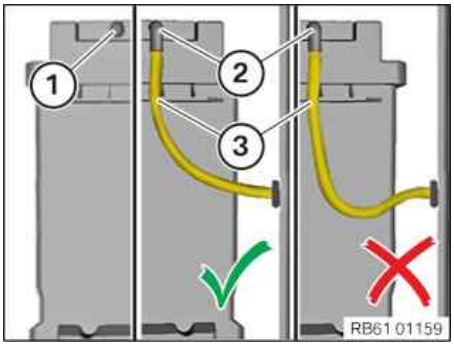
Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check
- Check if the vent hole (1) is correctly closed with a dummy plug.

Result
» No dummy plug.

Measure
- Close the vent hole (1) correctly with a dummy plug.

Check
- Check if the vent hole (2) has a correctly connected vent hose (3).

Result
» The vent hose (3) is not correctly connected.

Measure
- At the vent hole (2), connect the vent hose (3) correctly.

Check
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result
» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure
- Route the vent hose (3) correctly as shown in the centre image.

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◁

▶ **Install electronics box**

Prerequisite

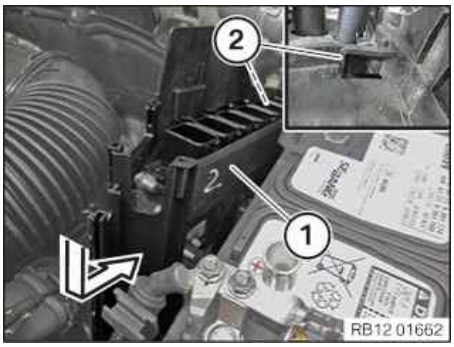
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

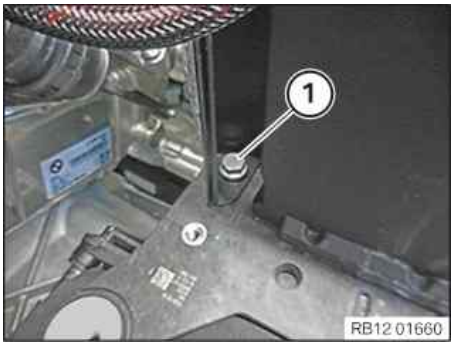
Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

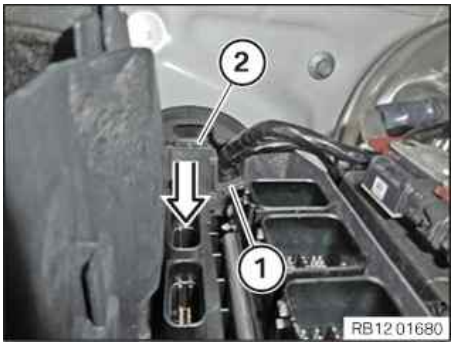
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

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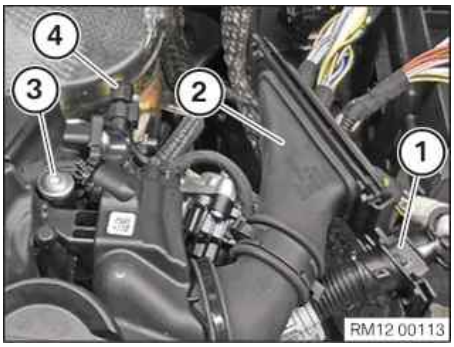
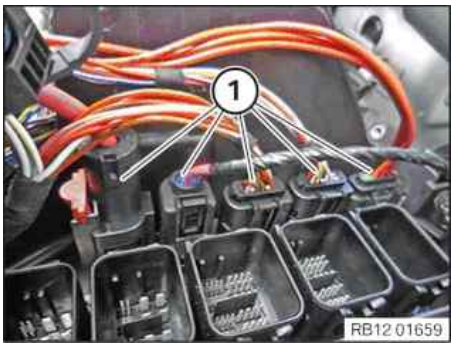


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

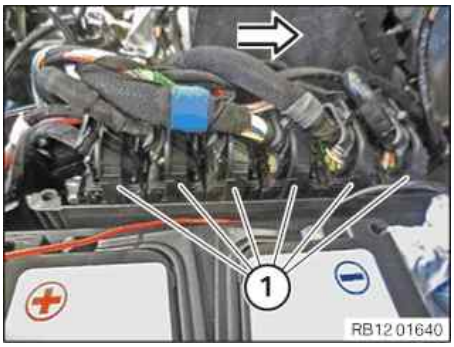
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

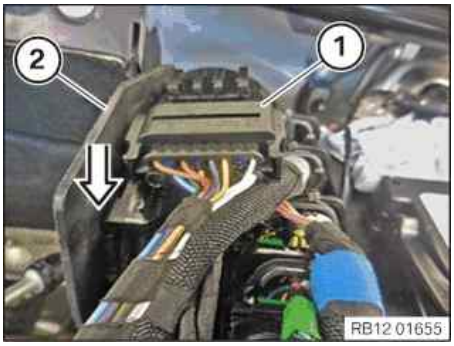
- Attach connector (4) to the differential pressure sensor and lock it audibly.



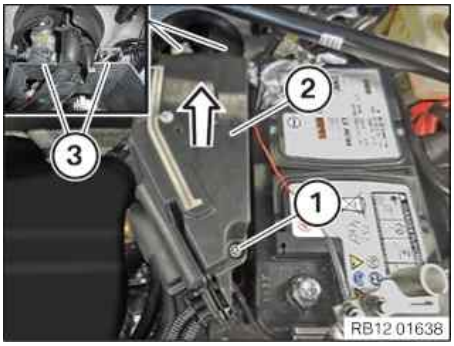
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



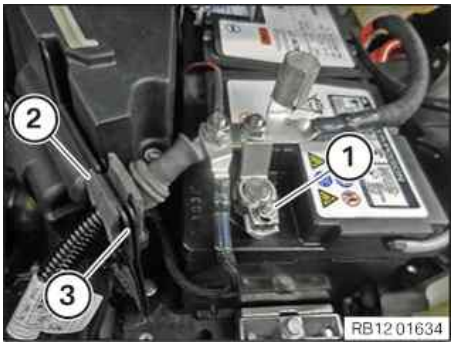
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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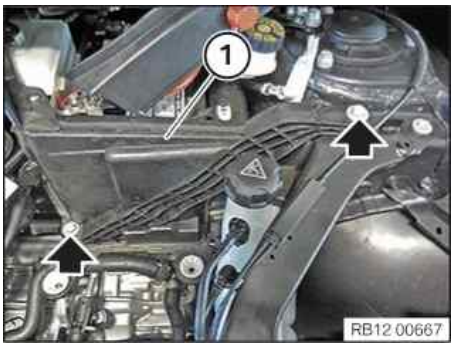


- Feed in and install tension strut (1).
- Tighten screws (arrows).

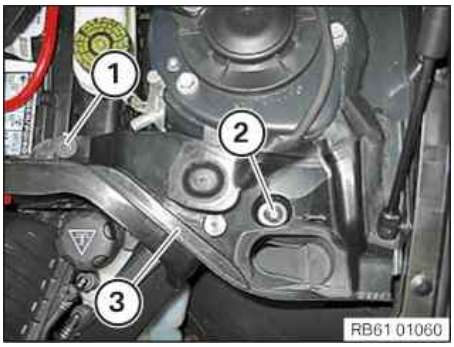
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

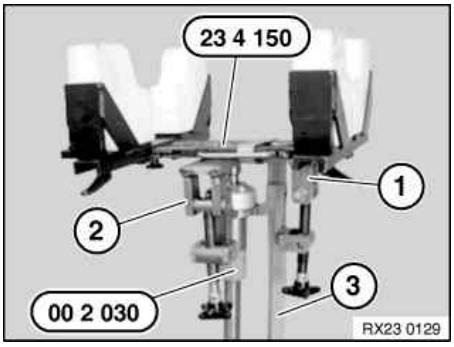
		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Loosening the tensioning strap (3).
- Remove special tools **0 490 133 (00 2 030)** and .

30 – Tighten down transmission-side bolting connection oil sump

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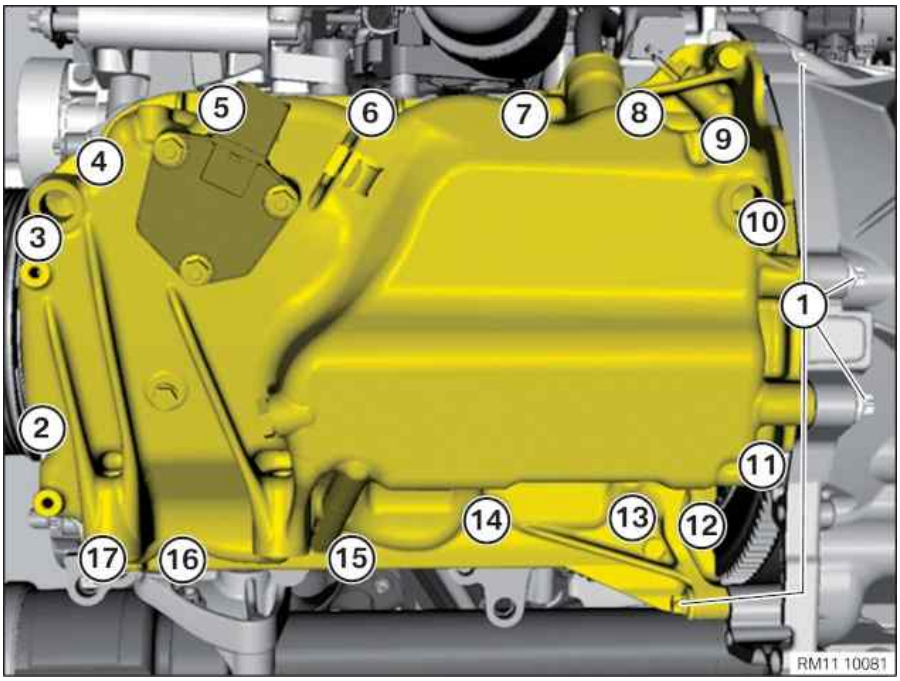


- Join transmission bolts (1) with 5 Nm.
- Tighten the transmission bolts (1) on the transmission.

Transmission to oil sump

M8			19 Nm

31 – Installing right output shaft partially

▸ **Installing the radial shaft seal, right in the differential (manual gearbox)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

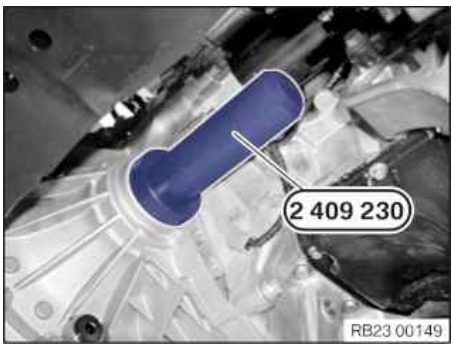
- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Coat sealing lips of radial shaft seal with transmission oil.
- Drive the radial shaft seal into the housing with the special tool **2 409 230** until the sealing ring finishes flush with the transmission housing.

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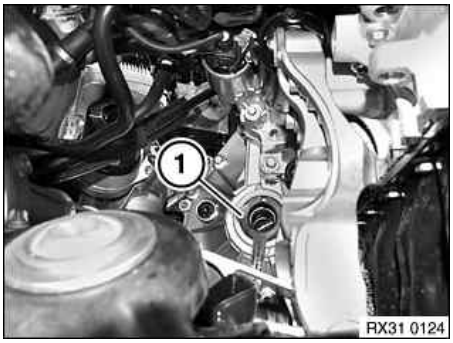
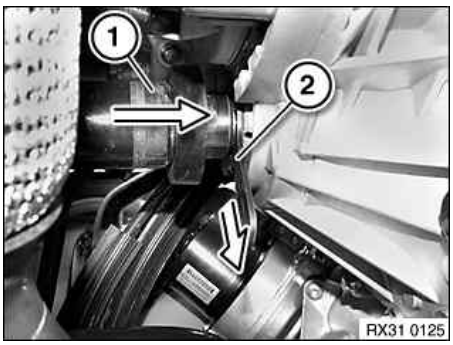
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

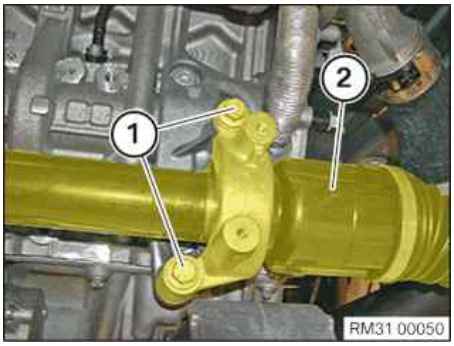
  Parts: O-ring
- Insert new O-ring (1).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.



- Insert output shaft (1) into transmission.
- Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.
- Check for secure seat by levering.



- Tighten the screws (1).

Output shaft bearing to engine block

M10		Tightening torque	38 Nm

32 – Partially installing the left output shaft

▸ **Installing the left radial shaft seal on the differential (manual gearbox)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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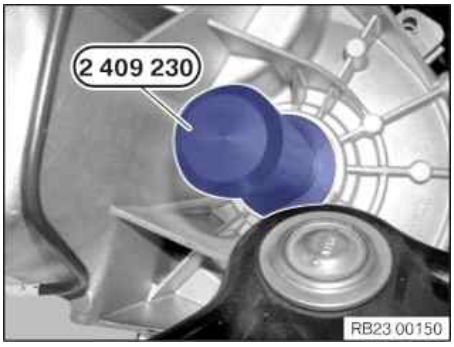
RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

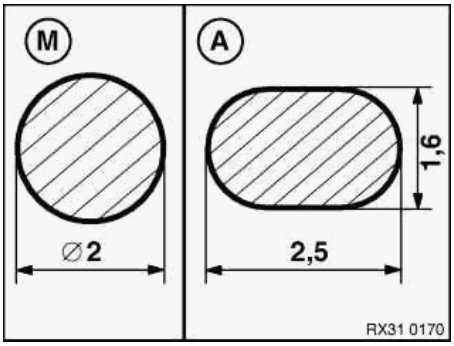
- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.



- Coat sealing lips of radial shaft seal with transmission oil.
- Drive the radial shaft seal into the housing with the special tool **2 409 230** until the sealing ring finishes flush with the transmission housing.

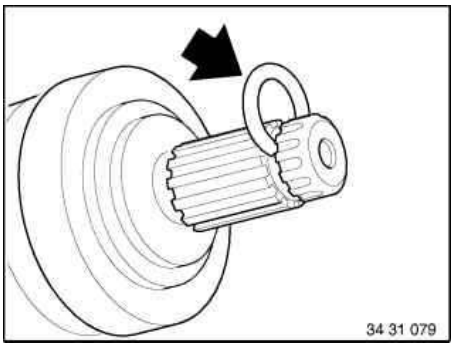
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

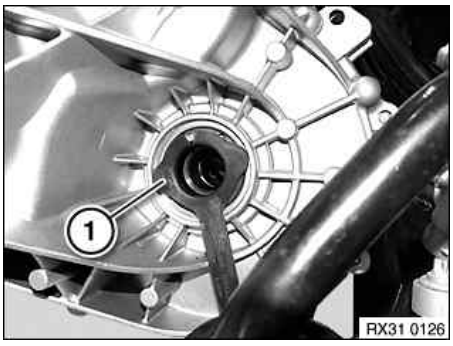


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission



- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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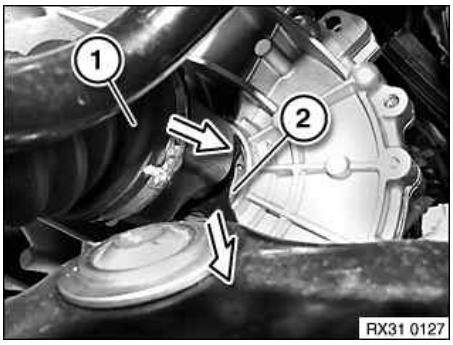
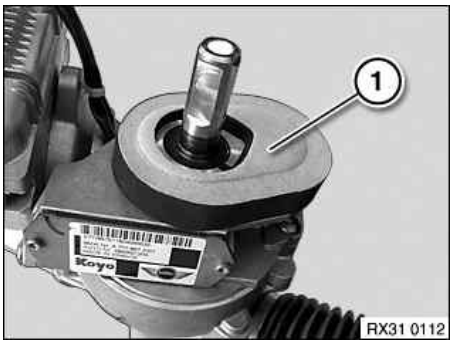


- Insert output shaft (1) into transmission.
- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

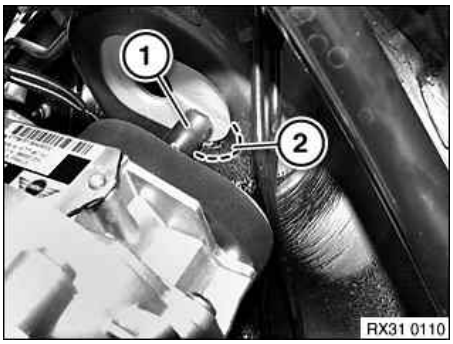
  The output shaft (1) must engage audibly.
- Check for secure seat by levering.

33 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

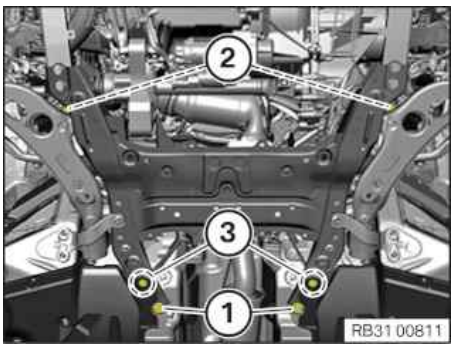


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm

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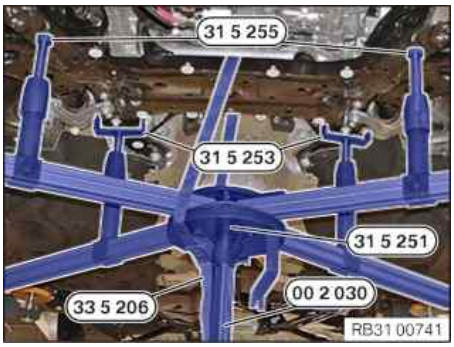
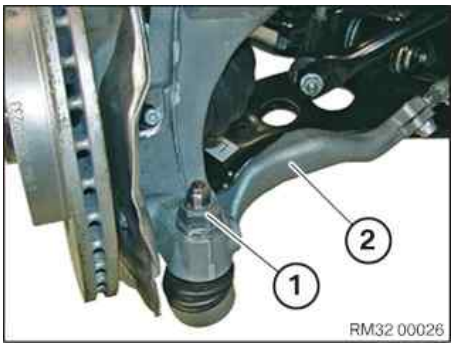


- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.



NOTICE

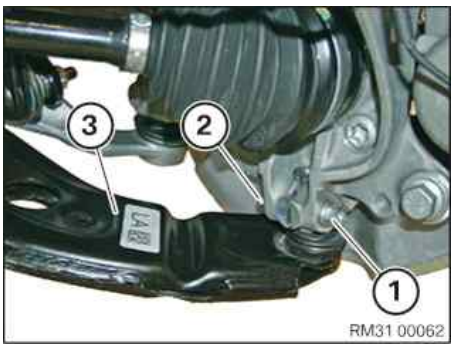
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

34 – Install the mounted parts on the front axle support

NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

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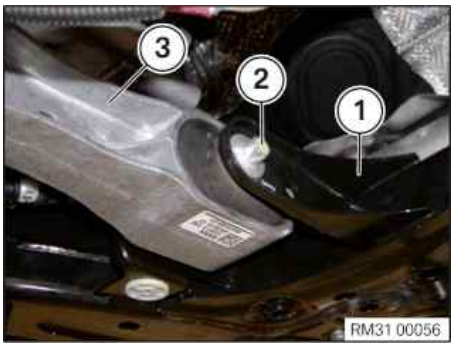
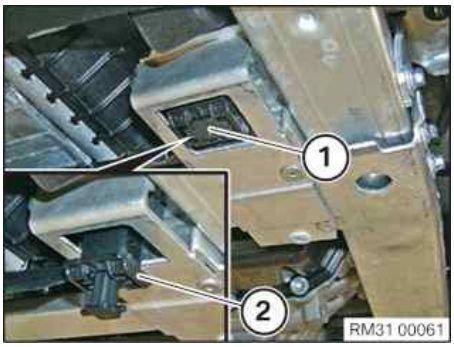


- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

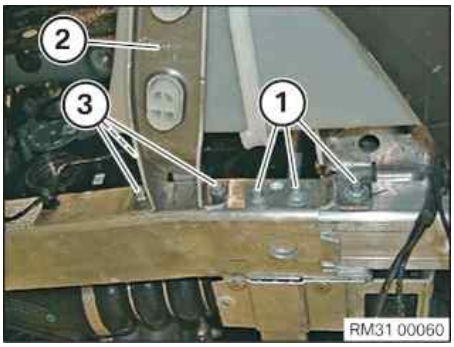
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

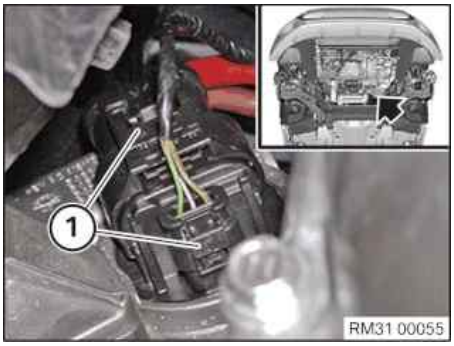
Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

35 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.

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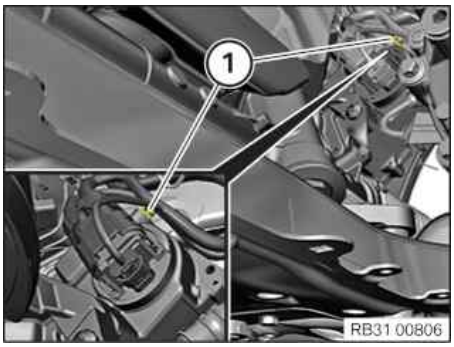
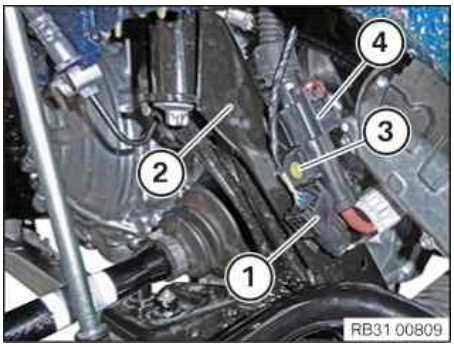


- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

36 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

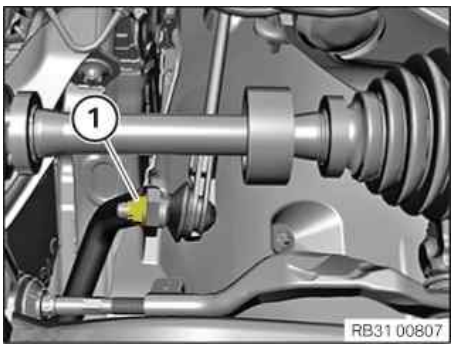
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

37 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

38 – With right installation: Securing the cable for the ride height sensor

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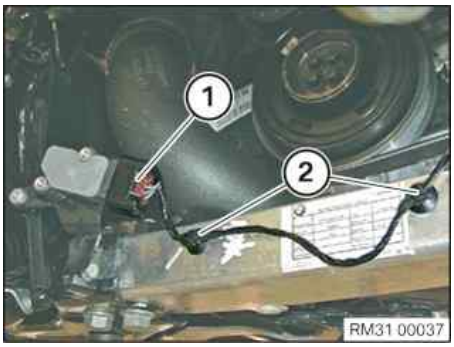


- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

39 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

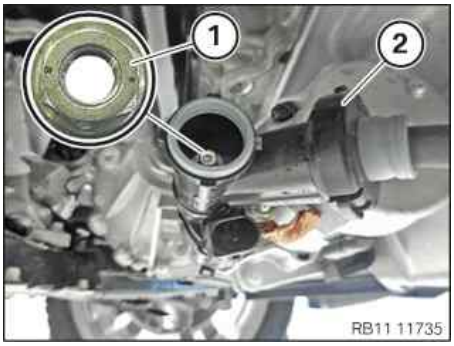
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

40 – Top up the oil level in the manual gearbox (GS6-58BG, GS6-59DG)

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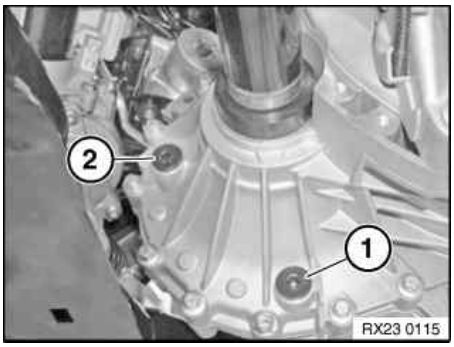
CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Adding transmission oil:
  - Undo oil filler plug (2).
  - Pour in gear oil until overflowing.
  - Screw in oil filler plug (2).

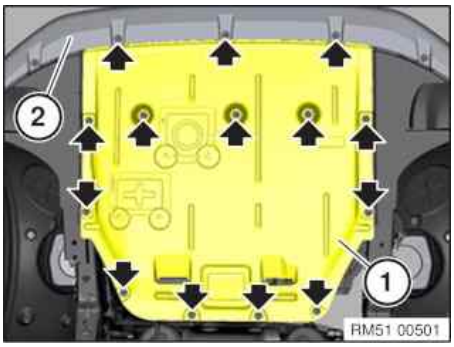
Transmission oil capacity

Transmission oil GS6-58/59BG/DG	1,9 l
Transmission oil: Technically suitable manual gearbox oil	

Oil drain plug / oil filler plug

Hexagon socket		Tightening torque	43 Nm

41 – Installing the front underbody protection

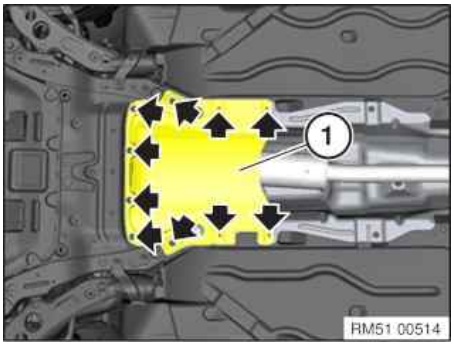


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

42 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

43 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**

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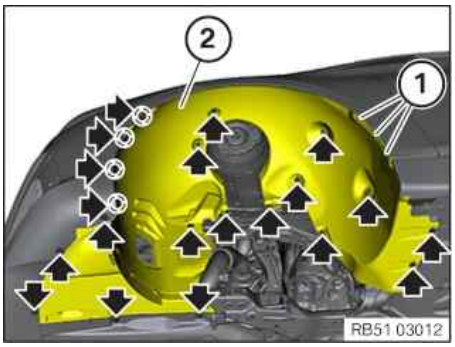


- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

44 – Mount the front left and right wheels

▸ **Mounting the wheel**

▹ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

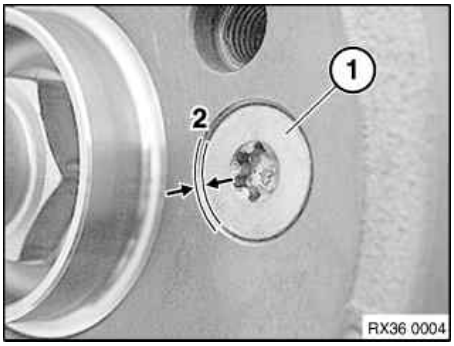
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

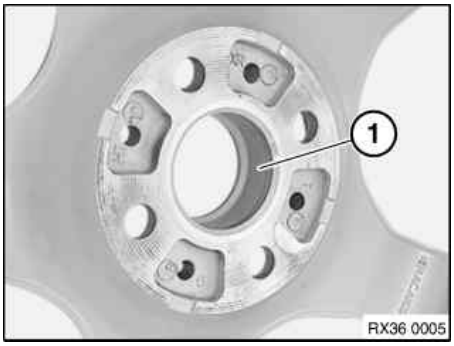
  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

◃

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

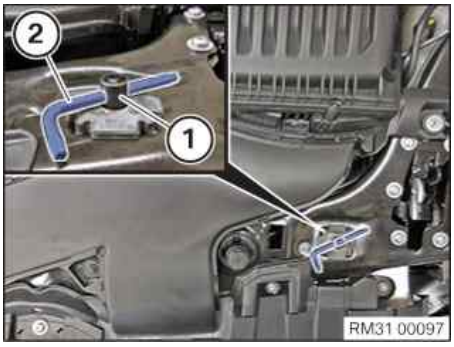
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

45 – Removing fastener for left and right radiator

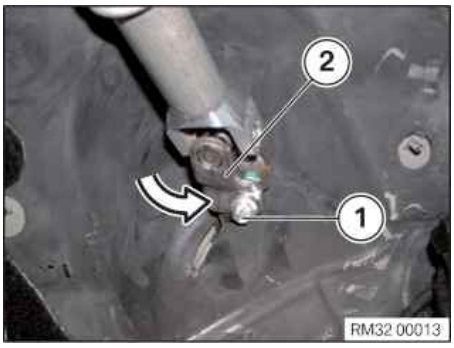


NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

46 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

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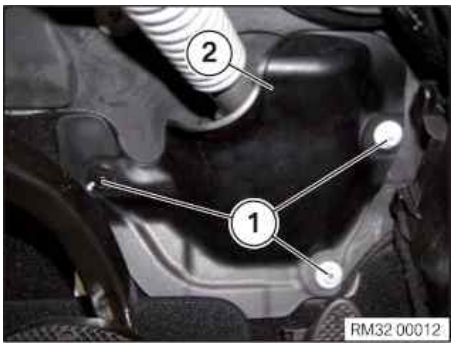


- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

47 – Remove the engine bridge

CAUTION

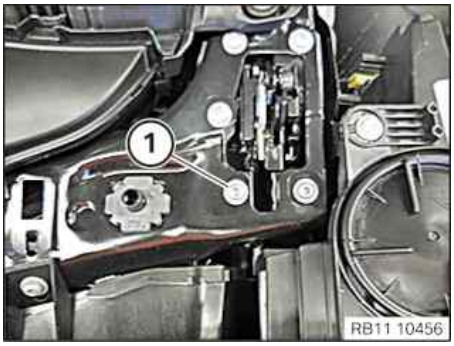
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Detach the spindle screw (1) from the engine bridge.
- Unscrew the leg screws (2) and (3).
- Guide the engine bridge out of the vehicle with the help of another person and remove.

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.



- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

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- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

48 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

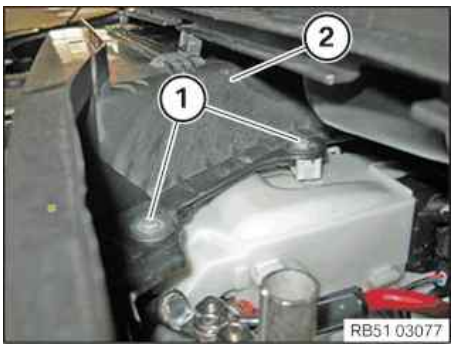
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

49 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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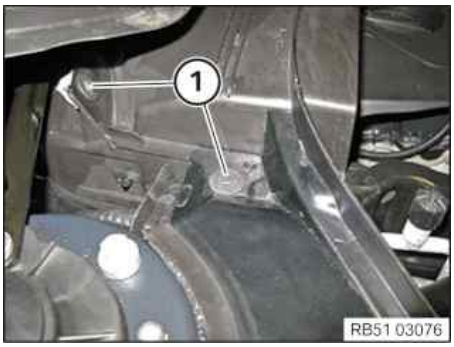


- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

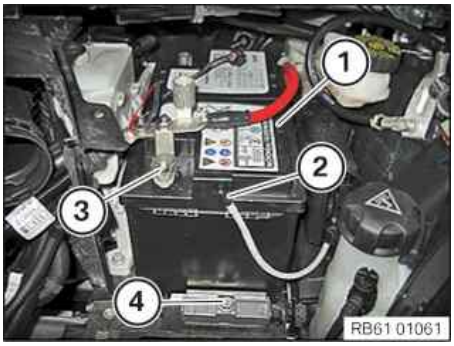
Bulkhead cover, top

Screw		Tightening torque	3 Nm

50 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

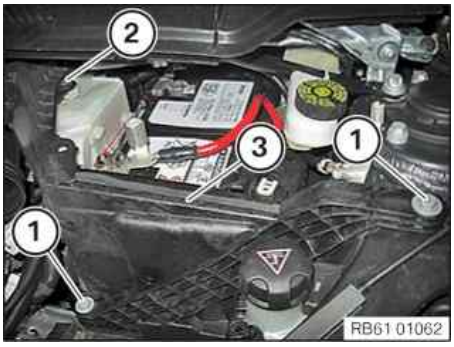
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm

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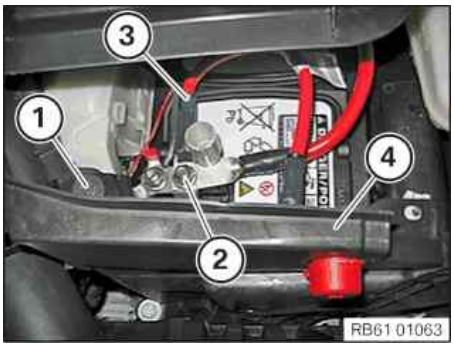


- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

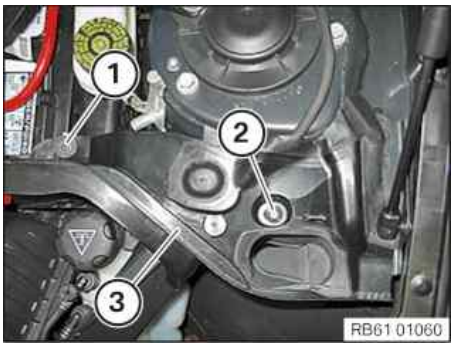
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

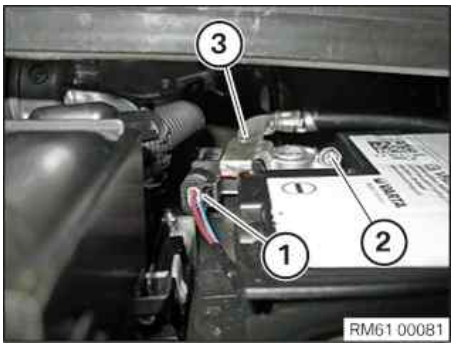
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

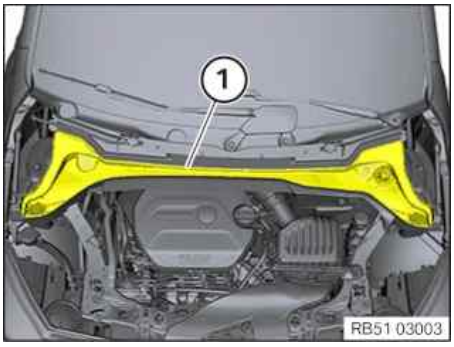


- Position the negative battery terminal (3).
- Tighten nut (2).

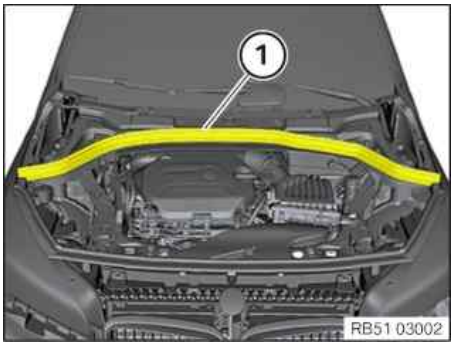
Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.



- Feed in the cowl panel cover (1).



- Press the gasket (1) in a downwards direction.

51 – Installing intake silencer housing

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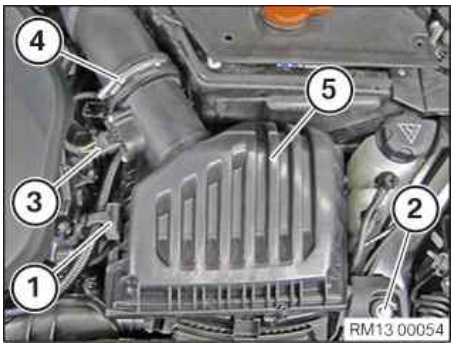


- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

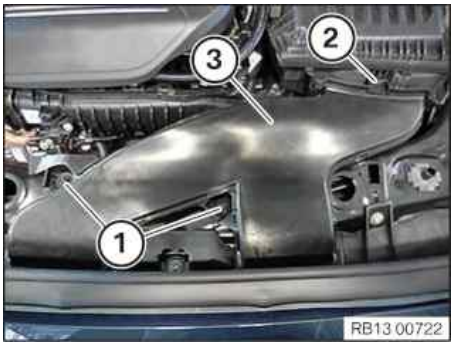
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

52 – Install the intake neck for the intake filter housing

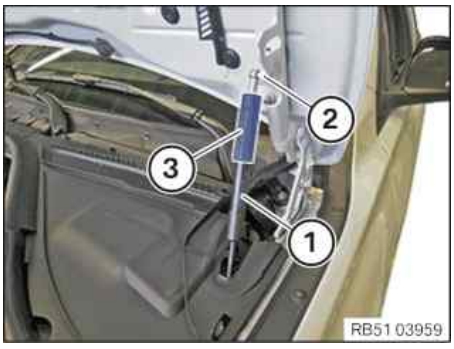


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

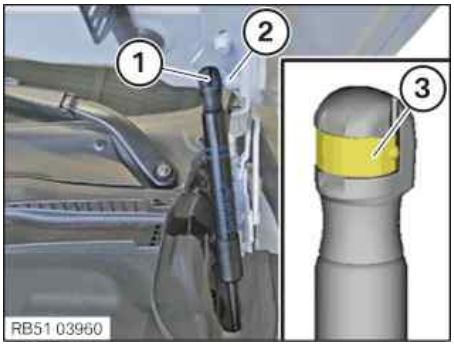
Intake neck to cross connection

M6		Tightening torque	8 Nm

53 – Take bonnet out of the service position



- Support the bonnet by hand.
- Remove the special tool **2 353 020**(3) from the ball pin (2).
- Pull off the special tool **2 353 020**(3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.



CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head — Used in step 6

M8		Tightening torque	21,5 Nm

Oil drain plug / oil filler plug — Used in step 14 40

Hexagon socket		Tightening torque	43 Nm

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Flywheel to crankshaft — Used in step 27

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel — Used in step 28

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Transmission to engine — Used in step 29

M8x40		Tightening torque	19 Nm
M12x75		Tightening torque	66 Nm

Transmission mounting — Used in step 29

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Clutch slave cylinder to transmission housing — Used in step 29

M8		Tightening torque	19 Nm

Battery holder to engine support — Used in step 29

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray — Used in step 29

M8			19 Nm

Electronics box to battery tray — Used in step 29

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 29

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 29

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 29

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 29

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 29

		Tightening torque	3 Nm

Battery cover — Used in step 29 50

Screw			2,8 Nm

Transmission to oil sump — Used in step 30

M8			19 Nm

Output shaft bearing to engine block — Used in step 31

M10		Tightening torque	38 Nm

Rear end of front axle support to body — Used in step 33

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 33

M12 screw	Renew screw.	Tightening torque	108 Nm

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Underbody protection to body — Used in step 33 42

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing — Used in step 33

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 33

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body — Used in step 34

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support — Used in step 34

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 34

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier — Used in step 34

		Tightening torque	11,8 Nm

Holder to front axle support — Used in step 35

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar — Used in step 37

M10	Renew nut.	Tightening torque	56 Nm

Starter motor to transmission — Used in step 39

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 39

M8		Tightening torque	13,5 Nm

Underbody protection front — Used in step 41

			3 Nm

Wheel arch cover to body — Used in step 43

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 43

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 44

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub — Used in step 44

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 44

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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Lower steering shaft to steering gear — Used in step 46

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead — Used in step 46

Plastic nut		Tightening torque	3 Nm

Cross connection on support for cross connection — Used in step 47

M6x20		Tightening torque	12 Nm

Bulkhead cover, top — Used in step 49

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 50

M8 screw			19 Nm

Positive battery terminal — Used in step 50

NutM6			5 Nm

Trailing link — Used in step 50

M8 screw			19 Nm

Positive battery cable to battery terminal — Used in step 50

Nut M8			15,2 Nm

Negative battery terminal (with IBS) — Used in step 50

NutM6			5 Nm

Intake silencer housing to lock bridge — Used in step 51

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 51

Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 52

M6		Tightening torque	8 Nm

Overview of Special Tools

2 459 012 Holder

Common — Used in step 6 47

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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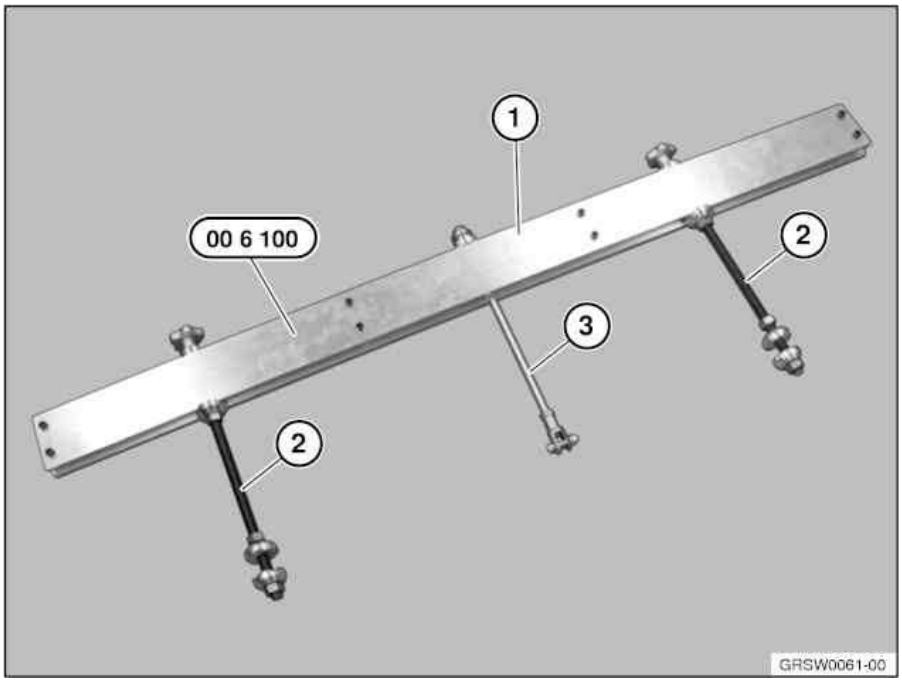
0 496 852 (00 6 100) Device



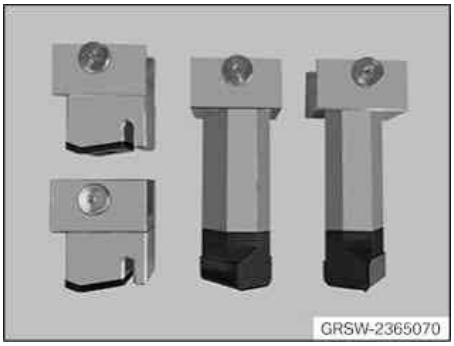
Common Used in step 6

Usage	Engine bridge (device) 006000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 10 (659)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	2 361 507 (00 6 102)		**Spindle** Set (2 pieces) in connection with 00 6 100.	
3	2 361 506 (00 6 103)		**Spindle** Spindle (central spindle) for Traverse 00 6 100.	

2 365 070 Upholstery



Common Used in step 6

Usage	Washer for securing the engine support.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	Engine bridge 006100 - 0496852 Section 006051 - 0496436 Adapter 006130 - 2209122 Adapter 2318635
SI-Number	01 45 14 (186)

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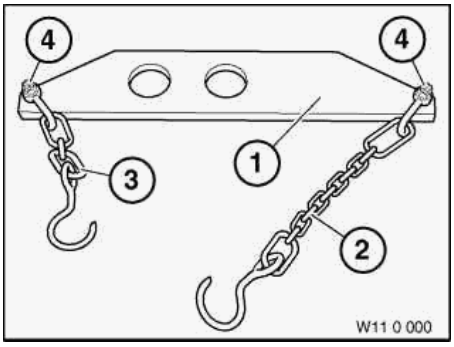
0 490 561 (11 0 000) Lifting gear



Common Used in step 6

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

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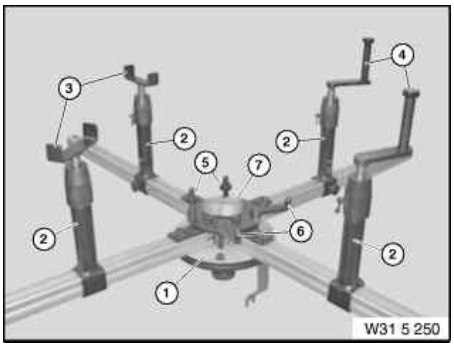
2 357 269 Shackle

Common Used in step 6

Usage	Set consisting of 4 pieces. Was valid as campaign for BMW i Aftersales High Voltage. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 19 13 (985)

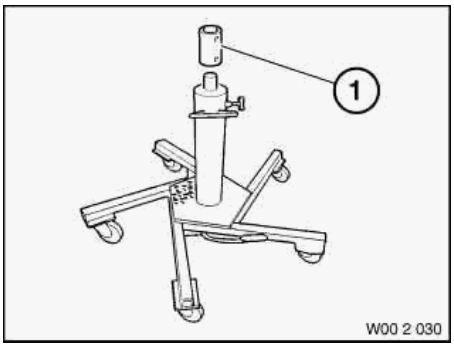
0 495 817 (31 5 251) Basic body



Common Used in step 20 33

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



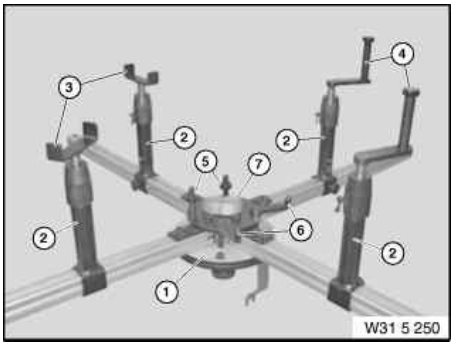
Common Used in step 20 24 29 33

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 821 (31 5 255) Adapter



Common Used in step 20

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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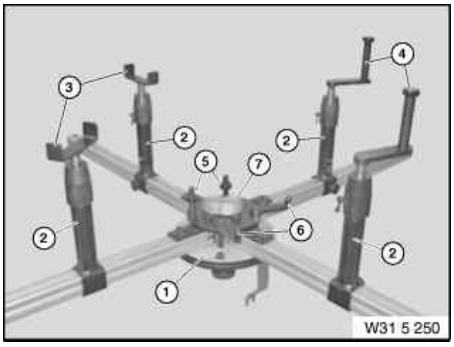
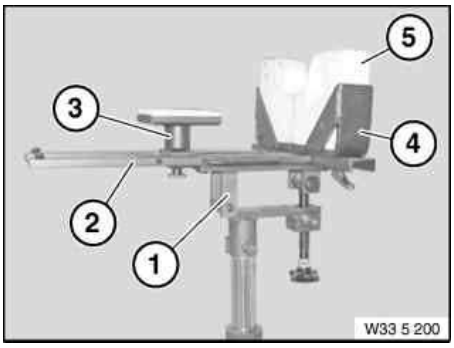
0 495 819 (31 5 253) Adapter



Common	Used in step 20
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt

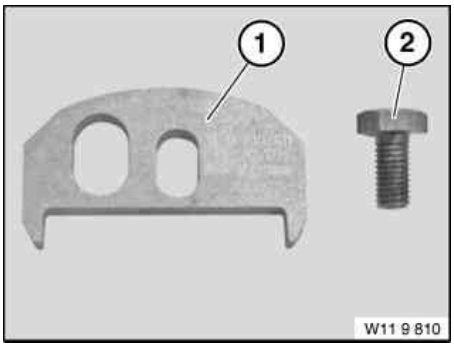


Common	Used in step 20 33
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 698 (23 0 120) Puller

Common	Used in step 21 22
Usage	For pulling out the radial shaft seal on the output (differential) left/right.
Included in the tool or work	
Storage location	A87
Replaced by	
In connection with	
SI-Number	01 11 09 (550)

0 496 171 (11 9 811) Holder



Common	Used in step 25 26 27
Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush

Common	Used in step 25 26 27
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

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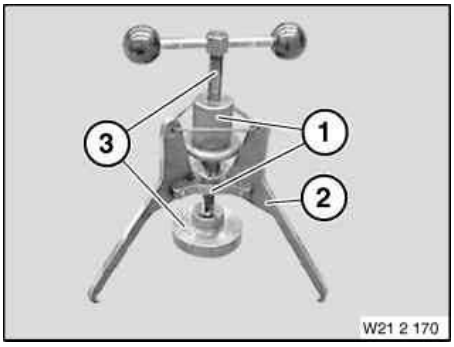
0 493 839 (21 2 170) Device



Common Used in step 25 28

Usage	(tensioning device) For resetting adjusting ring and installing self-adjusting clutch on flywheel without tension.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 00 (622)

Consisting of

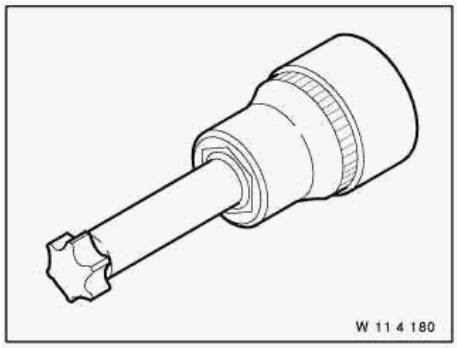
Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 558 (21 2 171)		**Basic body** (Basic body) Basic body with adjusting spindle Deletion, only available via tool set	
2	0 494 559 (21 2 172)		**Claw** (Clamping claw (1 piece)) Available as part of complete tool set 0493839 only.	
3	0 494 560 (21 2 173)		**Spindle** (Pressure spindle with washer) Available as part of complete tool set 0493839 only.	

2 288 165 Synchronising key

Common Used in step 25 28

Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

0 491 018 (11 4 180) Socket WAF 46



Common Used in step 26 27

Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

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2 285 058 Tool set

Common	Used in step 27
Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

2 358 471 Clutch tool

Common	Used in step 28
Usage	For installation of coupling drive plate.. (Getrag transmission) . Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A55
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

2 409 230 Mandrel

Common	Used in step 31 32
Usage	For installing the rear-wheel drive of Transmission output shaft le./ri. silhouette foil is contained in delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A75
Replaced by	
In connection with	
SI-Number	01 56 14 (214)

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2 344 011 Tool

Common	Used in step 44
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

2 353 020 Support

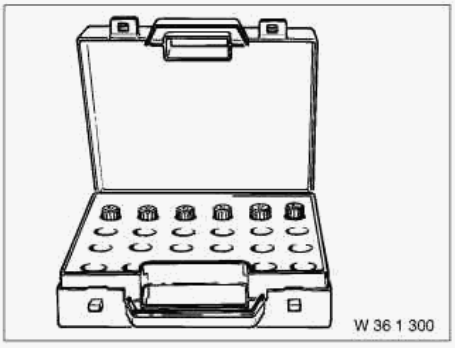
Common	Used in step 53
Usage	For service position of engine compartment lid Associated contour-graphic silhouette foil can be ordered under: 83 30 2 356 848. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A74
Replaced by	
In connection with	
SI-Number	01 11 13 (960)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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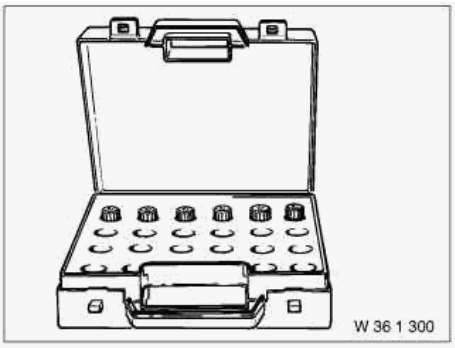
0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 9
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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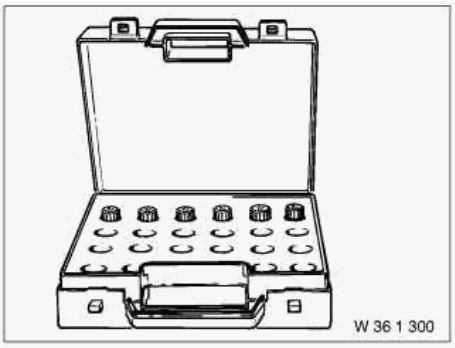
0 495 229 (36 1 332) Wheel stud



Common	Used in step 9
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 9
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Transmission oil capacity	Used in step 40
Transmission oil GS6-58/59BG/DG	1,9 l
Transmission oil: Technically suitable manual gearbox oil	

Screw-in depth of thread cutter	Used in step 27
Screw-in depth	18 mm

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 50
61 12 ... Notes on intelligent battery sensor (IBS)	1 50
61 00 ... Notes for disconnecting and connecting battery	1 50

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	24

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Operating materials	Used in step
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	14
2.0 Grease for wheel centring	44

Operating materials	Used in step

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11 22 000 Removing and installing/replacing the flywheel

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.

WARNING

Motor vehicle may slip off the vehicle hoist if the weight is distributed unevenly.

Danger! Life-threatening injuries!

- Ensure there is a specific weight compensation on the motor vehicle.

WARNING

Vehicle may slip off the vehicle hoist if the vehicle hoist is handled incorrectly.

Danger! Life-threatening injuries!

- Observe safety information on raising the vehicle using a vehicle hoist.
- For additional information see: 00 ... Raising the vehicle using a vehicle hoist.

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

PRELIMINARY WORK

1 – Bring front compartment lid in the service position

Prerequisite

Engine compartment lid is open.

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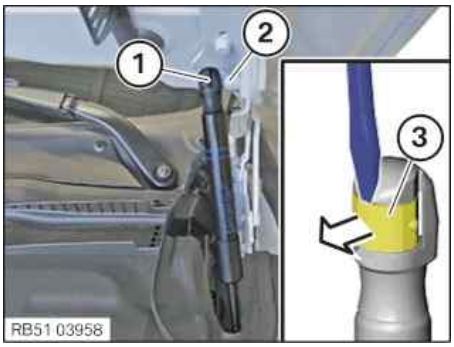
CAUTION

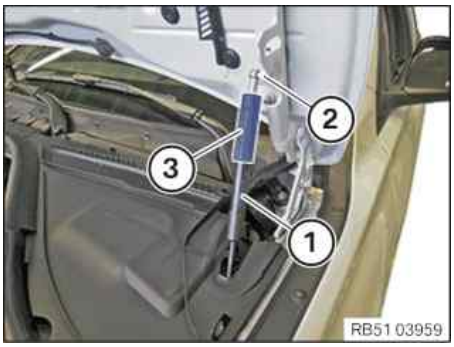
Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.



- Lift clamp (3) slightly using a screwdriver, in the direction of the arrow.
- Lift off ball socket (1) from ball pin (2).
- Repeat the operation on the other side of vehicle.



TECHNICAL INFORMATION

Conduct the following operation with the assistance of a second person.

- Remove the bonnet support and open the bonnet further.
- Push special tool **2 353 020** (3) over gas pressure spring (1).
- Place special tool on the ball pin (2) and engage using force.
- Repeat the operation on the other side of vehicle.

2 – Remove vehicle battery

WARNING

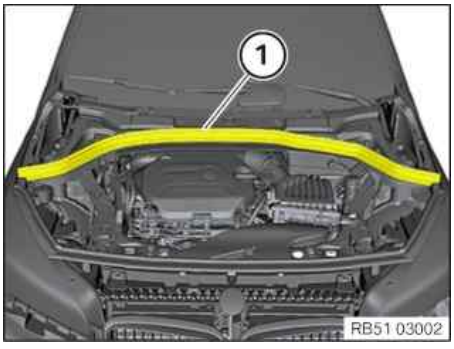
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.

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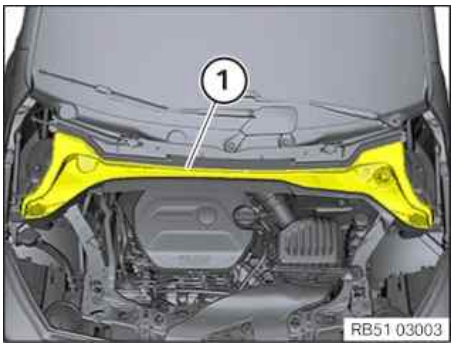
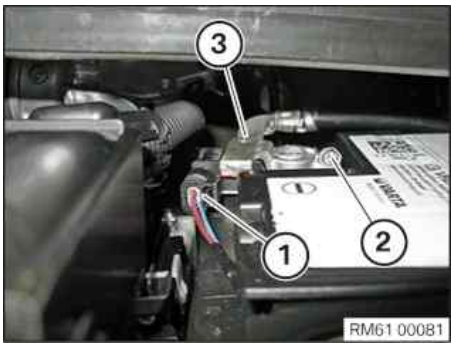
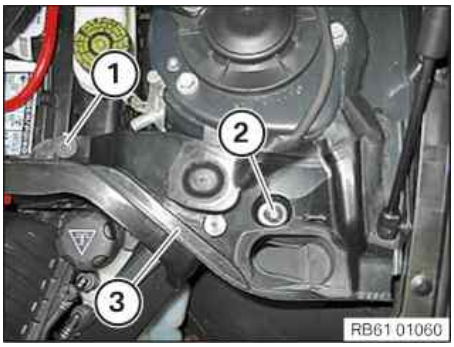


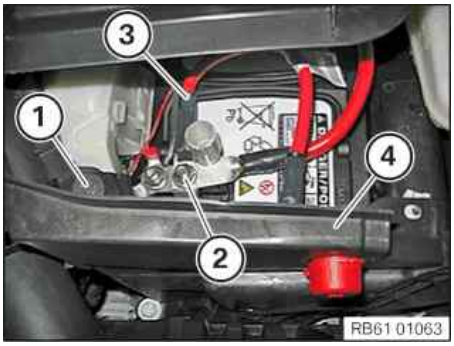
- Remove the cowl panel cover (1) to the top.



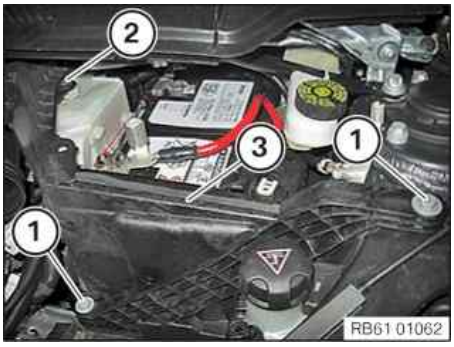
- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.

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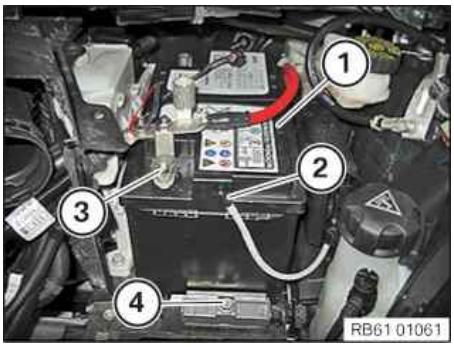


- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

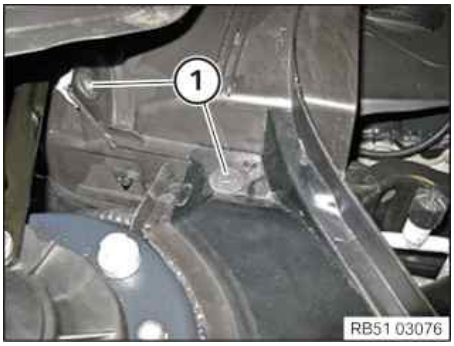
Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

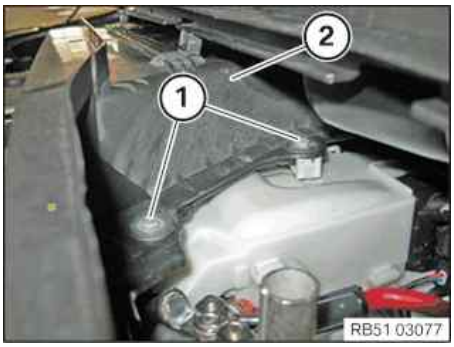
- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

3 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

4 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

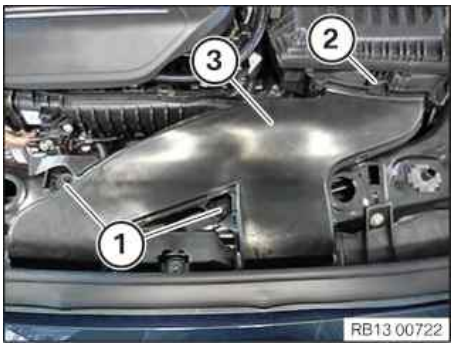
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

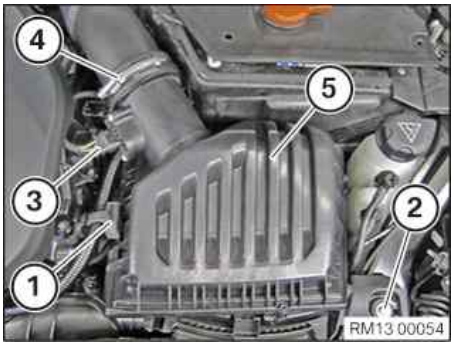
- Unclip the acoustic cover from the marked areas towards the top.

5 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

6 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

7 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

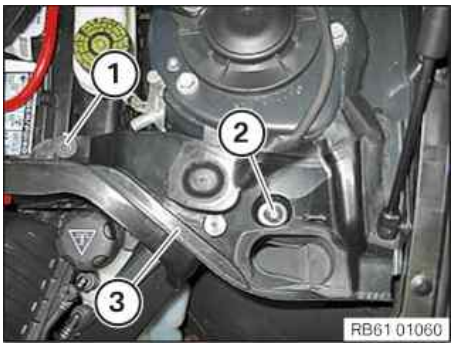
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

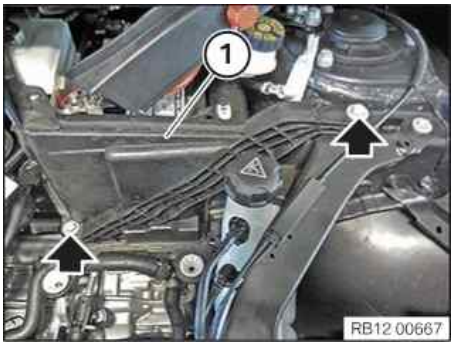
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

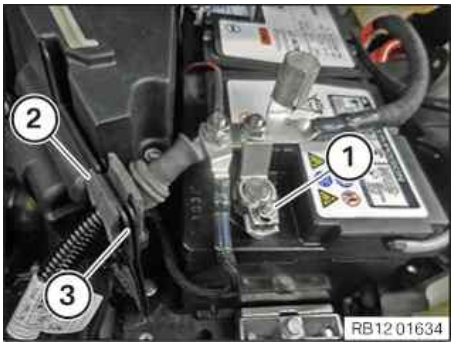


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

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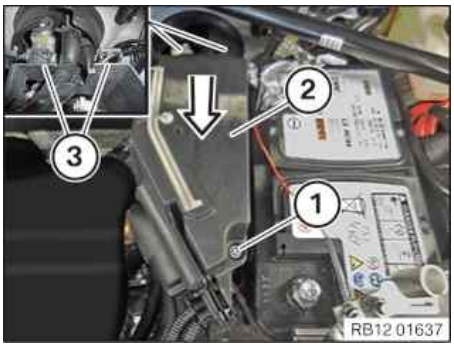
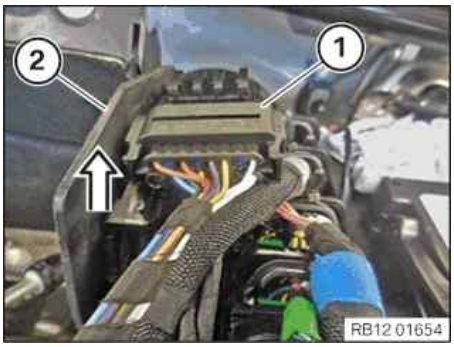
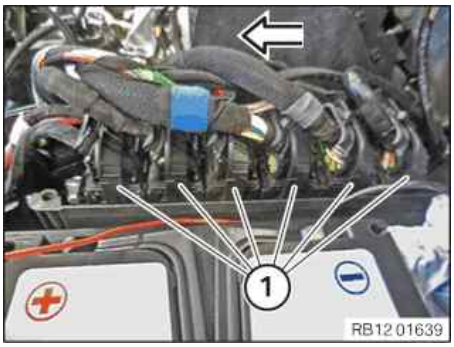


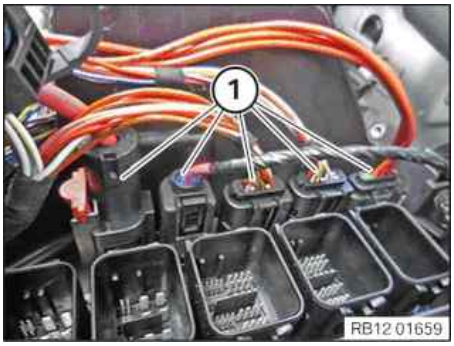
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



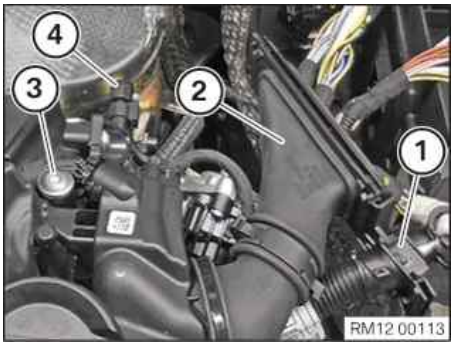
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



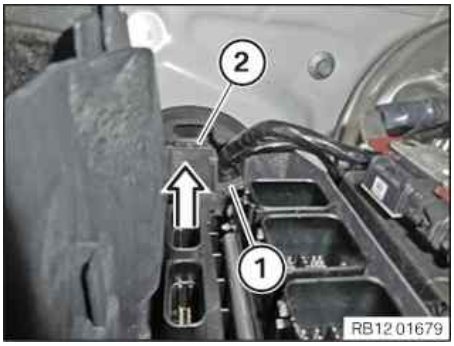
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

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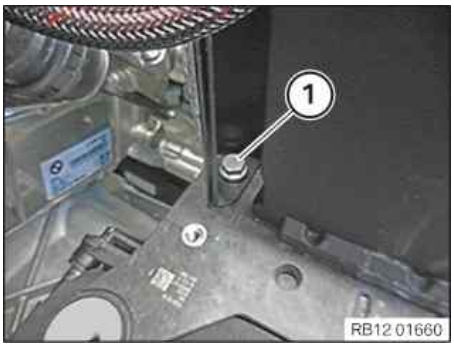
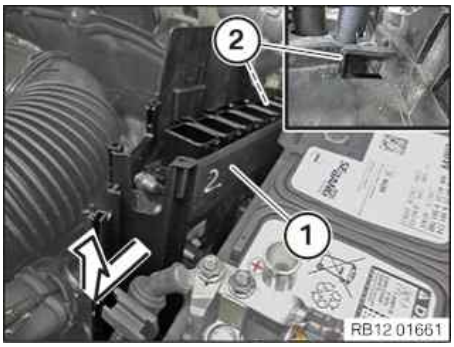
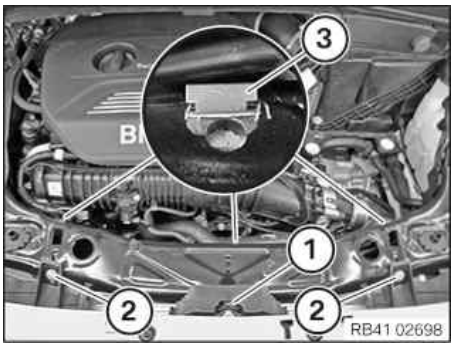


- Loosen screw (1).

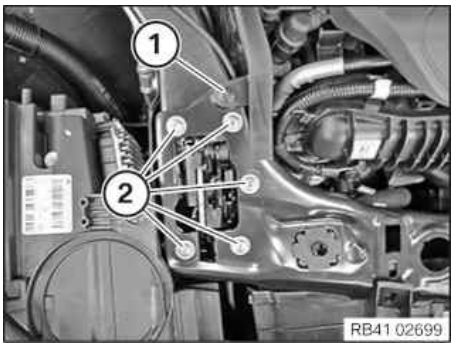


- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

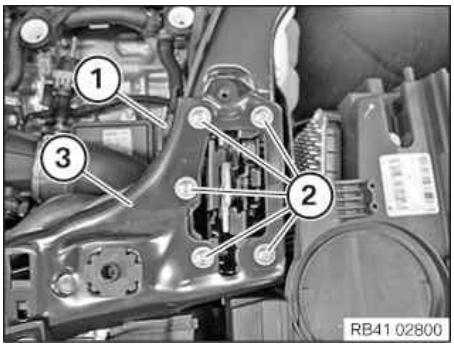
8 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

9 – Removing the fan cowl with electric fan

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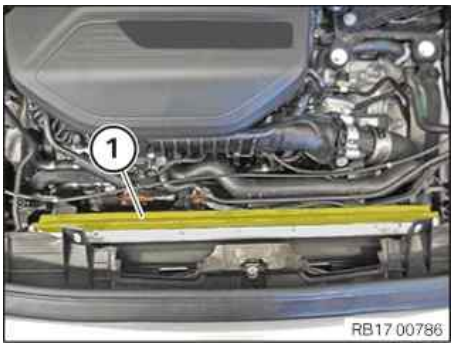
WARNING

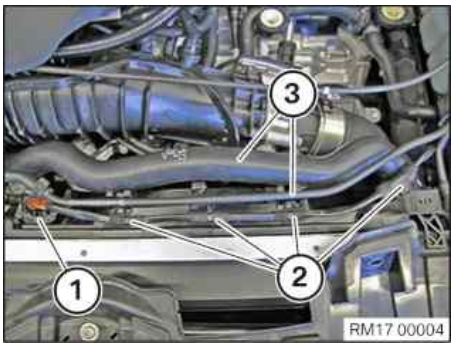
Hot surfaces.

Risk of burning!

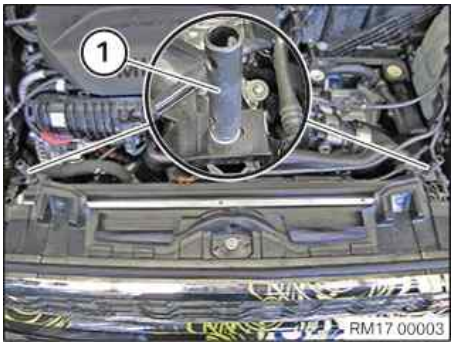
- Perform all work only on components that have cooled down.



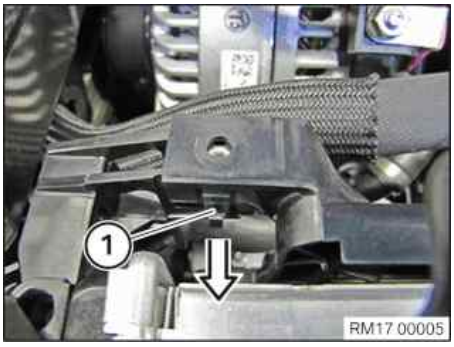
- Feed out and remove the sealing (1) from the radiator.



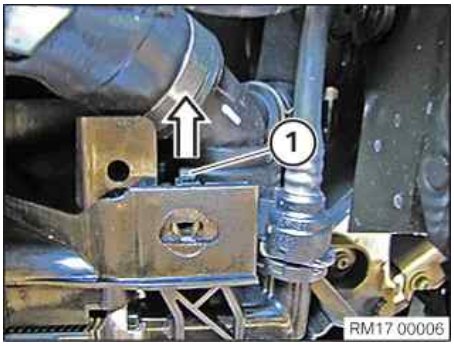
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

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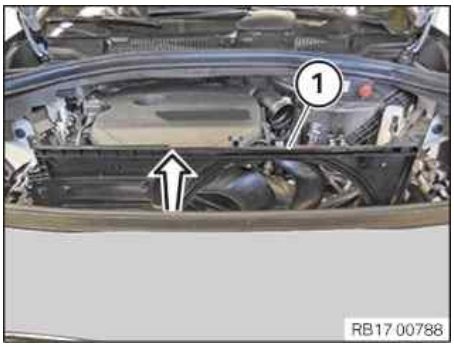
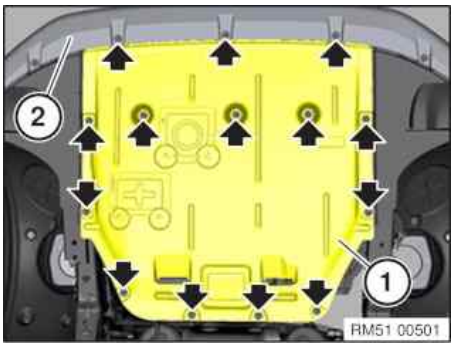


- Guide out fan cowl (1) in direction of arrow and remove.

10 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

11 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

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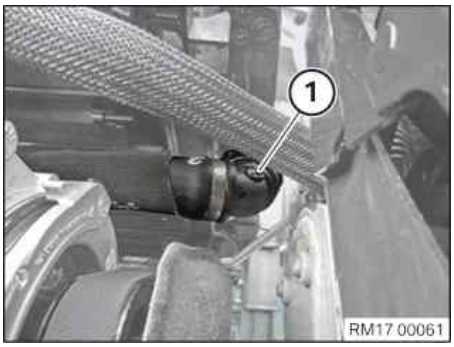
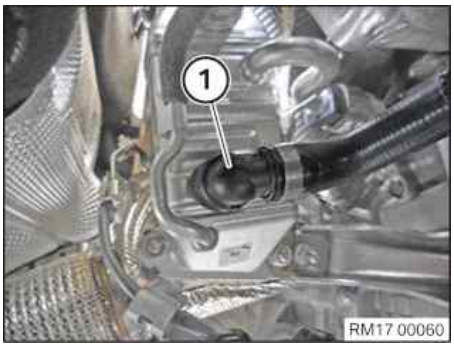


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

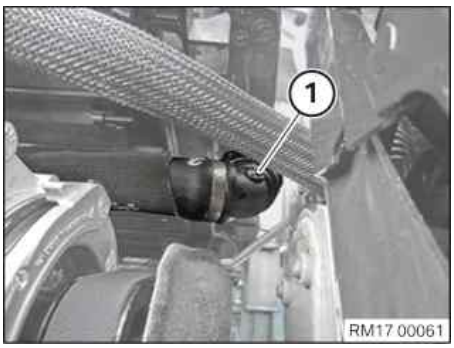


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

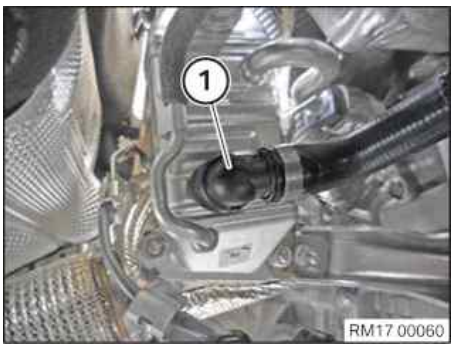
12 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

13 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

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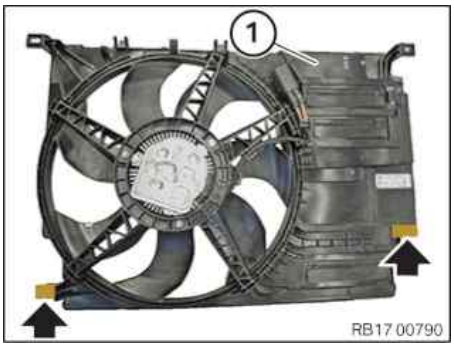
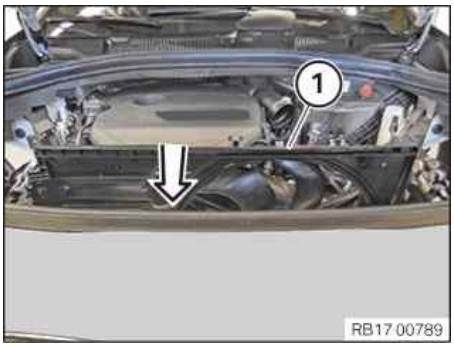
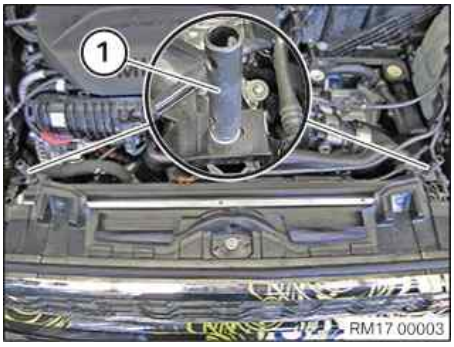


- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.

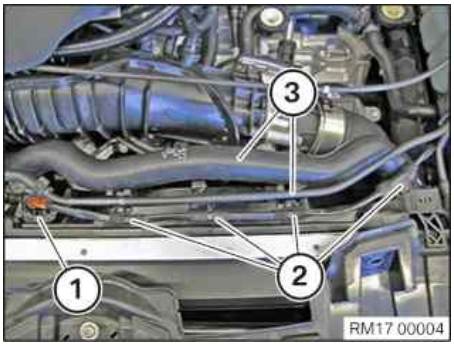
- Lock the left and right locks (arrows).



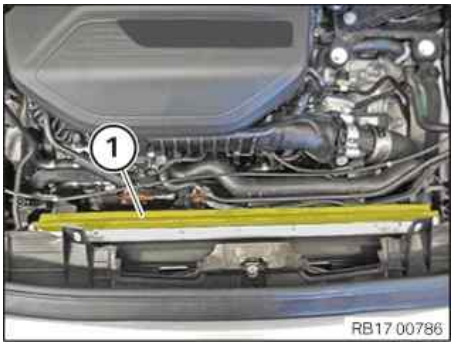
- Tighten the screws (1).

Fan cowl on radiator

M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.
  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



- Guide the sealing (1) on the radiator in and install it.

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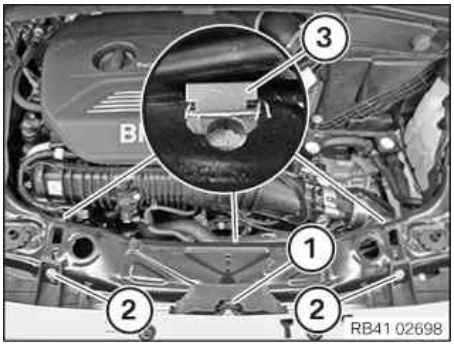
14 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

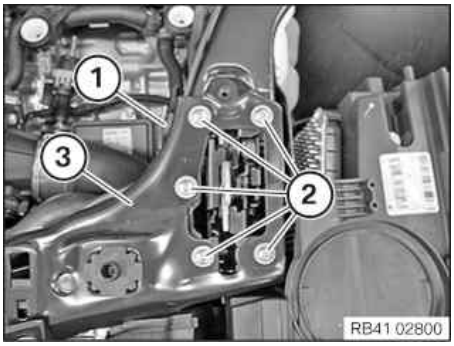
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

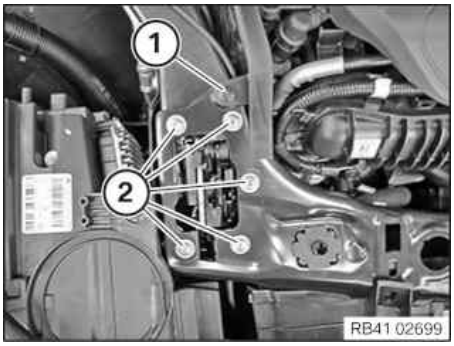


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



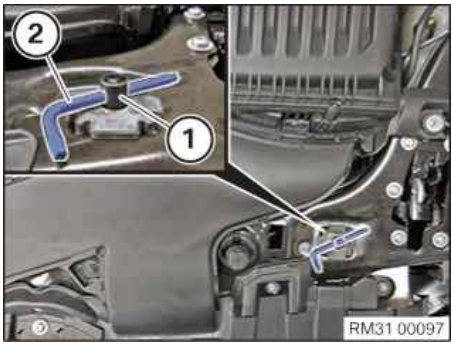
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

15 – Securing radiator on left and right

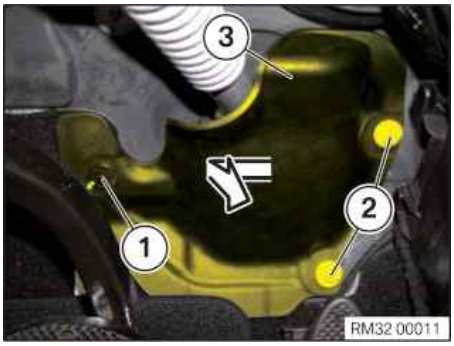


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

16 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!

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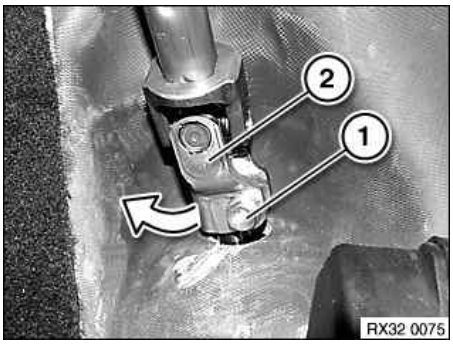
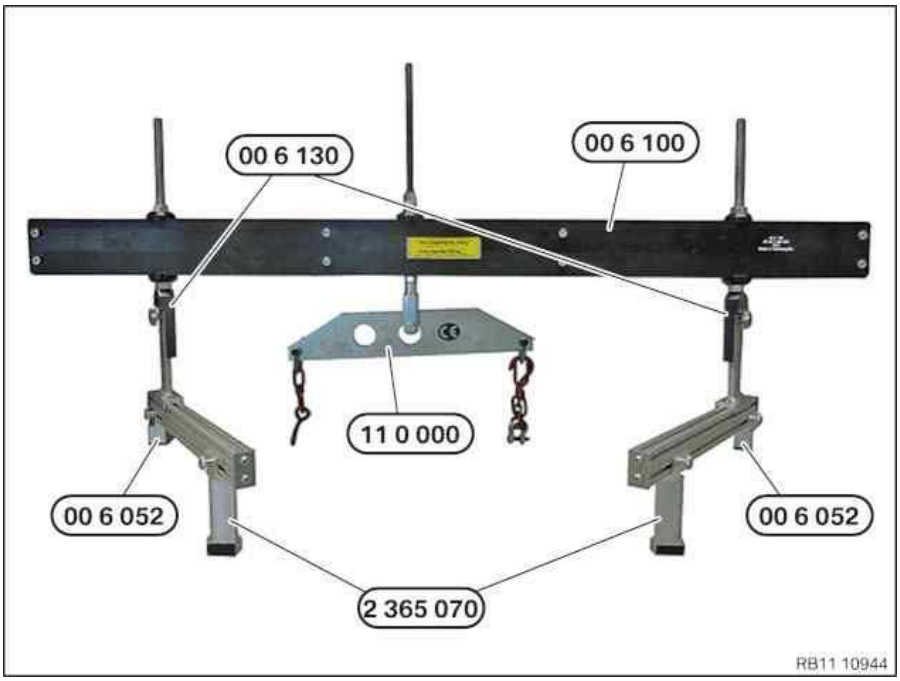


- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

17 – Install the engine bridge

Overview: Prepared engine bridge



Prerequisite

Front compartment lid is in service position.

CAUTION

Components connected to the engine joint or cross member.

Danger of injury!

- Check lifting eyes and engine mounting brackets for damage, e.g. cracks.
- Attach the component to correctly mounted engine joints or cross members only.
- Exclusively lift the component, do not move it forwards, backwards or in transverse direction.

- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm

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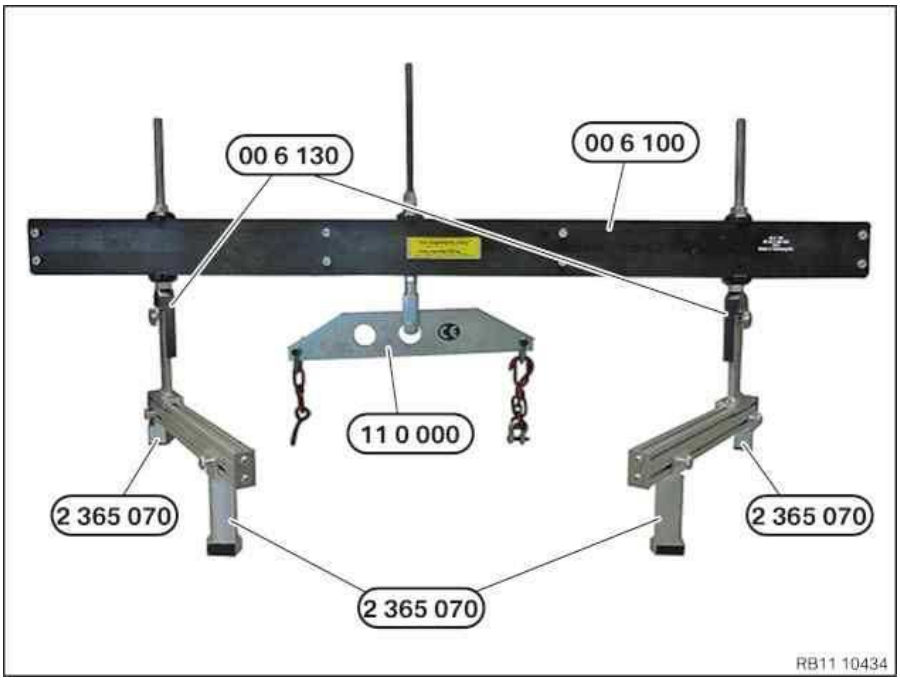


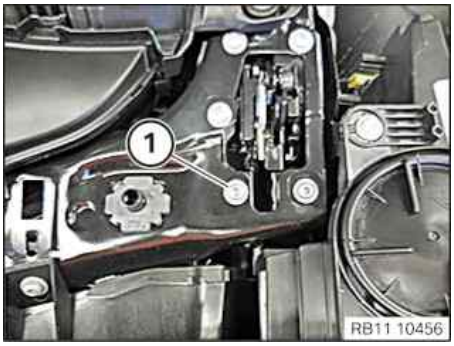
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

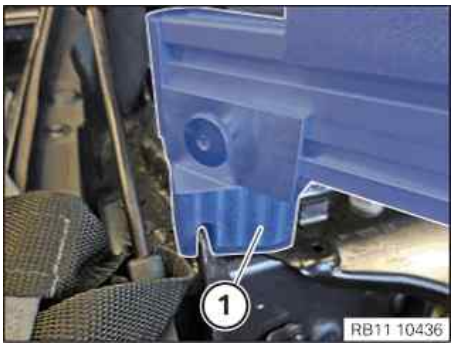
- Remove and install heavy components with the aid of another person/other persons.

- Set entire cross member **0 496 852 (00 6 100)** on the vehicle and position with the help of an auxiliary person.

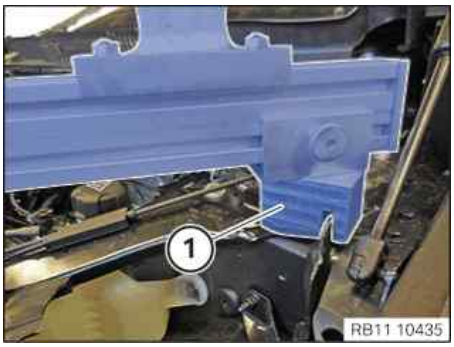


- Loosen screw (1) of the left bonnet catch.

- Loosen screw (1) of the right bonnet catch.



- Position special tool **2 365 070** to the rear mounting point (1) at the right.



- Position special tool **2 365 070** to the rear mounting point (1) at the left.

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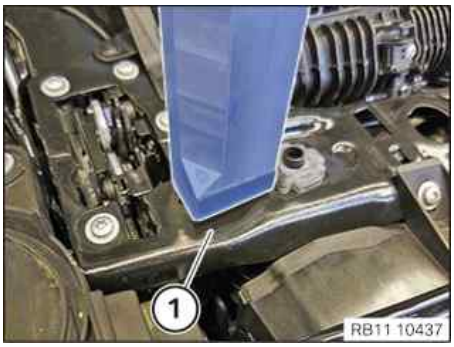
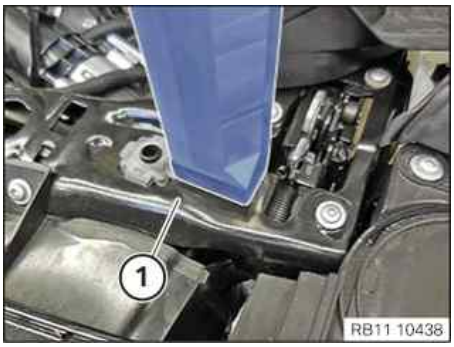
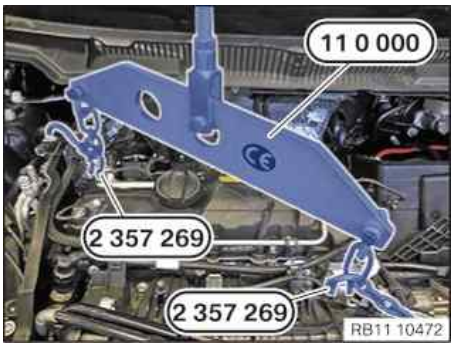


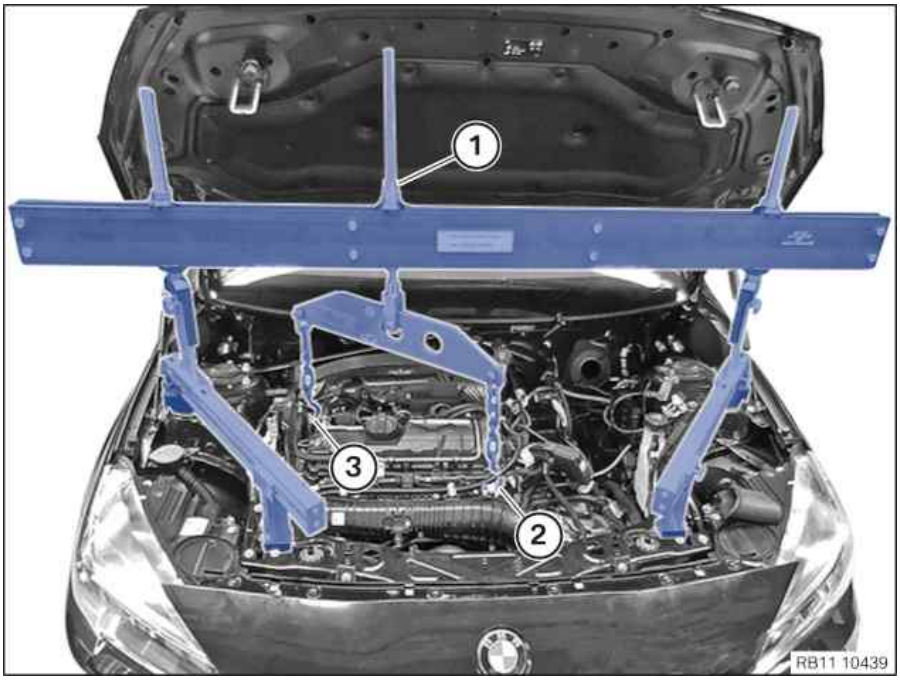
- Position special tool **2 365 070** to the front mounting point (1) at the right.



- Position special tool **2 365 070** to the front mounting point (1) at the left.



- Position special tool **0 490 561 (11 0 000)** above the engine.
- Attach special tools **2 357 269** to the mounting lugs of the engine.



- Tighten side screws (2) and (3).
- Slightly pretension the spindle screw (1) of the engine support beams.
- Tighten down all adjusting screws, knurled screws and nuts on cross member **0 496 852 (00 6 100)** and on special tool .

18 – Remove the front left and right wheel

▸ **Removing the wheel**

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- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

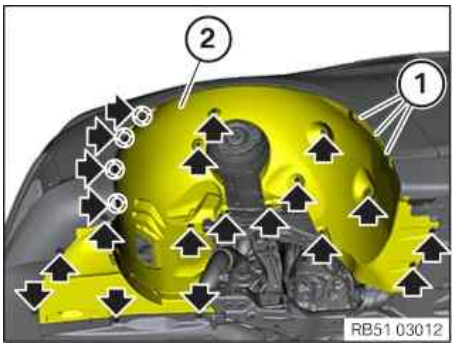
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

19 – Removing front left and right wheel arch cover

NOTICE

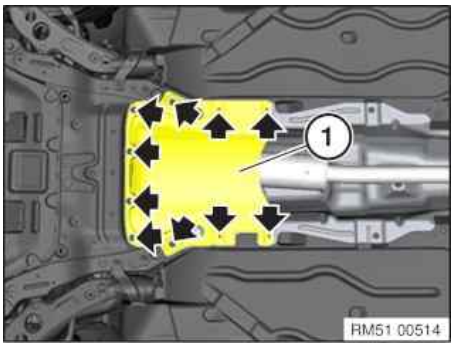
Perform the operations on the left and right side.

▸ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

20 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

21 – Removing starter motor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

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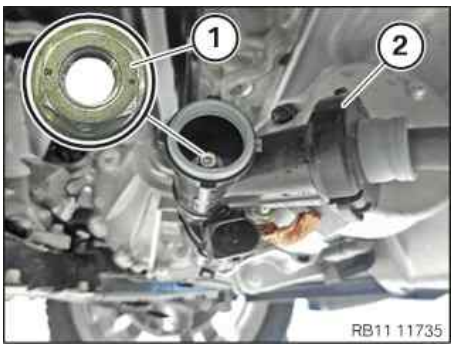
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

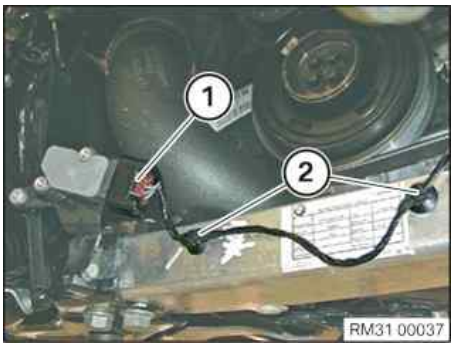
- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

- Loosen screws (1).
- Feed out starter motor and remove.

22 – With right installation: Detaching ride height sensor cable



- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

23 – Releasing anti-roll bar on left and right from anti-roll bar link

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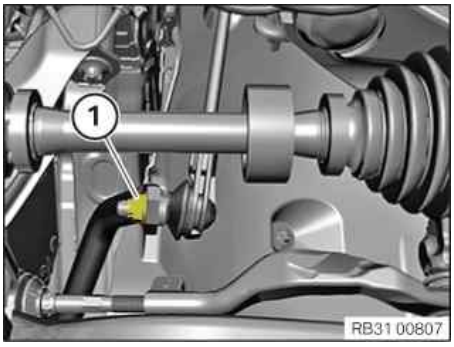
NOTICE

Perform the operations on the left and right side.

▸ **Detach the anti-roll bar from the anti-roll bar link**



- Unfasten nut (1).

Note: Use the Torx socket for counter support.

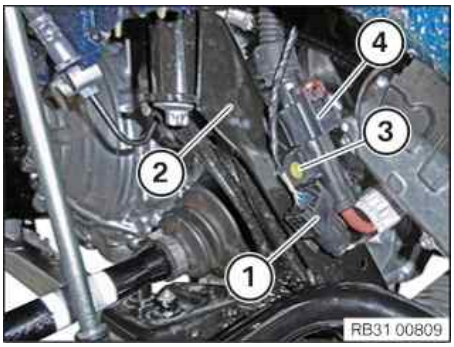
- Loosen the anti-roll bar link from the anti-roll bar .

24 – Detaching rubber mount from front axle support

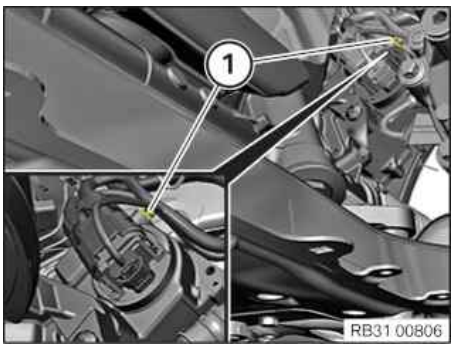
- Spray rubber mount (1) with lubricant and release from holder on front axle support.

25 – Disconnecting plug connections from steering gear

▸ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).



- Disconnect wiring harness (1) from steering gear.

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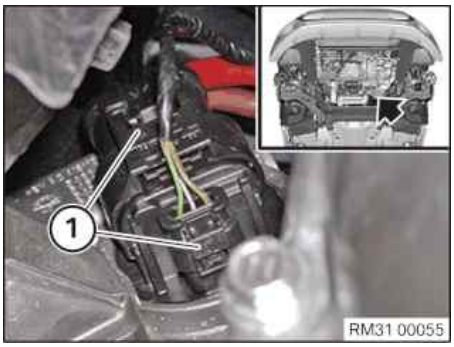
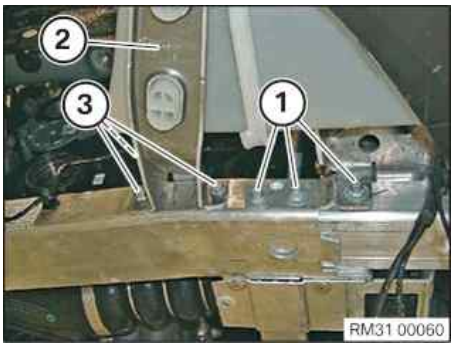
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

26 – Releasing the mounted part from the front axle support

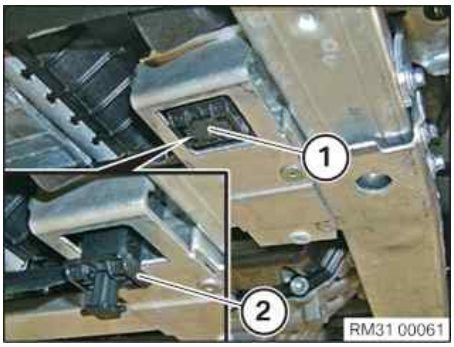


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

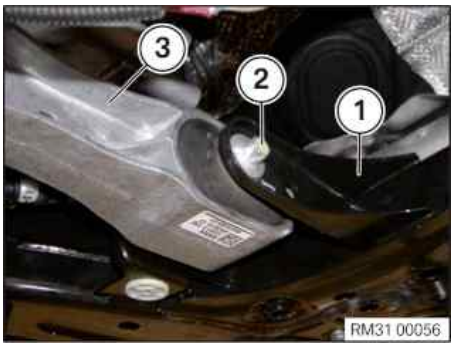
- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



- Loosen screw (2) of the engine support (3) on the front axle (1).

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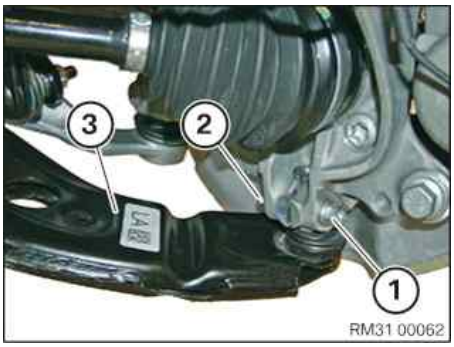
NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

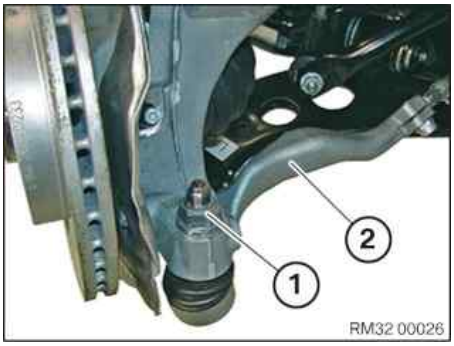
27 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

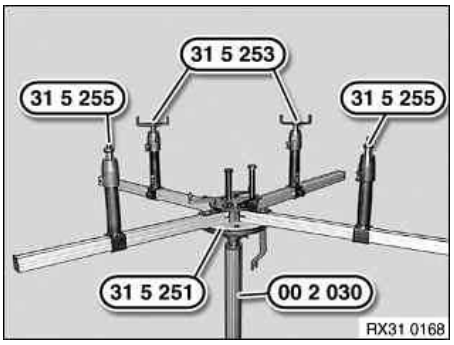
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

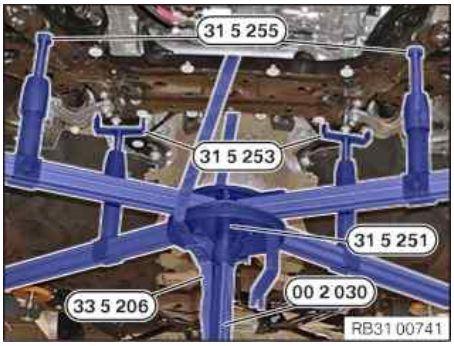
Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

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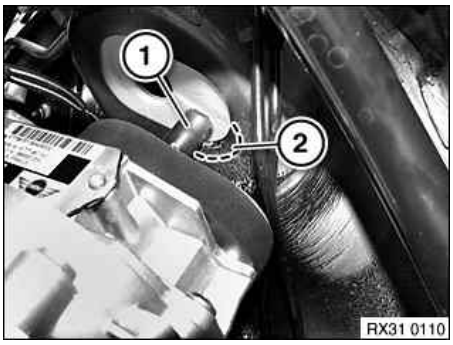
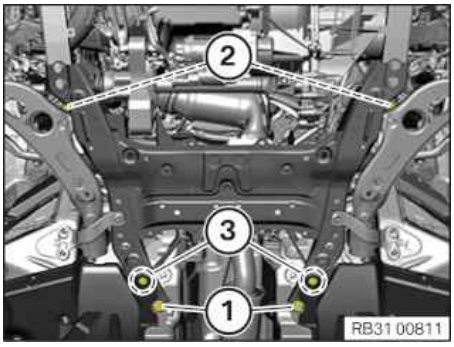


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



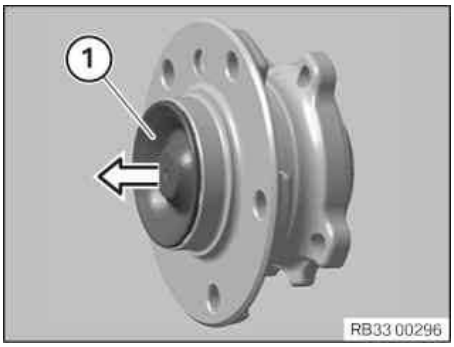
- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

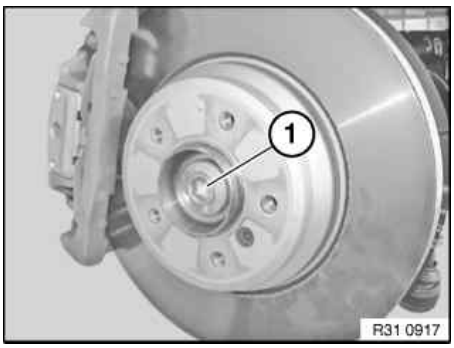
Note the information on thread repairs using Helicoil thread inserts.
For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

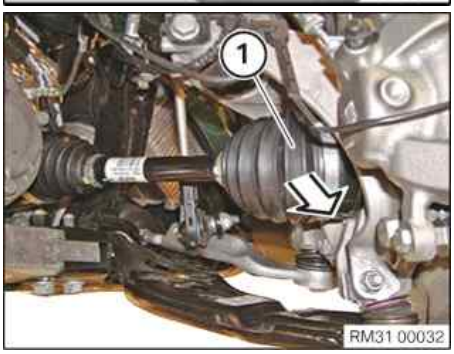
28 – Remove the left drive shaft (double-clutch transmission (DKG))



- If necessary, lever off the protective cap (1).



- Press the brake pedal to the floor to unscrew the collar bolt (1).



- Turn steering wheel to left.
- Pull the output shaft (1) out toward the front.

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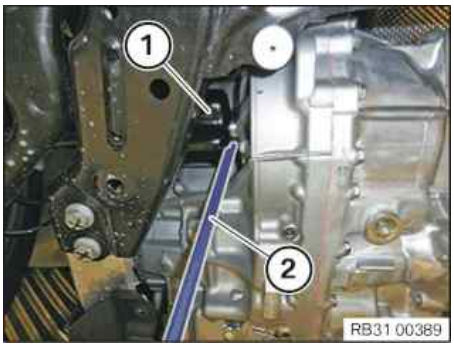


- Protect the output shaft (1) from falling.
- Lever out the output shaft (1) with a mounting lever (2) from the transmission.
- Remove output shaft (1).

▸ **Removing the left radial shaft seal on the differential (7DCT300)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

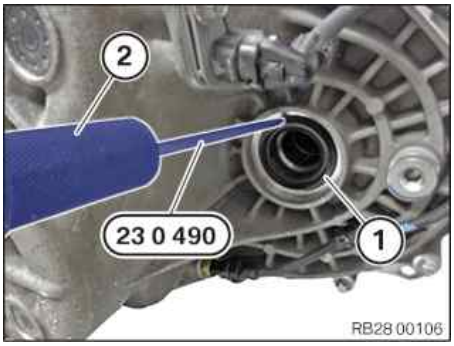
Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

TECHNICAL INFORMATION

Clean the transmission around the radial shaft seal prior to removing the propeller shaft!
Transmission oil (at maximum 0.3 l) may escape from the radial shaft seal opening when pulling off the propeller shaft!
Collect and dispose of escaping transmission oil!

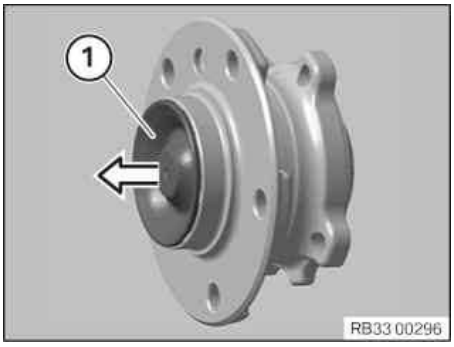


TECHNICAL INFORMATION

Do not use a drill.
Swarf may damage the transmission and result in a failure of the transmission.

- Drill a hole in the radial shaft seal (1) using a centre punch.
- Screw special tool **0 491 454 (23 0 490)** in the radial shaft seal (1).
- Drive out radial shaft seal (1) with the impact weight (2).

29 – Removing right output shaft (double-clutch transmission (DKG))



- If necessary, lever off the protective cap (1).

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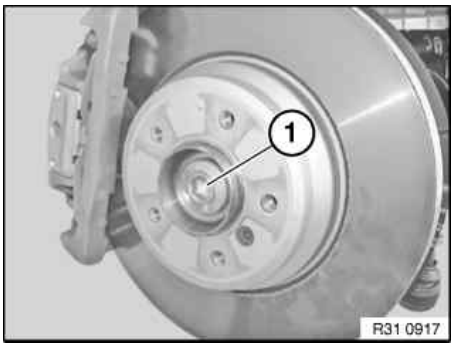
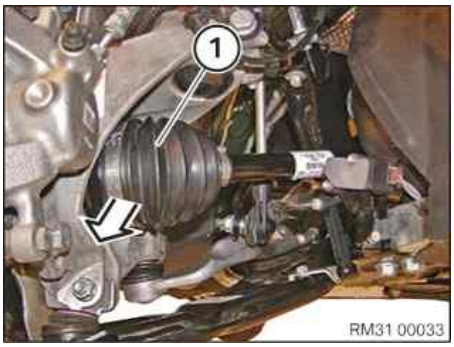
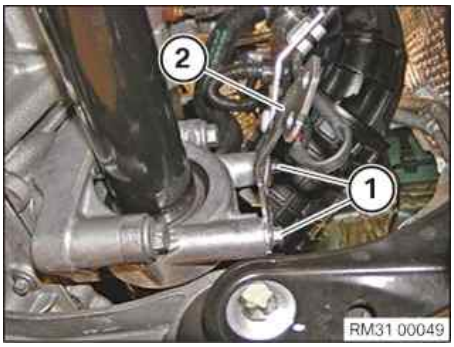


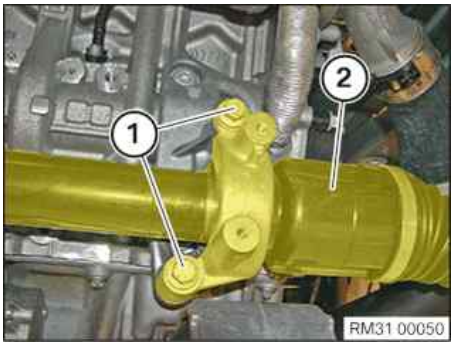
- Press the brake pedal to the floor to unscrew the collar bolt (1).



- Protect the output shaft (1) from falling.
- Turn steering wheel to right.
- Pull the output shaft (1) out.



- If necessary, unscrew the bolts (1) and remove the holder (heat shield) (2).



- Loosen screws (1).
- Pull the output shaft (2) out of the transmission and remove it sideways.
- Remove output shaft (1).

▸ Removing the right radial shaft seal on the differential (7DCT300)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

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TECHNICAL INFORMATION

Clean the transmission around the radial shaft seal prior to removing the propeller shaft!
Transmission oil (at maximum 0.3 l) may escape from the radial shaft seal opening when pulling off the propeller shaft!
Collect and dispose of escaping transmission oil!

TECHNICAL INFORMATION

Do not use a drill.
Swarf may damage the transmission and result in a failure of the transmission.

- Drive a hole into the radial shaft seal (1) using a centre punch.
- Screw the special tool **0 491 454 (23 0 490)** into the radial shaft seal (1).
- Drive out the radial shaft seal (1) with the impact weight (2).

30 – Removing the double-clutch transmission (DKG)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the engine block.

Damaged and corroded bolts will lead to major damage in the engine block and the transmission.

- It is imperative that protruding threads of the transmission bolts are checked for corrosion and damage prior to removal.
- It is imperative that all rust is removed from corroded threads and that they are cleaned prior to removal.
- Renew rusted and damaged bolts.

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

RISK OF DAMAGE

Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.

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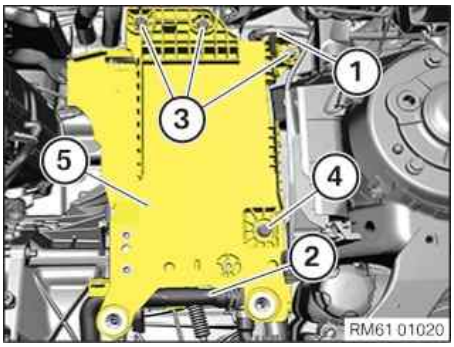
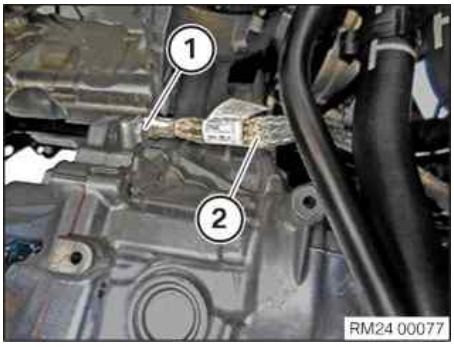
TECHNICAL INFORMATION

It is essential to adhere to conditions of absolute cleanliness.
Any dirty parts must be cleaned before removing the double-clutch transmission (DKG).

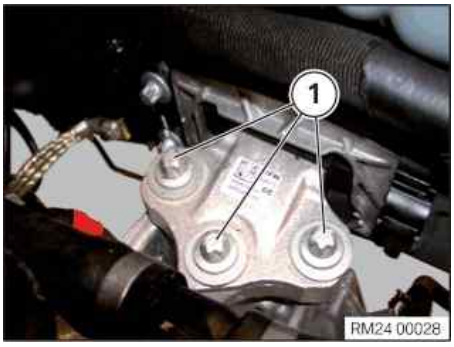
▸ **Remove battery holder**



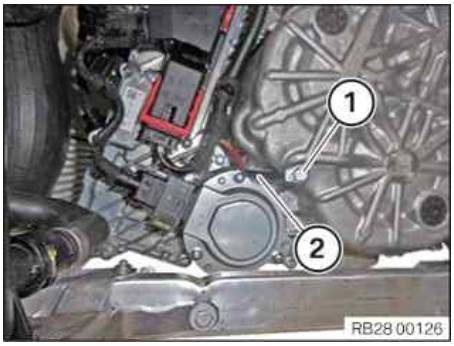
- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).



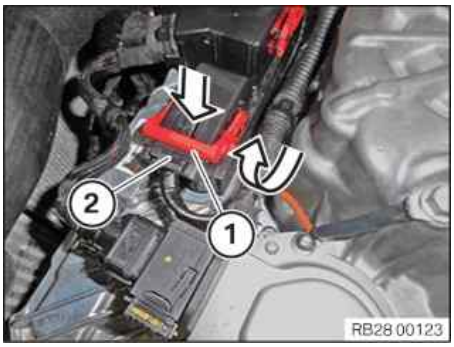
- Loosen screw (1).
- Detach the ground strap (2) from the transmission and set it aside.



- Loosen screws (1).



- Release the screw (1) and put the grounding cable (2) to one side.



- Fold down the red lever (1) in direction of arrow and pull the plug connection (2) out of the control unit.

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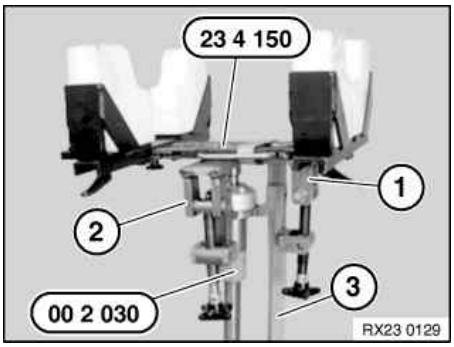
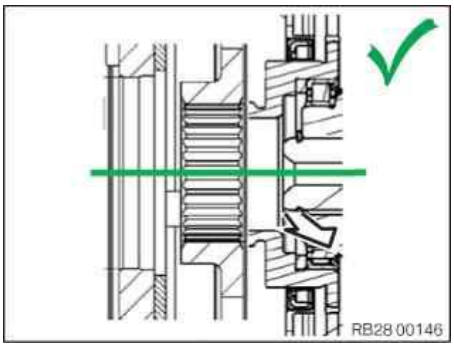
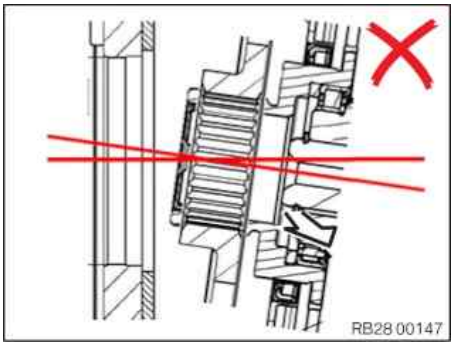
- Unlock and release coolant line (1).



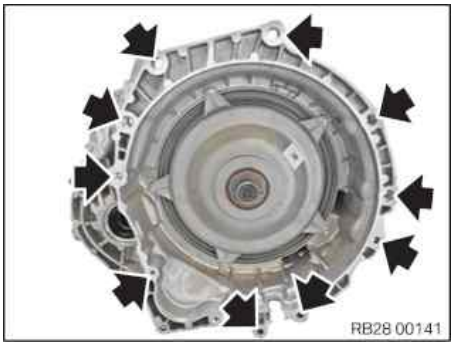
- Support the transmission with special tool **0 490 133 (00 2 030)**and .
- Secure the double-clutch transmission (DKG) with the tensioning strap (3).



- **Correct:** Pull the double-clutch transmission (DKG) horizontally off the flywheel.



- **Wrong:** Do not pull the double-clutch transmission (DKG) off the flywheel if it is tilted.



- Remove screws (arrows).
- Pull the double-clutch transmission (DKG) off the flywheel when it is absolutely horizontal.

MAIN WORK

31 – Remove flywheel (DKG)

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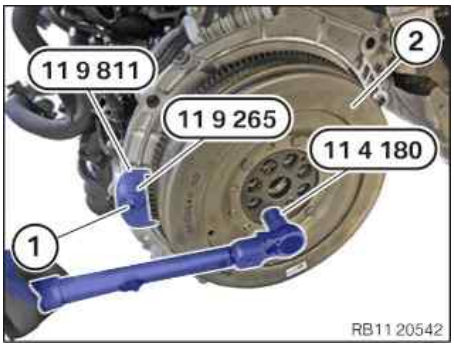
CAUTION

Heavy component.

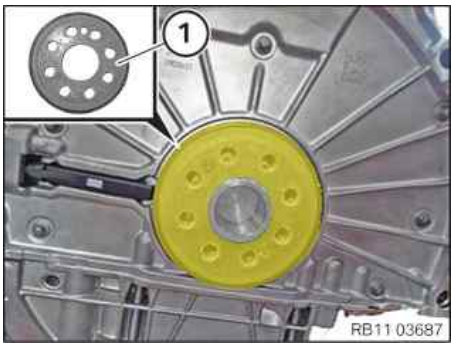
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Position special tool **0 496 171 (11 9 811)** with a **standard** 5 mm thick washer between the crankcase and the flywheel.

  The 5 mm thick washer must be mounted between the crankcase and special tool **0 496 171 (11 9 811)** .
- Secure the special tool **0 494 793 (11 9 265)** with the transmission bolt (1).
- Protect the flywheel (2) from falling.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Guide out the flywheel (2) and remove.



RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove increment wheel (1) from the crankshaft and set it aside properly.

32 – Installing the flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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TECHNICAL INFORMATION

Clean all threads with a screw tap.

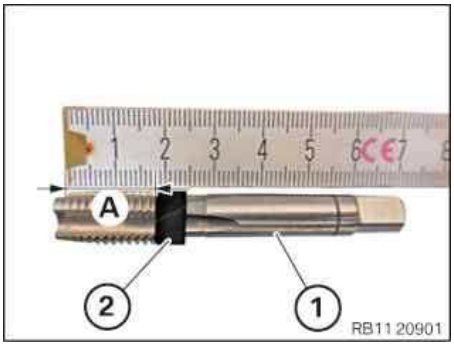
- Clean all the screw threads (1).

- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

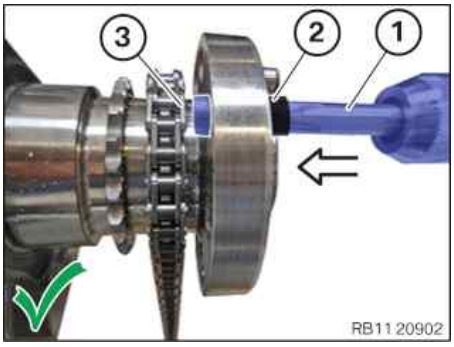
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the depth of insertion (A) on the thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

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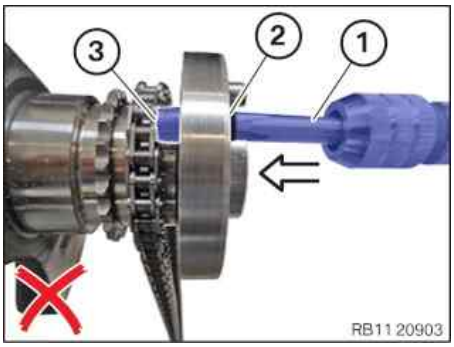
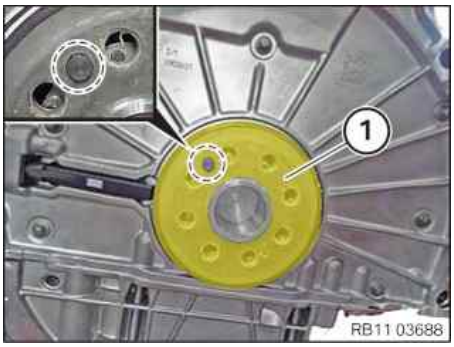


TECHNICAL INFORMATION

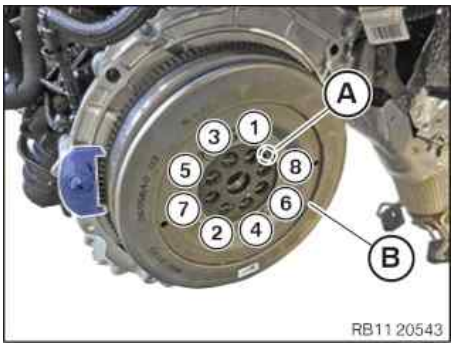
- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the depth of insertion (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- It is essential to observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

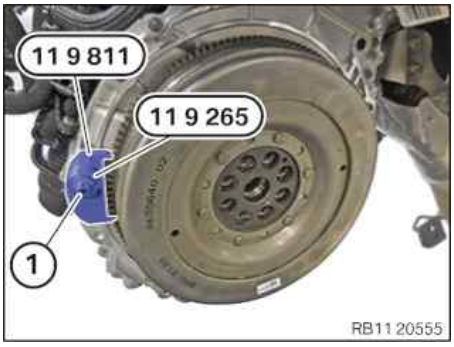


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Thread out special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)** remove.
- Ensure that the washer (5 mm) is removed.

POSTPROCESSES

33 – Installing the double-clutch transmission (DKG)

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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RISK OF DAMAGE

Damage to the engine block.

Damaged and corroded bolts will lead to major damage in the engine block and the transmission.

- It is imperative that protruding threads of the transmission bolts are checked for corrosion and damage prior to removal.
- It is imperative that all rust is removed from corroded threads and that they are cleaned prior to removal.
- Renew rusted and damaged bolts.

RISK OF DAMAGE

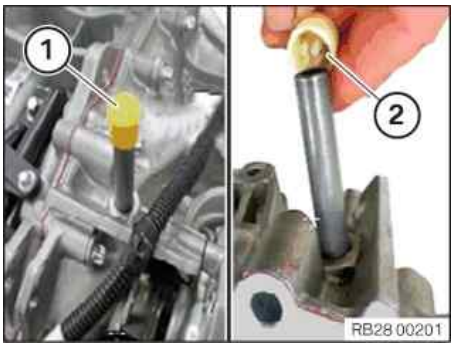
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.

TECHNICAL INFORMATION

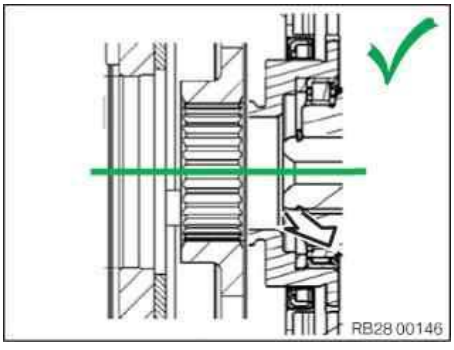
After completing work:
Check gearbox oil level. Use only the approved transmission oil.
Failure to comply with this instruction will result in serious damage to the double-clutch transmission (DKG).



- Remove the protective caps (1) on the new transmission and renew them with the white series vent cap (2).

Note: Failure to comply with this may result in damage or leakage in the transmission.

- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.



- **Correct:** Insert the double-clutch transmission (DKG) horizontally into the flywheel.

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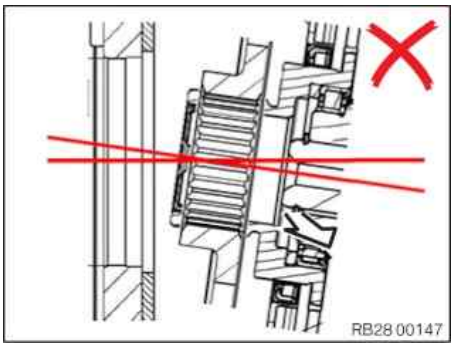
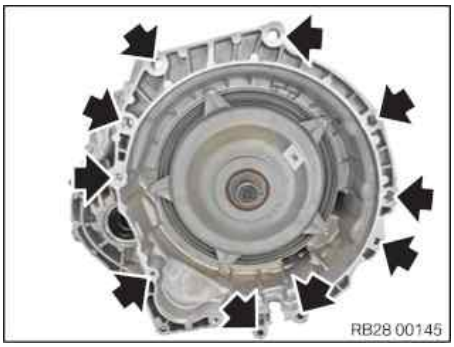


- **Wrong:** Do not tilt the double-clutch transmission (DKG) when inserting it into the flywheel.

- Clean the gearing (1) of the drive shaft.
- Coat the gearing (1) with MI-Setral-43N grease (BMW part number 83 23 2 152 082).

  Tooth gaps must be filled with grease up to tooth height.

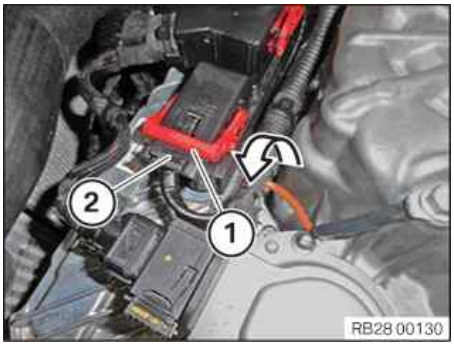


- Flange-mount the double-clutch transmission (DKG) to the engine so that it is absolutely horizontal.
- Hand-tighten the bolts (arrows).
- Tighten screws (arrows).

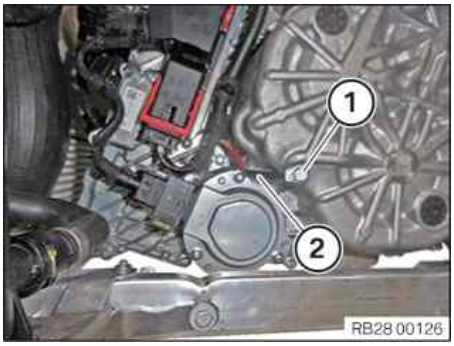
Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Connect and lock the coolant lines (1).



- Install the connector (2) on the control unit and fold down the red lever (1) in the direction of arrow up to the limit position.
- Check the correct fit of the plug connection (2).



- Install the grounding cable (2) and tighten the bolt (1).

Standard screw connection M6

M6		8 Nm

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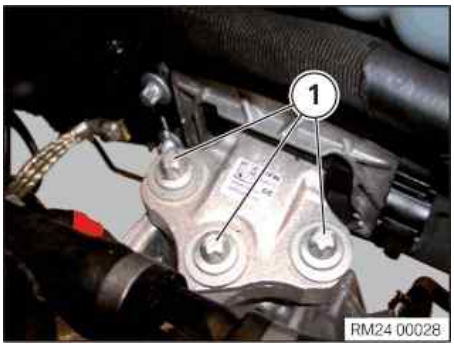
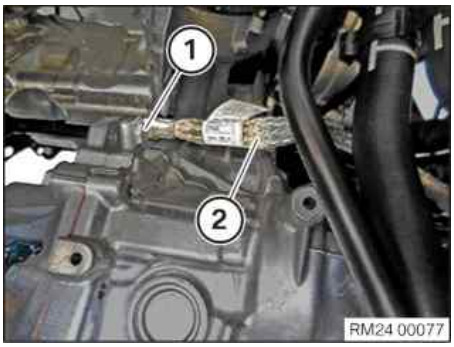


- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Transmission mounting

M10	Renew screws.	Jointing torque Angle of rotation	40 Nm 90 °

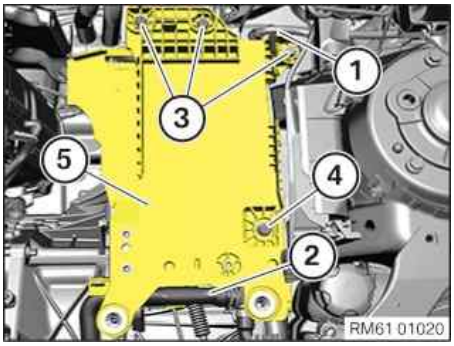


- Screw ground strap (2) onto transmission with screw (1).

Standard screw connection M8

M8		Tightening torque	19 Nm

▸ **Install the battery holder**



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

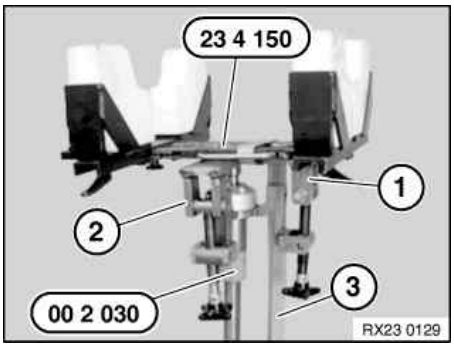
Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).



- Loosening the tensioning strap (3).
- Remove special tools **0 490 133 (00 2 030)** and .

34 – Installing left output shaft (double-clutch transmission (DKG))

▸ **Installing the left radial shaft seal on the differential (7DCT300)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

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RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

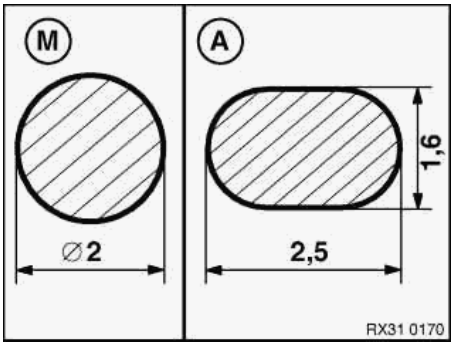
- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

- Coat sealing lips of radial shaft seal with transmission oil.
- Drive in radial shaft seal using the special tool **2 409 230** into the transmission housing.

  The sealing ring must close flush with the transmission housing.

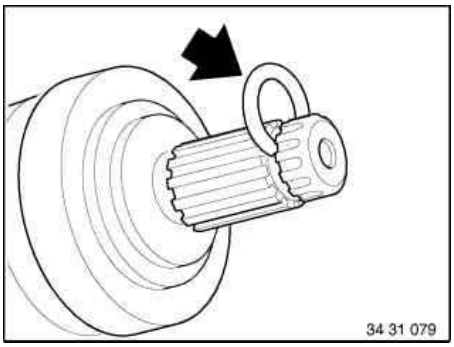
- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).

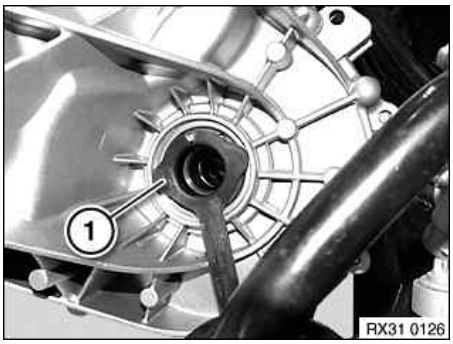


- Do not mix up circlips.

  Different types of output shafts fitted:
  - M: Manual transmission
  - A: Automatic transmission



- Renew circlip (arrow).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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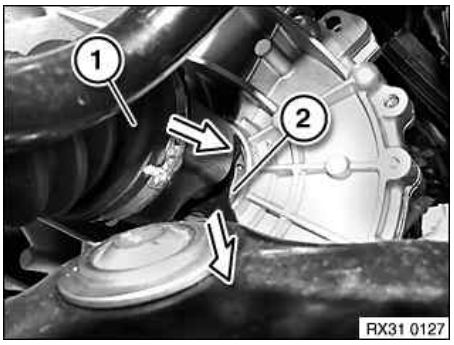
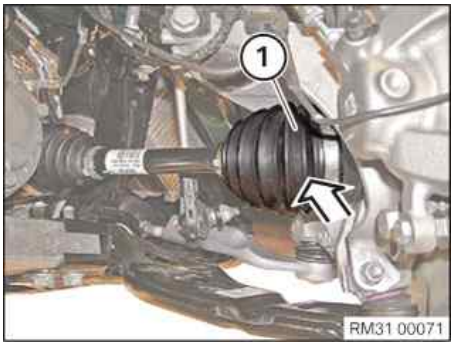


- Insert output shaft (1) into transmission.

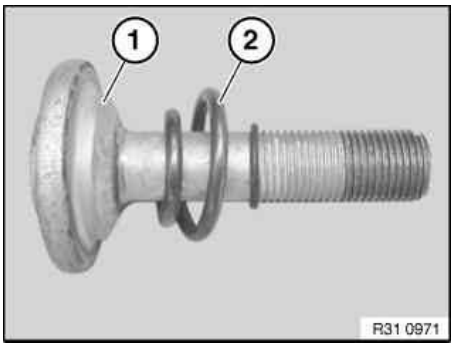
Note: Make sure the output shaft is joined in parallel to the axle and without being entangled.

- **Manual gearbox only:** Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.

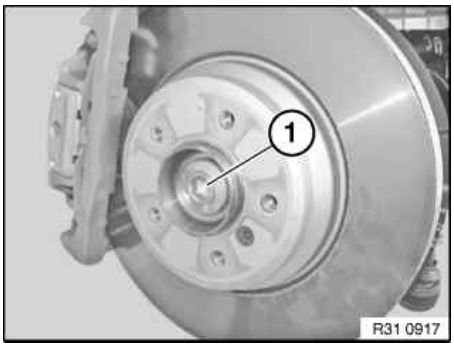
  The output shaft (1) must engage audibly.
- Check for secure seat by levering.



- Turn steering wheel to left.
- Insert the output shaft (1) into the swivel bearing from the front.

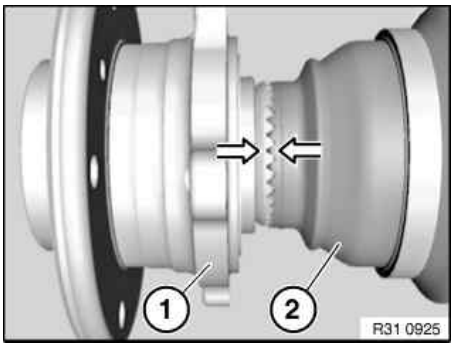


- Note installation position of compression spring (2).
- Keep the collar bolt (1) and the front gearing of the wheel bearing and the output shaft clean and free of grease.



- Renew collar bolt (1) with compression spring.

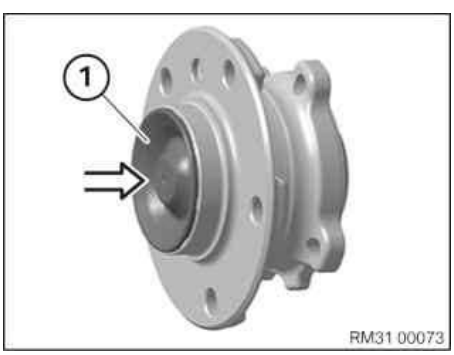
  Parts: Collar bolt with compression spring
- Hand-tighten the collar bolt (1) with the compression spring.



- Install the front gearing of the wheel bearing (1) and output shaft (2) in an interlocking position (tooth-in-tooth position).
- Check whether the front gearing is locked tooth in tooth by reciprocally rotating wheel hub and the output shaft.
- When positive locking is ensured: Tighten the collar bolt to tightening torque. For this purpose, press the brake pedal.

Output shaft to wheel bearing

M16	Replace the collar bolt.	Jointing torque	210 Nm
		Angle of rotation	90 °



- If necessary, attach protective cap (1).

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▸ **Installing the right radial shaft seal on the differential (7DCT300)**

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Damage to the transmission.

Damage to the transmission through unapproved transmission oil.

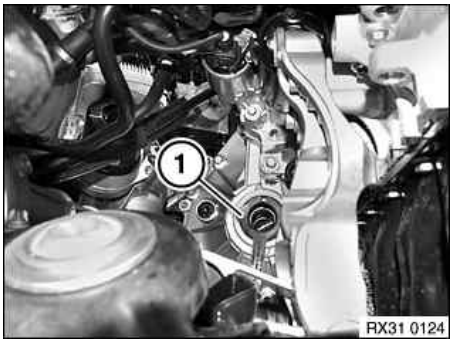
- Use only the approved transmission oil.
- After completion of repair work, check transmission oil level.

- Coat sealing lips of radial shaft seal with transmission oil.
- Drive the radial shaft seal into the gearbox housing using the special tool **2 409 230**.

  The sealing ring must lie flush with the gearbox housing.

- **With automatic transmission only:**
- Lever out O-ring (1).
- Renew O-ring (1).

  Parts: O-ring
- Insert new O-ring (1).



- Insert installation protection ring (1) into the radial shaft seal.
- Make sure the tool fits over the lip of the radial shaft seal so there is no damage to sealing ring when the output shaft is inserted.

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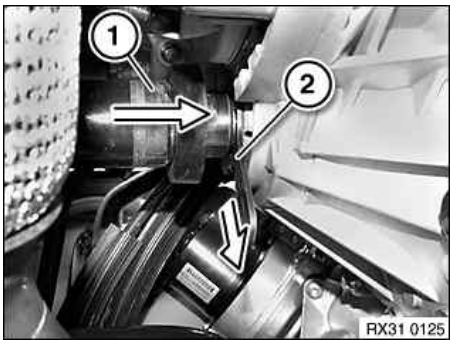
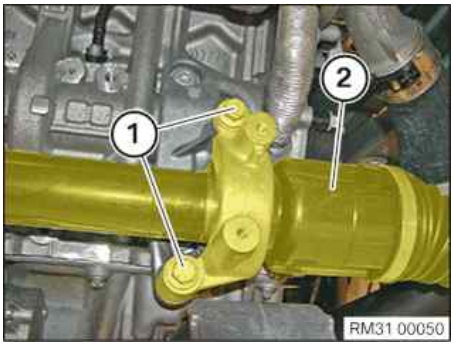


- Insert output shaft (1) into transmission.

Note: Make sure the output shaft is joined in parallel to the axle and without being entangled.

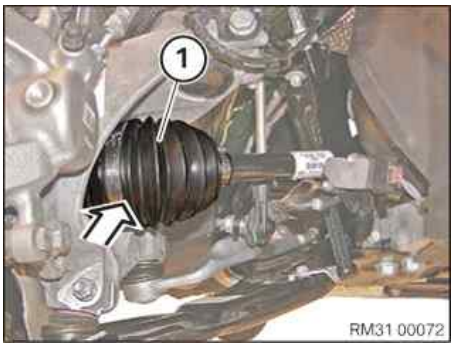
- Pull on the handle to remove the installation protection ring (2) and dispose of it.
- Slide output shaft (1) into the transmission as far as the limit position.
- Check for secure seat by levering.



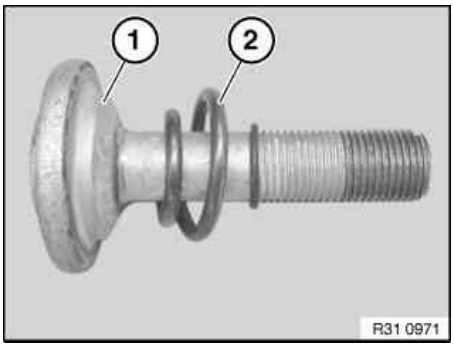
- Tighten the screws (1).

Output shaft bearing to engine block

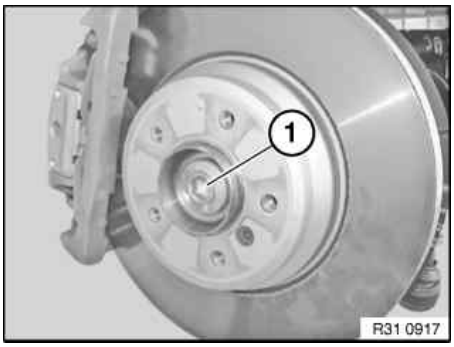
M10		Tightening torque	38 Nm



- Turn steering wheel to right.
- Insert the output shaft (1) into the swivel bearing from the front.

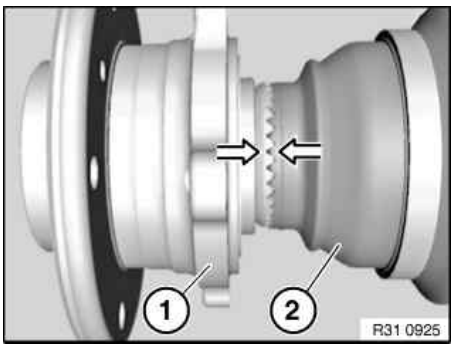


- Note installation position of compression spring (2).
- Keep the collar bolt (1) and the front gearing of the wheel bearing and the output shaft clean and free of grease.



- Renew collar bolt (1) with compression spring.

  Parts: Collar bolt with compression spring
- Hand-tighten the collar bolt (1) with the compression spring.



- Install the front gearing of the wheel bearing (1) and output shaft (2) in an interlocking position (tooth-in-tooth position).
- Check whether the front gearing is locked tooth in tooth by reciprocally rotating wheel hub and the output shaft.
- If positive locking is ensured: Tighten the collar bolt to tightening torque. For this purpose, press the brake pedal.

Output shaft to wheel bearing

M16	Replace the collar bolt.	Jointing torque	210 Nm
		Angle of rotation	90 °

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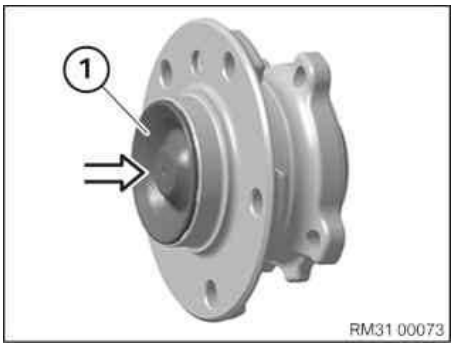
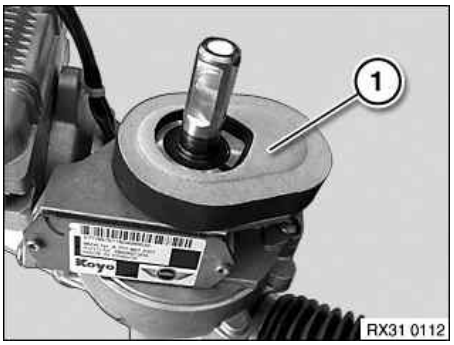


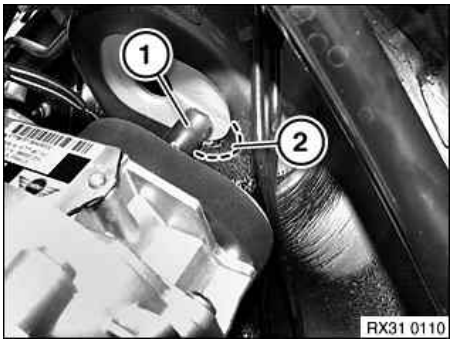
- If necessary, attach protective cap (1).

36 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

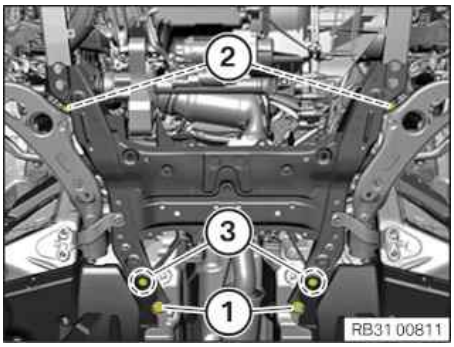


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm

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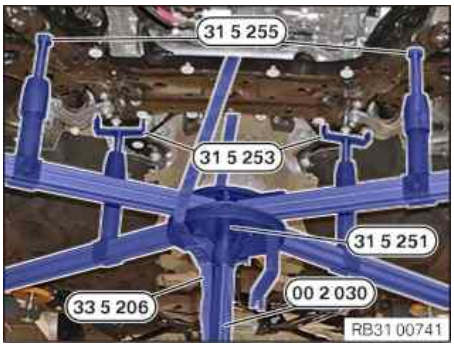
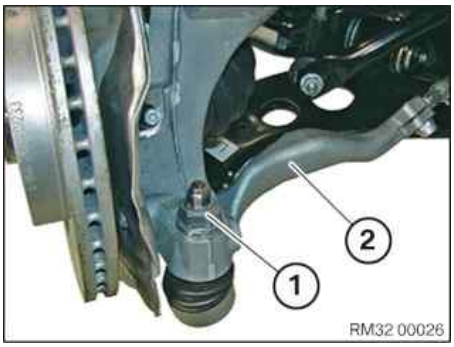


- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.



NOTICE

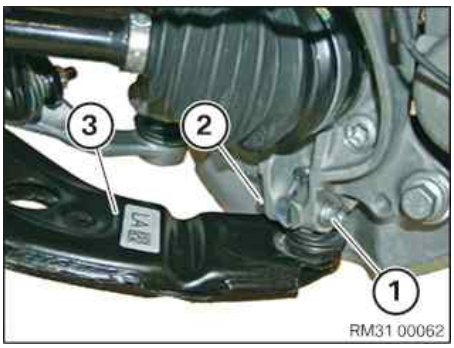
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

37 – Install the mounted parts on the front axle support

NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

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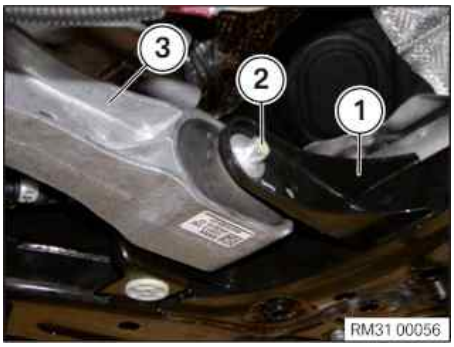
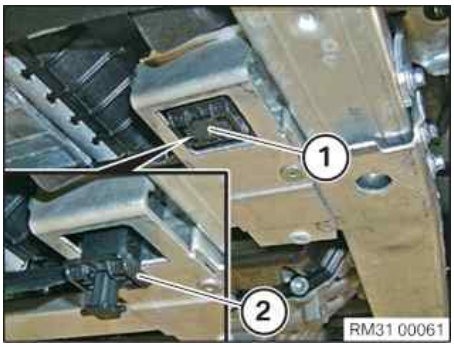


- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

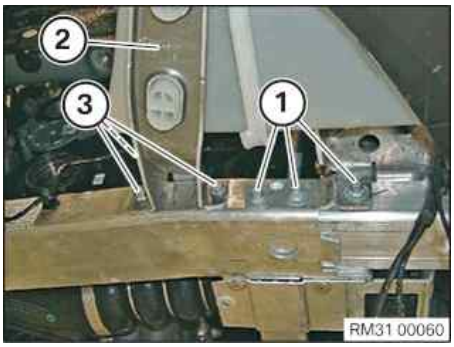
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

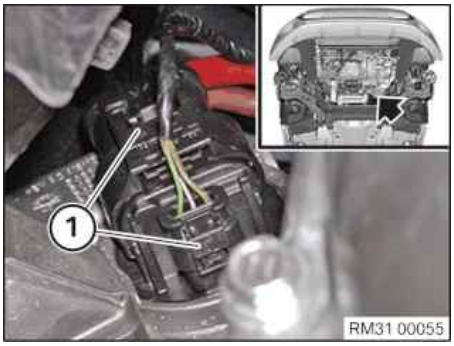
Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

38 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.

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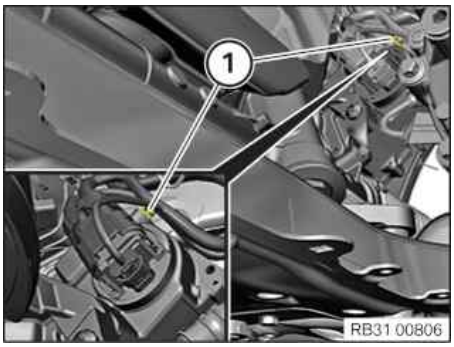
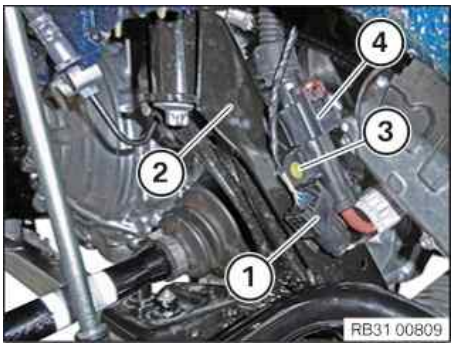


- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

39 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

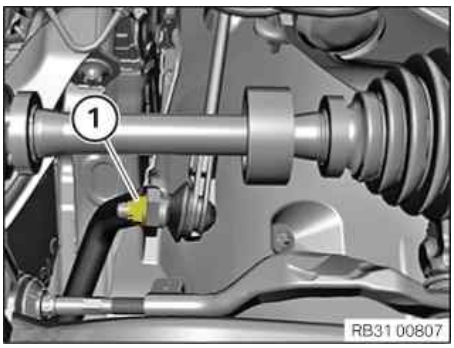
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

40 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

41 – With right installation: Securing the cable for the ride height sensor

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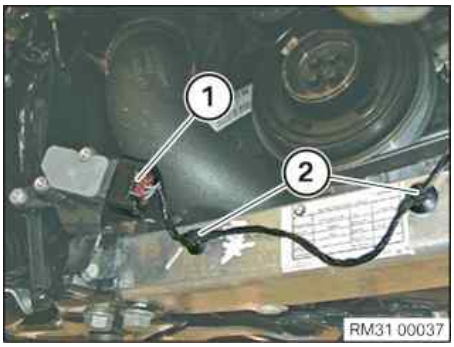


- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

42 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

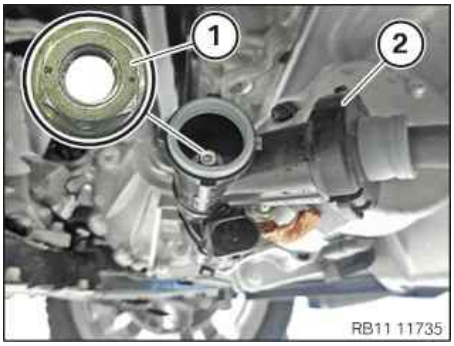
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

43 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**

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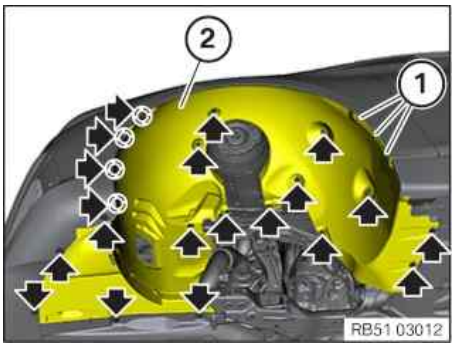


- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

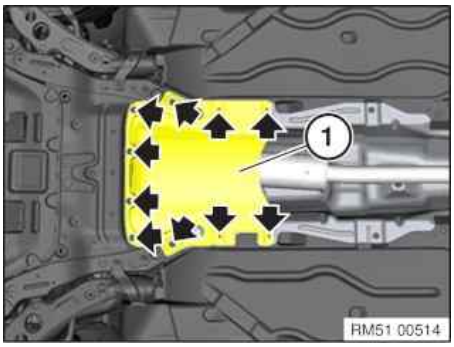
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

44 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

45 – Mount the front left and right wheels

▸ **Mounting the wheel**

▹ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

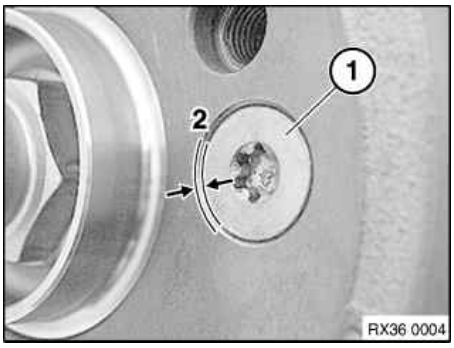
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm

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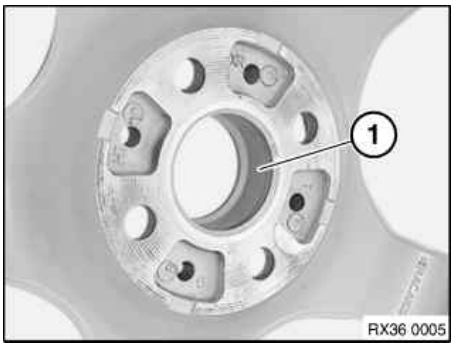


- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

◁

TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

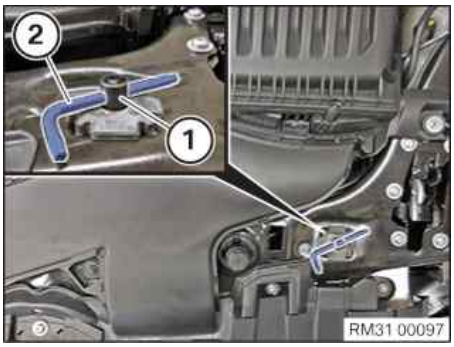
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

46 – Removing fastener for left and right radiator



NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

47 – Secure the steering shaft at the bottom on the steering gear

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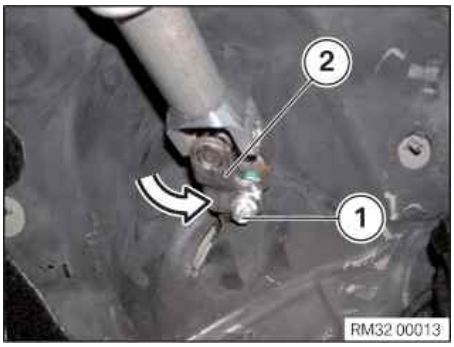
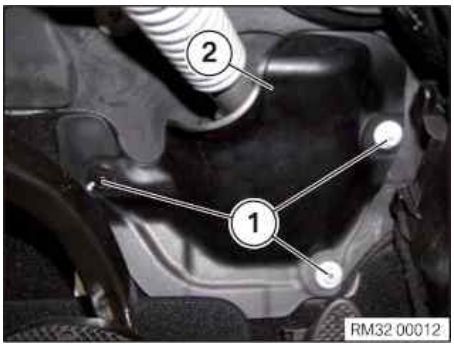


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

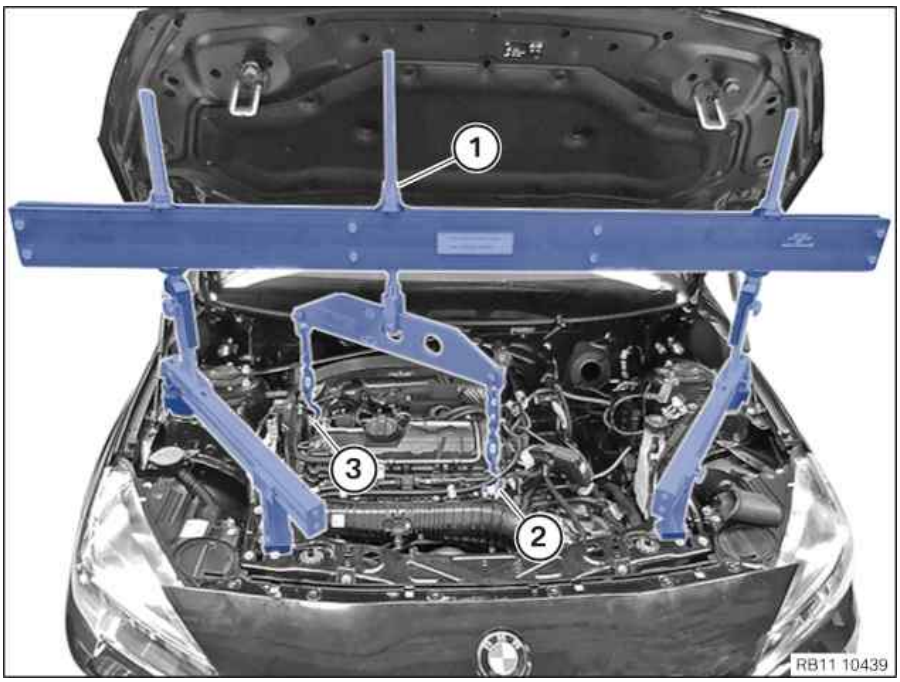
48 – Remove the engine bridge

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Detach the spindle screw (1) from the engine bridge.
- Unscrew the leg screws (2) and (3).
- Guide the engine bridge out of the vehicle with the help of another person and remove.

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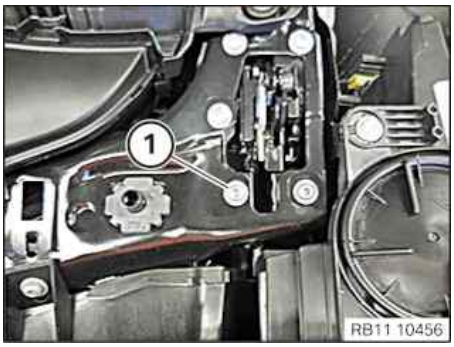
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.



- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Tighten the screw (1) of the bonnet catch.

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

49 – Install electronics box

Prerequisite

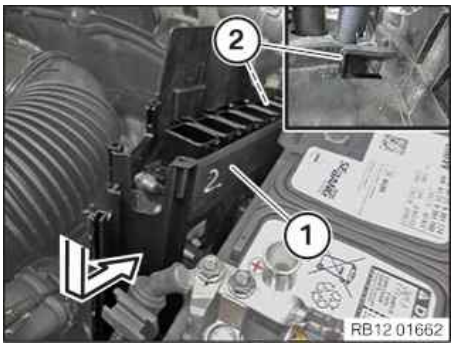
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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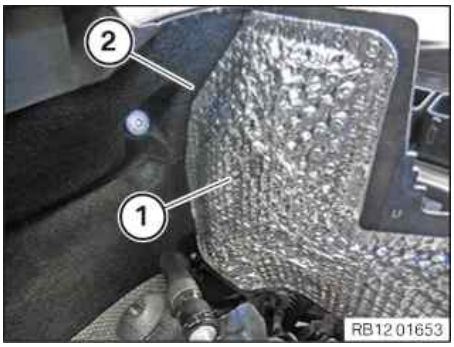
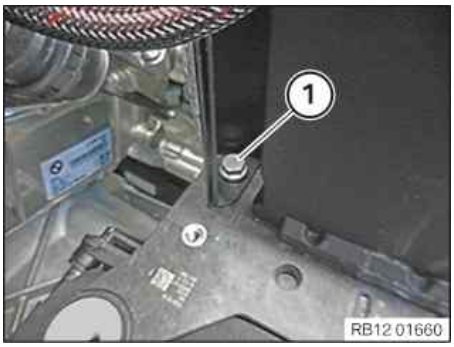


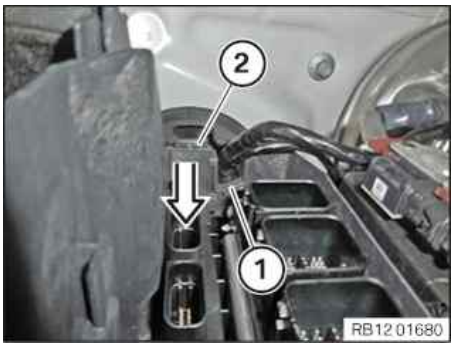
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



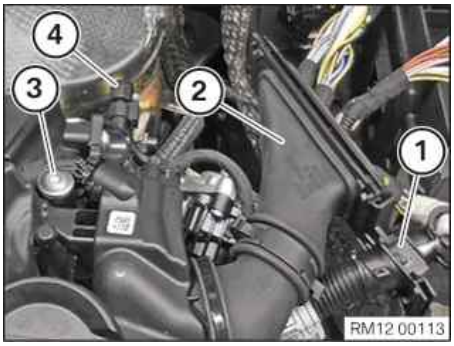
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

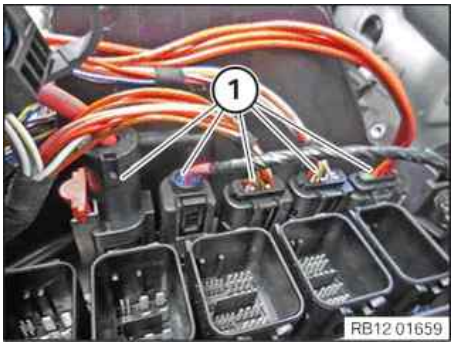


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

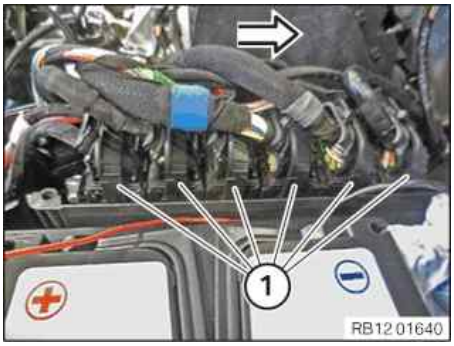
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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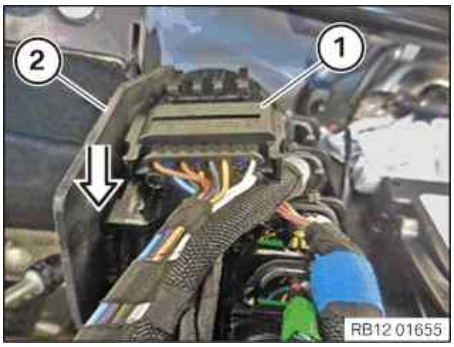
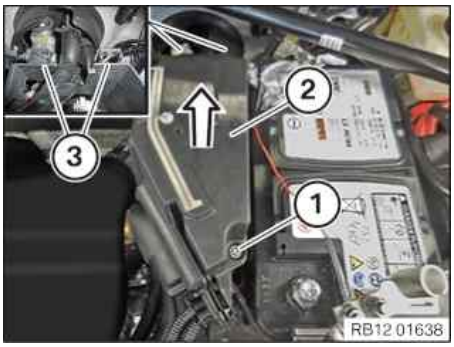


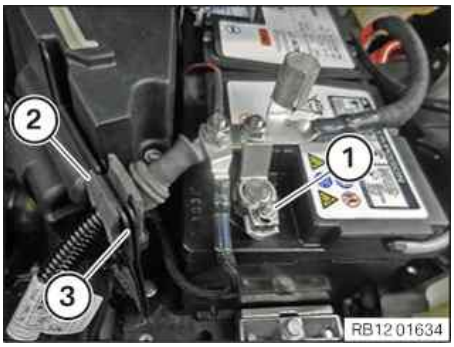
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

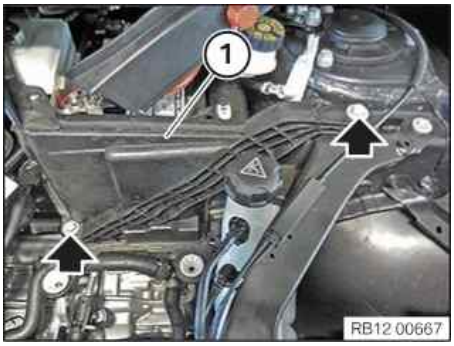
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

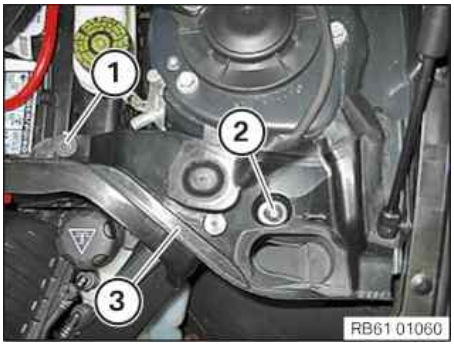
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

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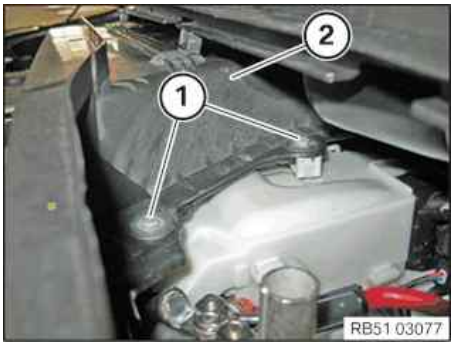
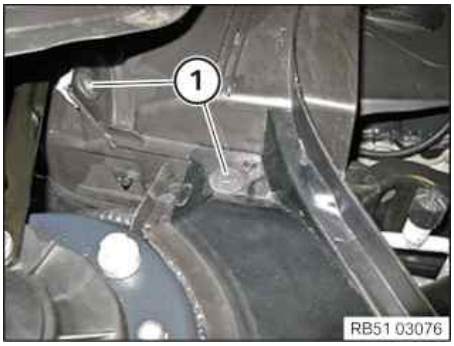
50 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

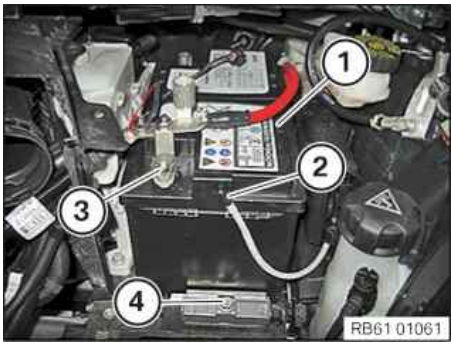
Bulkhead cover, top

Screw		Tightening torque	3 Nm

51 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm

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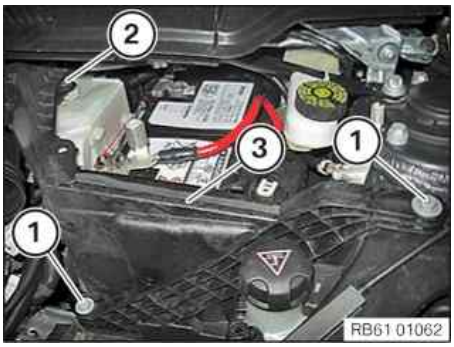


- Insert the tension strut (3).
- Tighten down screw (2).

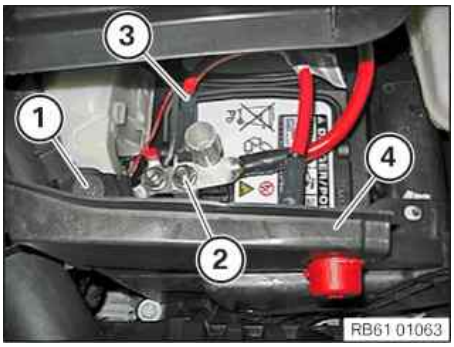
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

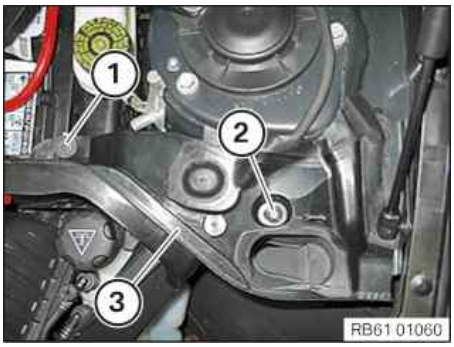
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

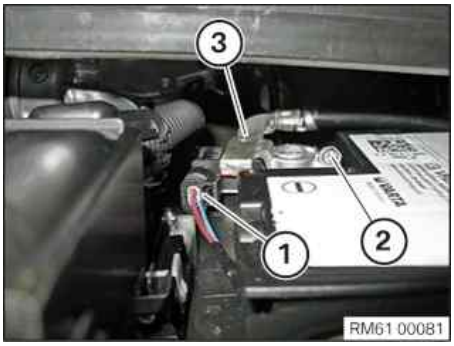
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

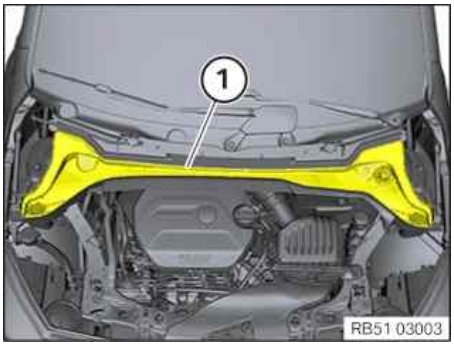


- Position the negative battery terminal (3).
- Tighten nut (2).

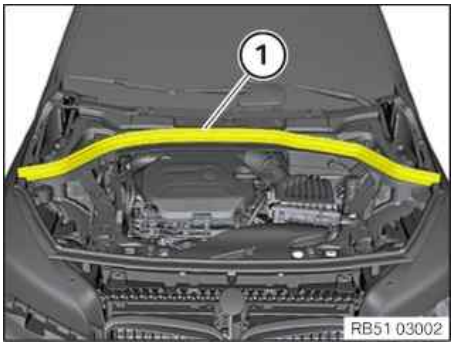
Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.



- Feed in the cowl panel cover (1).



- Press the gasket (1) in a downwards direction.

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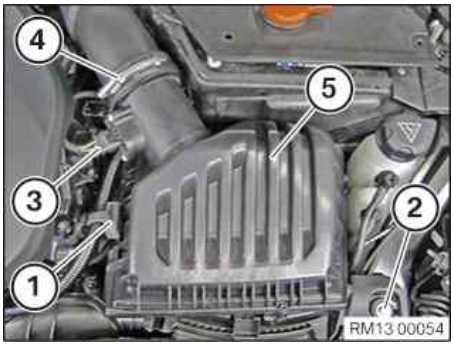
52 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

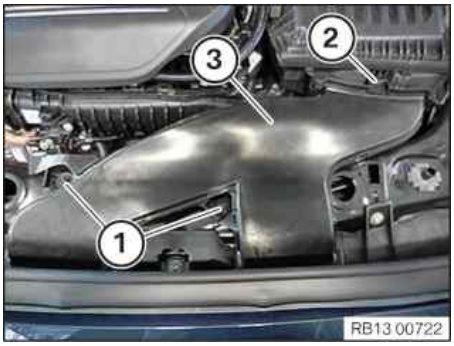
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

53 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

54 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

55 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

- See additional information.

56 – Checking/topping up oil level in the double-clutch transmission (DKG) (7DCT300)

CAUTION

Acid burns may result from skin contact with oil or inhaling oil vapours.

Risk of acid burns from contact with oil!

- Wear safety goggles and protective gloves.
- Ensure adequate ventilation.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Transmission oil temperature 20 °C up to a maximum 40 °C!
Carry out the "Transmission oil adjustment" service function with the diagnosis system.
The double clutch also needs to be replaced if you exceed the oil change interval by more than 3000 km!
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox (DKG).

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- **Check / top up the oil level (transmission oil temperature must be between 20 °C and 40 °C):**
- Open the oil filler plug (1).
- If oil escapes, seal off again immediately.
- If no oil escapes, add oil until it flows over.
- Drain off excess oil (up to lower edge of filler hole).
- Replace the oil filler plug (1).

  Parts: Oil filler plug
- Tighten the oil filler plug (1).

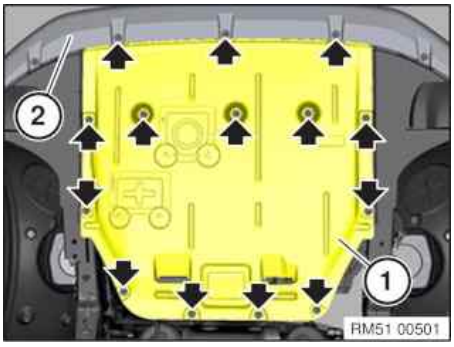
Expendable materials

Twin-clutch gearbox oil BMW DCTF-2	1 , Bottle	83 22 2 433 157

Oil drain plug/oil filler plug of double-clutch transmission (DKG)

M18	Renew screw.	Tightening torque	43 Nm

57 – Installing the front underbody protection

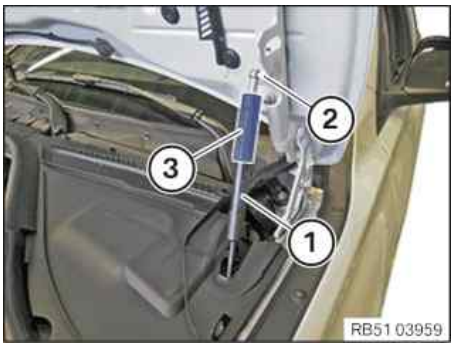


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

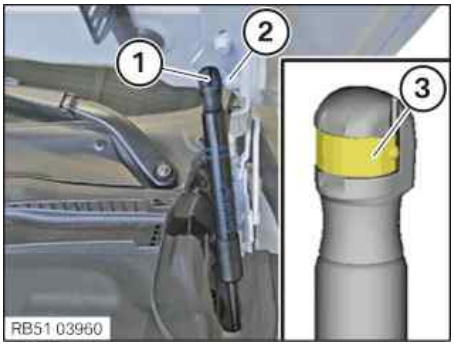
Underbody protection front

			3 Nm

58 – Take bonnet out of the service position



- Support the bonnet by hand.
- Remove the special tool **2 353 020**(3) from the ball pin (2).
- Pull off the special tool **2 353 020**(3) from the gas pressure spring (1).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.



CAUTION

Shutting bonnet or tailgate.

Danger of injury!

- Support bonnet/tailgate in fully open position with the aid of a suitable device.

- Check the clamp (3) is fitted correctly.
- Connect ball socket (1) to ball pin (2).
- Continue to support the bonnet and repeat the operation on the other side of vehicle.

Additional Information

Overview of Tightening Torques

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Fan cowl on radiator — Used in step 13

M6X12		Tightening torque	6 Nm

Bracing strut to top cross connection — Used in step 14

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 14

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 14 48

M6x20		Tightening torque	12 Nm

Special tool to cylinder head — Used in step 17

M8		Tightening torque	21,5 Nm

Flywheel to crankshaft — Used in step 32

M12x1.5	Renew screws.	Tightening torque	120 Nm

Transmission to engine — Used in step 33

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Standard screw connection M6 — Used in step 33

M6			8 Nm

Transmission mounting — Used in step 33

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

Standard screw connection M8 — Used in step 33

M8		Tightening torque	19 Nm

Battery holder to engine support — Used in step 33

Hexagon screw M8x30		Tightening torque	19 Nm

Output shaft to wheel bearing — Used in step 34 35

M16	Replace the collar bolt.	Jointing torque	210 Nm
		Angle of rotation	90 °

Output shaft bearing to engine block — Used in step 35

M10		Tightening torque	38 Nm

Rear end of front axle support to body — Used in step 36

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 36

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 36 44

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing — Used in step 36

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing — Used in step 36

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

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Holder, wishbone rubber mount, to body — Used in step 37

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support — Used in step 37

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate — Used in step 37

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier — Used in step 37

		Tightening torque	11,8 Nm

Holder to front axle support — Used in step 38

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar — Used in step 40

M10	Renew nut.	Tightening torque	56 Nm

Starter motor to transmission — Used in step 42

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 42

M8		Tightening torque	13,5 Nm

Wheel arch cover to body — Used in step 43

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 43

Plastic nut		Tightening torque	3 Nm

Brake disc to front wheel hub — Used in step 45

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub — Used in step 45

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 45

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear — Used in step 47

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead — Used in step 47

Plastic nut		Tightening torque	3 Nm

Electronics box to battery tray — Used in step 49

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 49

TS5x20		Tightening torque	3,5 Nm

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Cover to electronics box — Used in step 49

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 49

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 49

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 49

		Tightening torque	3 Nm

Battery cover — Used in step 49 51

Screw			2,8 Nm

Bulkhead cover, top — Used in step 50

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 51

M8 screw			19 Nm

Positive battery terminal — Used in step 51

NutM6			5 Nm

Trailing link — Used in step 51

M8 screw			19 Nm

Positive battery cable to battery terminal — Used in step 51

Nut M8			15,2 Nm

Negative battery terminal (with IBS) — Used in step 51

NutM6			5 Nm

Intake silencer housing to lock bridge — Used in step 52

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 52

Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 53

M6		Tightening torque	8 Nm

Oil drain plug/oil filler plug of double-clutch transmission (DKG) — Used in step 56

M18	Renew screw.	Tightening torque	43 Nm

Underbody protection front — Used in step 57

			3 Nm

Overview of Special Tools

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2 353 020 Support

Common	Used in step 1 58
Usage	For service position of engine compartment lid Associated contour-graphic silhouette foil can be ordered under: 83 30 2 356 848. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A74
Replaced by	
In connection with	
SI-Number	01 11 13 (960)

2 459 012 Holder

Common	Used in step 17 48
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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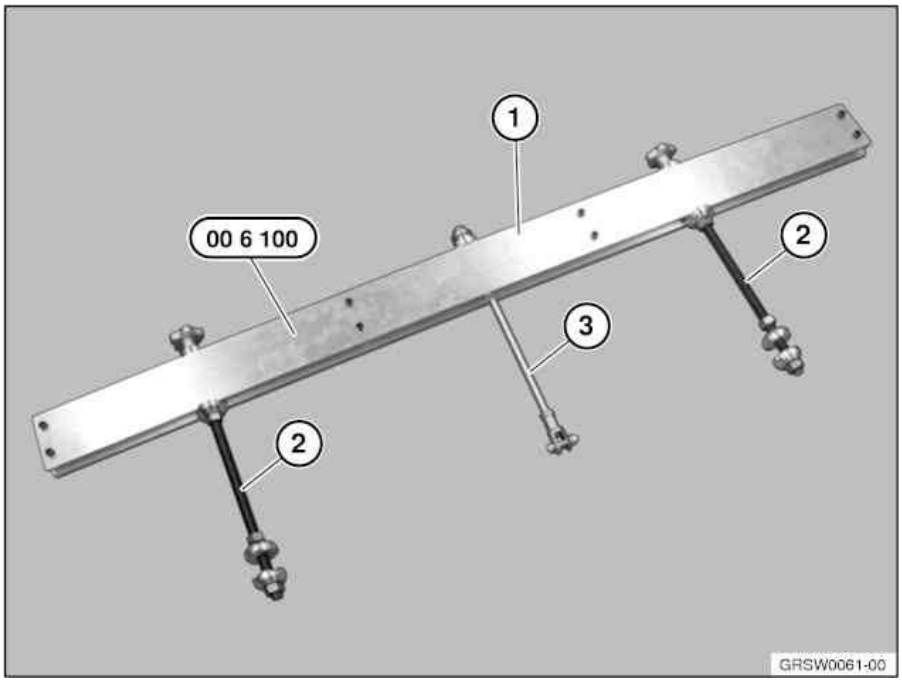
0 496 852 (00 6 100) Device



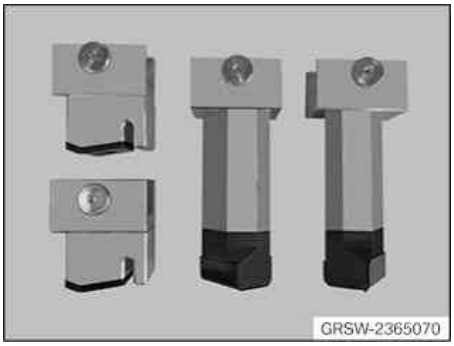
Common Used in step 17

Usage	Engine bridge (device) 006000
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 10 (659)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	2 361 507 (00 6 102)		**Spindle** Set (2 pieces) in connection with 00 6 100.	
3	2 361 506 (00 6 103)		**Spindle** Spindle (central spindle) for Traverse 00 6 100.	

2 365 070 Upholstery



Common Used in step 17

Usage	Washer for securing the engine support.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	Engine bridge 006100 - 0496852 Section 006051 - 0496436 Adapter 006130 - 2209122 Adapter 2318635
SI-Number	01 45 14 (186)

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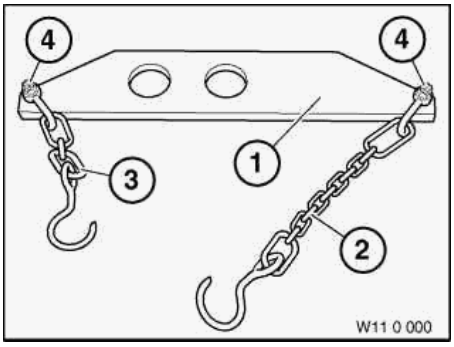
0 490 561 (11 0 000) Lifting gear



Common

Used in step 17

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

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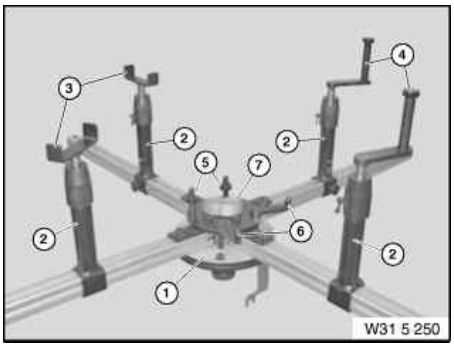
2 357 269 Shackle

Common Used in step 17

Usage	Set consisting of 4 pieces. Was valid as campaign for BMW i Aftersales High Voltage. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 19 13 (985)

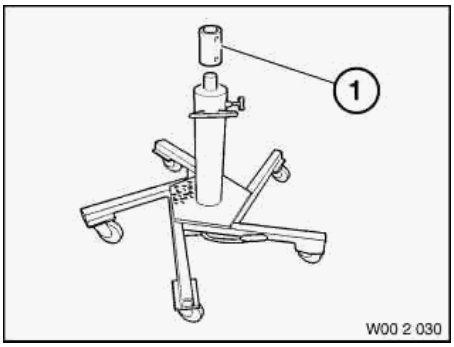
0 495 817 (31 5 251) Basic body



Common Used in step 27 36

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



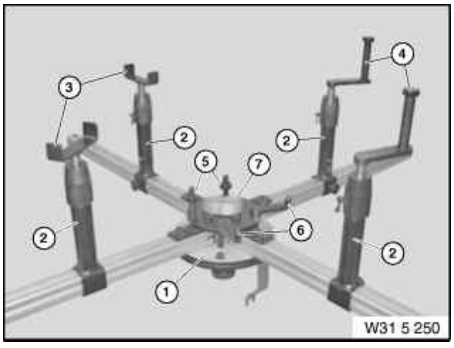
Common Used in step 27 30 33 36

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 821 (31 5 255) Adapter



Common Used in step 27

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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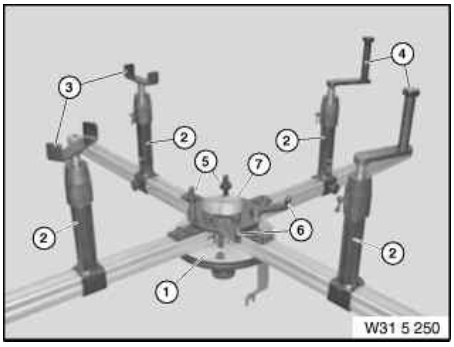
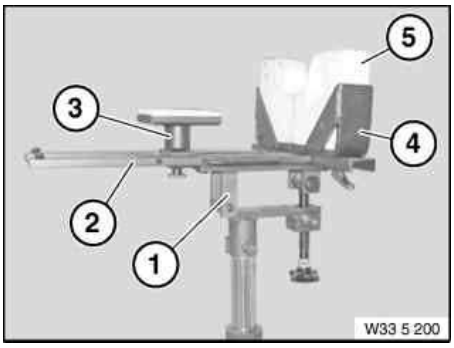
0 495 819 (31 5 253) Adapter



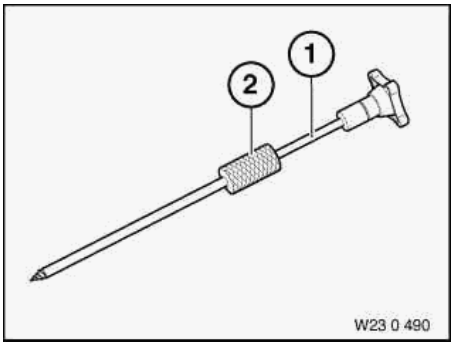
Common	Used in step 27
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt



Common	Used in step 27 36
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

0 491 454 (23 0 490) Puller

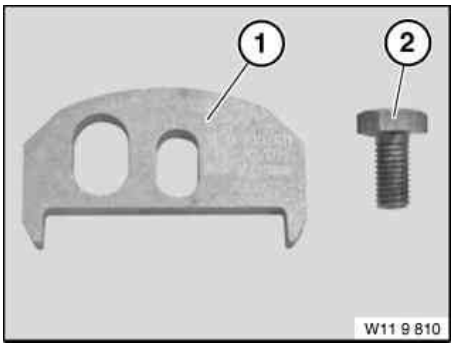


Common	Used in step 28 29
Usage	For removing shaft seal
Included in the tool or work	
Storage location	A13
Replaced by	
In connection with	
SI-Number	01 15 96 (106)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 491 455 (23 0 491)		**Rod** With self-tapping screw Deletion, only available via tool set	
2	0 491 456 (23 0 492)		**Weight** (Weight)	

0 496 171 (11 9 811) Holder



Common	Used in step 31 32
Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

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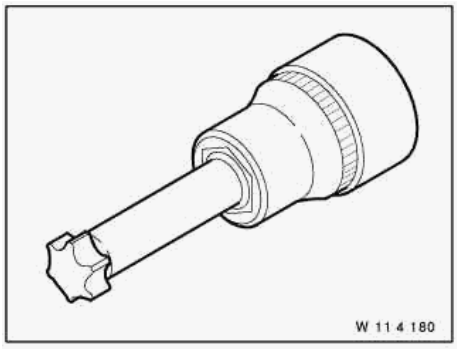
0 494 793 (11 9 265) Bush

Common	Used in step 31 32
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 31 32
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

2 285 058 Tool set

Common	Used in step 32
Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

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2 409 230 Mandrel

Common	Used in step 34 35
Usage	For installing the rear-wheel drive of Transmission output shaft le./ri. silhouette foil is contained in delivery specification. Further information on the contour-graphic silhouette foil is included in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A75
Replaced by	
In connection with	
SI-Number	01 56 14 (214)

2 344 011 Tool

Common	Used in step 45
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 18
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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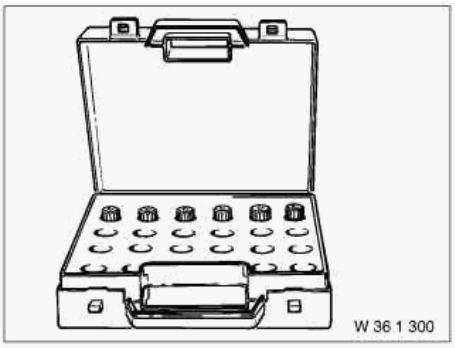
0 495 224 (36 1 326) Wheel stud



Common	Used in step 18
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 18
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 18
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 18
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 18
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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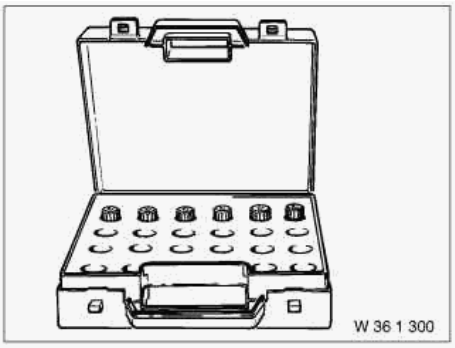
0 495 229 (36 1 332) Wheel stud



Common	Used in step 18
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 18
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Screw-in depth of thread cutter	Used in step 32
Screw-in depth	18 mm

Links

General repair instructions	Used in step
61 20 ... Notes on AGM battery	2 51
61 12 ... Notes on intelligent battery sensor (IBS)	2 51
61 00 ... Notes for disconnecting and connecting battery	2 51

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	7
17 00 008 Draining and topping up coolant for high-temperature circuit	55
17 00 008 Draining and topping up coolant for high-temperature circuit	55
17 00 008 Draining and topping up coolant for high-temperature circuit	55
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	55
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	55
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	55
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	55
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	55
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	55
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	55
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	55
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	55
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	55
17 00 039 Bleeding cooling system (B37, B47)	55
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	55
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	55
17 00 008 Draining and topping up the high-temperature coolant circuit	55
17 00 008 Draining and topping up the high-temperature coolant circuit	55
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	55
17 00 008 Draining and topping up the high-temperature coolant circuit	55
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	55
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	55
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	55
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	55
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	55

Operating materials	Used in step
2.0 Grease for wheel centring	45
14.0 Automatic transmission fluid for ZF-transmission GA8HP45Z / GA8HP50Z / GA8HP70Z / GA8HP90Z / GA8P70H / GA8P75H / GA8HP75Z	56

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11 23 010 Removing and installing/replacing vibration damper

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

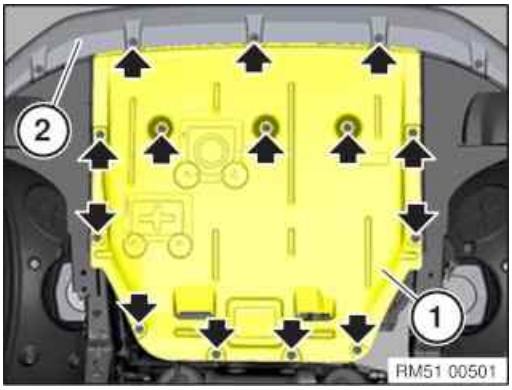
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

3 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

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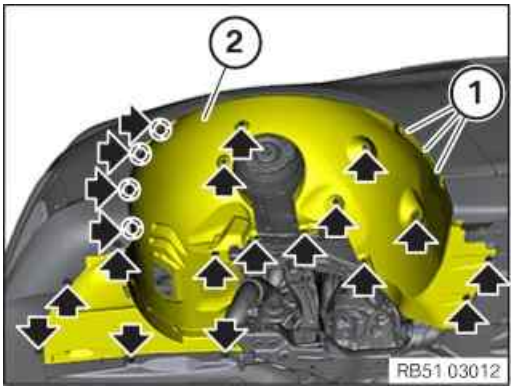
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

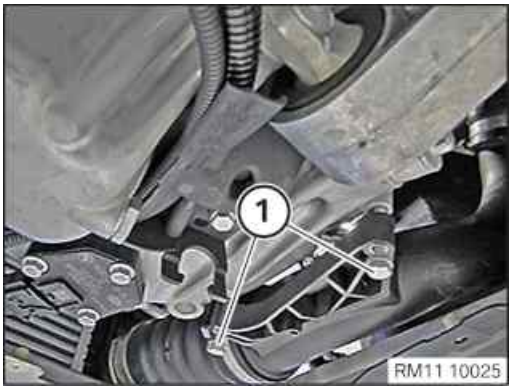
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

4 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

5 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

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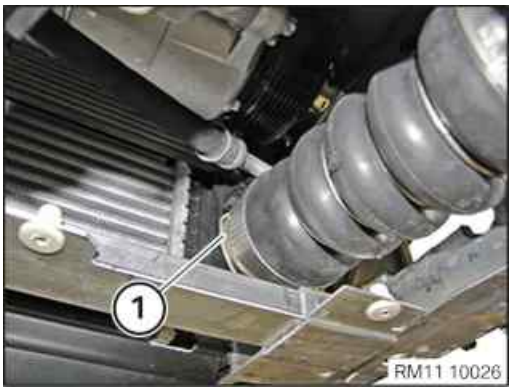
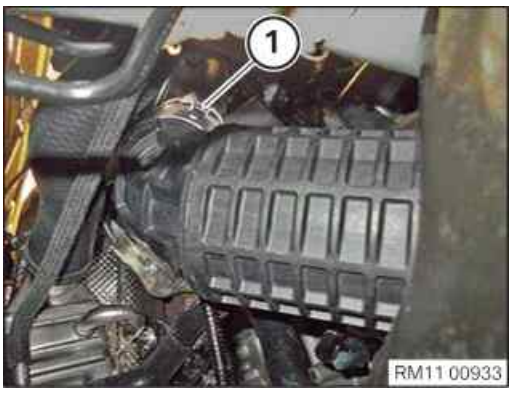
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



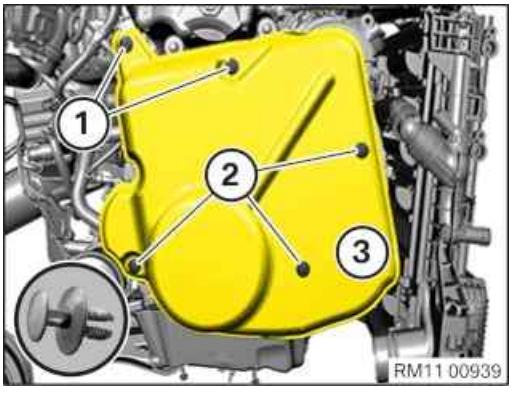
- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

6 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

7 – Removing the drive belt for alternator

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CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

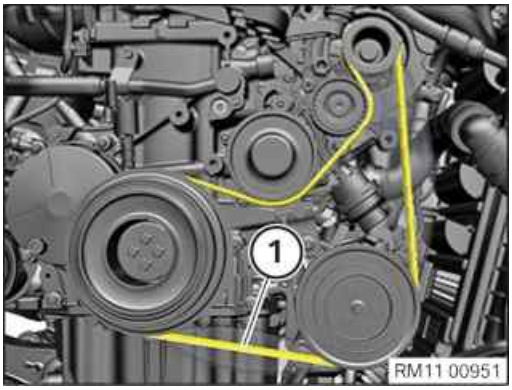
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.

MAIN WORK

8 – Removing the vibration damper

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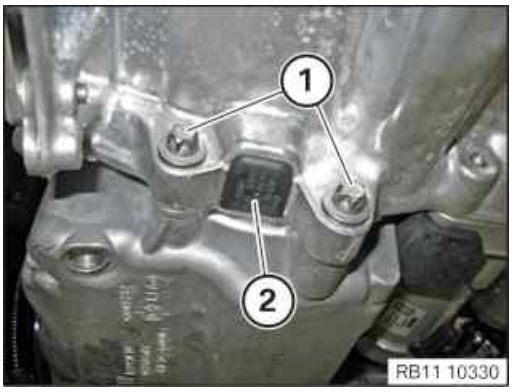
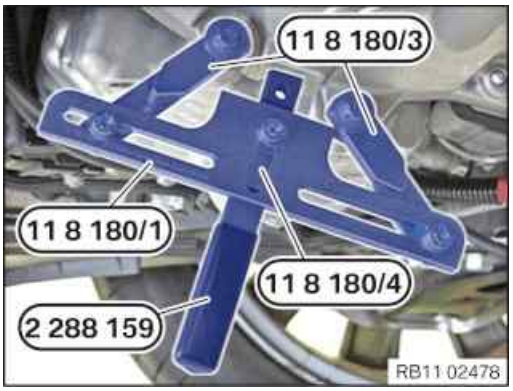
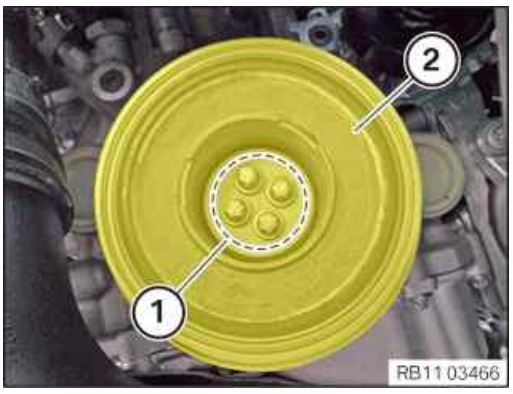


- Release the transmission bolts (1).
- Remove the protective cap (2).

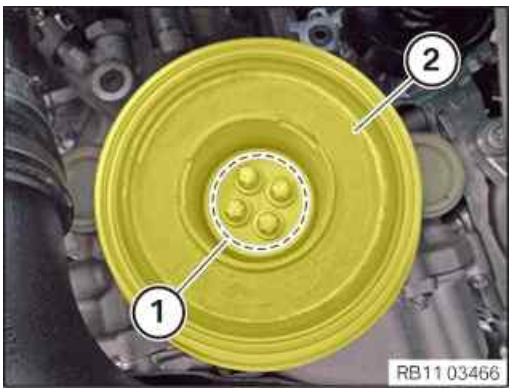


- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.



- Loosen screws in the area (1).
- Remove the vibration damper (2).

9 – Installing the vibration damper



- Position vibration damper (2).
- Renew screws (1).

  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

Vibration damper with belt pulley to crankshaft

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °

- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.

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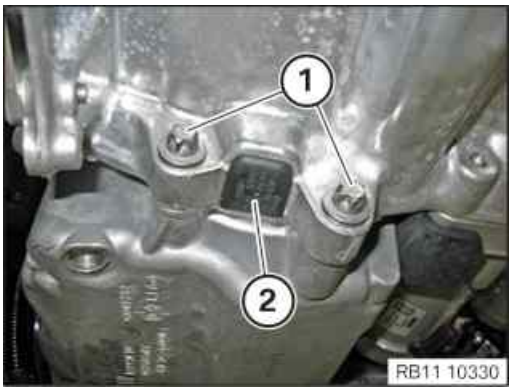


- Tighten transmission screws (1).

Transmission to oil sump

M8			19 Nm

- Install protective cap (2).

POSTPROCESSES

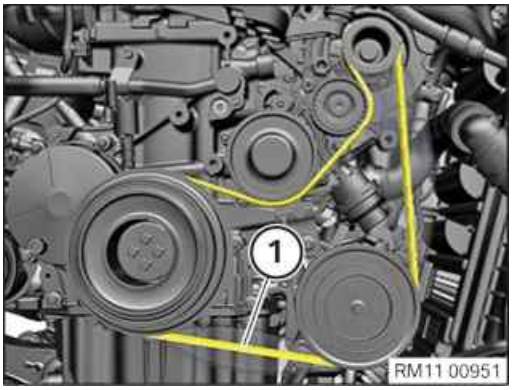
10 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

11 – Install the acoustic cover for the engine at the front

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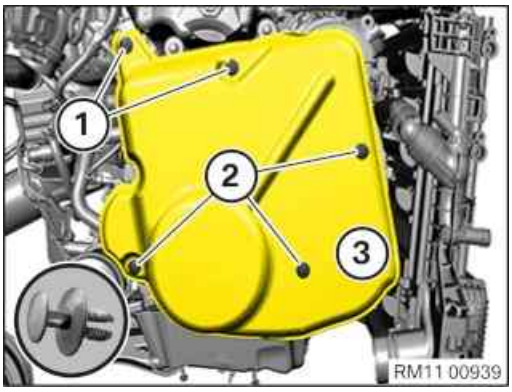


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

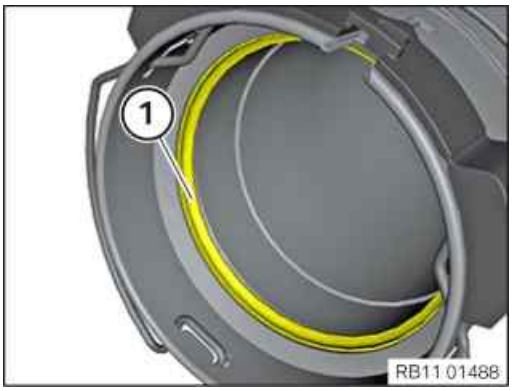
12 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

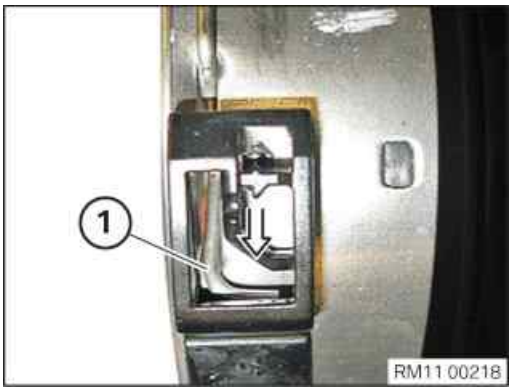
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

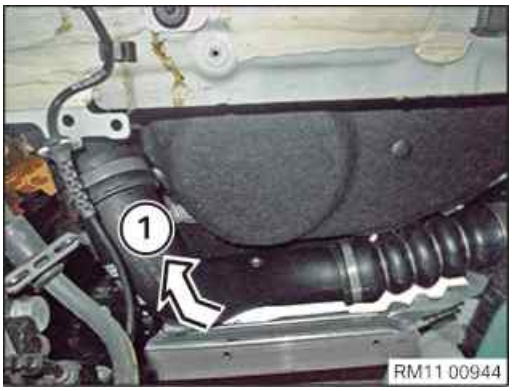


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.

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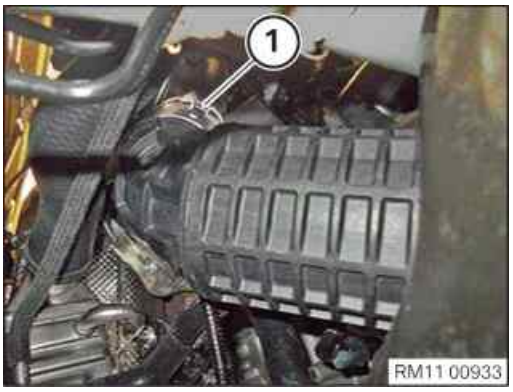
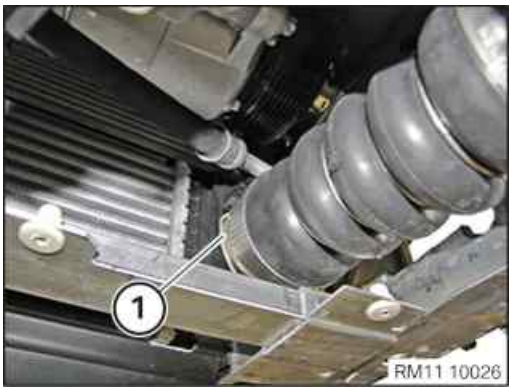


- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

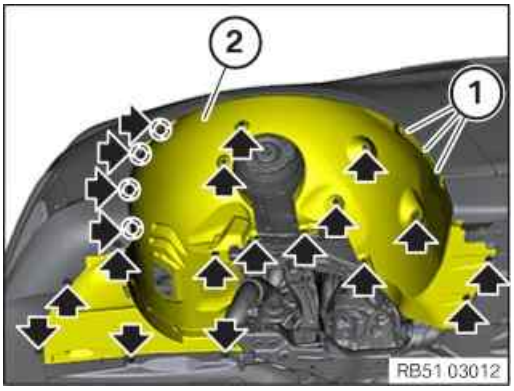
M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

13 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

14 – Installing the front right wheel

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▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

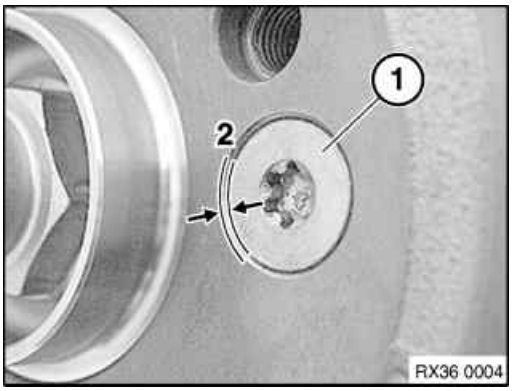
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

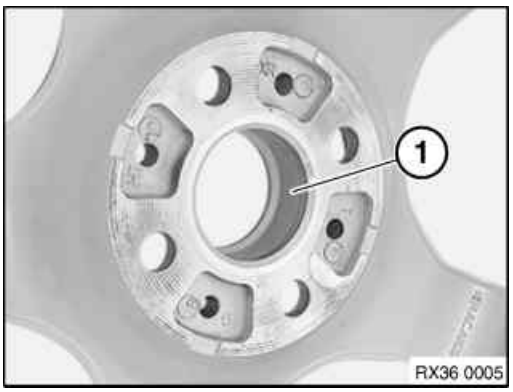


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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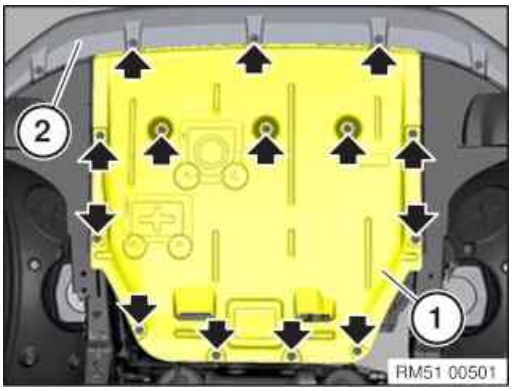
15 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

16 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Vibration damper with belt pulley to crankshaft — Used in step 9

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °

Transmission to oil sump — Used in step 9

M8			19 Nm

Charge air line to crankcase — Used in step 12

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 12

M6		Tightening torque	8 Nm

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Wheel arch cover

Used in step 13

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub

Used in step 14

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 14

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

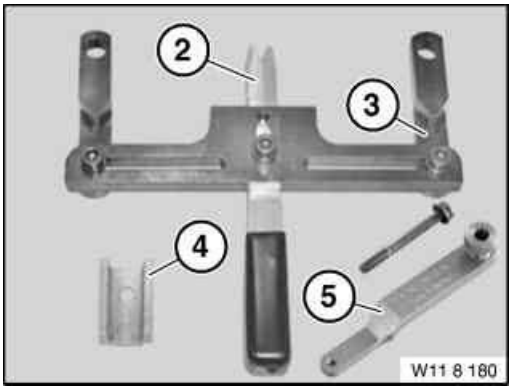
Underbody protection front

Used in step 15

			3 Nm

Overview of Special Tools

0 493 587 (11 8 180) Holder



Common

Used in step 8 9

Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

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2 344 011 Tool

Common	Used in step 14
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 3
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 3
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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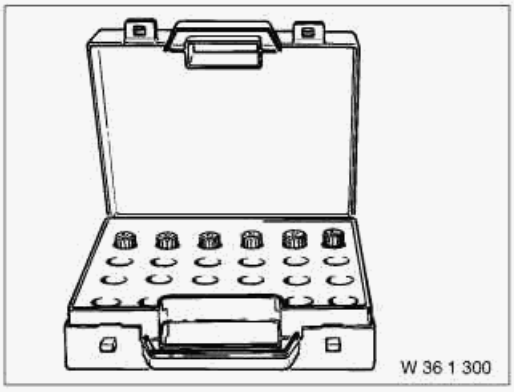
0 495 225 (36 1 327) Wheel stud



Common	Used in step 3
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 3
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 3
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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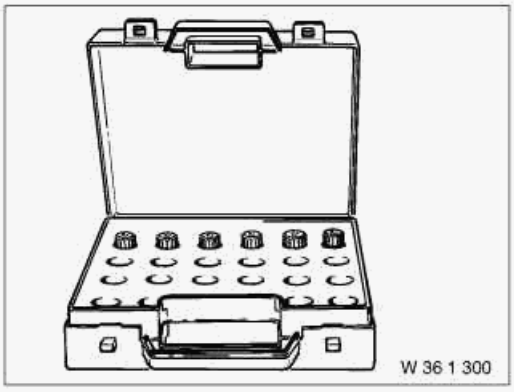
0 495 228 (36 1 331) Wheel stud



Common	Used in step 3
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 3
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 3
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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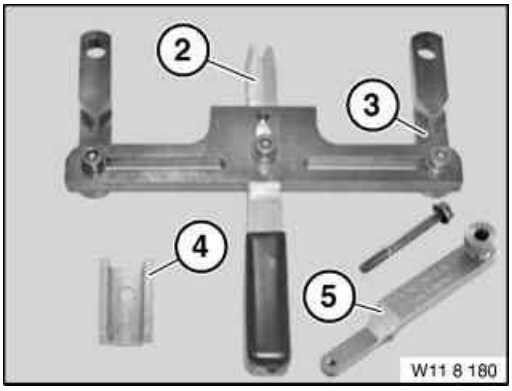
0 494 434 (11 8 183) Basic body



Common	Used in step 8 9
Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	14

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11 23 010 Removing and installing/replacing vibration damper (B37C)

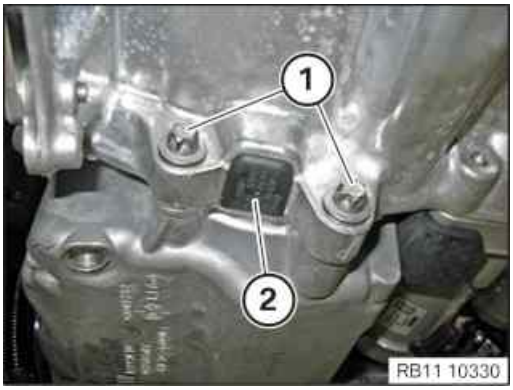
Special tools required:

- 11 8 180
- 2 288 159

Necessary preliminary tasks:

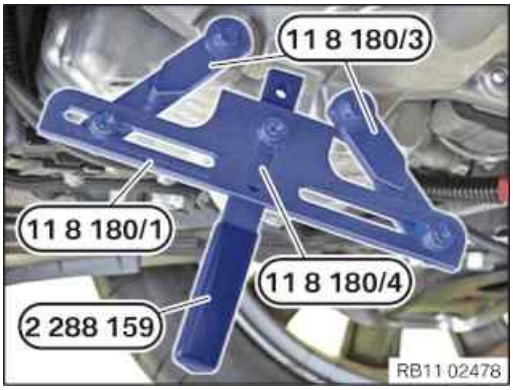
- Remove front underbody protection.
- Remove front right wheel arch cover.
- Remove drive belt.

Removal:



Release screws (1).

Remove protective cap (2).



Prepare special tool 11 8 180 /1 with special tool 11 8 180 /3, 11 8 180 /4 and 2 288 159 .

Fix the special tool 11 8 180 with the housing screws.

Slide the special tool 2 288 159 in the gearbox housing and fix the flywheel.

Tighten down all screws.

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Slacken all screws on the vibration damper (1).

Remove vibration damper (1).

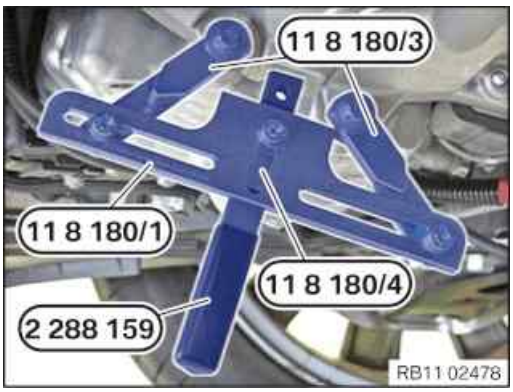
Installation:

Parts: Replace screws.

Position vibration damper (1).

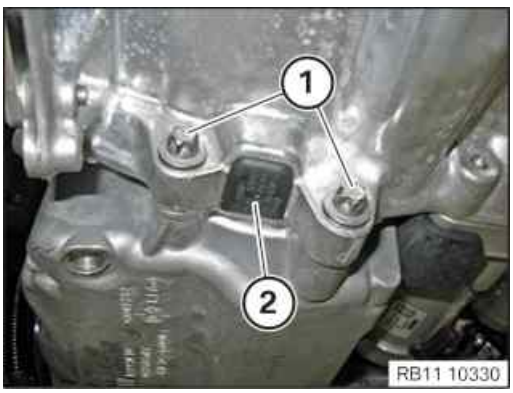
Tighten down all screws.

Tightening torque 11 23 1AZ.



Undo the Torx screws.

Remove special tool 11 8 180 with 2 288 159 .



Tighten down screws (1).

Tightening torque 11 13 1AZ.

Mount protective cap (2).

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Required reworking:

- Install drive belt.
- Install front right wheel arch cover.
- Install front underbody protection.

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11 24 571 Replace all connecting rod bearings (B37C)

Necessary preliminary tasks:

- Remove all pistons.

Important!

The connecting rod bearing shells for the connecting rod and the connecting rod bearing cap are **different**.

Dark connecting rod bearing shell must be mounted in connecting rod.

Light connecting rod bearing shell must be mounted in connecting rod bearing cap.

Replace connecting rod bolts.

Removal:

Remove connecting rod bearing (2) from connecting rod (1).

Remove connecting rod bearing (2) from connecting rod bearing cap (1).

Installation:

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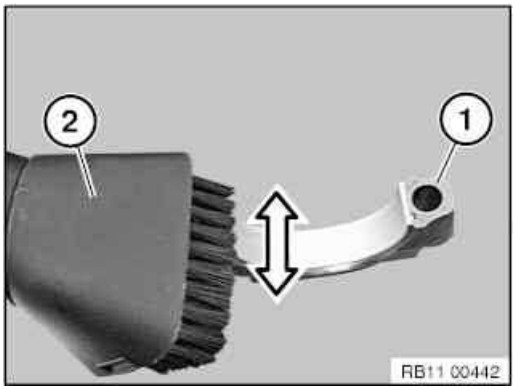
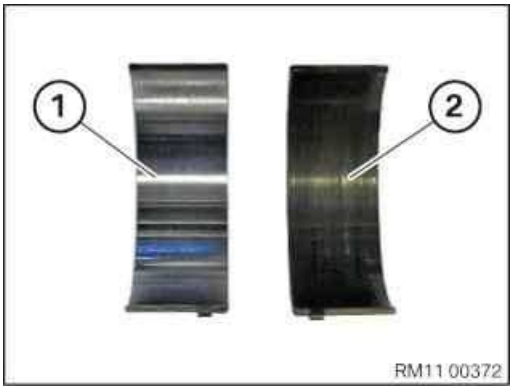


Important!

New connecting rods must be vacuum cleaned prior to installation.

Do not use compressed air to blow off cracked areas.

Use a commercially available vacuum cleaner (2) to vacuum clean cracked areas (1).



One light connecting rod bearing shell (1) and one dark connecting rod bearing shell (2) must be installed per connecting rod.

Clean connecting rod eye (1).

Insert dark connecting rod bearing shell (2) into connecting rod (1).

Oil connecting rod bearing shell (2).

Clean connecting rod bearing cap (1).

Insert light connecting rod bearing shell (2) into connecting rod bearing cap (1).

Oil connecting rod bearing shell (2).

Required follow-up work:

- Install all pistons.

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11 25 000 Removing and installing or replacing all pistons (B37C)

Special tools required:

- 11 8 860
- 2 288 944
- 11 4 492
- 11 8 140
- 00 2 530

Warning!

Protective goggles must be worn when working on the piston pin circlip.

Necessary preliminary tasks:

- Remove engine with transmission.
- Remove transmission.
- Mount engine on assembly stand.
- Remove cylinder head.
- Remove oil pump with vacuum pump.

Important!

If pistons, connecting rods and connecting rod bearing shells are reused, they must be reinstalled in the same places.

Individual connecting rod replacement is not permitted; they are classified by weight class.

Connecting rods and connecting rod bearing caps are denoted with the same pairing letters. Mixing up the components will result in engine damage.

Piston and gudgeon pins are paired and must not be fitted individually or confused.

Removal:

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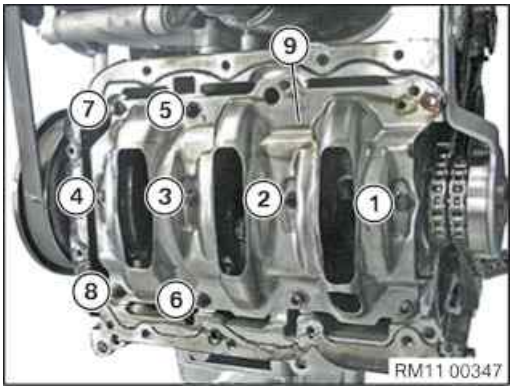
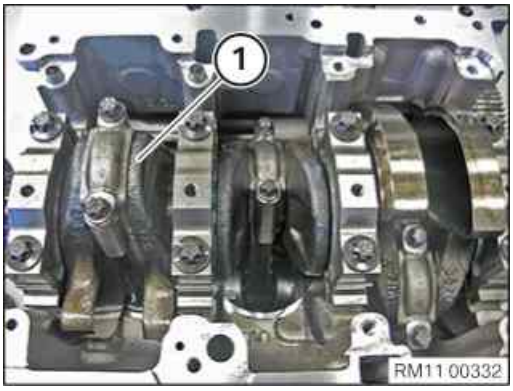


Release screws in the sequence **8 - 1**.

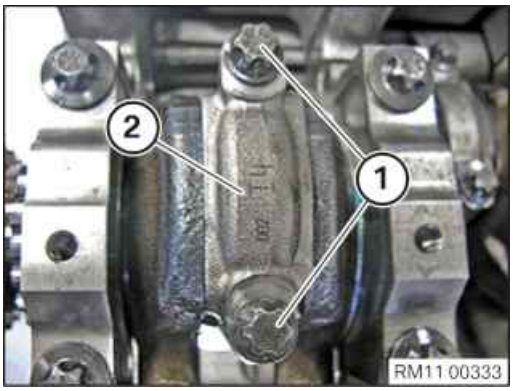
Remove reinforcement (9).



Important!

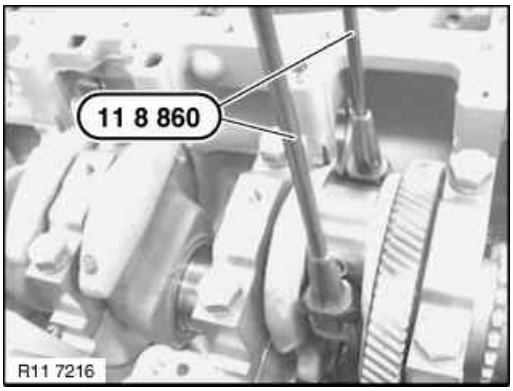
Position crankshaft vertically.

Proceed with care at the cylinder wall and oil spray nozzles **Risk of damage**!



Undo the connecting rod bolt (1).

Remove connecting rod bearing caps (2) and set down in neat order.



Screw special tool 11 8 860 in at large connecting rod eye.

Remove piston and connecting rod.

Installation note:
Pay attention to the protective edge for the cylinder wall.

Figure N47D20.

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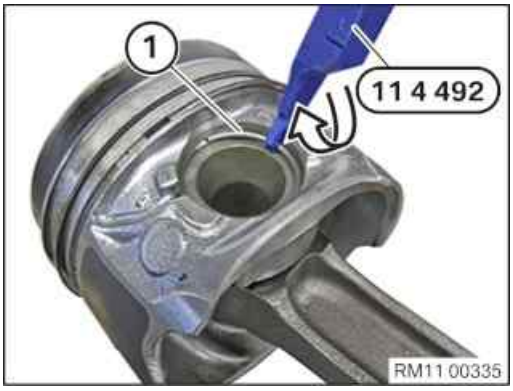
Position piston (1) with connecting rod on special tool 2 288 944 .

Warning!

Safety goggles must be worn for the next operation.



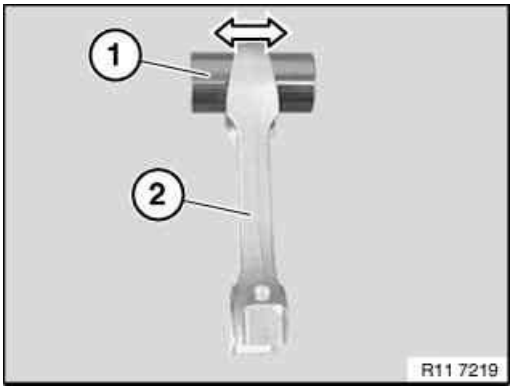
Warning!

Safety goggles must be worn.

Lever out piston circlip (1) with special tool 11 4 492 in direction of arrow.**Important!**

Piston and gudgeon pin are matched to each other.

They must not be mixed up.



Note:
It must be possible to press gudgeon pin (1) through the bush (small connecting rod eye) with little force; it must not reveal any noticeable play.

Remove gudgeon pin (1) from connecting rod (2).

Installation:

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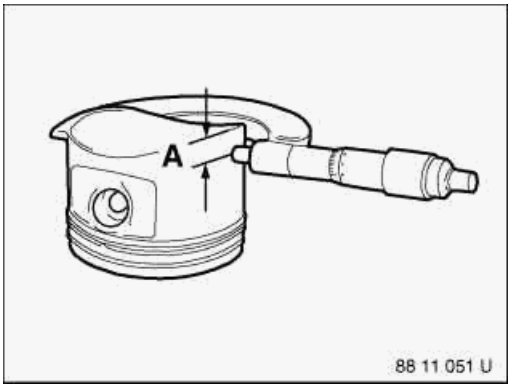
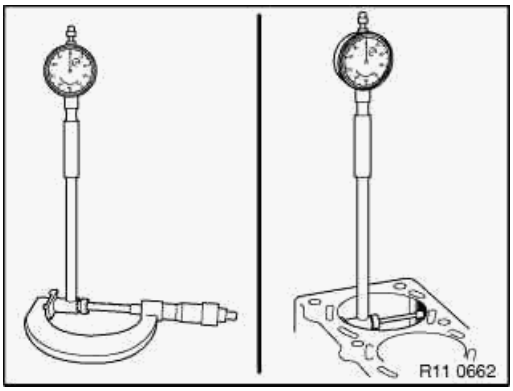


Before installation, measure piston installation clearance. Measure piston diameter with micrometre at measuring point A from lower edge of piston and offset at 90° to the axis of the gudgeon pin.

Distance A,

Refer to Technical Data.



Adjust micrometre to cylinder bore of engine block. Set internal measuring device on micrometer to zero. Measure bottom, centre and top of cylinder bore in direction of travel and direction of rotation.

Diameter of the cylinder bore,

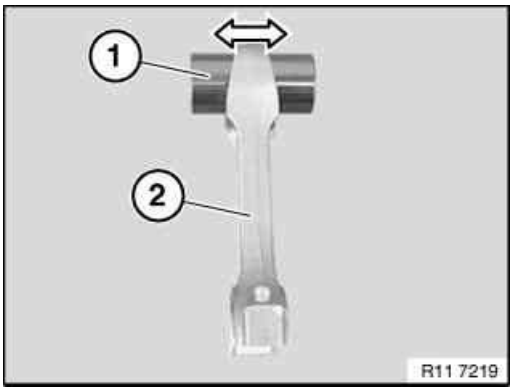
Technical Data.

Piston installation clearance,

Technical Data.

Permitted total wear clearance,

Technical Data.



Clean and oil connecting rod bearing.

If necessary, replace connecting rod bearing.

Installation note:
It must be possible to press gudgeon pin (1) through the bush (small connecting rod eye) and must not display any significant play.

Install gudgeon pin (1).

Warning!
Safety goggles must be worn for the next operation.

Pre-tension gudgeon pin circlip (1) in special tool 2 288 944 .

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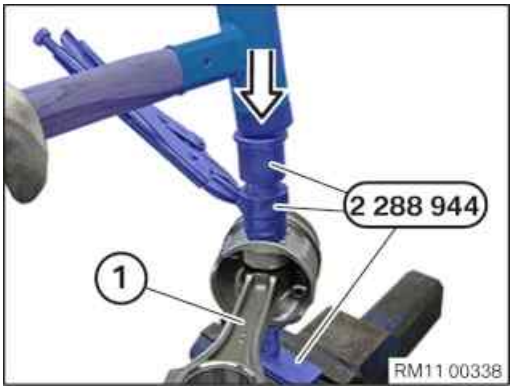
Note:
Make sure the tool is positioned correctly.



Important!

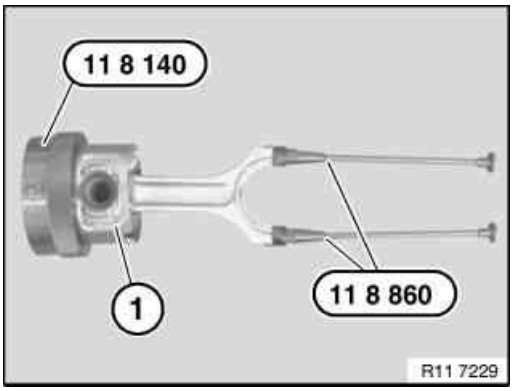
Piston and gudgeon pin are matched to each other.

They must not be mixed up.

Install circlip so that opening is opposite recess.

Insert connecting rod (1) with gudgeon pin into piston.

Drive in gudgeon pin circlip in direction of arrow.



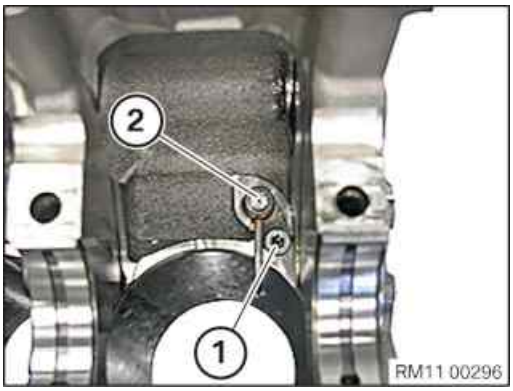
Align contact points of piston rings (offset at approx. 120°, but do not arrange over gudgeon pin boss).

Lightly coat pistons and piston rings with oil.

Prepare piston with piston rings on special tool 11 8 140 .

Screw special tool 11 8 860 on at large connecting rod eye.

Pay attention to the protective edge for the cylinder wall.



Important!

Oil spray nozzles (2) must not be maladjusted or bent.

A bent oil spray nozzle cannot be adjusted and must be replaced.

Release screw (1) and remove oil spray nozzle (2).

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Insert piston (1) with connecting rod in cylinder.

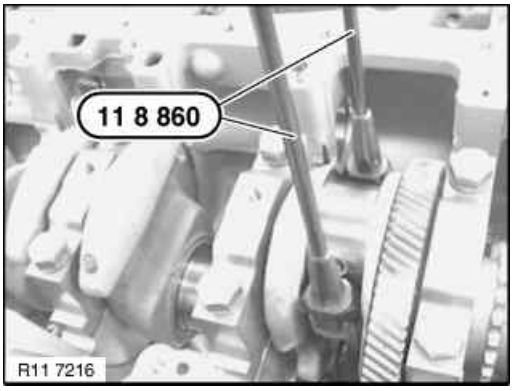
Important!

Risk of piston ring breakage.

Risk of damage to oil spray nozzle.

Only press pistons in with finger force - do **not** knock in!

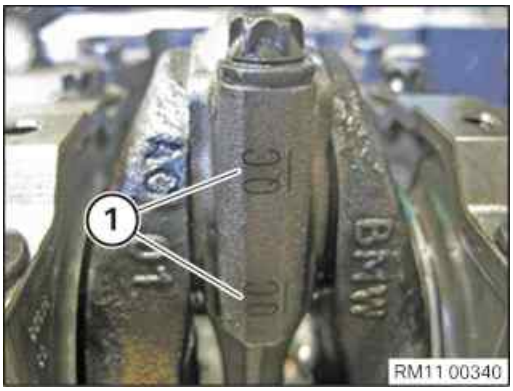
Insert piston so that the arrow points in direction of cylinder 1.



Slide connecting rod eye onto crankshaft.

Remove special tool 11 8 860 from large connecting rod eye.

Note:
Figure N47D20.

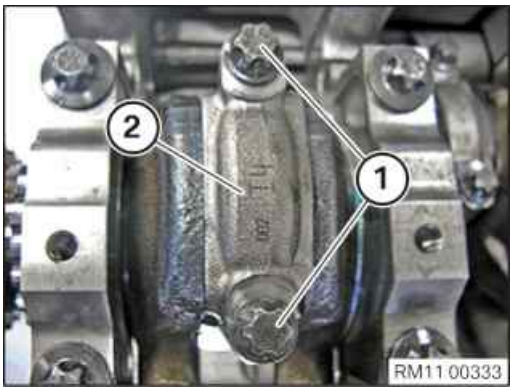


Clean and oil connecting rod bearing.

If necessary, replace connecting rod bearing.

Mount connecting rod bearing caps so that pairing letters (1) match.

Bolt piston (1) with connecting rod to crankshaft.



Parts: Replace connecting rod bolt (1).

Tighten connecting rod bolts (1).

Tightening torque: 11 24 1AZ.

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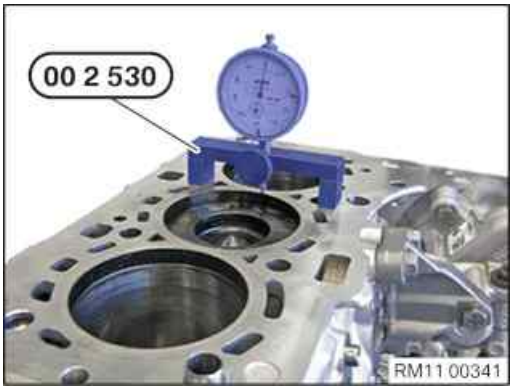
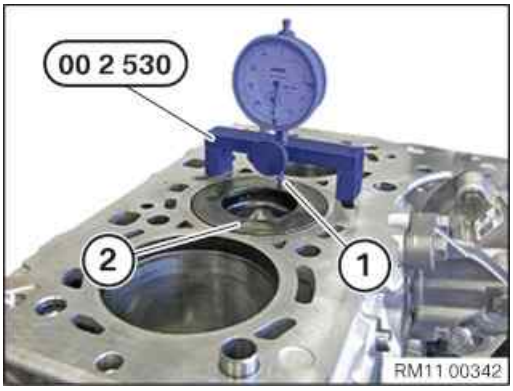


The gasket thickness must be recalculated when repair work is carried out on the crankshaft drive or pistons.

Measuring the **piston protrusion:**

Position dial gauge with measuring fixture special tool 00 2 530 on cleaned engine block sealing surface. Set dial gauge to zero under preload.



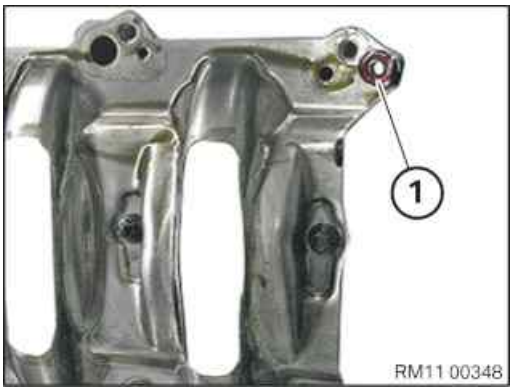
Position piston at TDC.

Clean piston at measuring points (1 and 2).

Position dial gauge at measuring point (1) on piston. Determine highest point by turning crankshaft.

Measure and note down piston protrusion at measuring points (1 and 2) on all pistons.

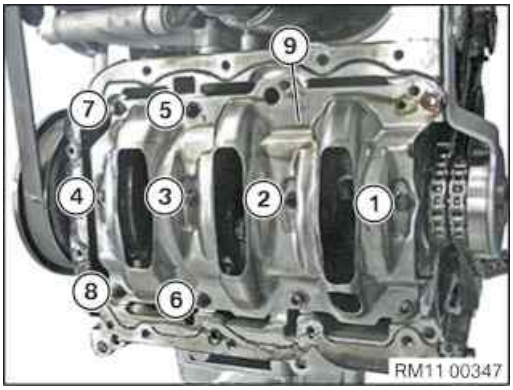
Determine thickness of cylinder head gasket.



Important!

Sealing ring (1) must not be damaged or missing.

Check centring bushes for damage, replace if necessary.



Parts:

- Replace reinforcement (9).
- Replace screws (1 - 4).

Install reinforcement (9).

Tighten screws in the sequence **1 - 4**.

Tightening torque: 11 41 3AZ.

Tighten screws in the sequence **5 - 8**.

Tightening torque: 11 41 2AZ.

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Required follow-up work:

- Install oil pump with vacuum pump.
- Install cylinder head.
- Remove engine from assembly stand.
- Fit transmission.
- Install engine.
- Check engine function and leak tightness.

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This documentation refers to special tools that were not yet available when going to press.

11 25 000 Removing and installing/replacing all pistons

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

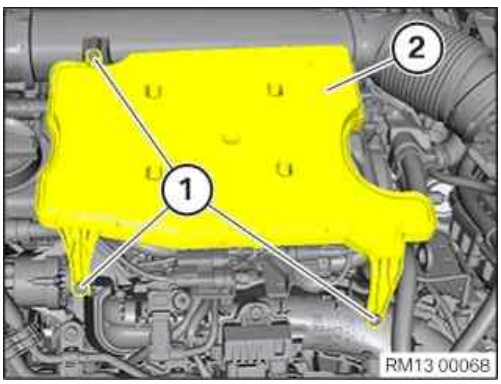
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

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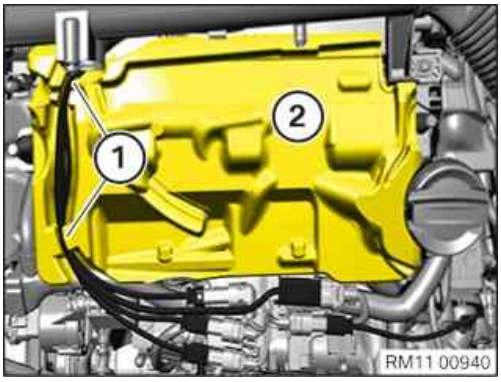
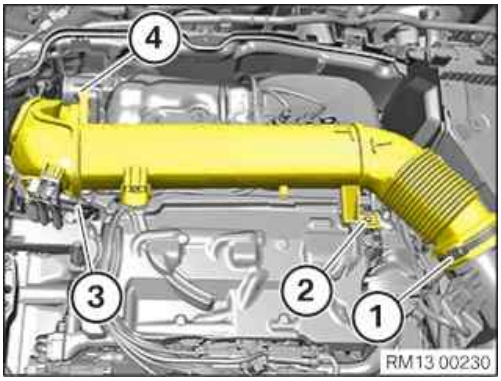
4 – Remove the acoustic cover for the injectors

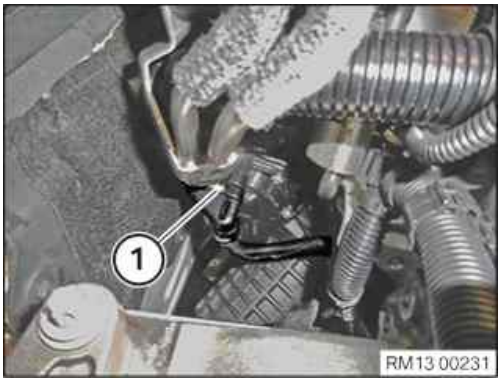


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

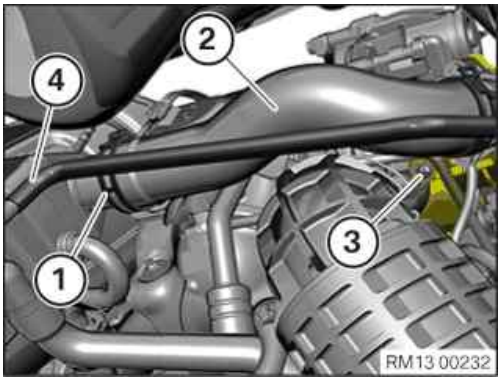
5 – Removing clean air pipe



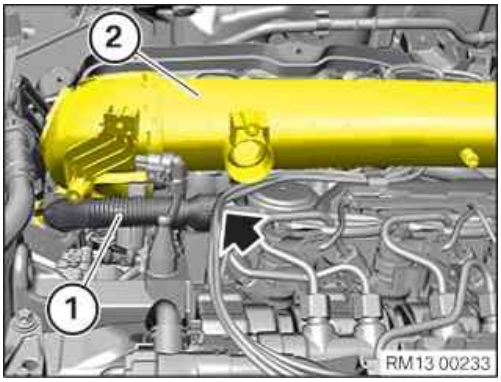
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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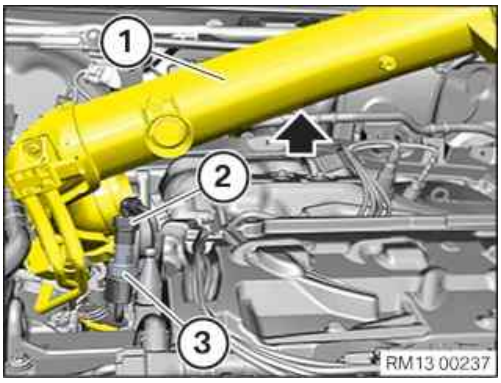


- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

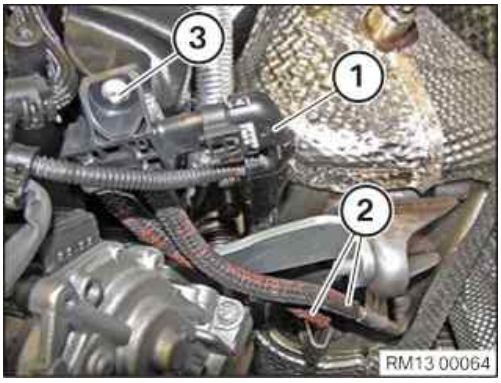
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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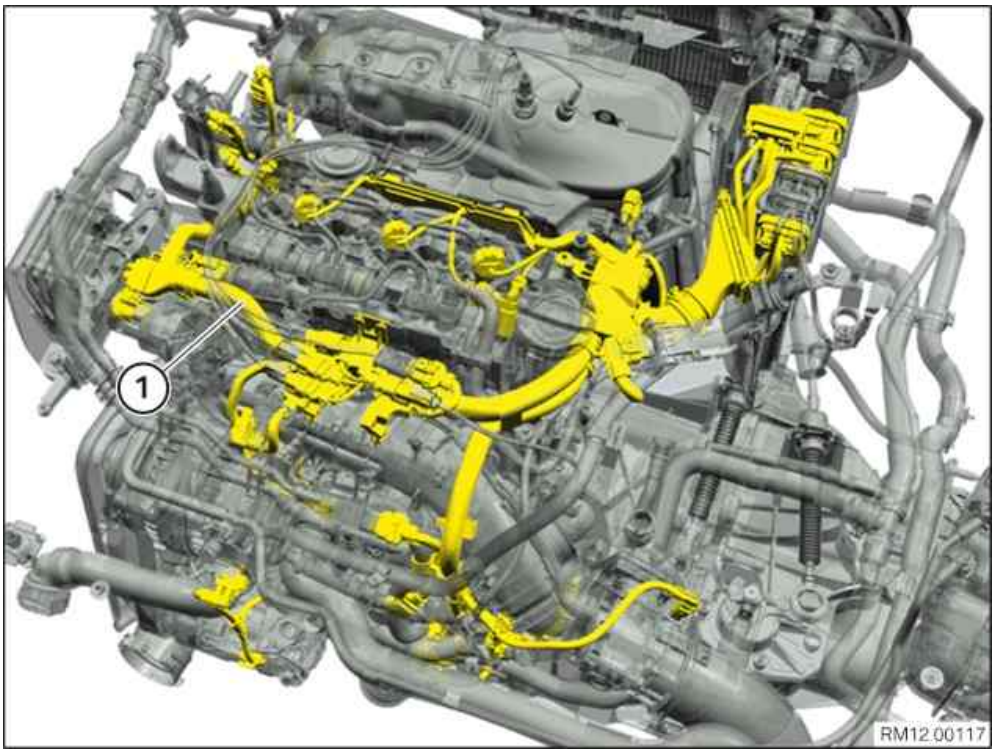
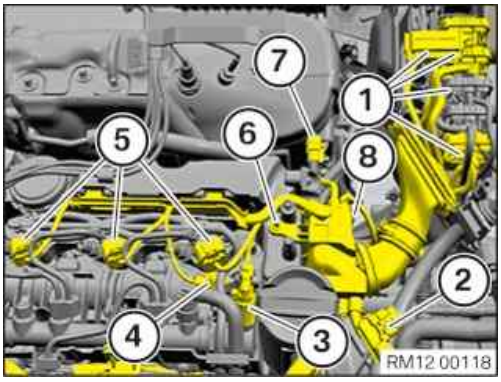
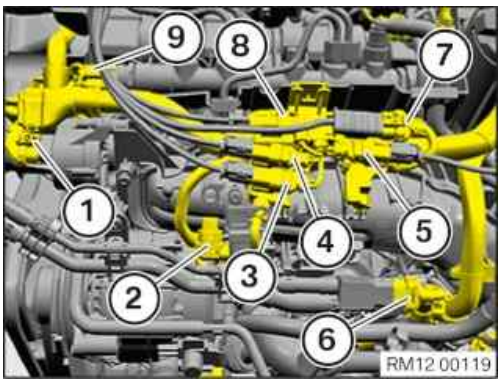
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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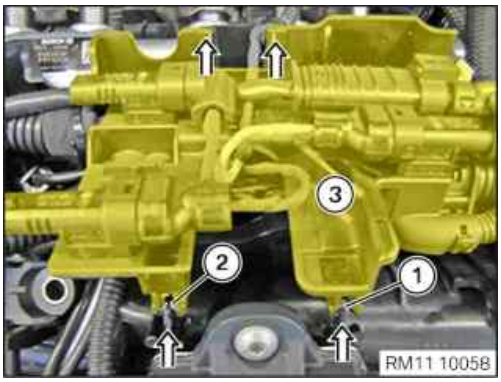
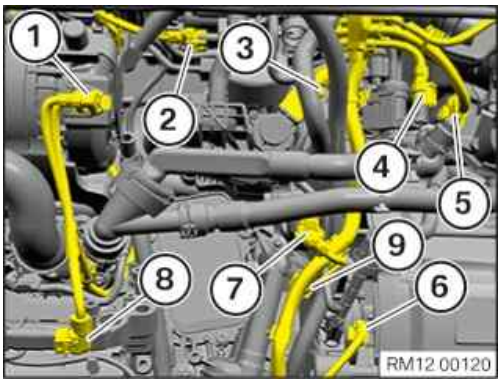
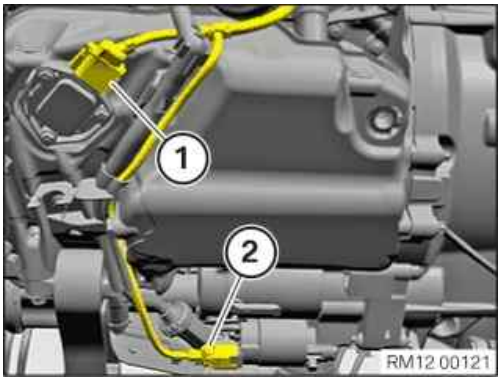


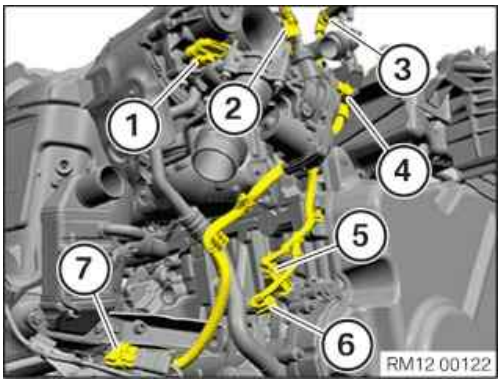
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



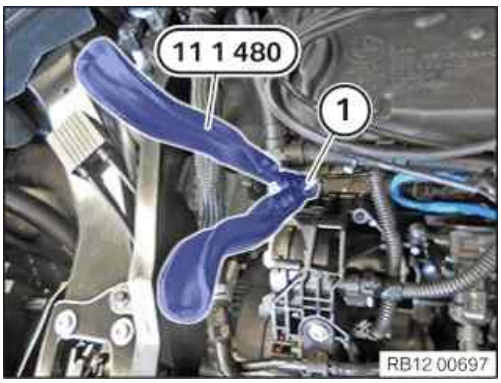
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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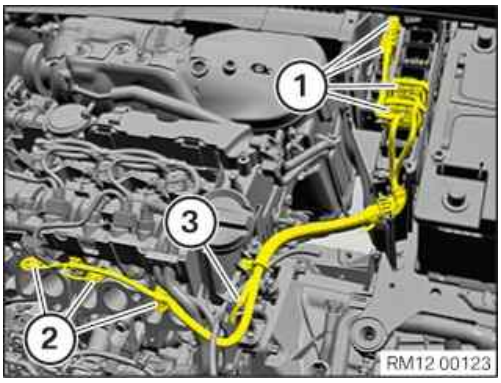


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

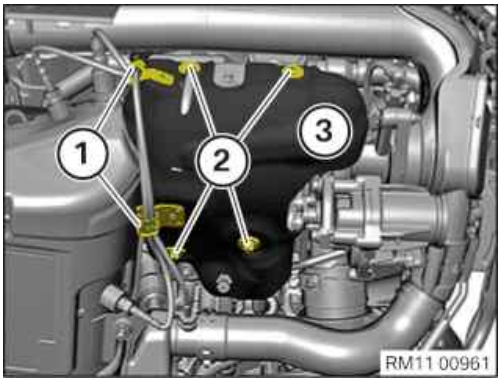
▶ Removing heat shield from top exhaust turbocharger

WARNING

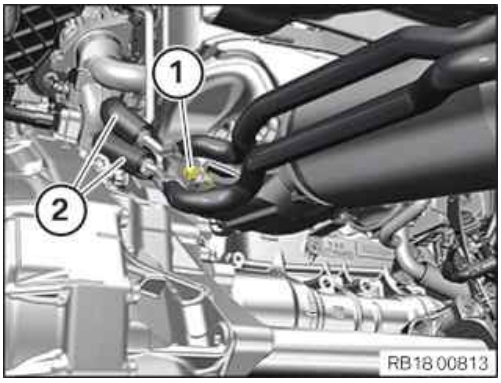
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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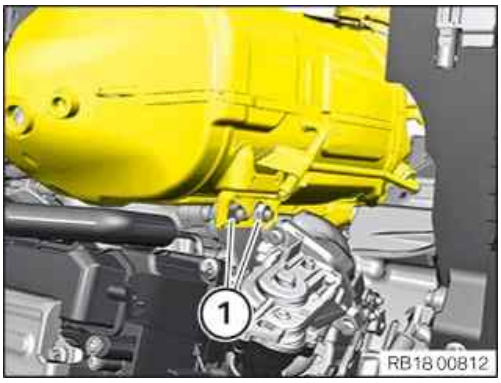
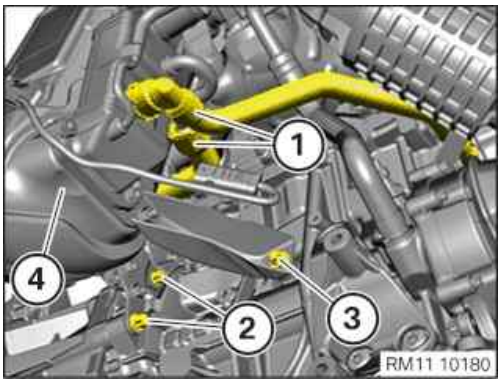


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

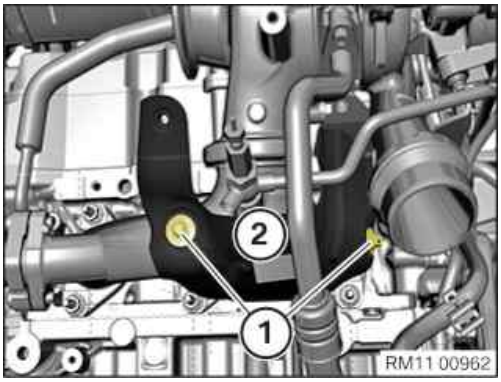
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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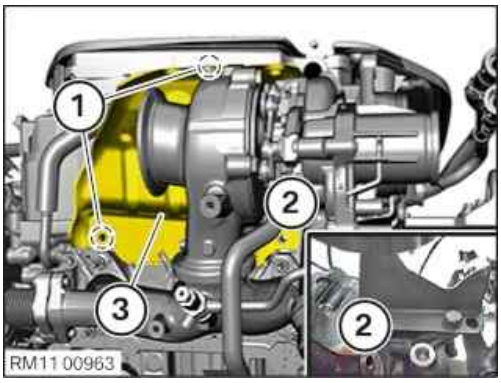


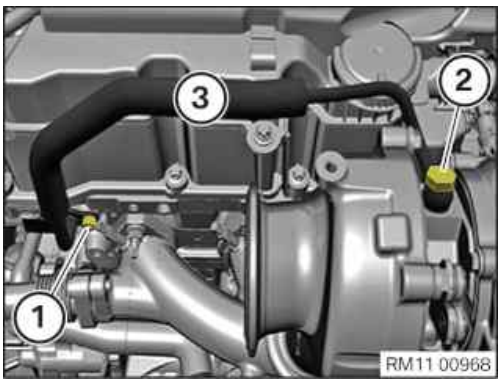
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

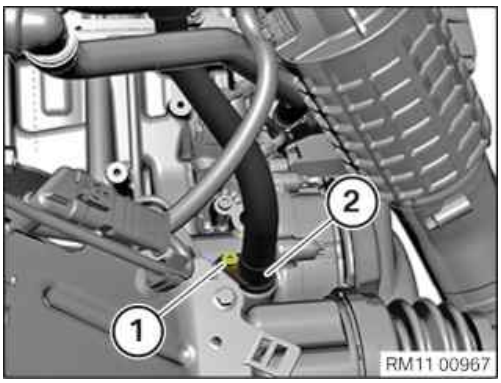
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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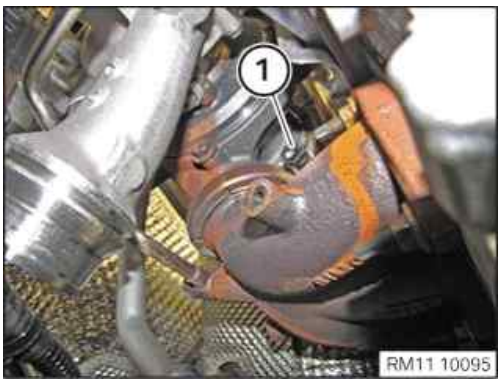
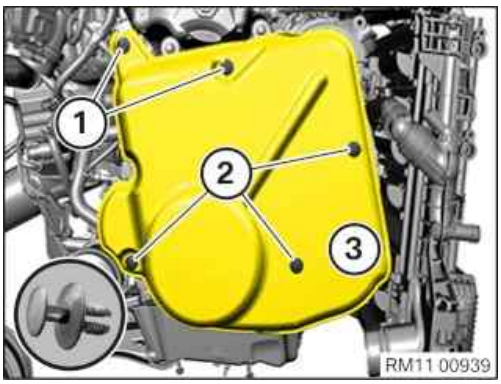
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

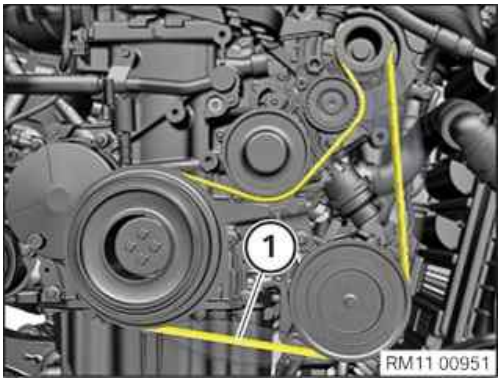
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

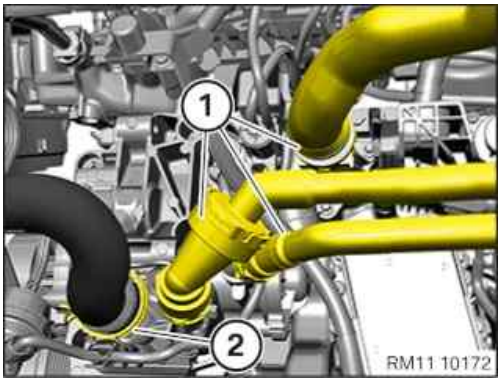
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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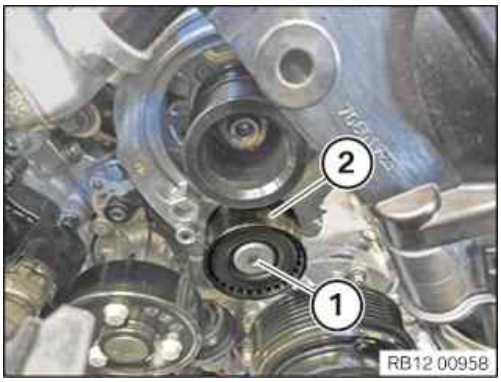
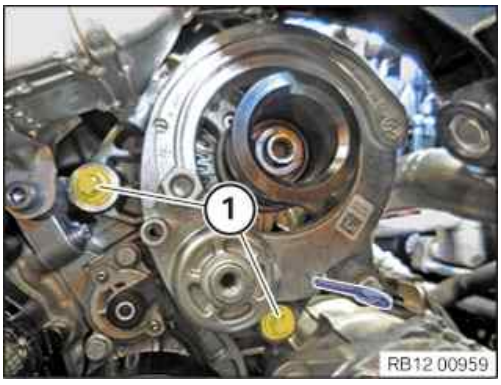
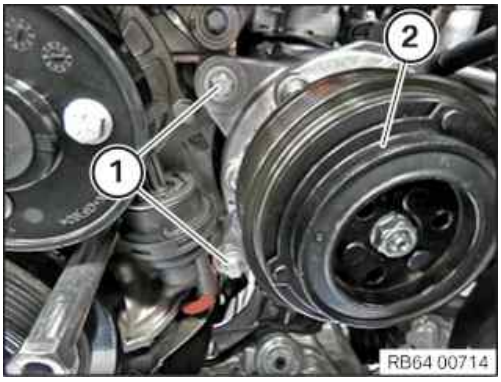


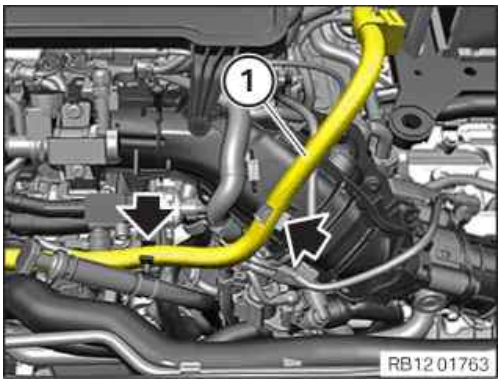
- Loosen screw (1).
- Remove the deflecting element (2).



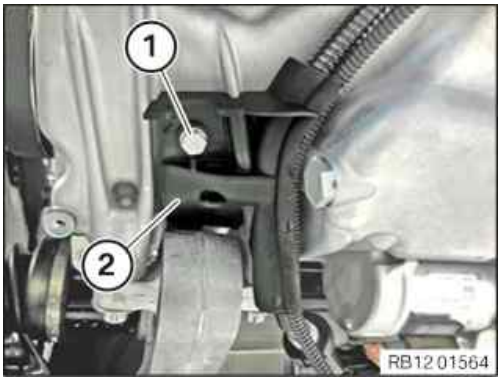
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

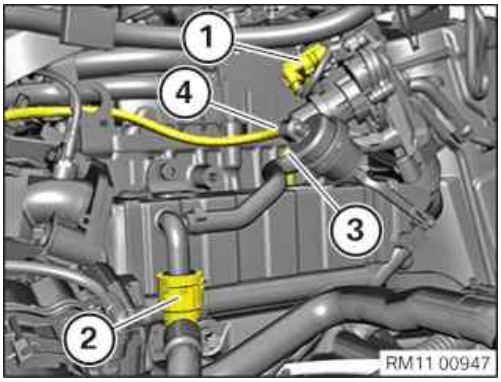
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

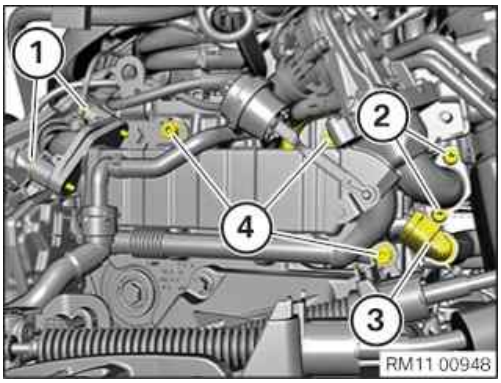
- Perform all work only on components that have cooled down.



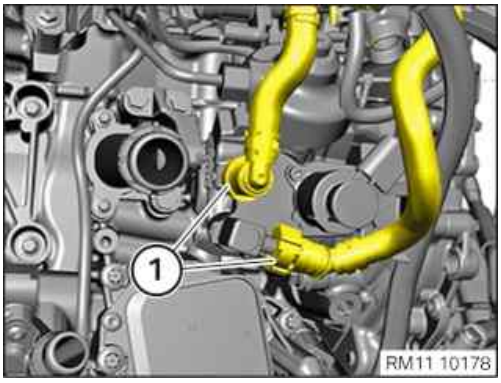
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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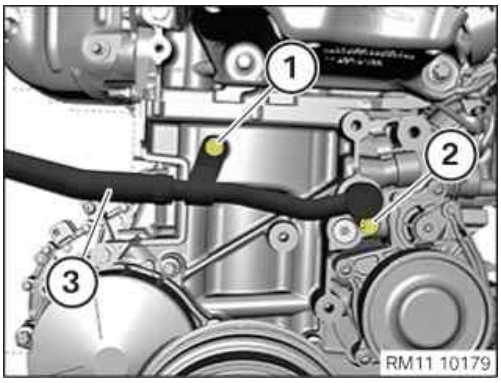


- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Detach the engine from the manual gearbox

Prerequisite

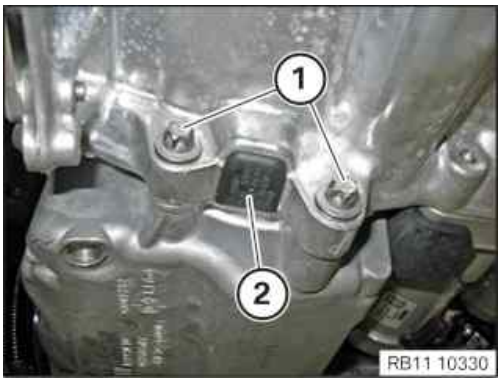
Engine has been removed.

CAUTION

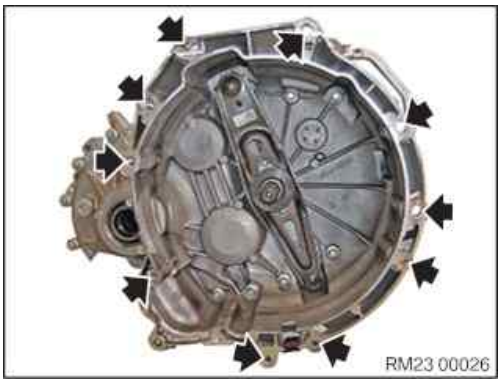
Heavy component.

Heavy components can lead to injury or damage.

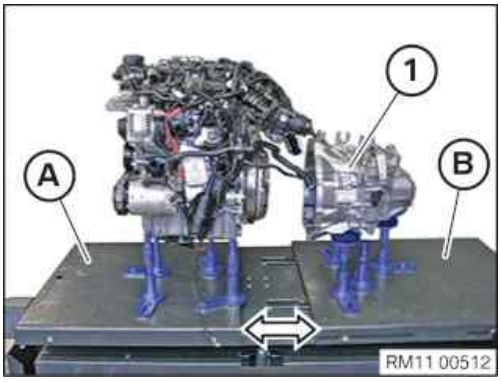
- Remove and install heavy components with the aid of another person/other persons.



- Loosen screws (1).
- Remove protective cap (2).



- Remove screws (arrows).



- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.

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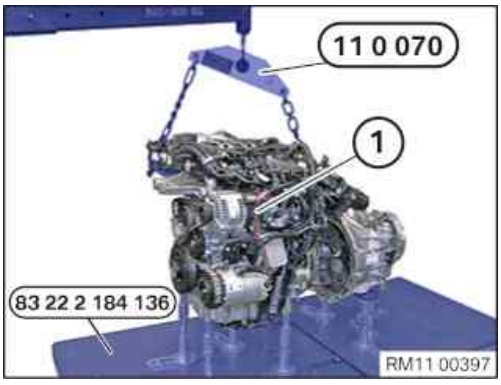
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool **0 490 579 (11 0 070)** and lift engine (1) off lifting table.

9 – Mount engine on assembly stand

CAUTION

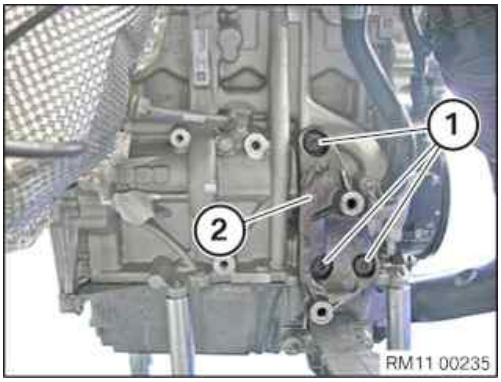
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

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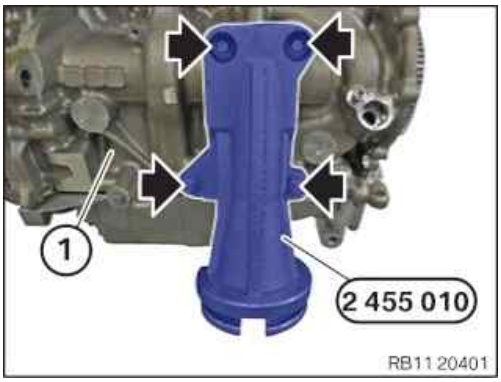
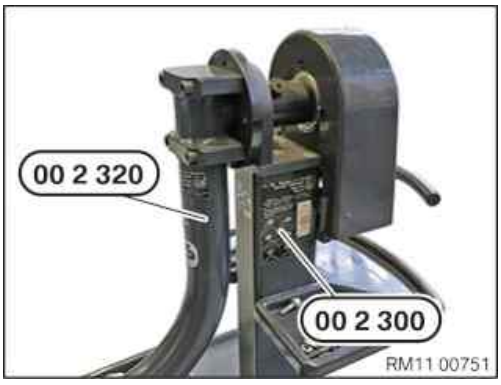


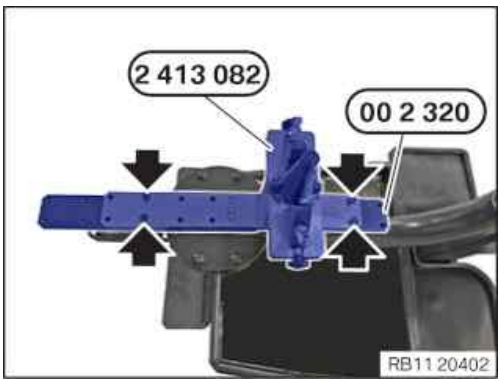
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.

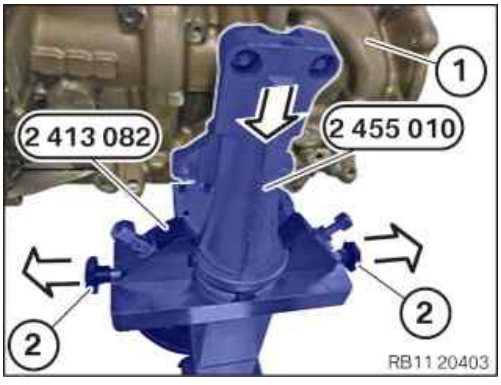


- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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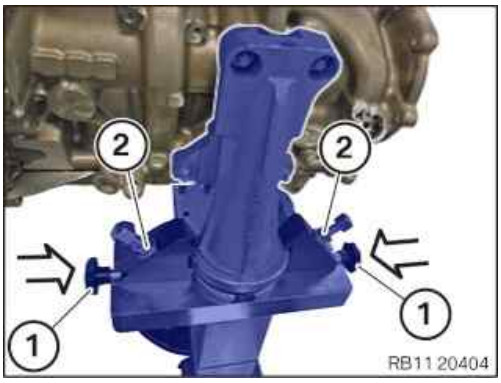


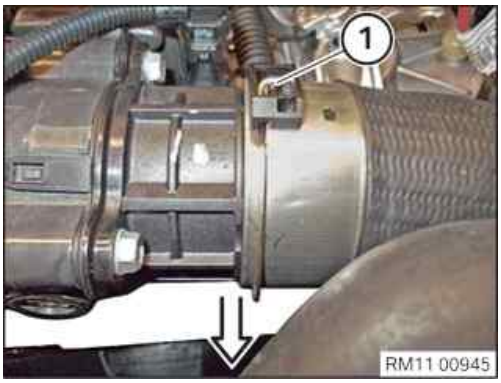
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

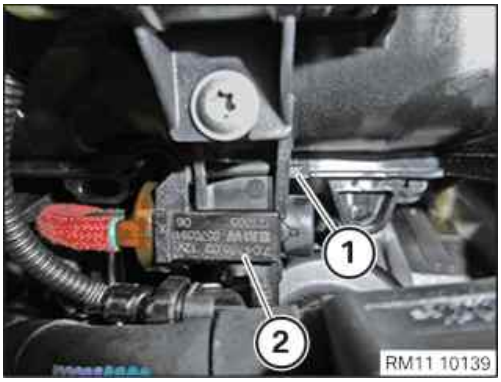
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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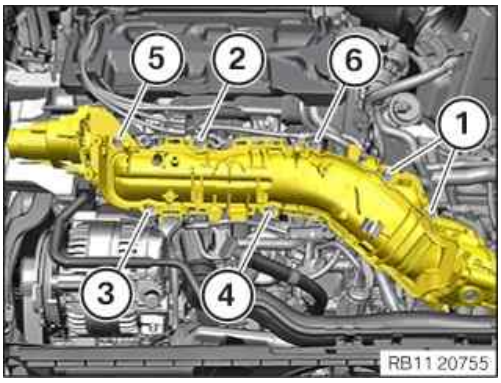
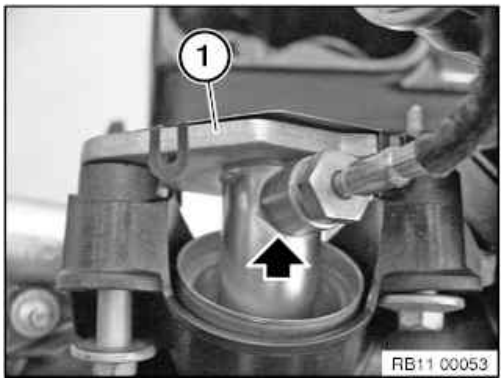


- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

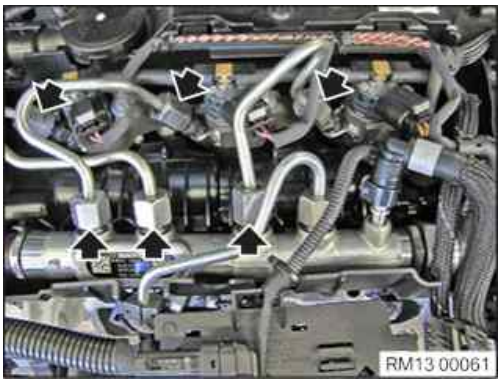
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

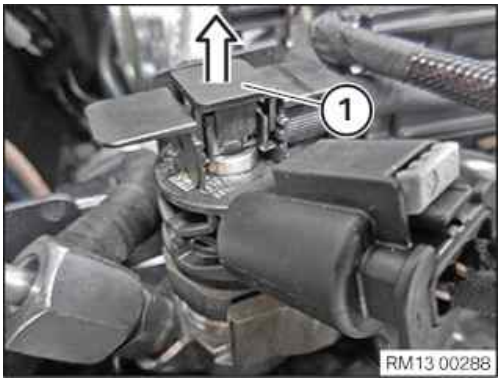
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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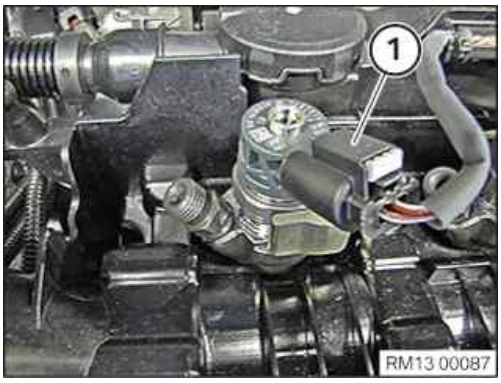
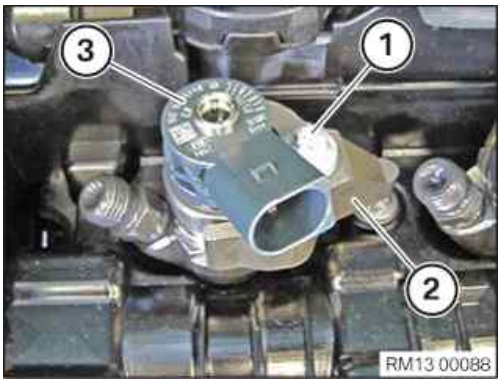


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

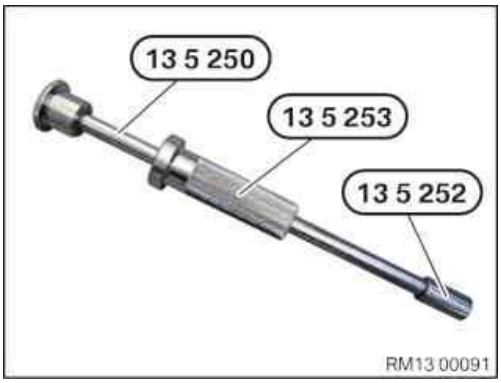
▶ **Loosen stuck injectors**

RISK OF DAMAGE

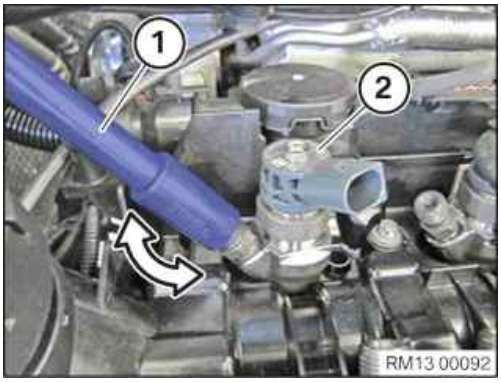
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

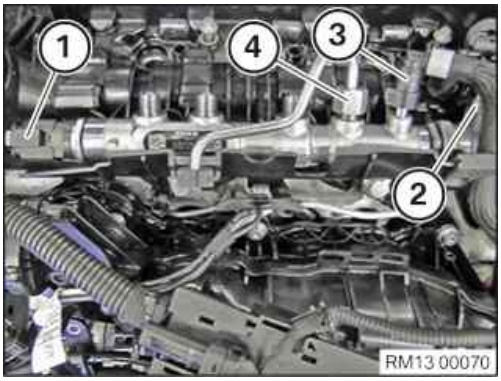
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

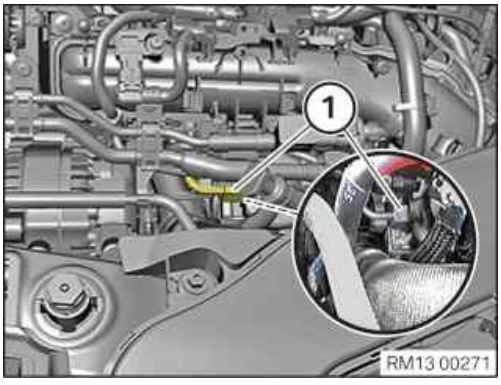
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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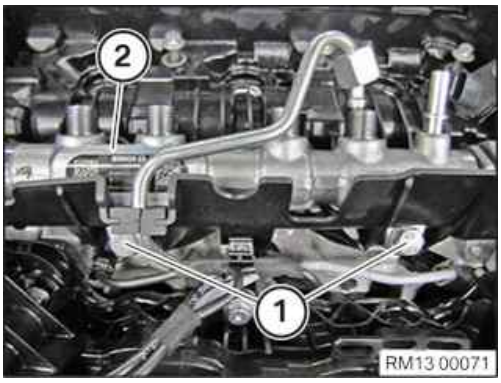
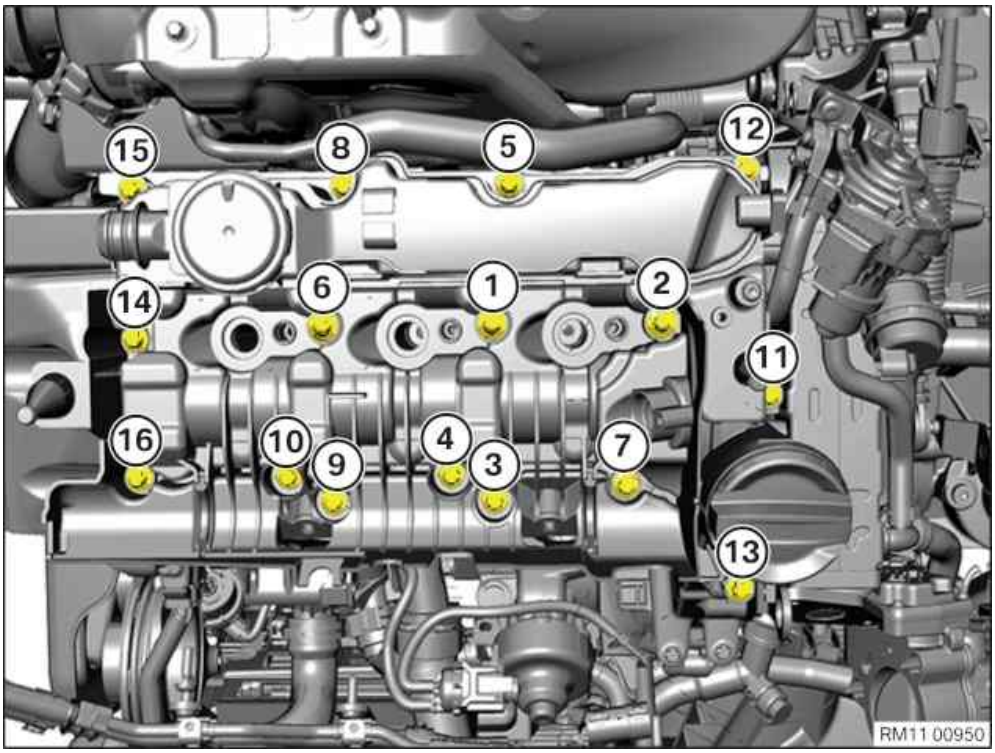


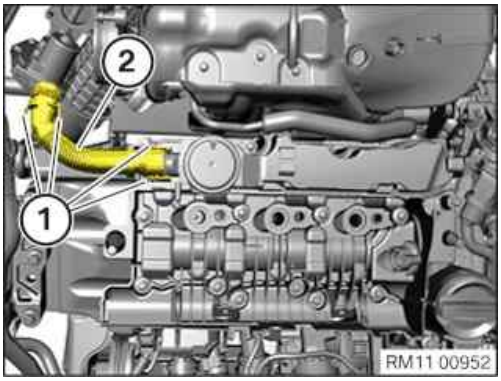
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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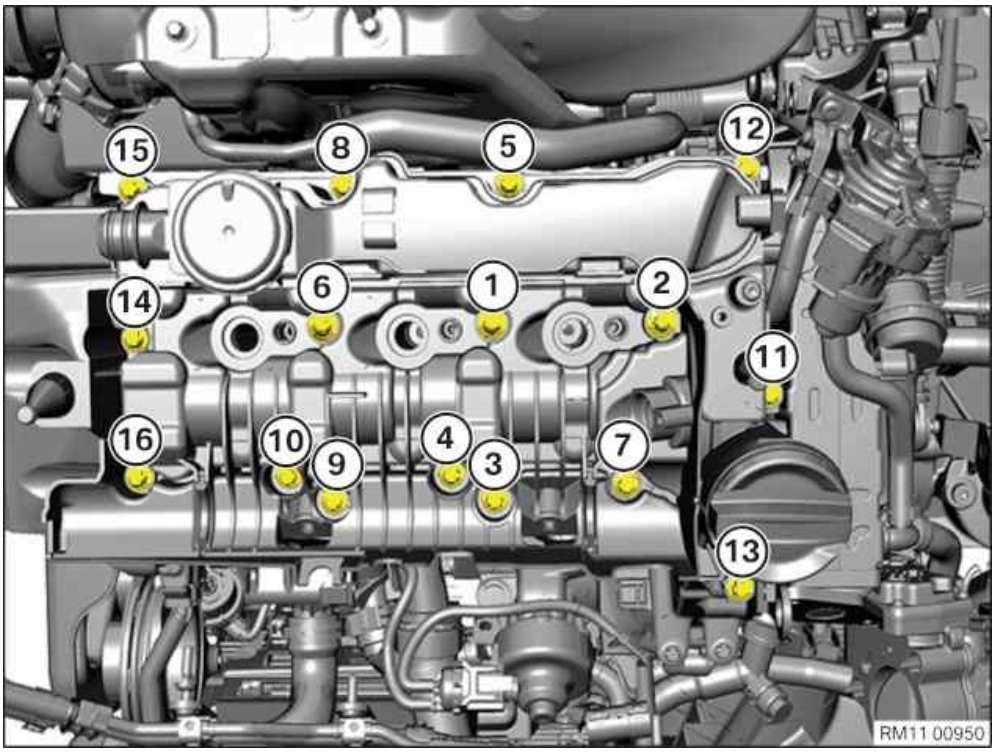

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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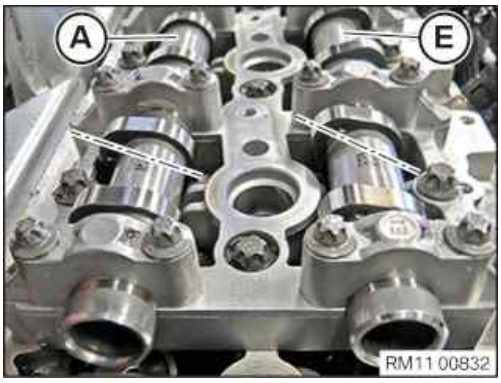
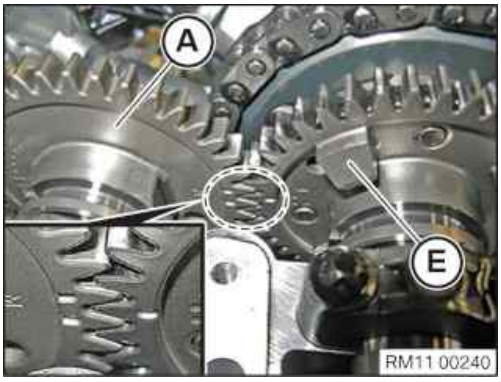


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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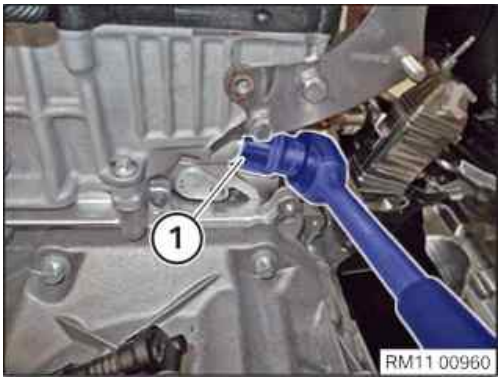
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

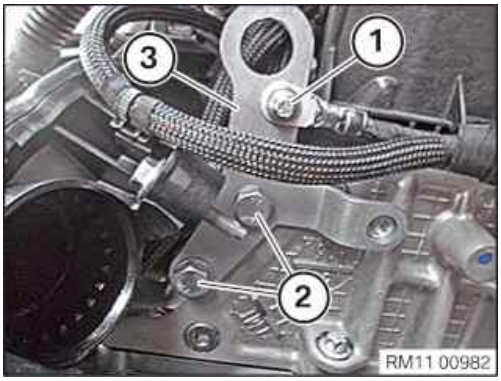


TECHNICAL INFORMATION

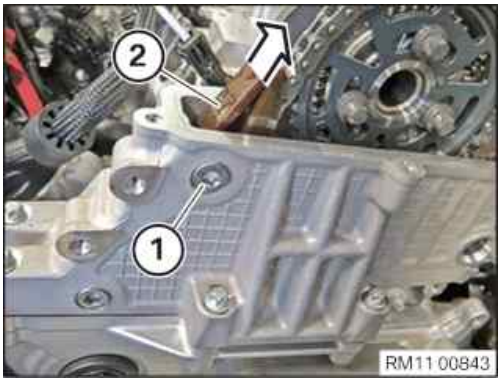
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

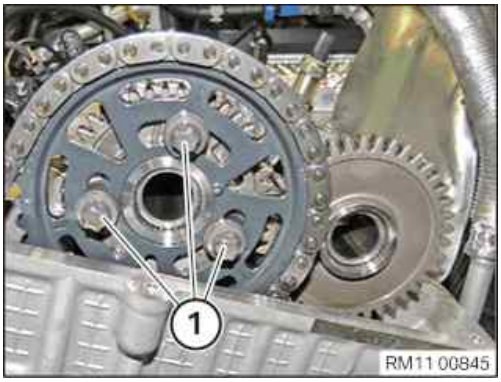


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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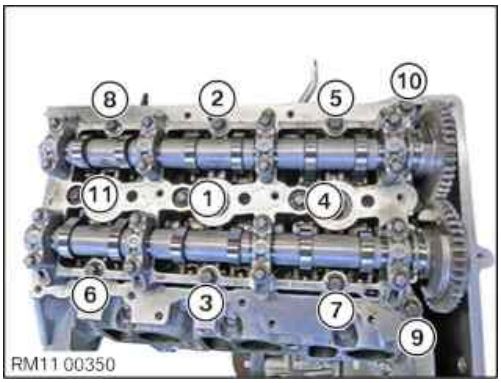
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

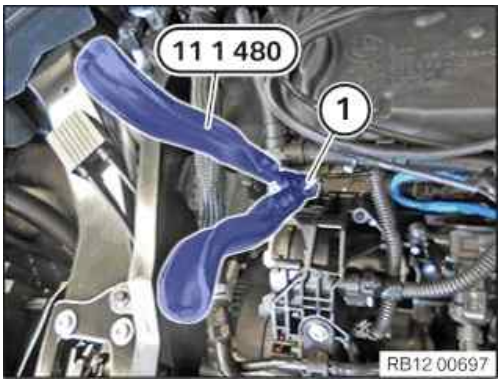
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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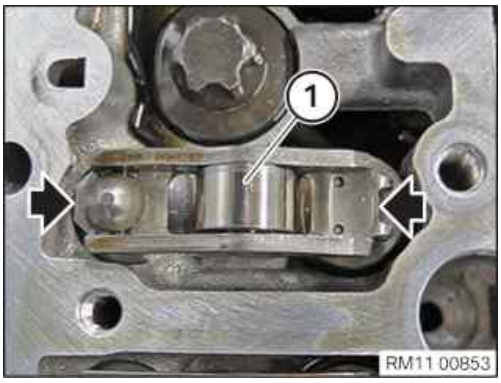


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

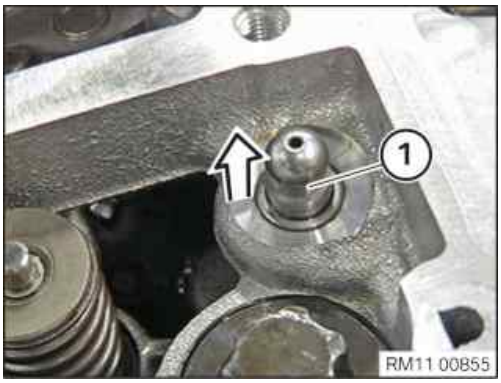
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

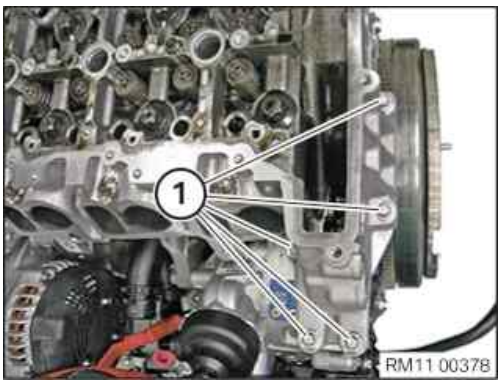
24 – Removing cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Loosen screws (1).

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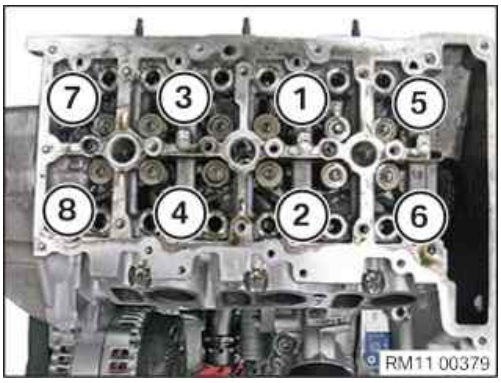
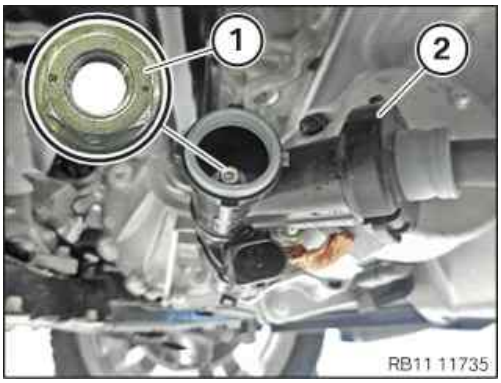


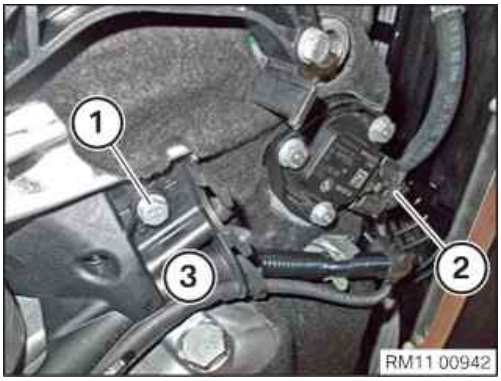
- Loosen the cylinder head bolts in the sequence from (8) to (1).
- Remove cylinder head.

25 – Removing the acoustic cover of the oil sump

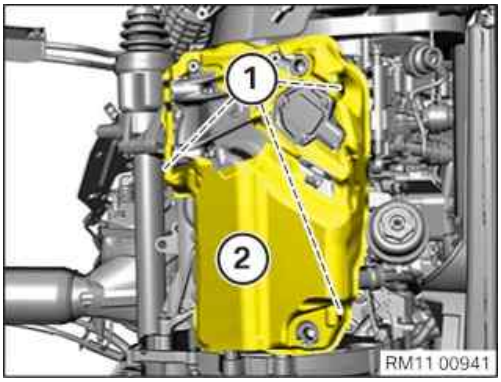
- Unlock connector (1) and pull off.
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Unscrew the screw (1) on the wiring harness to the oil sump.
- Unlock and pull off connector (2) on the oil-level sensor.
- Place wiring harness (3) to one side.



- Remove the expanding rivets (1) on both sides of the acoustic cover.
- Feed out and remove the acoustic cover (2).

26 – Remove oil sump

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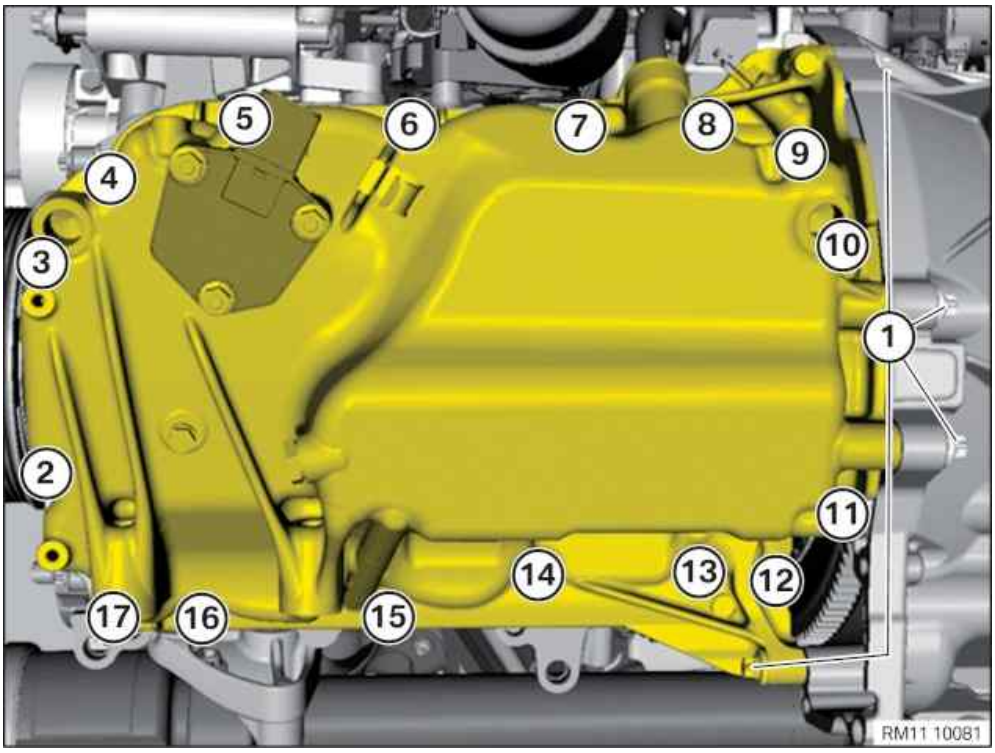
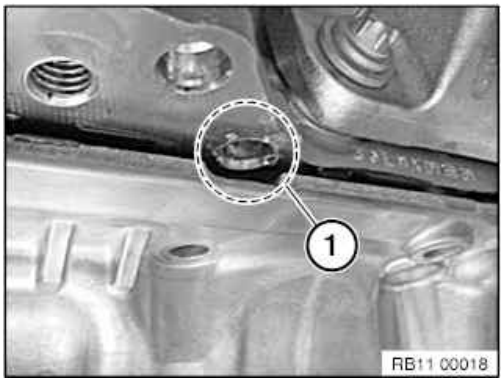
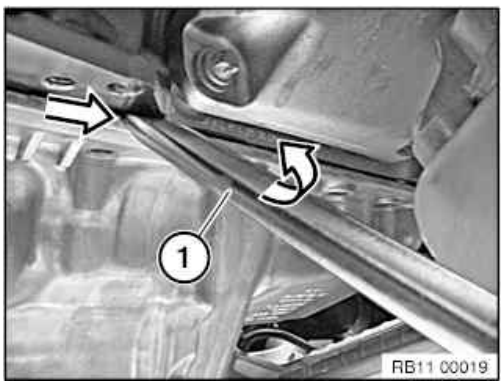
- Loosen screws (1).
- Feed out starter motor and remove.



- Release transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release the oil sump only in area (1).



- Release the oil sump carefully using a suitable mounting lever (1) at the appropriate position in the direction of the arrow.
- Secure the oil sump to prevent it from falling.

27 – Remove the oil vacuum pump

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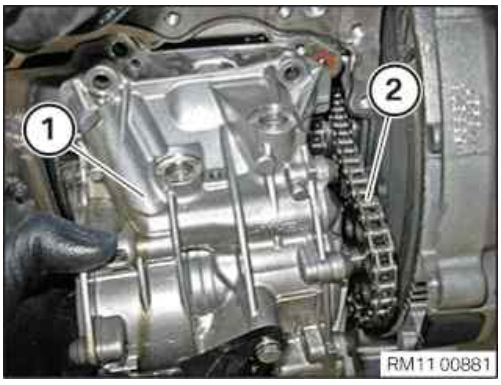
- Loosen screws (1) of the oil vacuum pump (2).



- Remove oil vacuum pump (1) and remove from the drive chain (2).

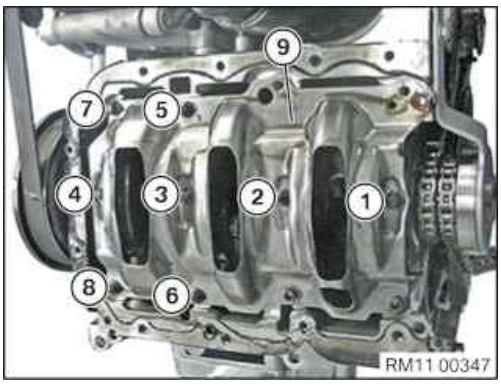
28 – Removing the oil deflector

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen screws in the order (8) to (1).
- Guide out and remove the oil deflector (9).

29 – Remove the connecting rod bearing cap

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

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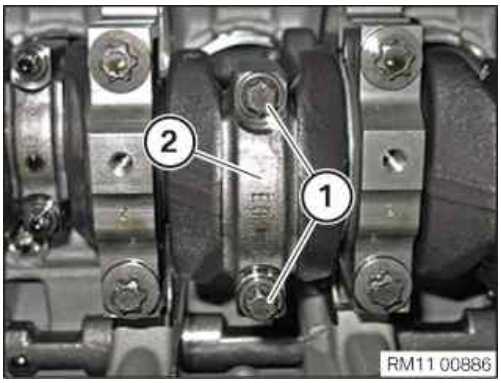
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

- Turn the crankshaft until the connecting rod bearing journal (1) reaches a vertical position.



- Unscrew the connecting rod bolts (1).

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing cap (2) and put to one side in the correct order.

MAIN WORK

30 – Removing the piston with connecting rod

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Screw special tool **0 496 144 (11 8 860)** in at large connecting rod eye.

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RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Remove the piston (1) and connecting rod.

31 – Remove the connecting rod bearing shells

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod (1) and store it properly.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod bearing cap (1) and store it properly.

32 – Measure side clearance of piston rings

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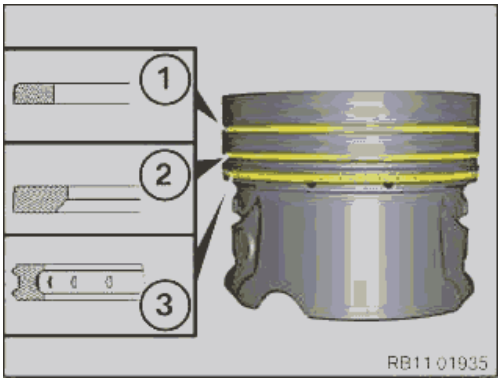
RISK OF DAMAGE

Damage to the piston rings.

Piston rings can bend or break due to large applications of force.

- Handle piston rings carefully.
- Only bend piston ring up lightly.

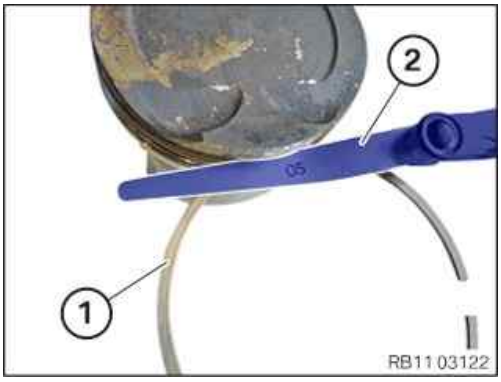


TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

- Mounting orientation of the piston rings

Position number	Description
1	1. Piston ring (plain rectangular compression ring)
2	2. Piston ring (taper faced piston ring)
3	3. Piston ring (oil scraper ring with spiral expander)



Check

- Install all piston rings (1) consecutively as shown in the piston ring groove. Measure the side clearance with a feeler gauge (2).

desired state

- The side clearance of the piston rings is within the tolerance.

Side clearance of piston rings

Clean all components before measuring the side clearance.	
Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

Result

» The side clearance of the piston rings is outside of the tolerance.

Measure

- Renew the piston ring.

33 – Measure the piston diameter

Check

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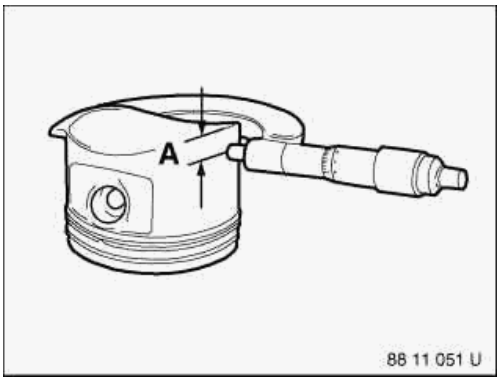


- Position the measuring bolt in the area (A) and measure the piston installation clearance 90 ° transversely to the gudgeon pin.

Piston diameter

Measure the piston diameter at distance (A) from the lower end of the piston skirt.	
Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Result

» The piston does not correspond to the specifications.

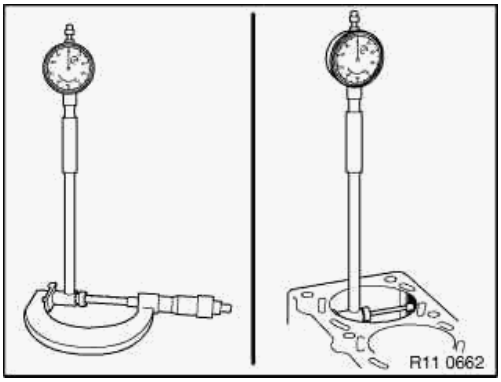
Measure

- Renew the piston.

34 – Measure the cylinder bores

Prerequisite

Cylinder barrel is cleaned.



Check

- Adjusting measuring screw to nominal dimension of cylinder bore.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

- Insert internal measuring device into measuring screw and set to zero.
- With the internal measuring device, measure the cylinder at the following points. Check the deviations from the nominal dimension.
  - Lower third of the cylinder bore in direction of travel,
  - Lower third of the cylinder bore transversely to direction of travel,
  - Middle third of the cylinder bore in direction of travel,
  - Middle third of the cylinder bore transversely to direction of travel,
  - Upper third of the cylinder bore in direction of travel,
  - Upper third of the cylinder bore transversely to direction of travel.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Result

» Cylinder does not correspond to the specifications.

Measure

- Replace motor.

  Parts: Engine

35 – If necessary: Renew the piston

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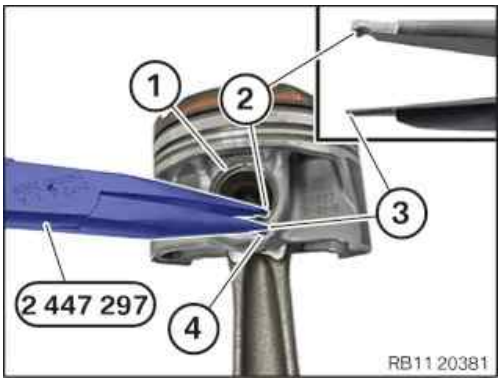


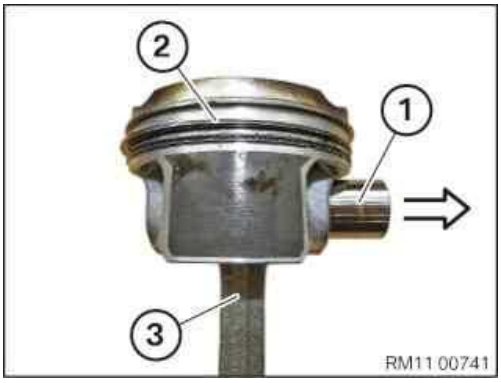
CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

- Use special tool to remove the gudgeon pin circlip.
- Insert the flat side (3) of special tool into the groove (4).
- Grab and remove the gudgeon pin circlip (1) with the arched side (2).



TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Remove the gudgeon pin (1) in the direction of arrow.
- Remove piston (2) from connecting rod (3).

- Renew piston with gudgeon pin.

  Parts: Pistons

TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Position piston (2) on the connecting rod (3).
- Install the gudgeon pin (1) in the direction of arrow.
- You must be able to install the gudgeon pin (1) without major effort.
- Gudgeon pin (1) must be free of play in piston and connecting rod.

- Prepare special tool on the fitting aid .

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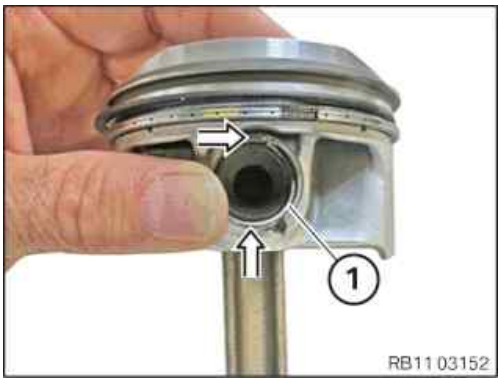
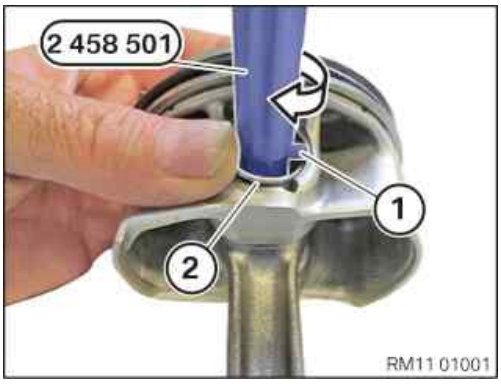
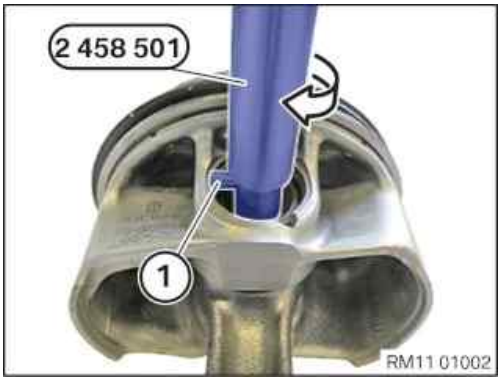


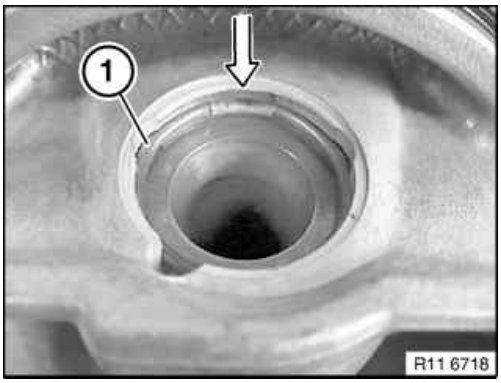
- Insert the gudgeon pin circlip (1) into the groove on the piston (see arrows).



- Screw in the positioned gudgeon pin circlip (2)with and with the guide pin (1) in the direction of the arrow.



- Screw the gudgeon pin circlip with guide pin (1) into the groove of the piston in the direction of the arrow.



- Gudgeon pin circlip (1) must be fitted correctly in the groove (arrow).

36 – Install the connecting rod bearing shell

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

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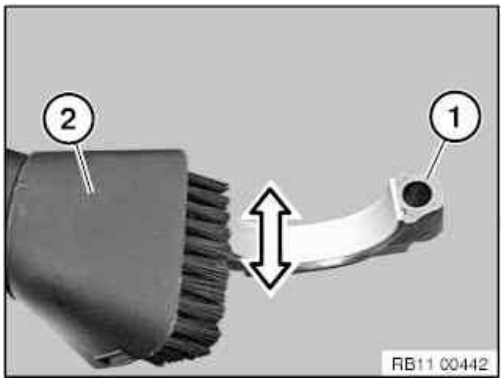
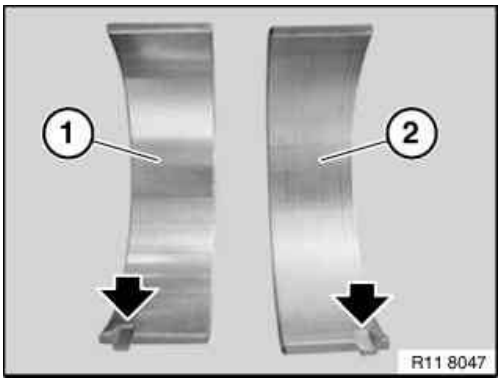
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

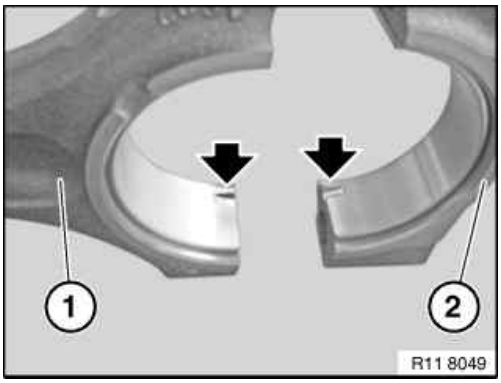


- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



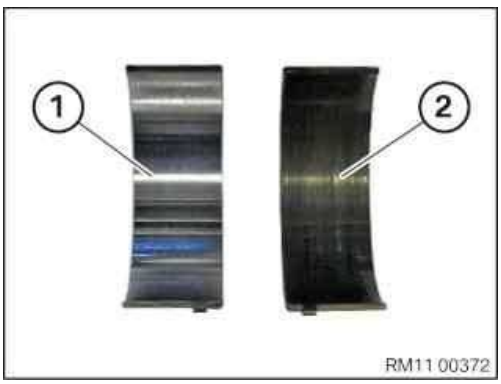
- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing (1) for the connecting rod bearing cap and the connecting rod bearing (2) for the connecting rod are each equipped with protection against incorrect assembly as shown in the marked area.



- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing cap (2) and the connecting rod (1) are each equipped with protection against incorrect assembly.



- Makes sure that a light connecting rod bearing shell (1) and a dark connecting rod bearing shell (2) are installed for each connecting rod.

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TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Insert the dark connecting rod bearing shell (2) into the connecting rod (1).
- Oil the connecting rod bearing shell (2).

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

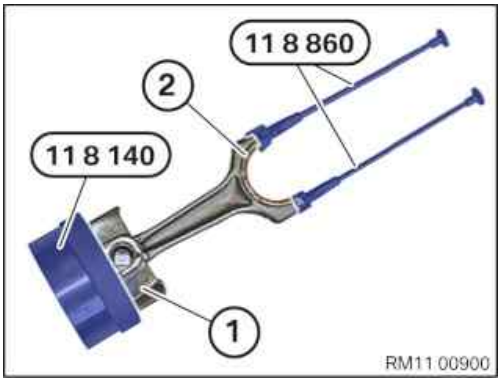
- Insert the light connecting rod bearing shell (2) into the connecting rod bearing cap (1).
- Oil the connecting rod bearing shell (2).

37 – Installing piston with connecting rod

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Coat the pistons (1) and piston rings lightly with oil.
- Mount the special tool **0 493 582 (11 8 140)** on the piston (1).
- Screw the special tool **0 496 144 (11 8 860)** in on the large connecting rod eye (2).

- Insert the piston with the special tool **0 493 582 (11 8 140)** with the arrow pointing to cylinder 1.

RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Install the piston in the crankcase.

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- Remove special tool **0 496 144 (11 8 860)** from large connecting rod eye.

POSTPROCESSES

38 – Install the connecting rod bearing cap

RISK OF DAMAGE

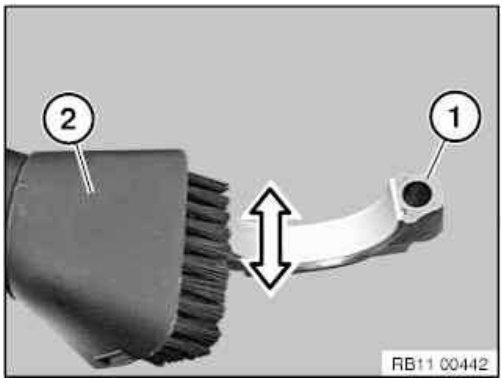
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

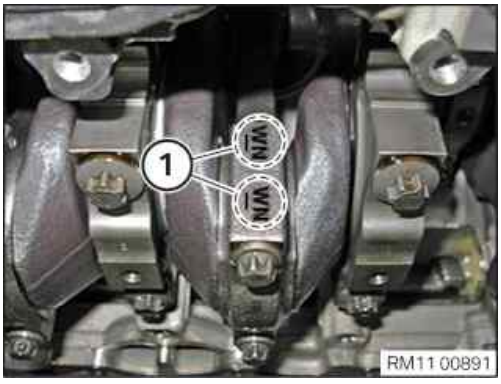
- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



- Attach the connecting rod bearing caps to the connecting rod until the designations (1) match.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Make sure that the connecting rod bearing is attached to the same connecting rod that it was detached from.

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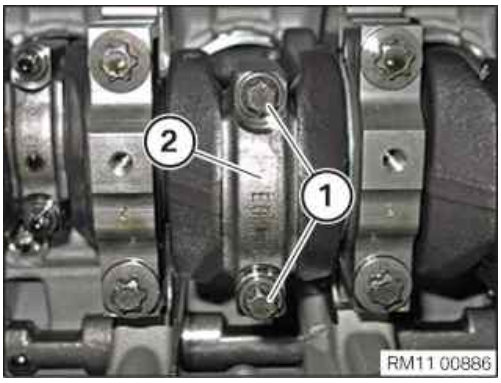
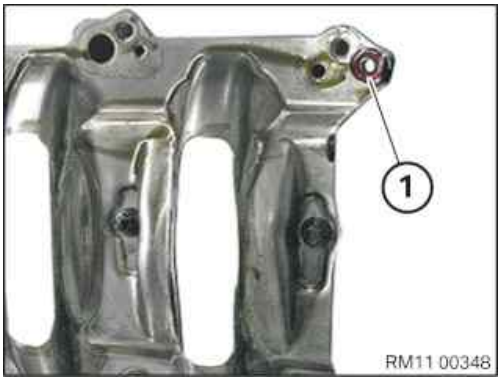


- Position the connecting rod bearing cap (2).
- Tighten the bolts (1) with the special tool **0 490 504 (00 9 120)**.

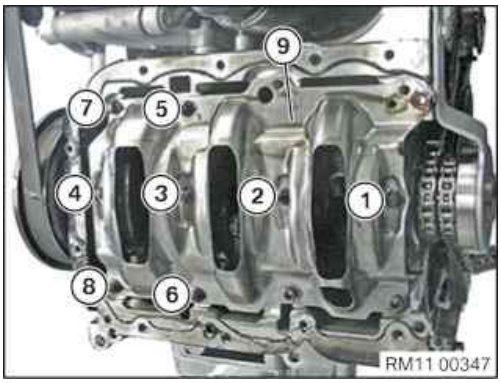
Connecting rod bearing cap to connecting rod

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

39 – Installing the oil deflector



- Check sealing ring (1) for damage and replace oil deflector if necessary.



- Insert and install the oil deflector (9).
- Renew screws (1) to (4).

  Parts: Bolts
- Hand-tighten the bolts (1) to (4).
-
- Tighten the screws (1) to (8).

Oil deflector to crankshaft bearing cap

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

- Tighten the screws (5) to (8).

Oil deflector to crankcase

M8x14		Tightening torque	19 Nm

40 – Install the oil vacuum pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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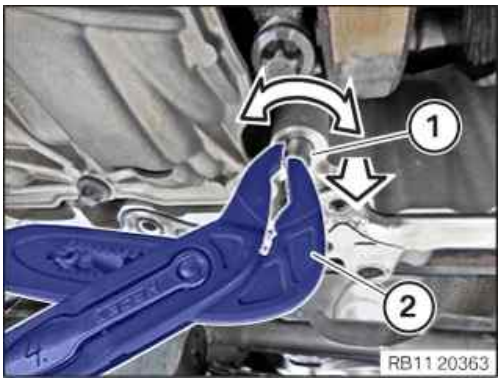
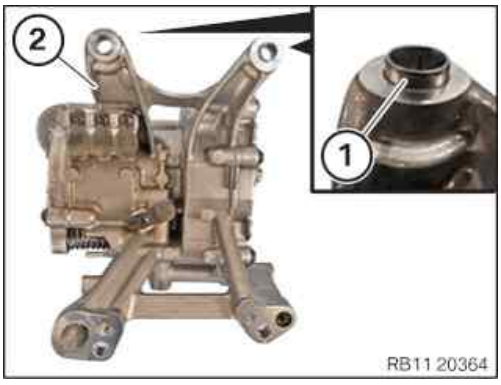
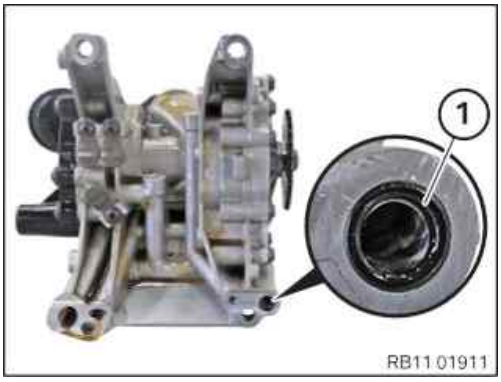


- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

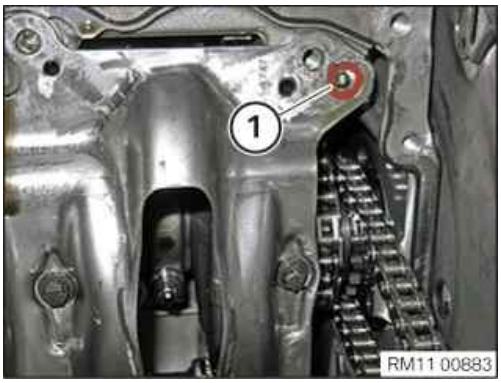
  Parts: Centring sleeves



- Install centering sleeves (1) in the oil vacuum pump (2).

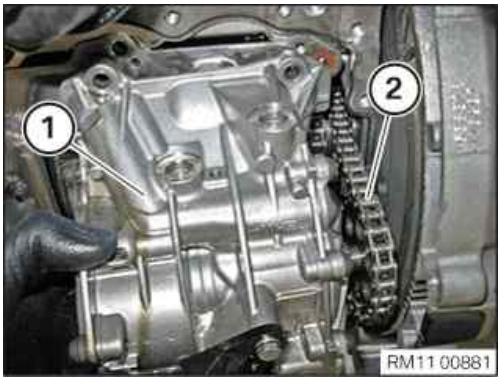


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).

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- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1) of the oil vacuum pump (2).

Oil vacuum pump to crankcaseB37

M8x35	*Renew screws.*	Tightening torque	15 Nm
		Angle of rotation	45 °

41 – Refitting sump

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

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TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

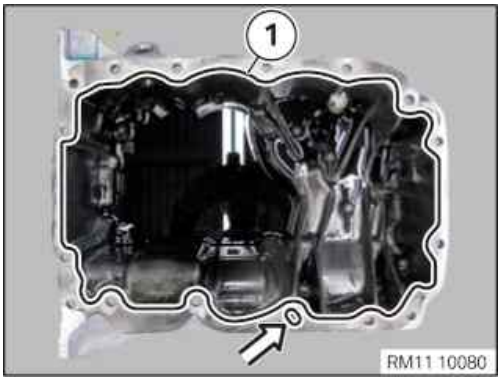
- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)



TECHNICAL INFORMATION

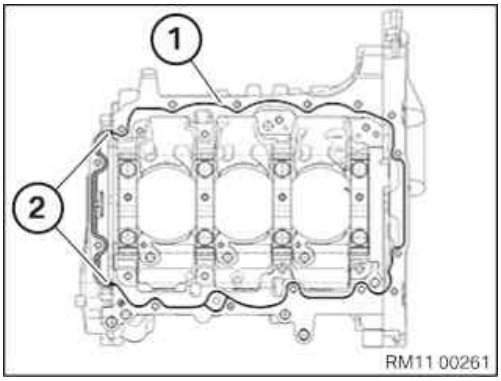
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.

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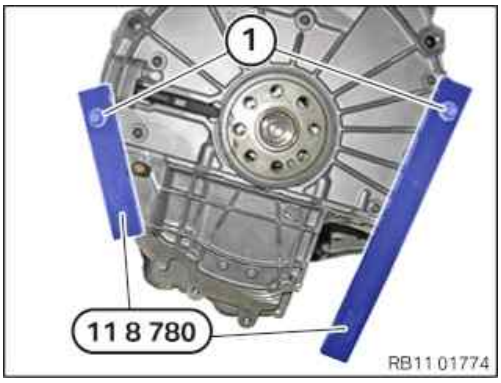
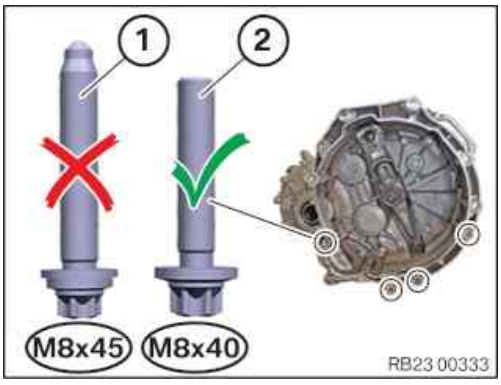


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

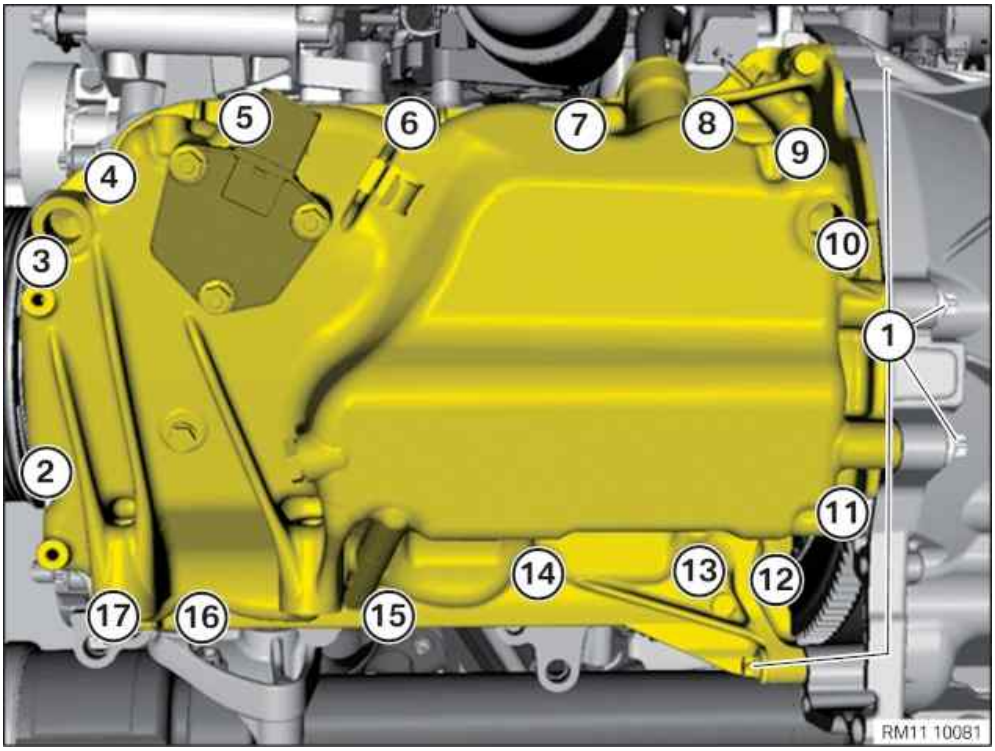
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Tighten screws (2) to (17) **hand-tight**, do **not** tighten fully.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws (2) to (17) on the oil sump.

Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten the transmission bolts (1) on the oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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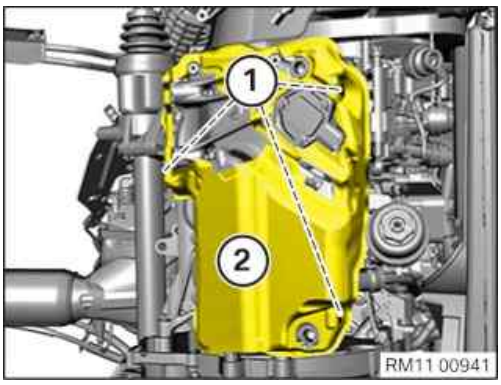
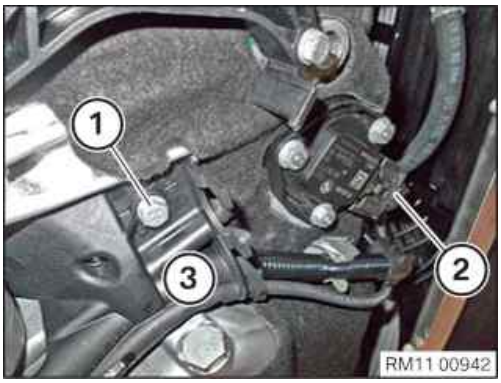
42 – Installing the acoustic cover for the oil sump



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



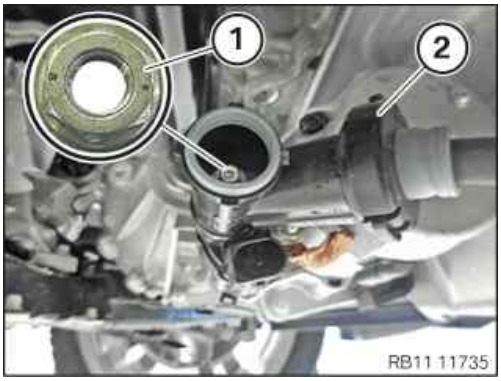
- Position wiring harness (3).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

- Connect and lock the connector (2) on the oil-level sensor.

  The connector must lock audibly.



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).

  The connector must engage audibly.

43 – Mounting the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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RISK OF DAMAGE

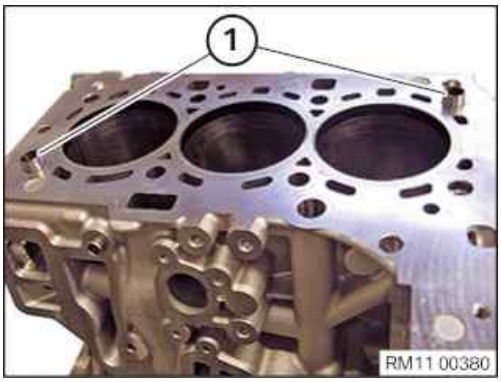
Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

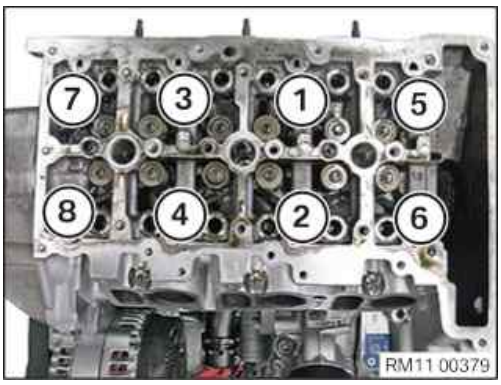
TECHNICAL INFORMATION

Do not remove bolt coating.



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.
- Clean tapped bores.
- Position the cylinder head on the crankcase.



- Fit new cylinder head bolts.

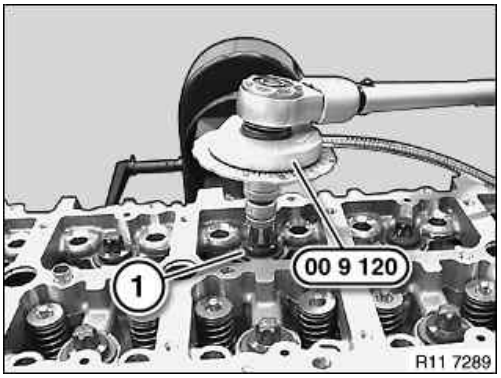
  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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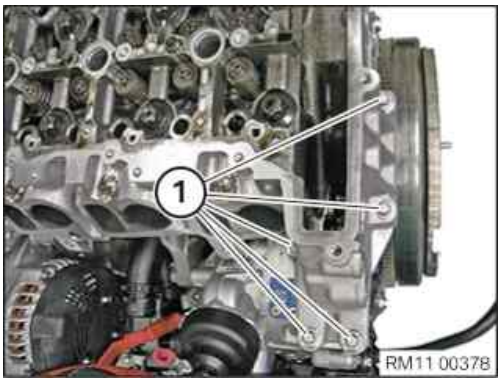


- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

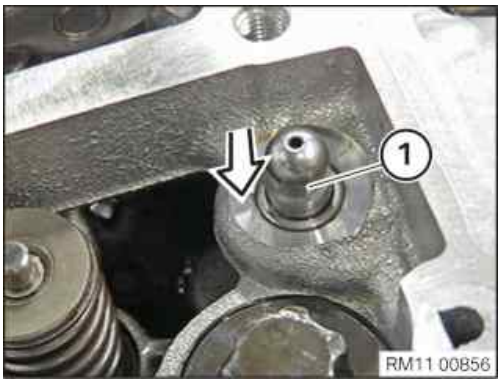
44 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

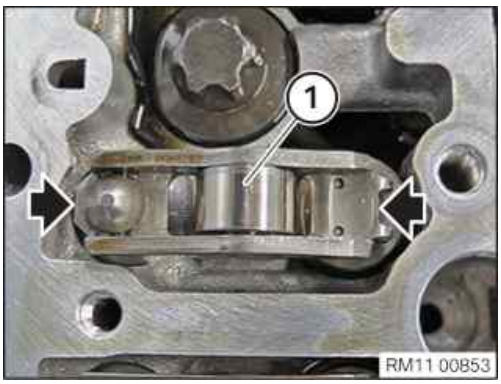


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

45 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.



- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

46 – Install glow elements

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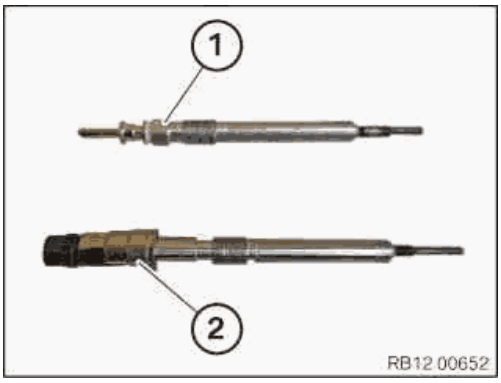
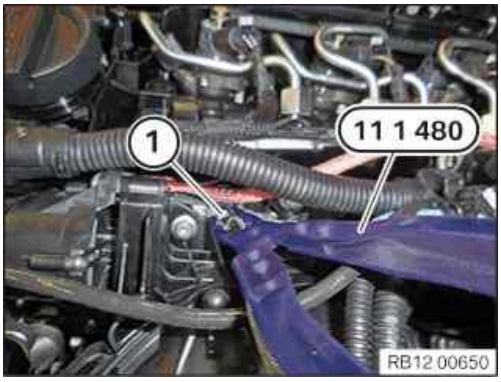


- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

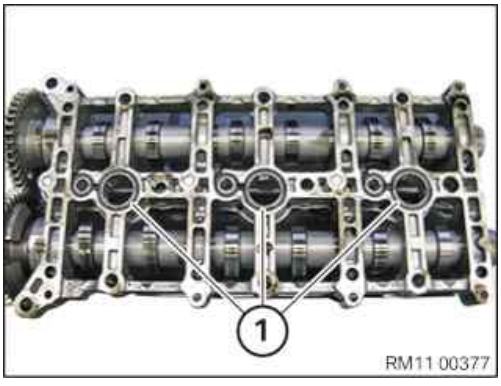
47 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Renew the seals (1) on the camshaft support.

  Parts: Seals

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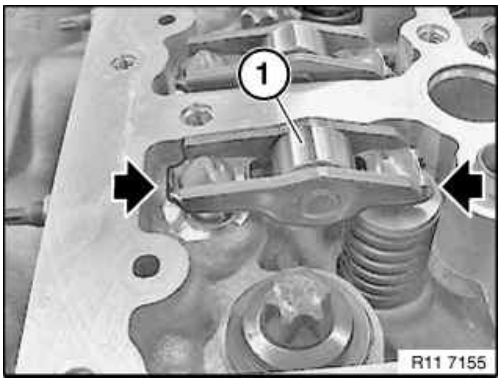
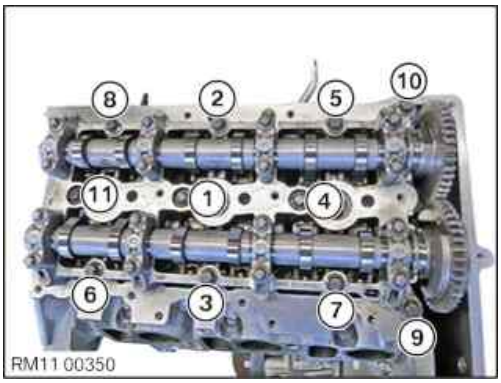


- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

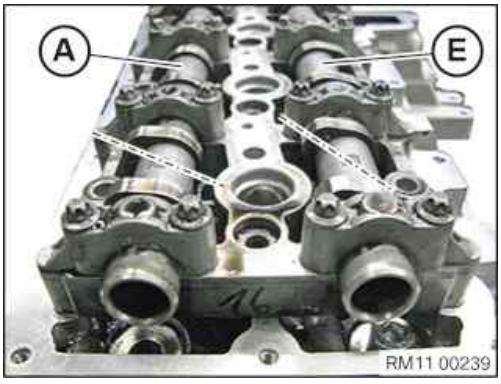
M7x35		Tightening torque	13 Nm

48 – Adjusting the timing of the camshafts

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

▸ **Remove chain tensioner piston**

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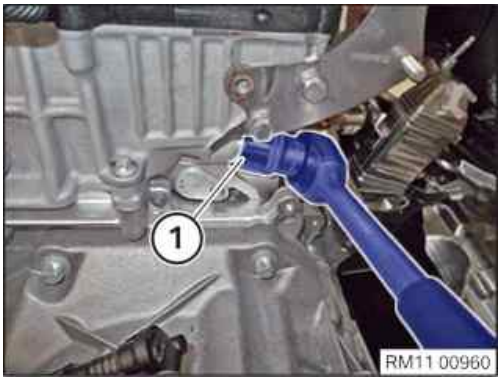
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

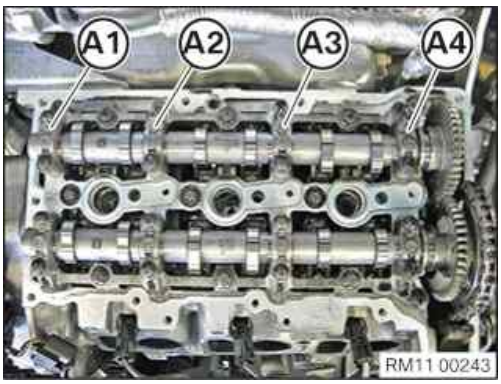
▶ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

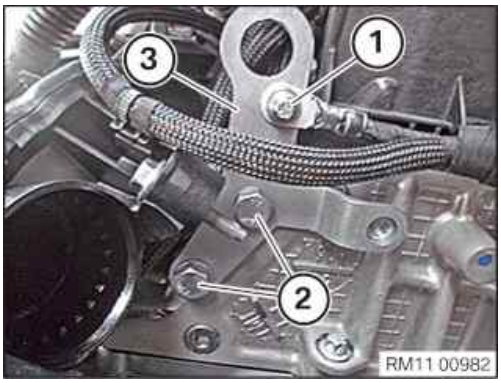


TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▶ **Remove the timing chain guide rail**



- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).

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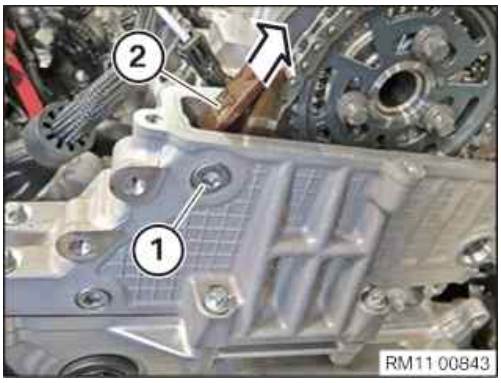
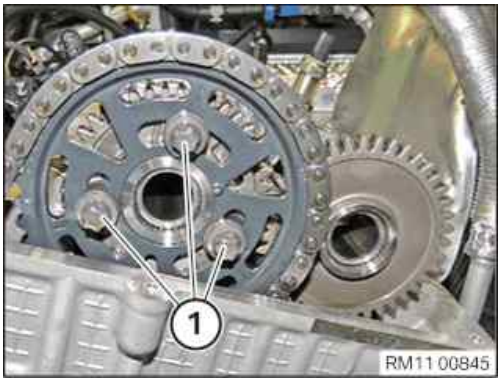


- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

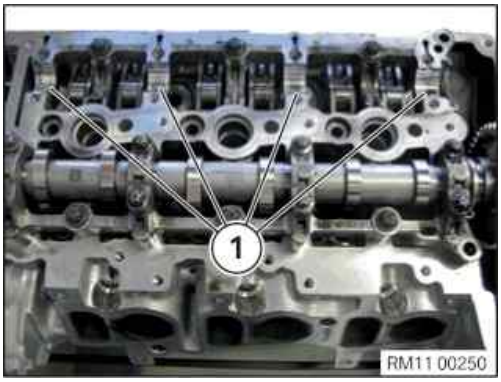
▶ **Installing exhaust camshaft**

RISK OF DAMAGE

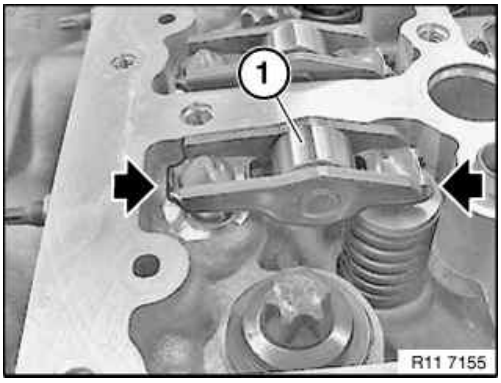
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

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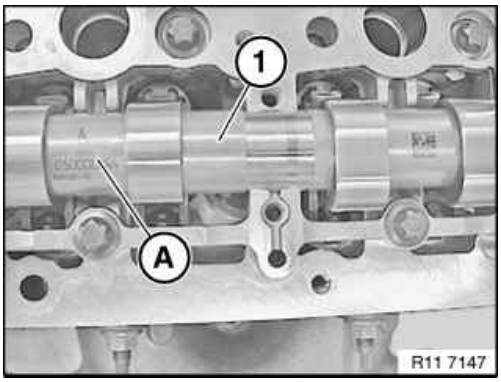
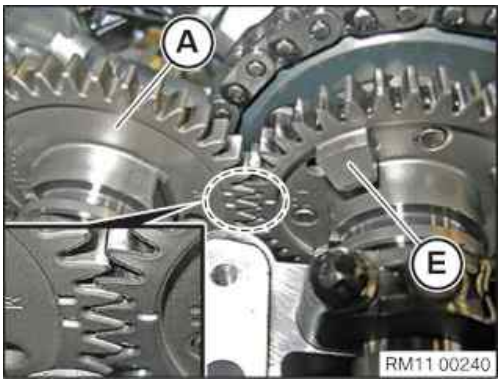
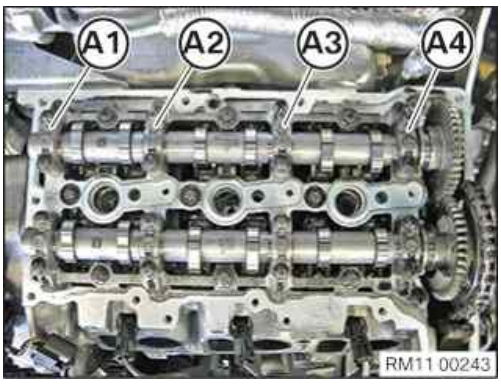


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

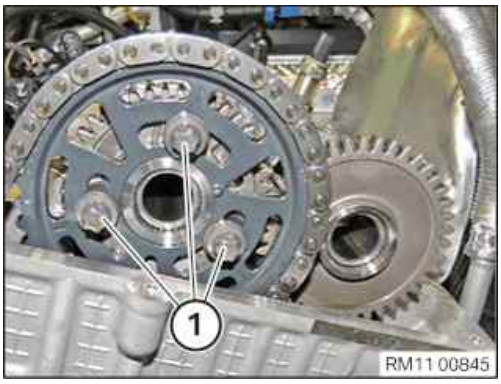
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

► **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

► **Install the timing chain guide rail**

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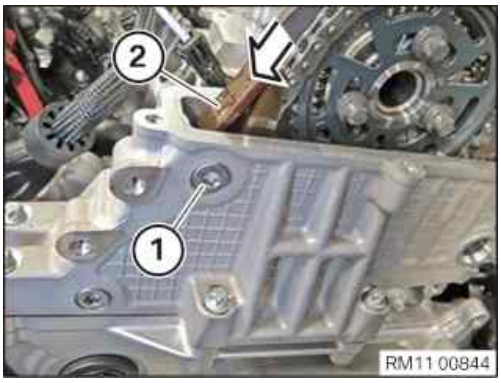


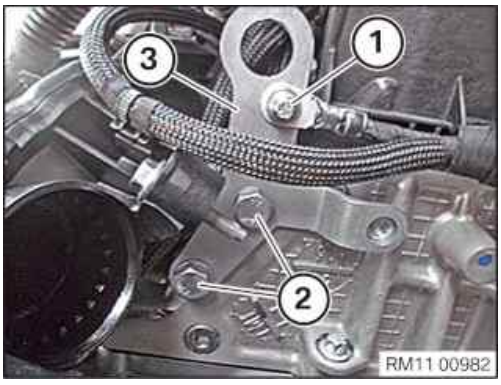
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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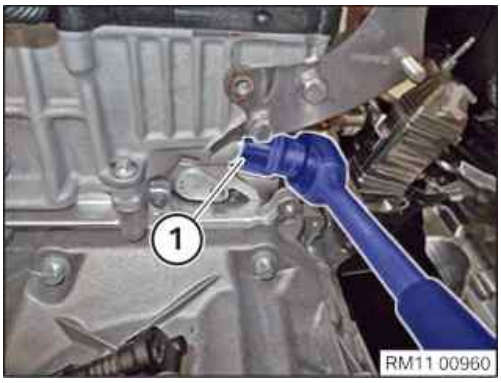
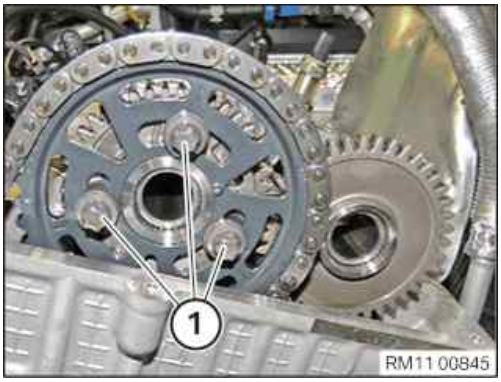


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

49 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

50 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

51 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

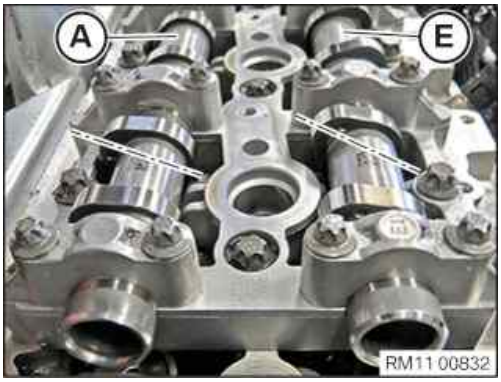
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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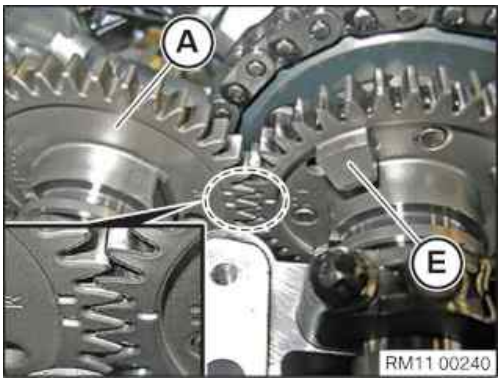


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

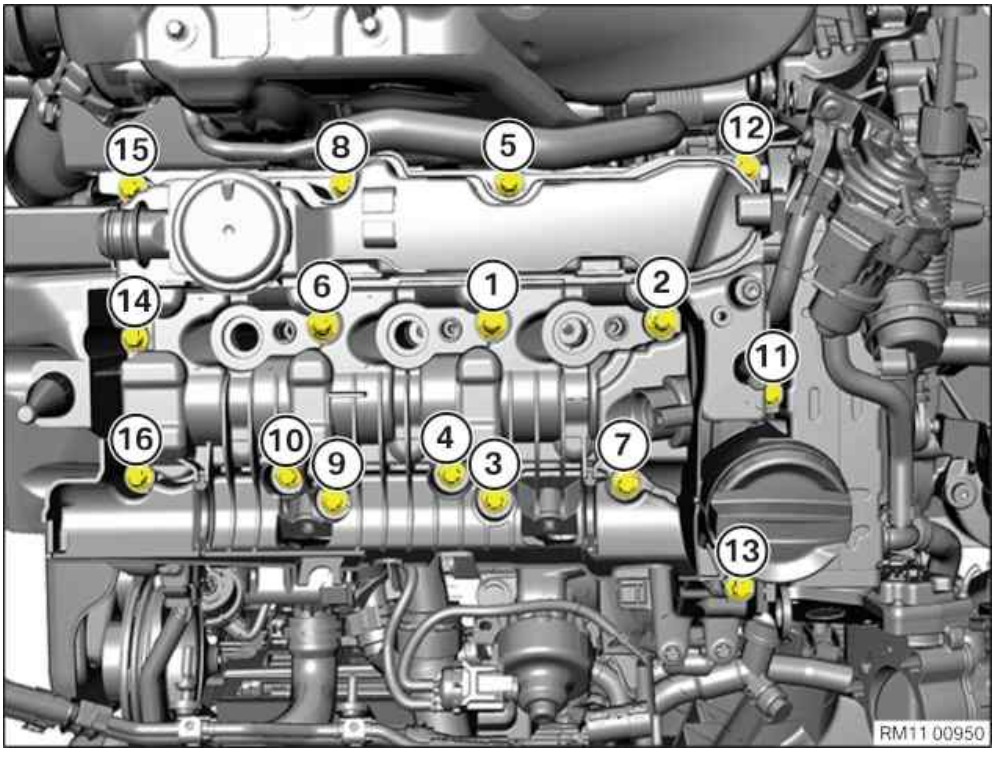
If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

52 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover

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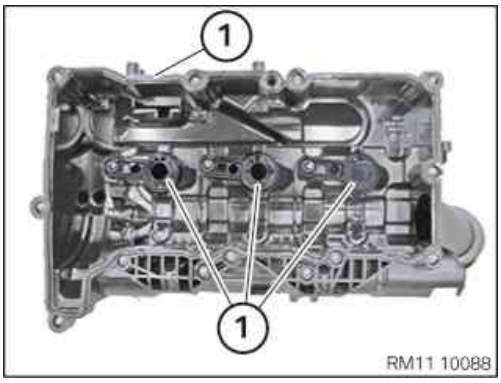
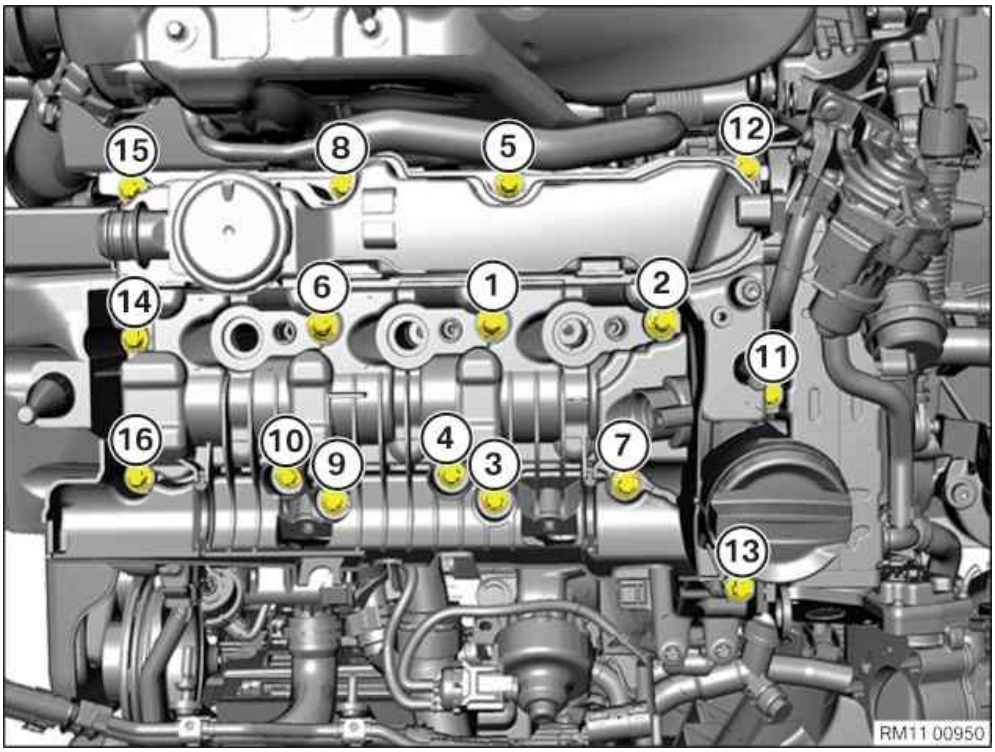


- Renew the gasket (1) of the cylinder head cover.

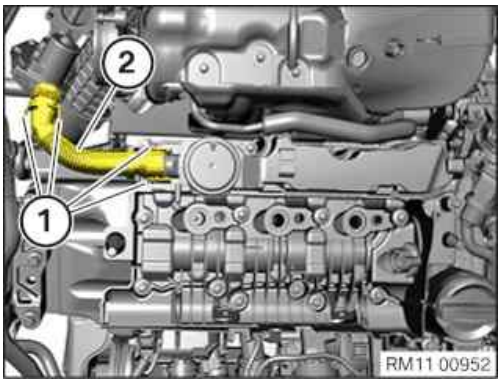
  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

53 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

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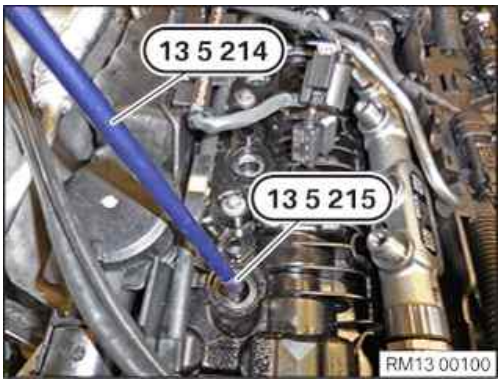
RISK OF DAMAGE

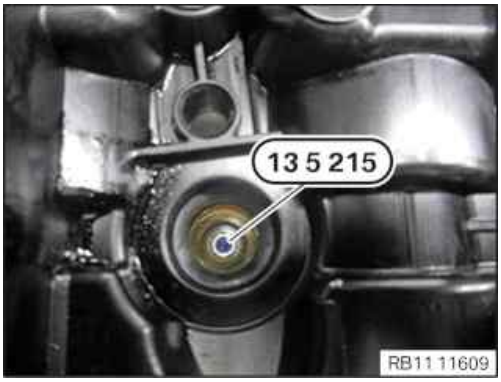
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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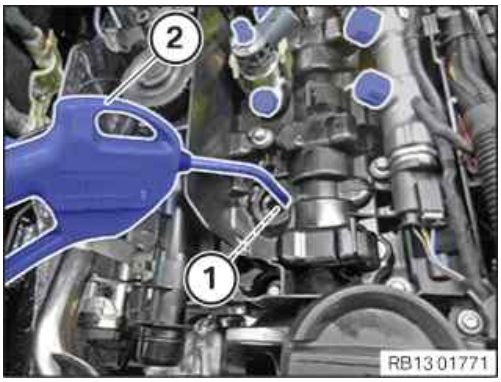
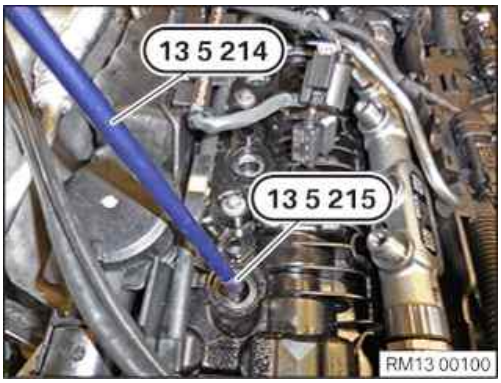


- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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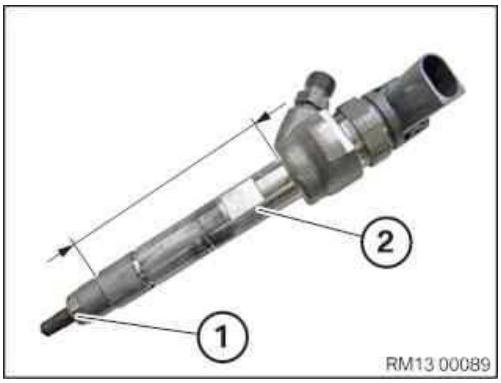
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

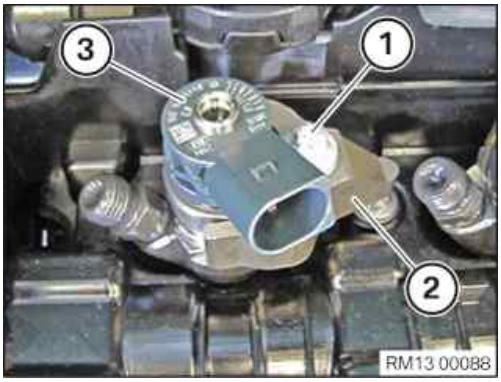


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

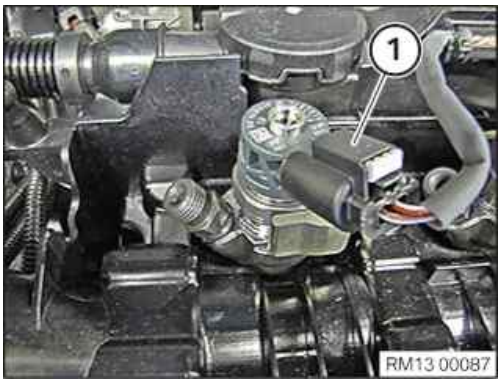
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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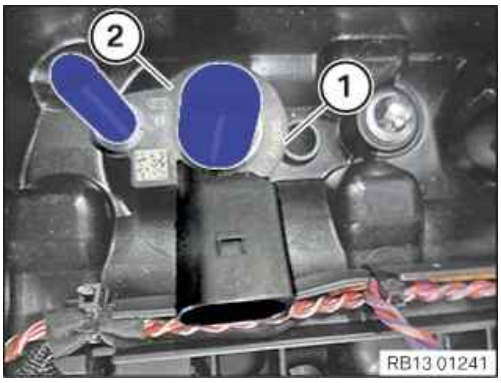
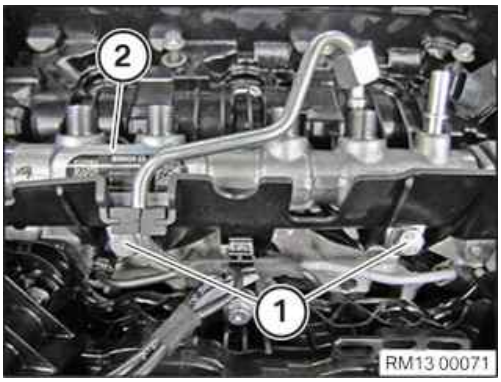


- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

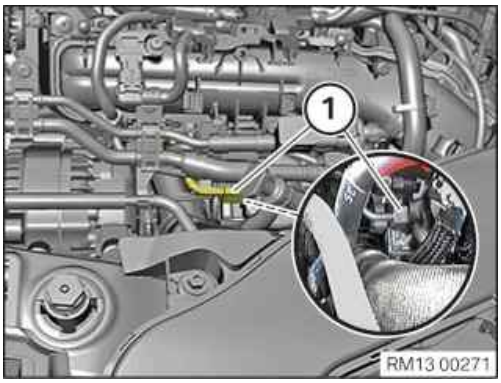
54 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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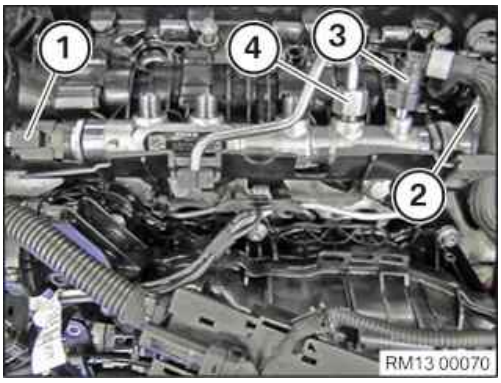

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

55 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

56 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

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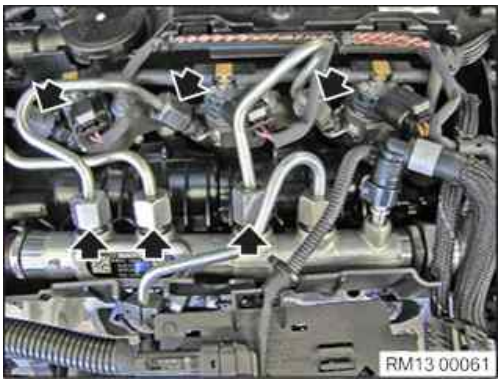
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

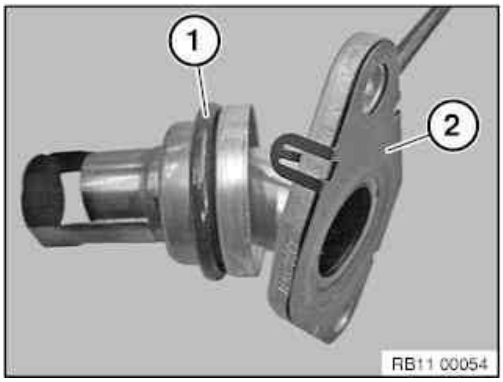
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

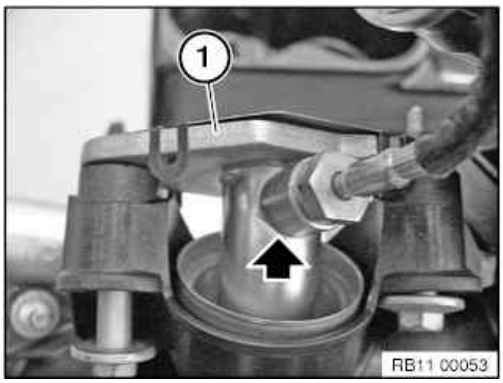
57 – Installing the intake plenum



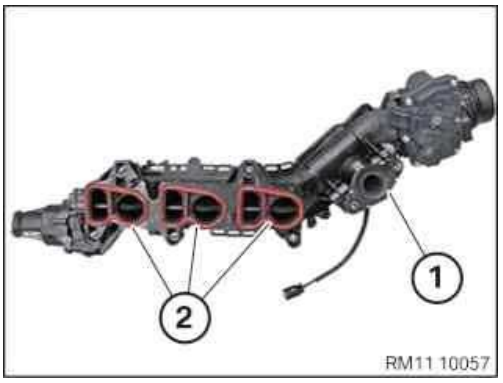
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

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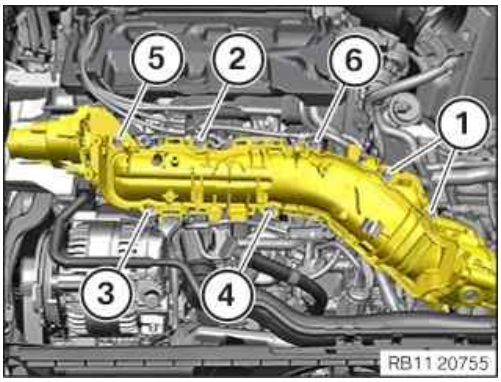
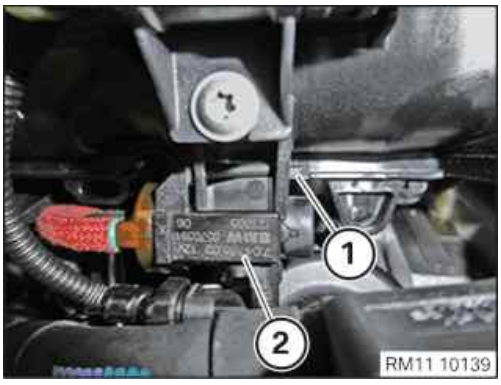


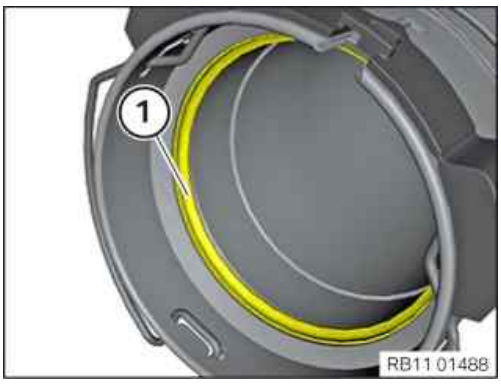
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

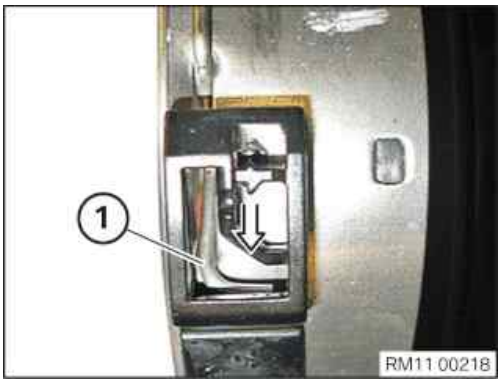


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.

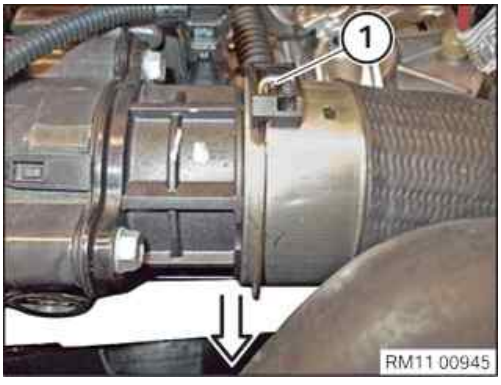


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

58 – Remove the engine from the assembly stand

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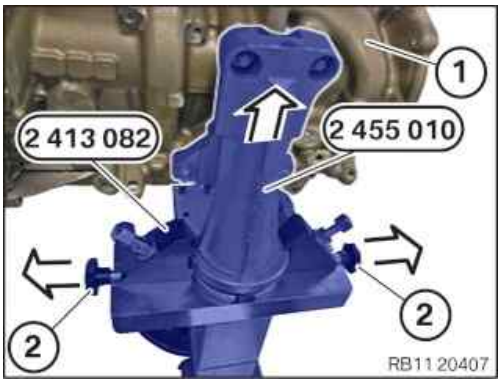
CAUTION

Heavy component.

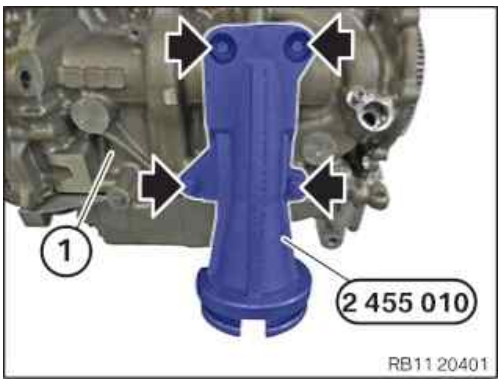
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

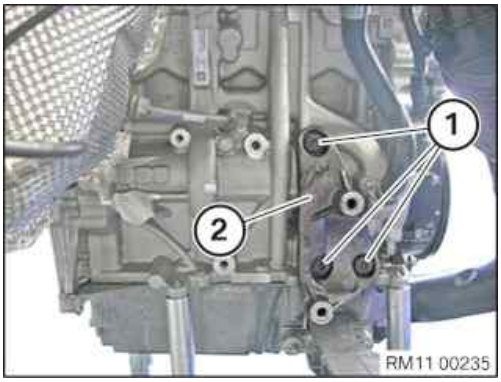
- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.



- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

M10		Tightening torque	38 Nm

59 – Mounting engine on manual gearbox

Prerequisite

Engine has been removed.

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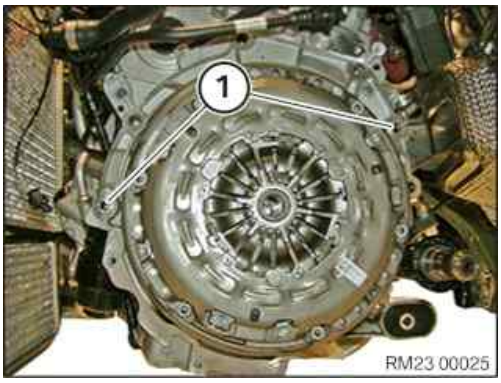
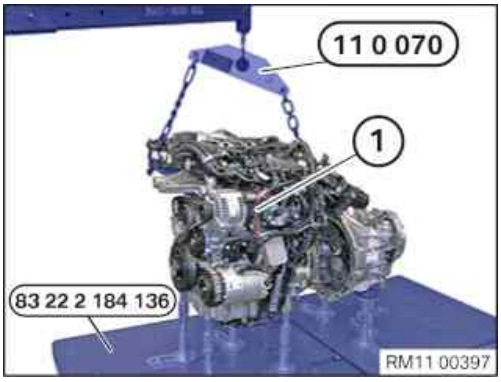
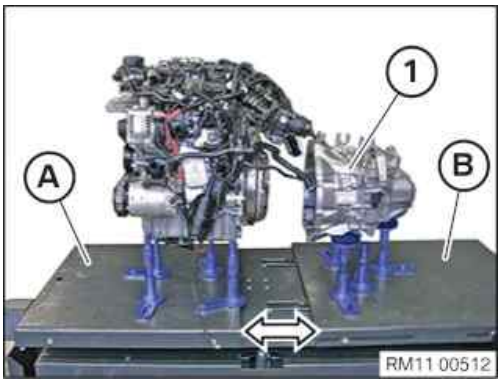


- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

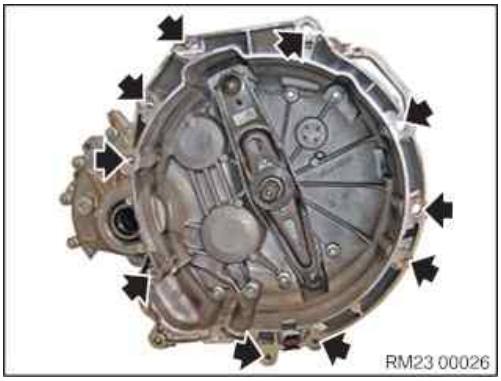
- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.



- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.



- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

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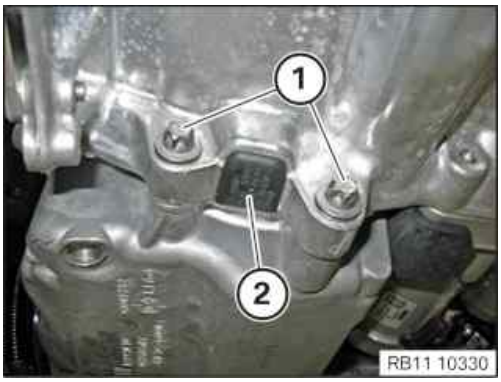


- Tighten the screws (1).

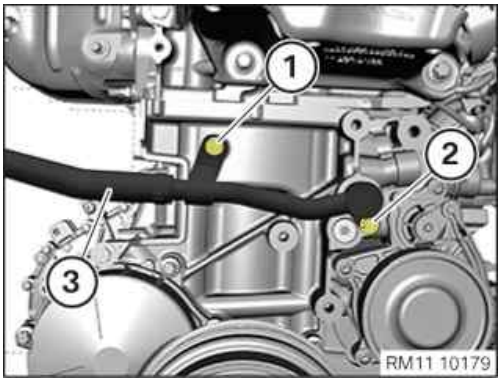
Transmission to oil sump

M8		Tightening torque	19 Nm

- Install the protective cap (2).

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

60 – Attaching assemblies (on lifting table)

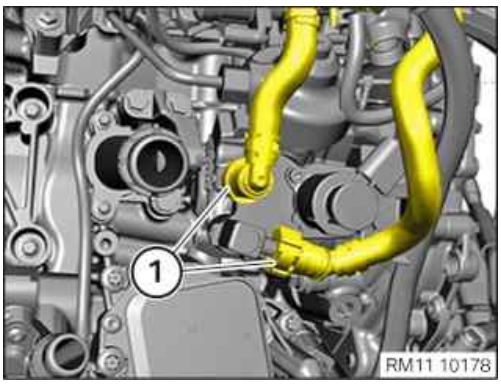


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The locks must engage audibly.

▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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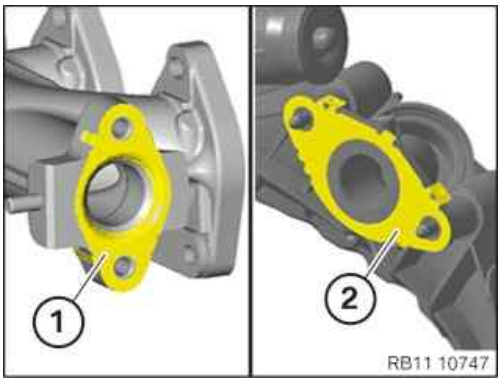
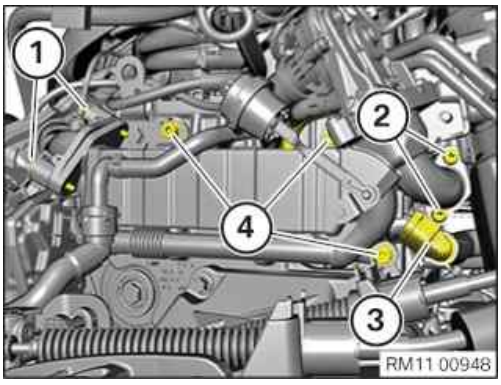


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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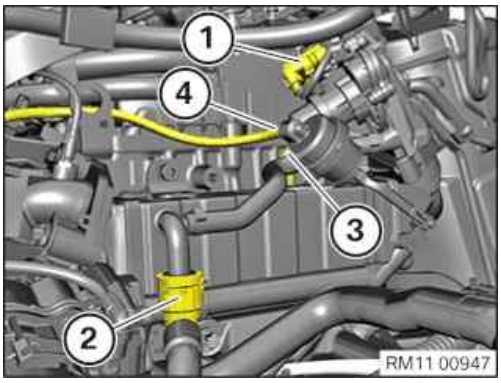
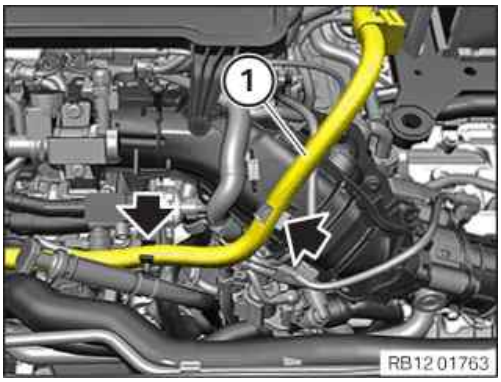


TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.



CAUTION

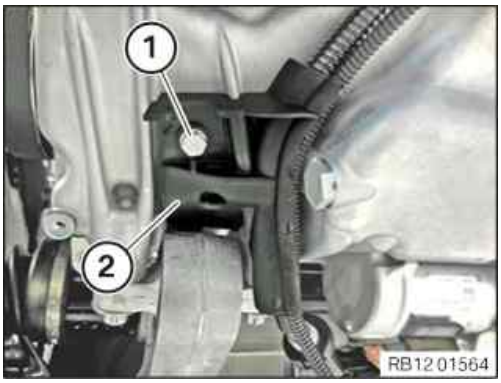
Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).

- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

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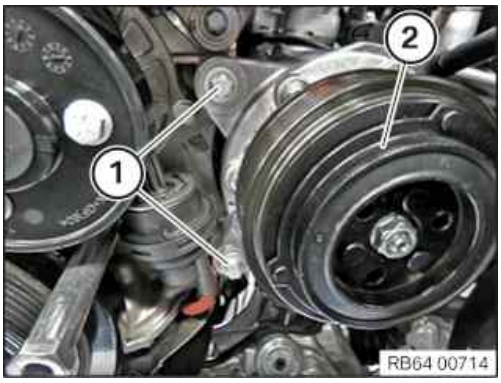
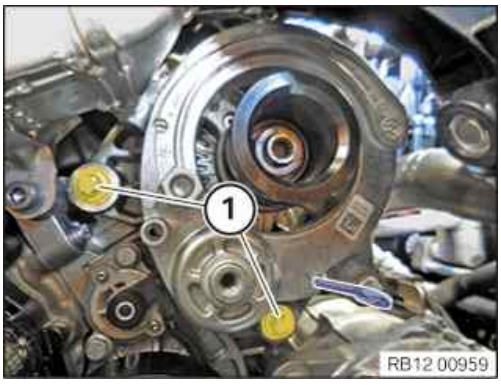


- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

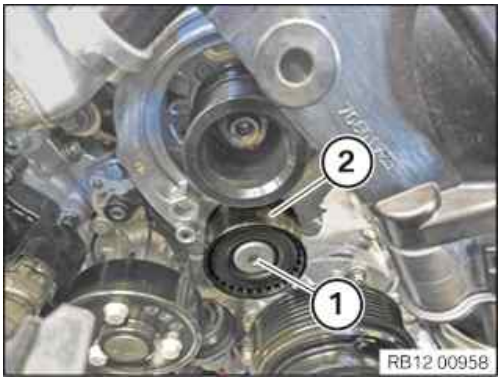
- Tighten the screws (1).



- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

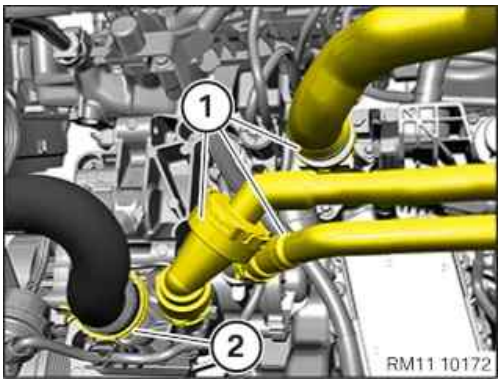
M10x75 / M10x125		Tightening torque	38 Nm



- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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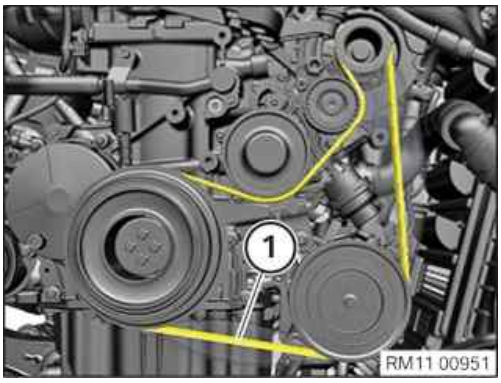
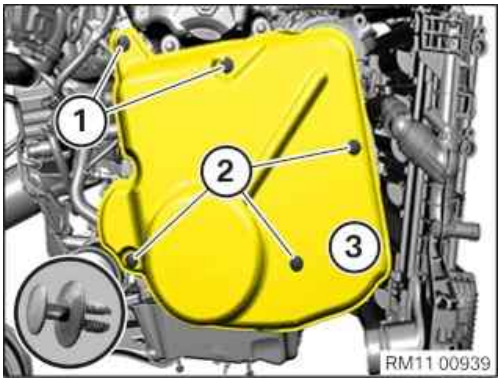


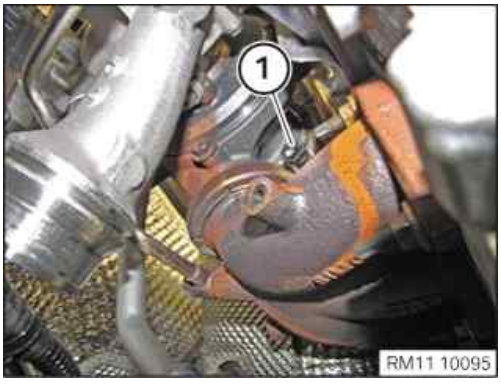
- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ **Install the acoustic cover for the engine at the front**



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

▸ **Installing the oil return line for the exhaust turbocharger**

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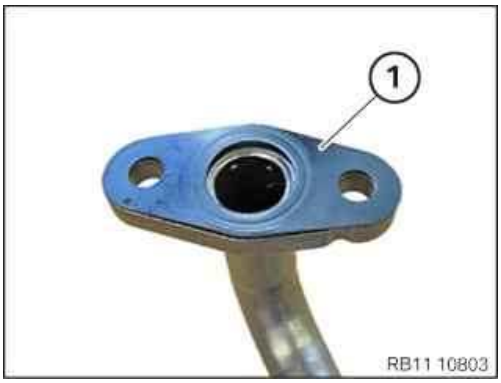
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

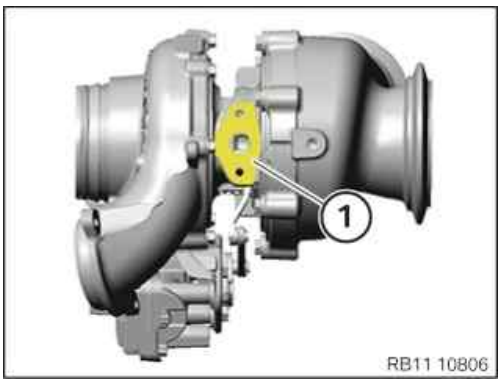
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface.

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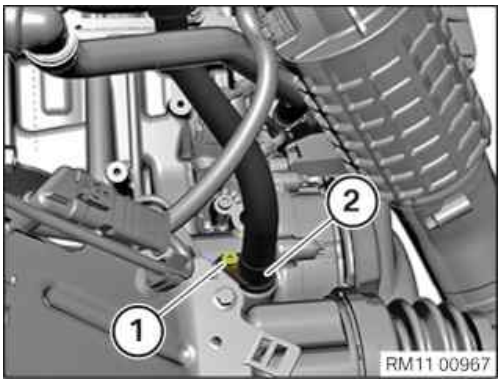
- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

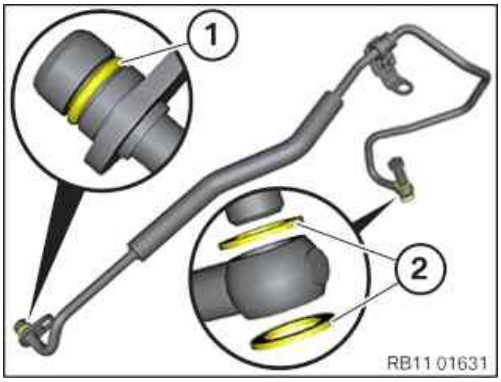


- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

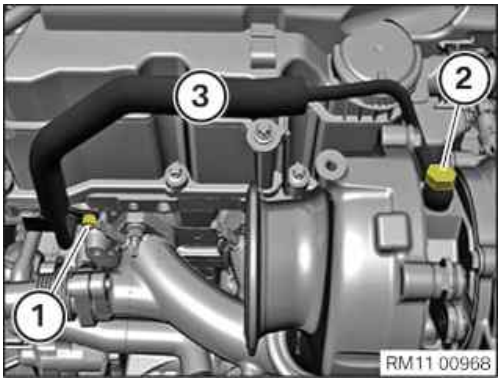
▸ **Install the oil feed line for the exhaust turbocharger**



- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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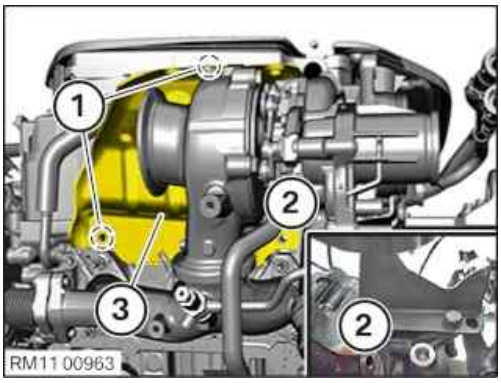


- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

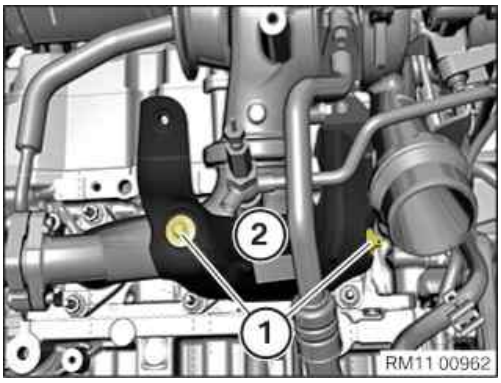
▶ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

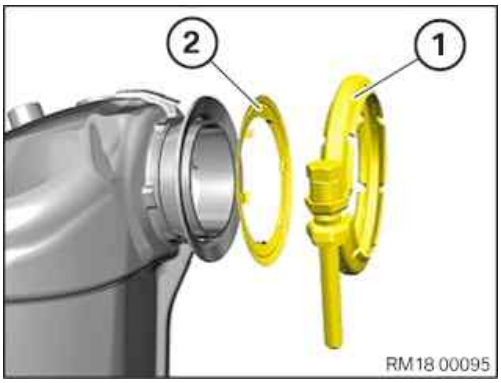
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

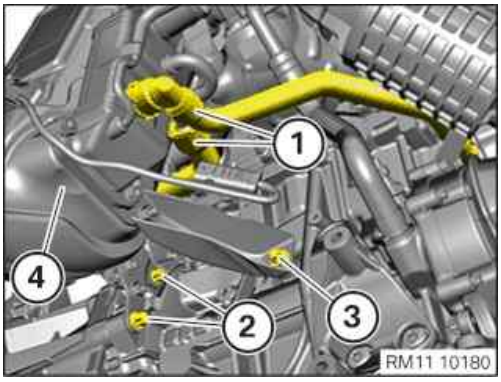
Torx screw BM 6x12		Tightening torque	10 Nm



- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).

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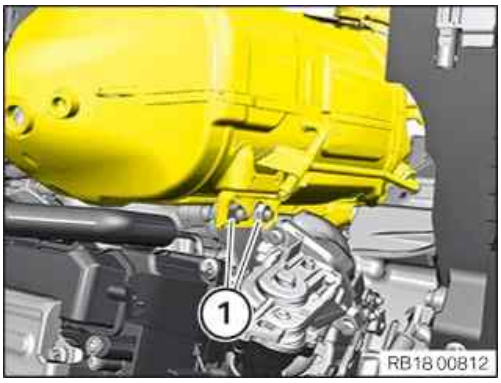


- Tighten nuts (1).

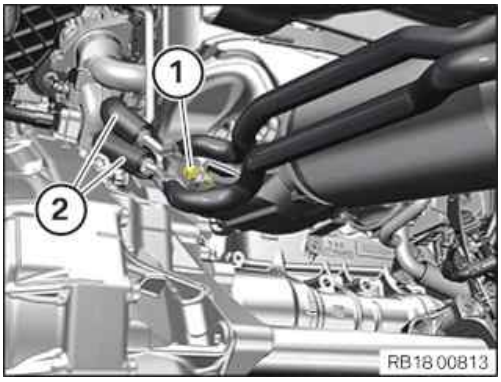
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

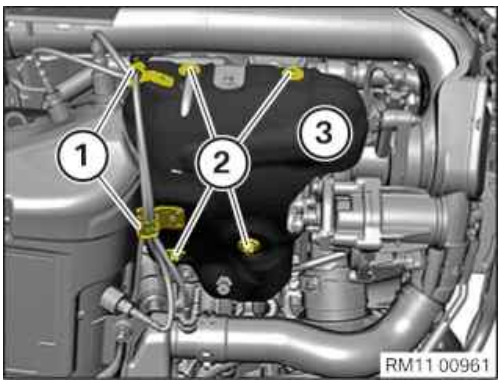
▸ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▸ **Installing the cable clip for the intake plenum**

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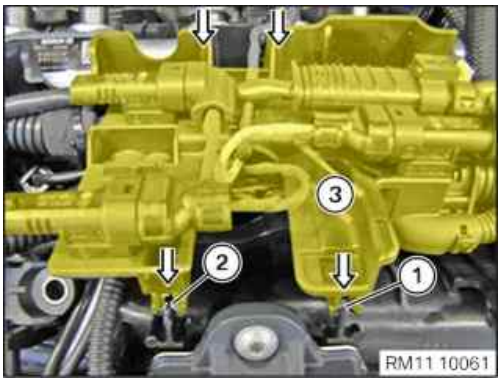
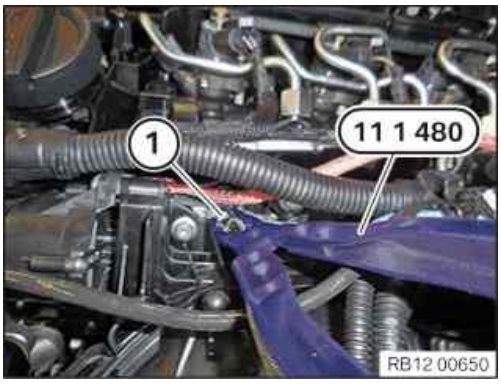
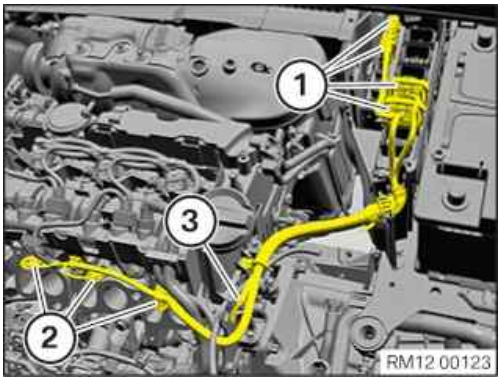


- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

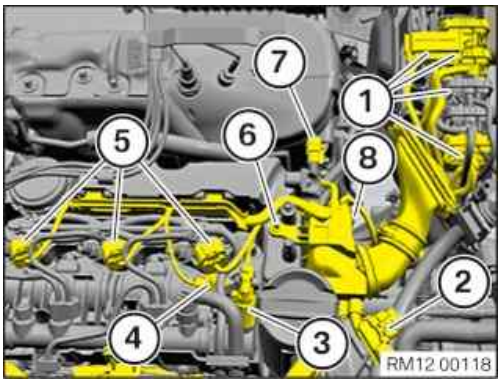
  The connector (1) must engage audibly.



- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm



- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.

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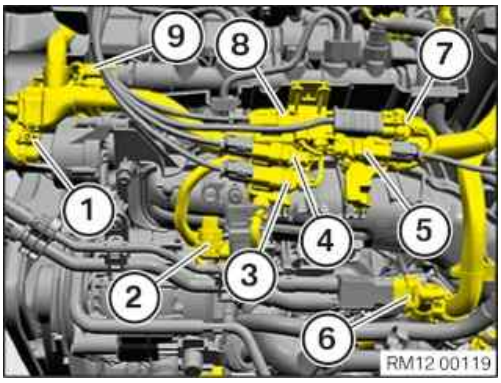
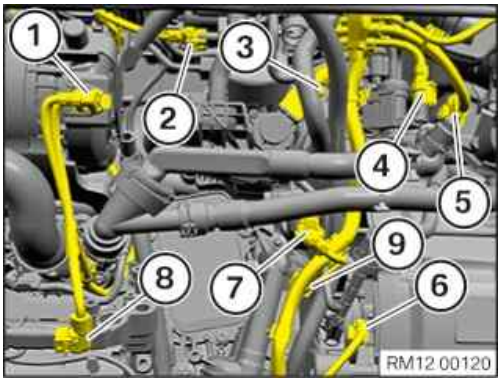
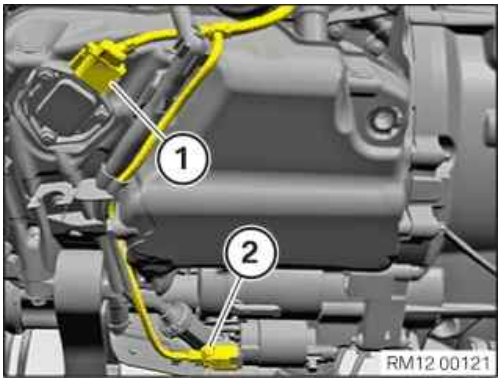


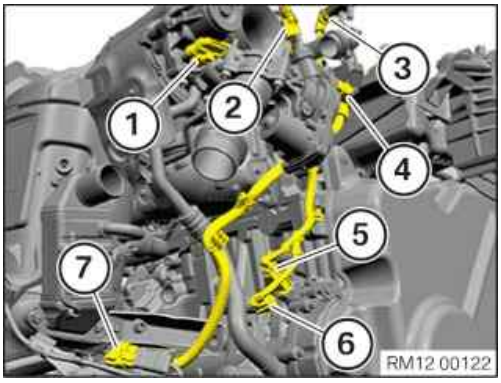
- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.



- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

61 – Installing differential pressure sensor

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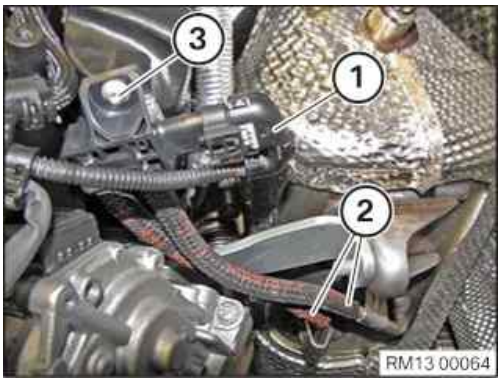


- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

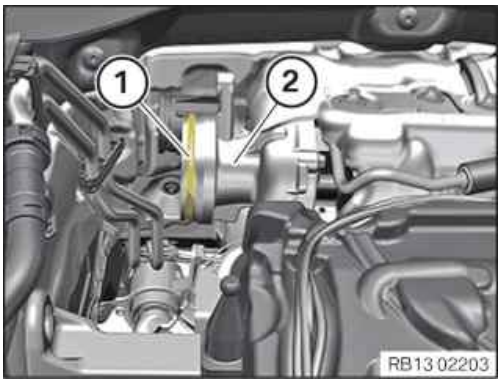
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

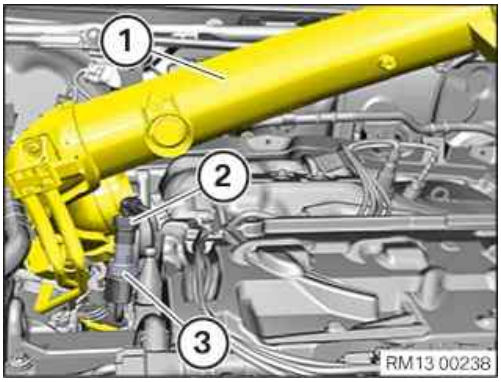
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

62 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



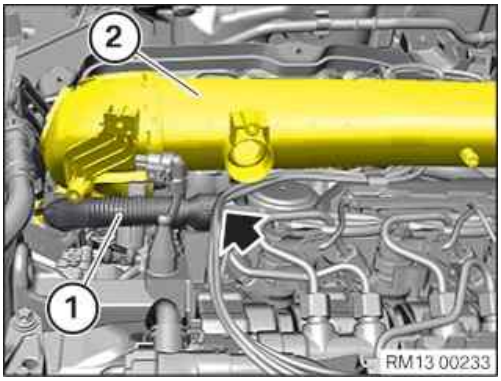
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.

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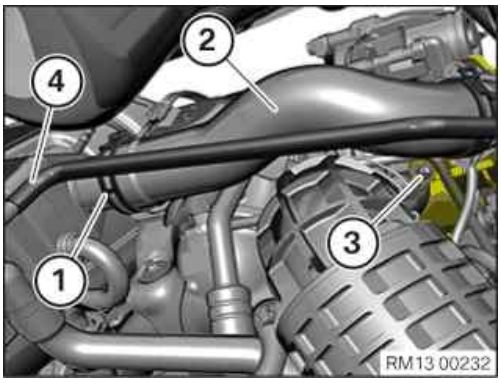


- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

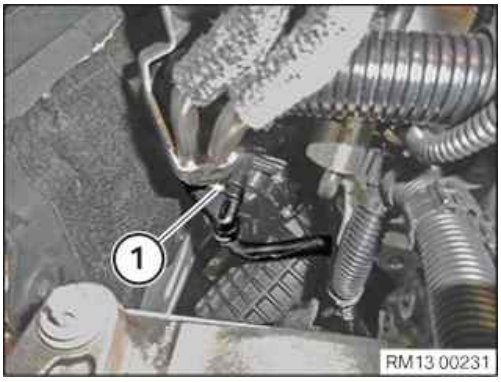
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

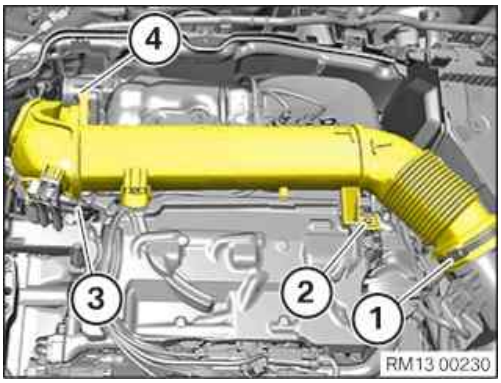
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

63 – Install the acoustic cover for the injectors

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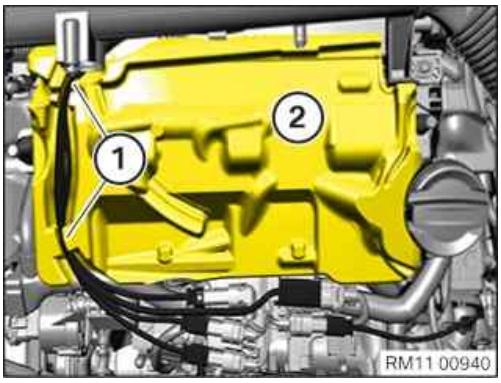
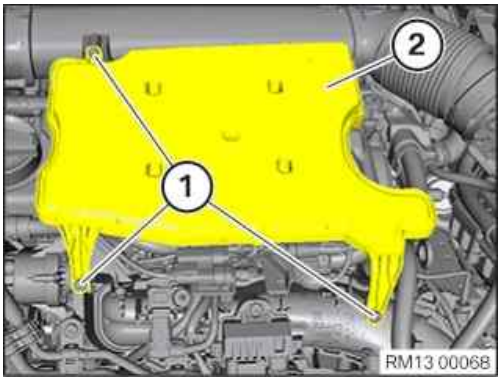


- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

64 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

65 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

66 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head — Used in step 8

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase — Used in step 9

M10x30		Tightening torque	38 Nm

Special tool 11 8 930 to special tool 00 2 320 — Used in step 9

M14x35		Tightening torque	160 Nm

Connecting rod bearing cap to connecting rod — Used in step 38

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

Oil deflector to crankshaft bearing cap — Used in step 39

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

Oil deflector to crankcase — Used in step 39

M8x14		Tightening torque	19 Nm

Oil vacuum pump to crankcaseB37 — Used in step 40

M8x35	*Renew screws.*	Tightening torque	15 Nm
		Angle of rotation	45 °

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Oil sump to crankcase

Used in step 41

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 41 59

M8		Tightening torque	19 Nm

Starter motor to transmission

Used in step 41

M8x45		Tightening torque	19 Nm

Bracket to oil sump

Used in step 42 60

M6		Tightening torque	8 Nm

Battery positive lead to starter

Used in step 42

M8		Tightening torque	13,5 Nm

Cylinder head to crankcase

Used in step 43

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 43

M8x40		Tightening torque	19 Nm

Glow elements to cylinder head

Used in step 46

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 47

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 48

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 48

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 48

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 48 60

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 48

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 48

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 52

M6		Tightening torque.	8,5 Nm

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Clamping claw facing to cylinder head cover

Used in step 53

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 53

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 54

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 54

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 56

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 57

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 58 60

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 59 60

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 60

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 60

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 60

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 60

M8x20		Tightening torque	19 Nm

Air conditioning compressor in component carrier

Used in step 60

M10		Tightening torque	38 Nm

Alternator to component carrier

Used in step 60

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner

Used in step 60

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold

Used in step 60

V-band clamp		Tightening torque	19 Nm

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Holder to exhaust turbocharger and crankcase — Used in step 60

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger — Used in step 60

M6x12		Tightening torque	8 Nm

Oil return line to crankcase — Used in step 60

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head — Used in step 60

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger — Used in step 60

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger — Used in step 60

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 60

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder — Used in step 60

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 60

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter — Used in step 60

Torx bolt BM6x16		Tightening torque	8 Nm

Ground cable to cylinder head — Used in step 60

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 60

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 61

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 61 62

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor — Used in step 62

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 62

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 62

Oval-head screw	Renew screw.	Tightening torque	8 Nm

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Clean air pipe to intake silencer housing Used in step 62

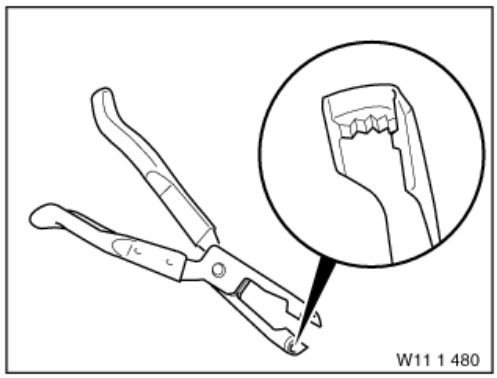
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe Used in step 64

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder

Common Used in step 8 59

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 490 579 (11 0 070) Lifting gear

Used in step 8 9 58 59

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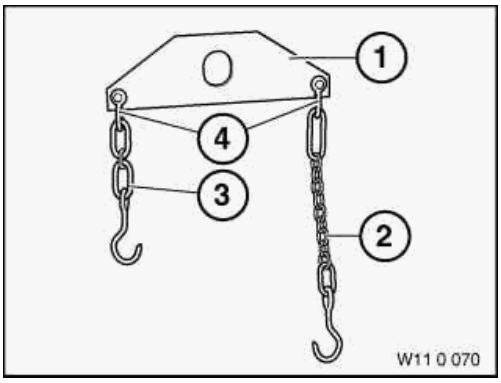

Common

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

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2 455 010 Engine support

Common Used in step 9 58

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 9

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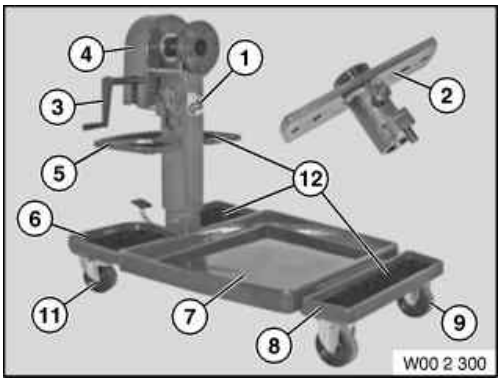

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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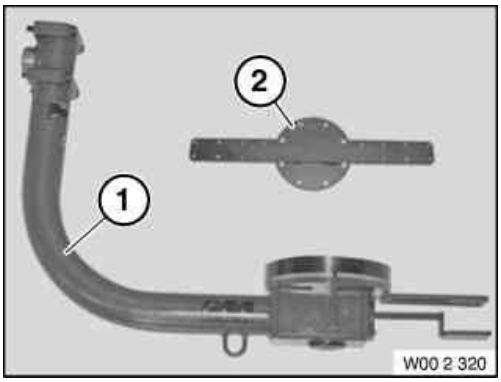
0 495 196 (00 2 320) Support arm



Common Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common Used in step 11 14 54 56

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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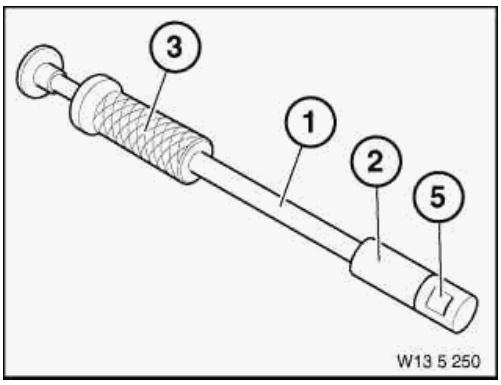
2 413 106 Fastener

Common Used in step 11 56

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush

Common Used in step 13

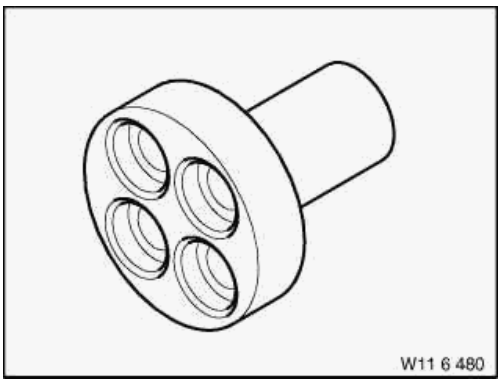
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 13

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 16 48 51

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 288 380 Locating stud

Common Used in step 16 48 49 51

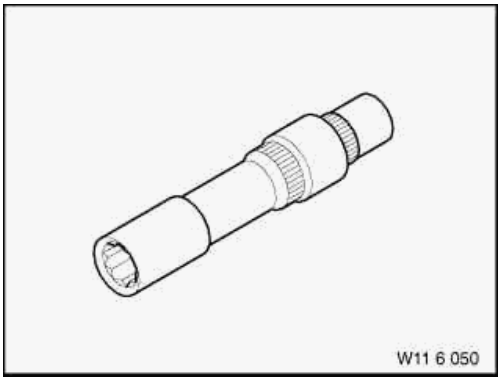
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common Used in step 16 48 50 51

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 21 46

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

Common

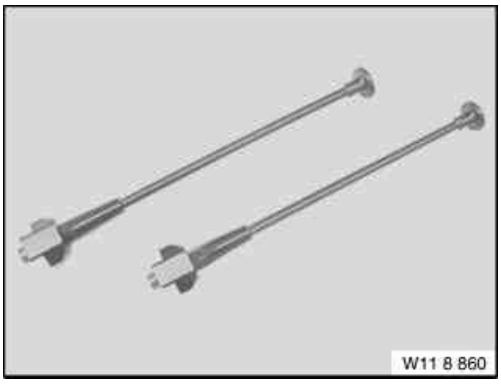
Used in step 22 23 48

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 144 (11 8 860) Assembly tool



Common

Used in step 30 37

Usage	For installing piston with connecting rod in crankcase.
Included in the tool or work	
Storage location	A23
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 493 582 (11 8 140) Bush

Common

Used in step 37

Usage	(Assembly bushes) For installing the pistons
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 394 (11 8 141)		**Bush** Bush for piston installation 84.00 mm	
2	0 494 395 (11 8 142)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	
3	0 494 396 (11 8 143)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	

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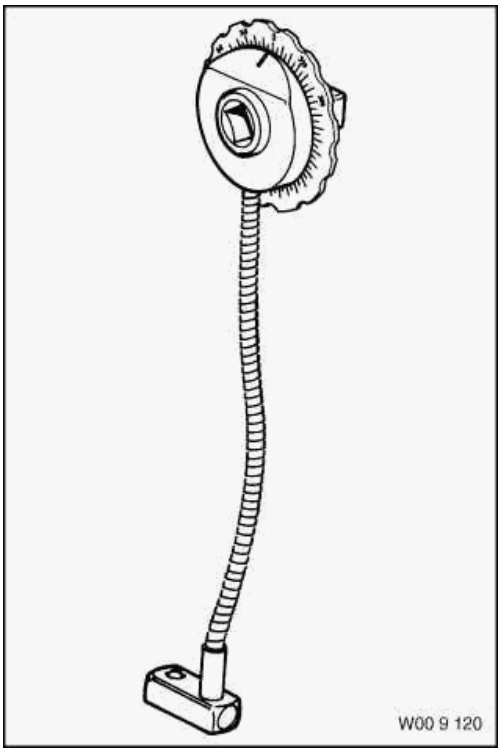
0 490 504 (00 9 120) Torque angle measuring dial



Common

Used in step 38 43

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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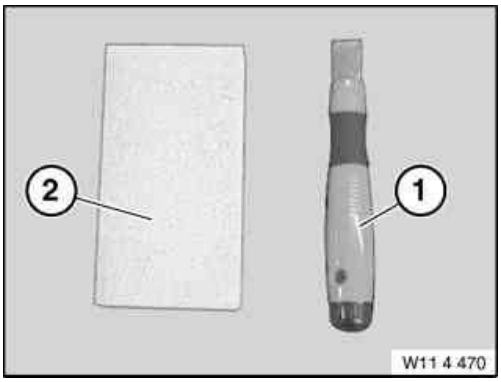
0 495 102 (11 4 470) Tool



Common

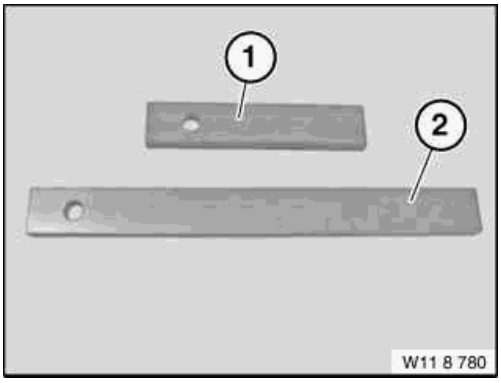
Used in step 41

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 496 120 (11 8 780) Plate



Common

Used in step 41

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

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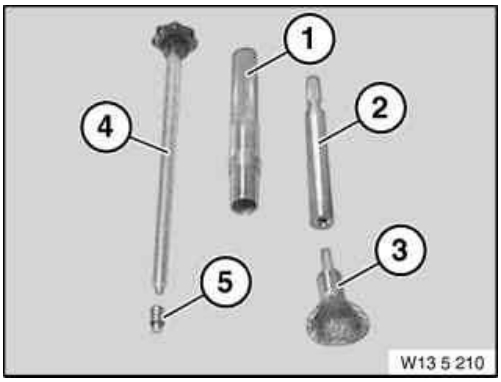
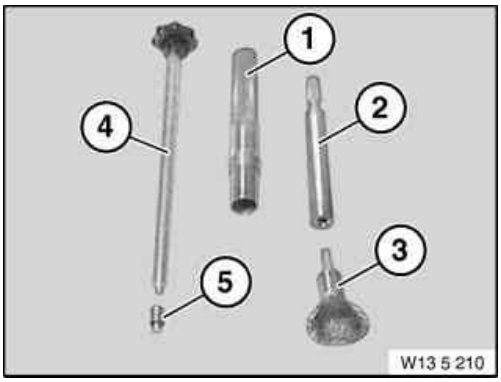
0 493 763 (13 5 215) Plug



Common Used in step 53

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common Used in step 53

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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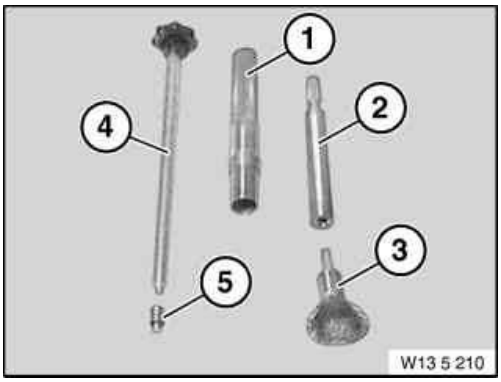
0 493 758 (13 5 210) Tool



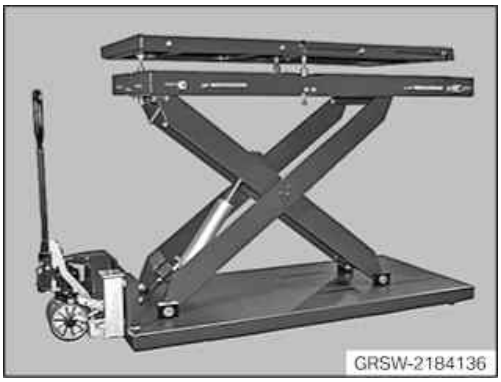
Common Used in step 53

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 59

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

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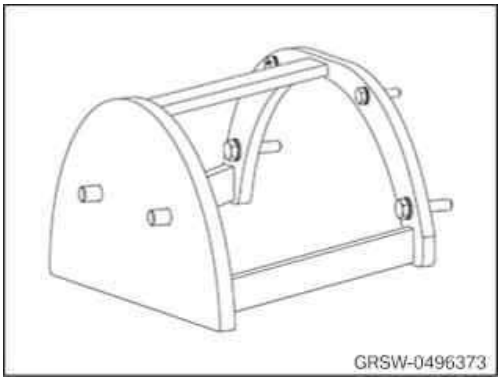
Replacement tools:

2 299 563 Adapter

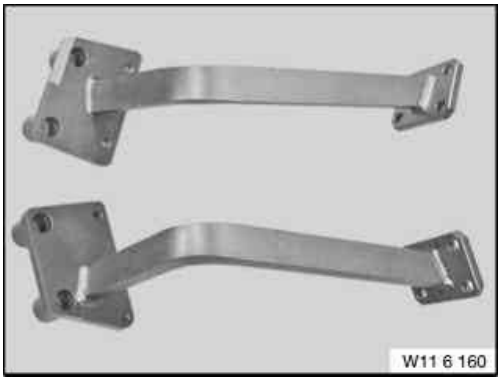
Common	Used in step 9
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 373 (11 5 420) Plate



Common	Used in step 9
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 9
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Side clearance of piston rings

Used in step 32

Clean all components before measuring the side clearance.

Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

Piston diameter

Used in step 33

Measure the piston diameter at distance (A) from the lower end of the piston skirt.

Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Cylinder bore

Used in step 34

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Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 60
EGR controller	7 60

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	41

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
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11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
31 10 001 Completely removing and installing front axle with engine and transmission	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
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11 00 050 Removing and installing engine	1 66
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11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 66
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11 00 050 Remove and install engine	1 66

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11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Removing and installing the engine (manual gearbox)	1 66
11 00 050 Remove and install engine (Automatic)	1 66
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11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine \PREMIUM	1 66
11 00 050 Removing and installing/replacing engine (N63)	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine (Automatic)	1 66
11 00 050 Remove and install engine (Automatic)	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine (Automatic)	1 66
11 00 050 Remove and install engine (Automatic)	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 66
11 00 050 Remove and install engine	1 66
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	48
Exhaust-gas recirculation cooler seal on exhaust manifold	60
Exhaust-gas recirculation cooler seal on intake plenum	60

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This documentation refers to special tools that were not yet available when going to press.

11 25 000 Removing and installing/replacing all pistons

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

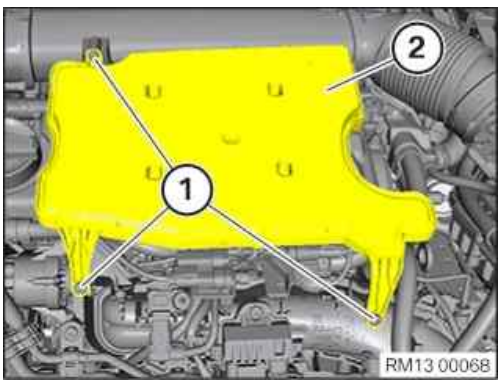
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

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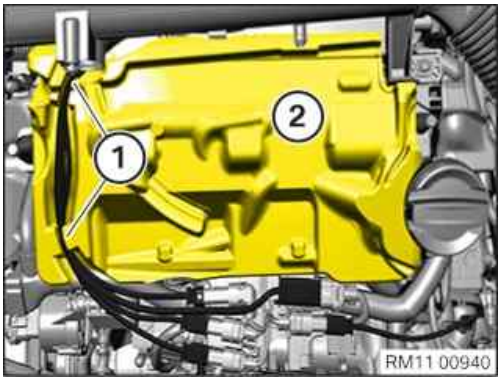
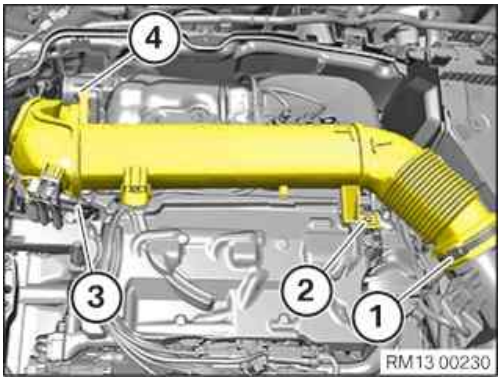
4 – Remove the acoustic cover for the injectors

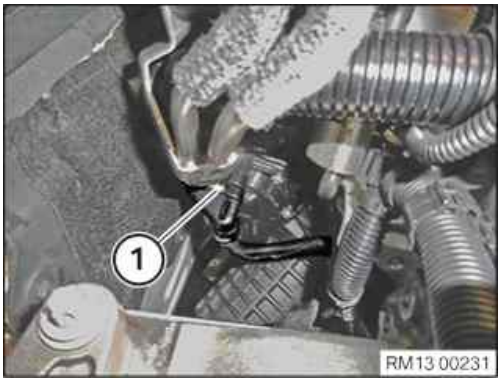


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

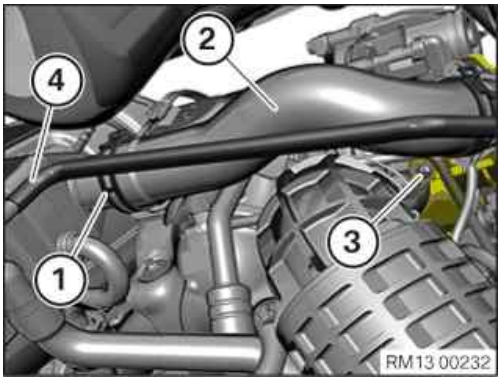
5 – Removing clean air pipe



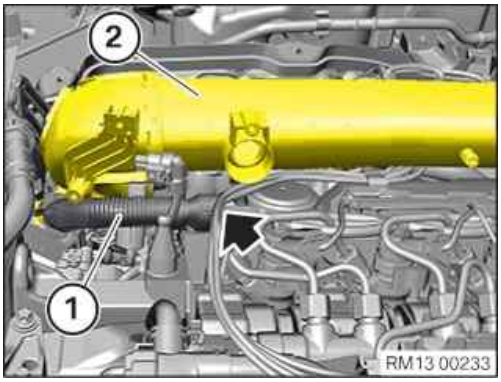
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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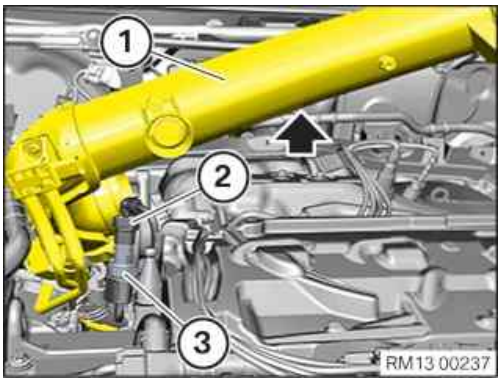


- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

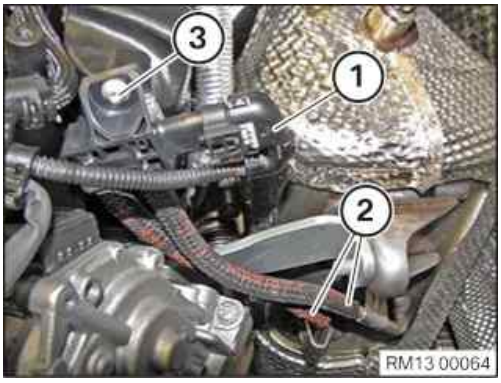
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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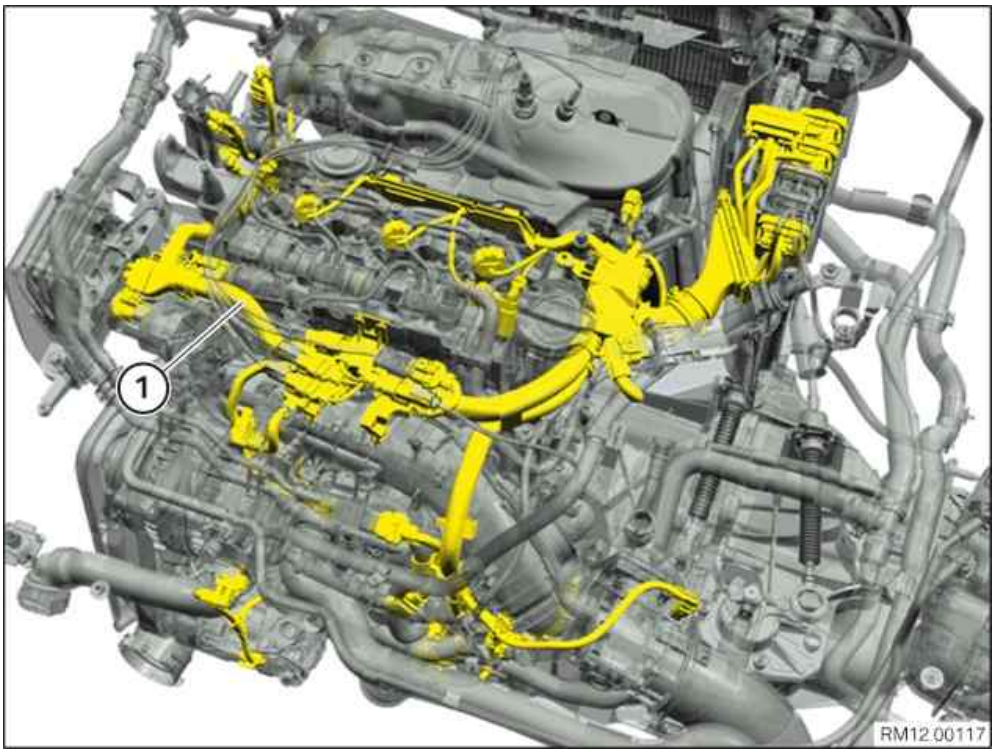
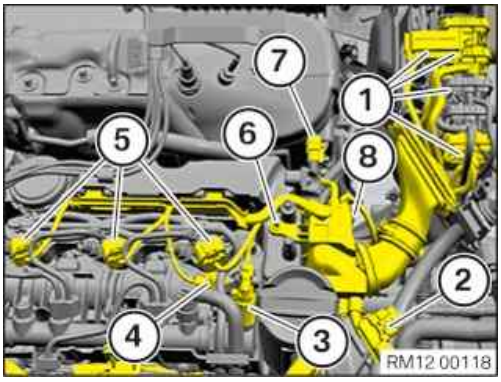
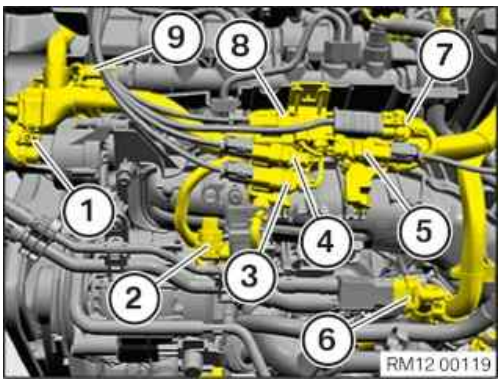
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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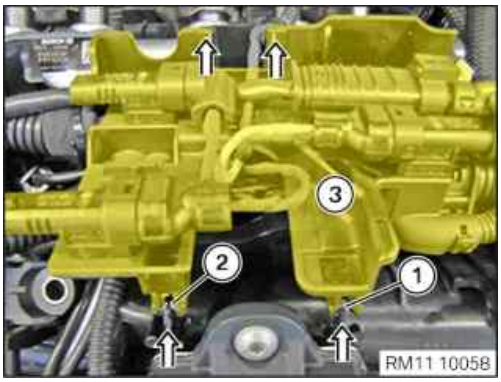
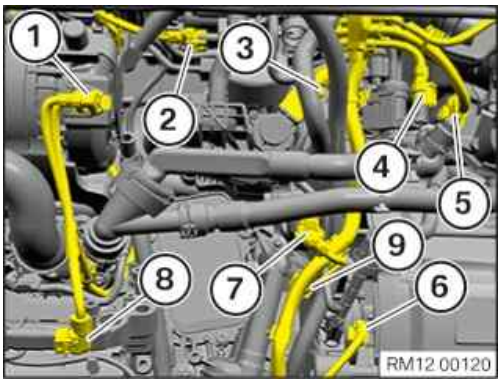
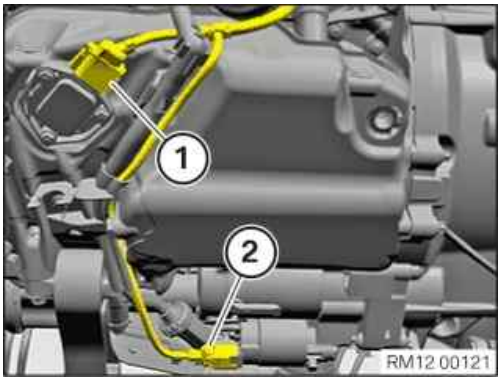


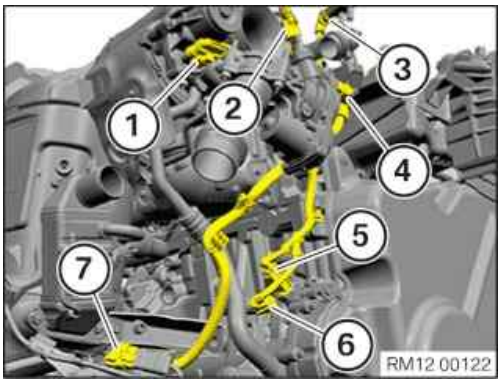
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



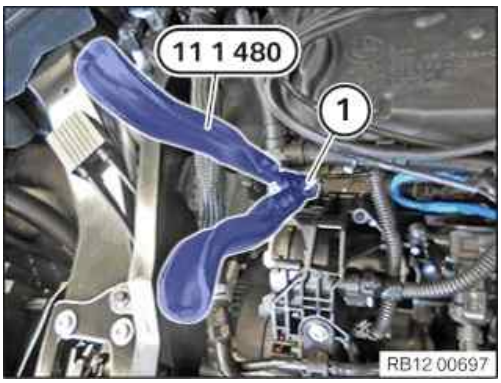
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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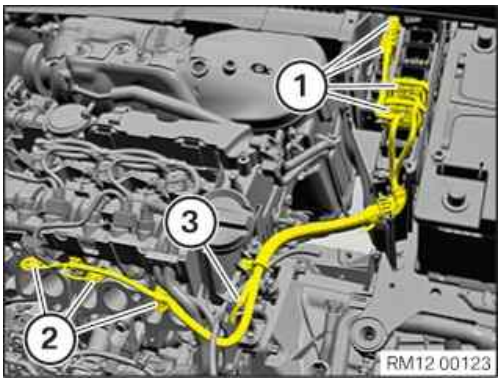


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

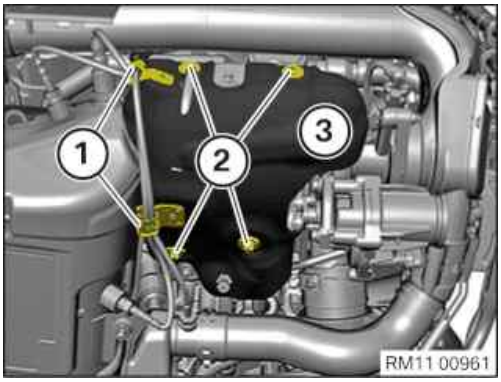
▶ Removing heat shield from top exhaust turbocharger

WARNING

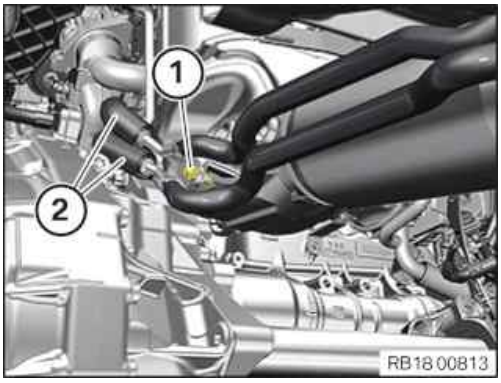
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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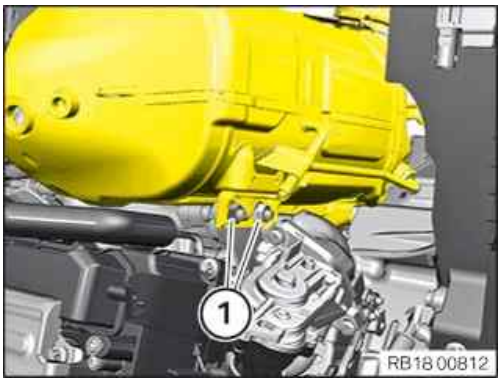
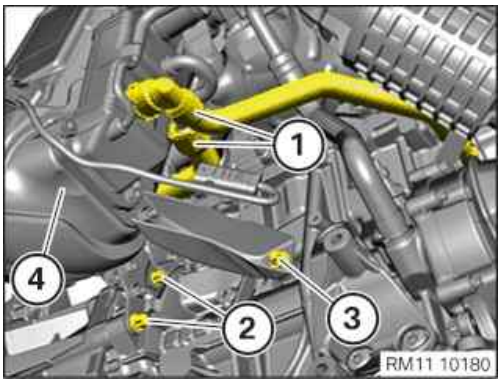


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

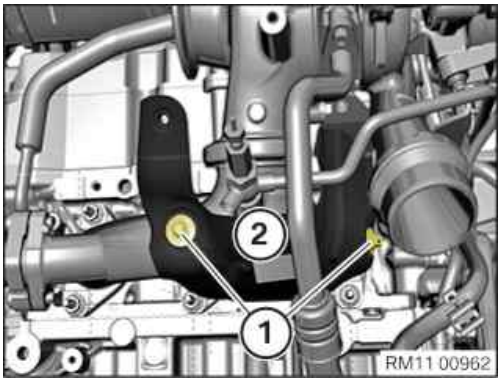
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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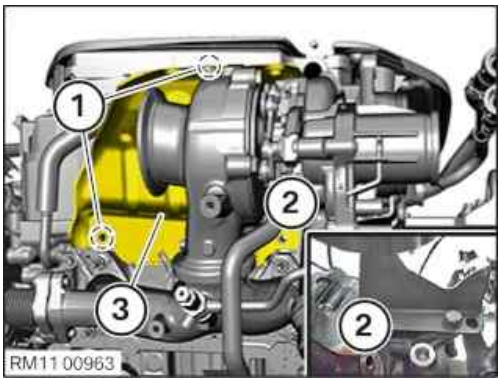


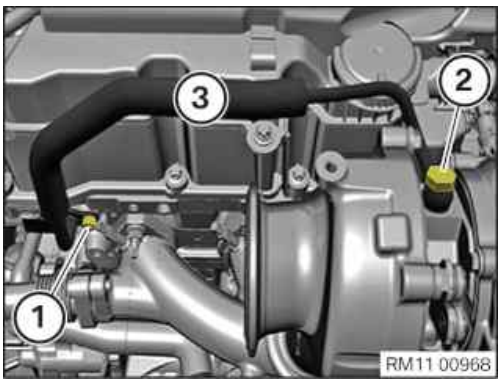
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

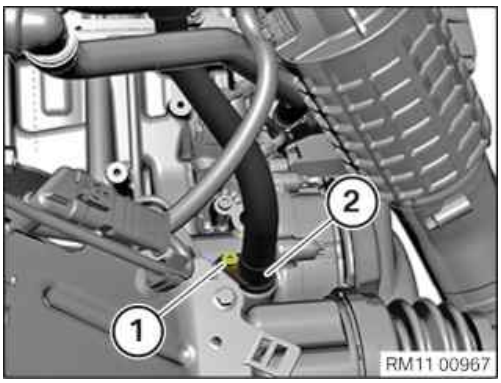
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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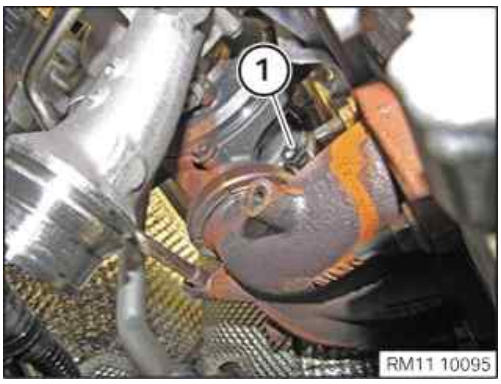
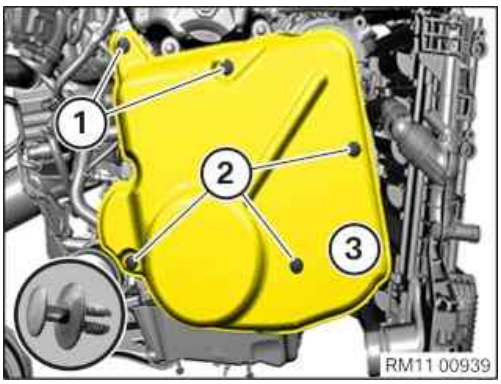
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

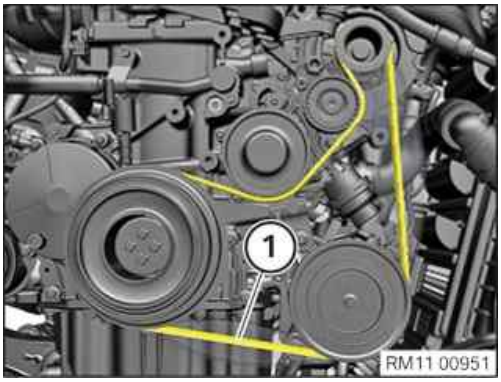
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

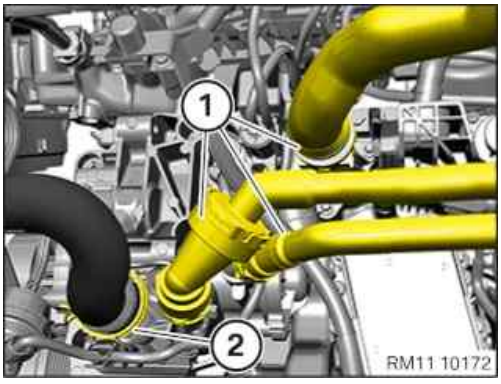
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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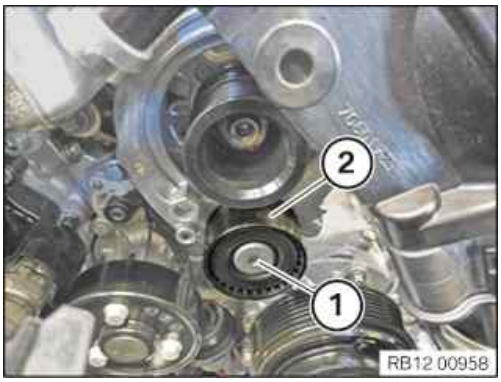
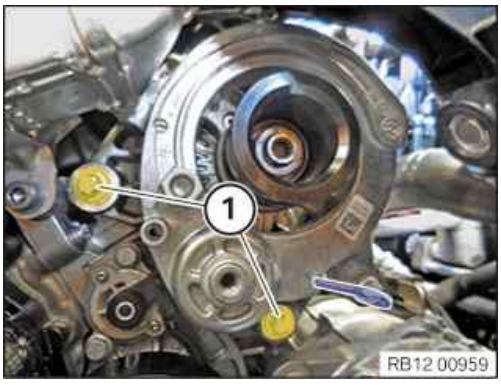
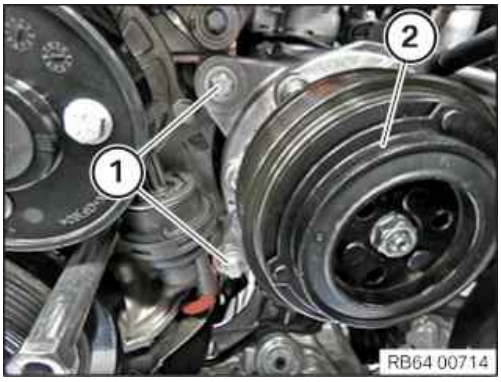


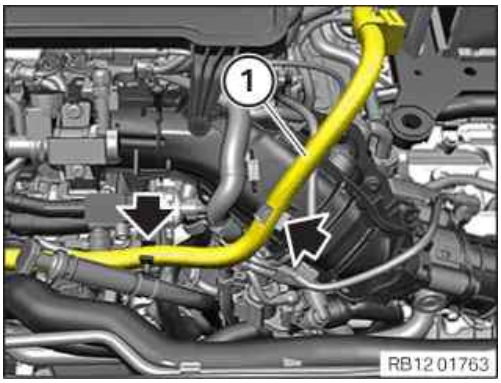
- Loosen screw (1).
- Remove the deflecting element (2).



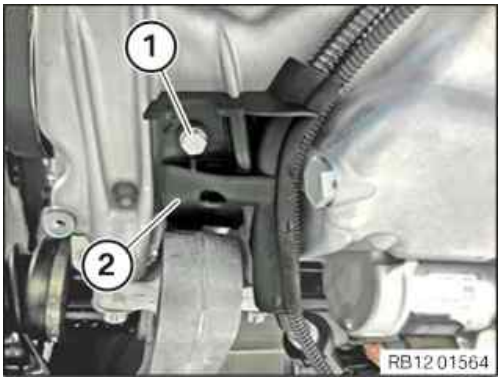
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

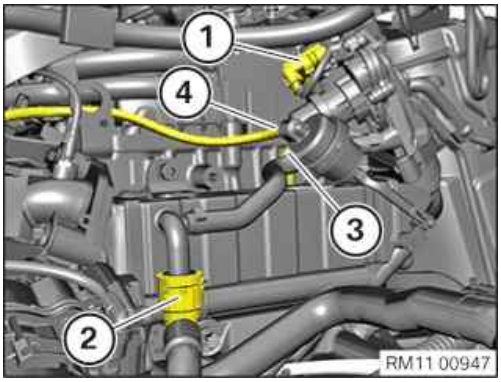
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

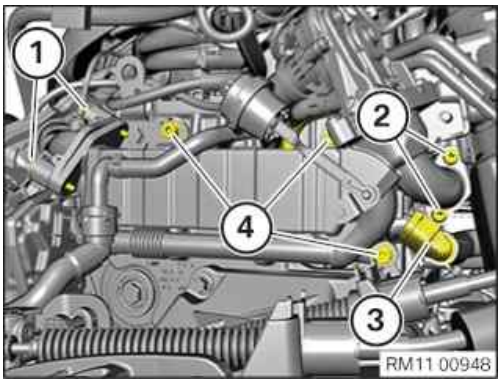
- Perform all work only on components that have cooled down.



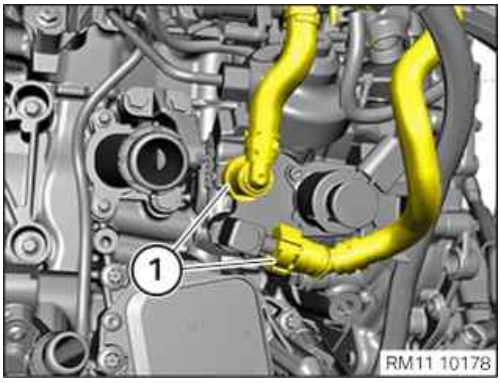
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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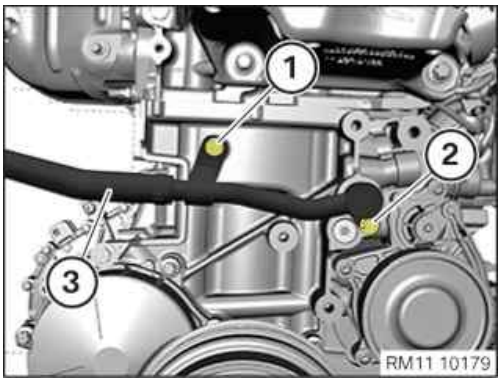


- Loosen screws (1) and (2).
- Remove coolant line (3).

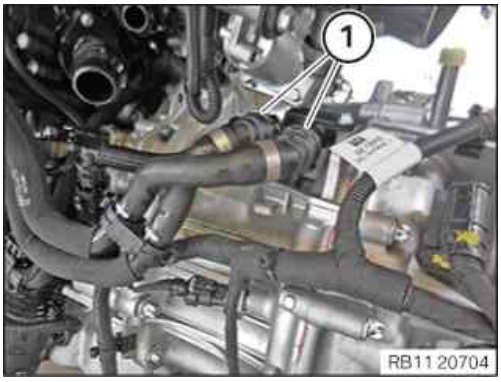
8 – Disconnect the engine from the double-clutch transmission (DKG)

RISK OF DAMAGE

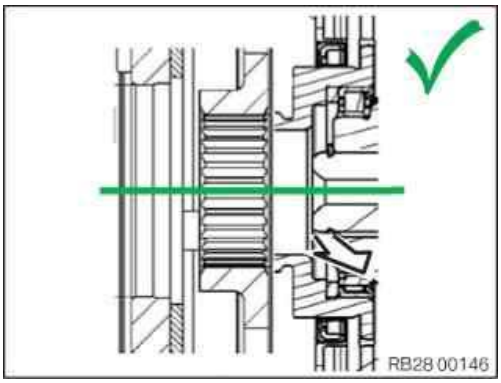
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

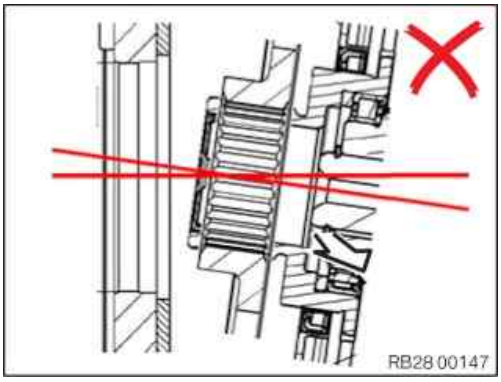
- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.



- Unlock and release coolant line (1).
- Catch and dispose of escaping coolant.



- **Correct:** Pull the double-clutch transmission (DKG) horizontally off the flywheel.



- **Wrong:** Do not pull the double-clutch transmission (DKG) off the flywheel if it is tilted.

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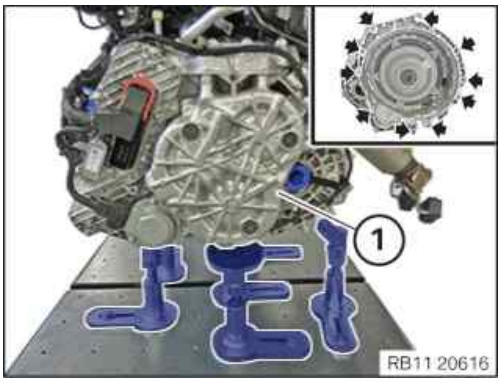
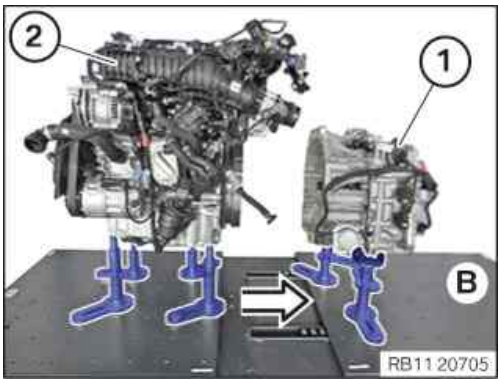


- Remove screws (arrows).
- Pull the double-clutch transmission (DKG) (1) off the flywheel when it is **absolutely** horizontal.



NOTICE

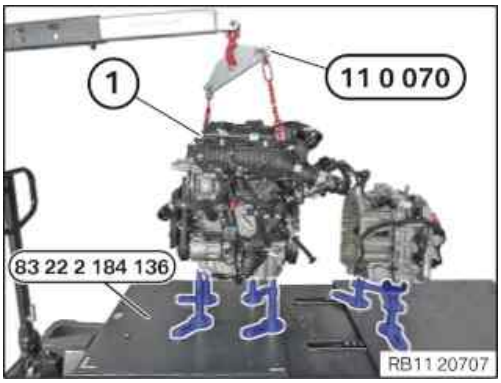
Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table top (B) in the direction of arrow and disconnect double-clutch transmission (DKG) (1) from the engine (2).

- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach the engine lifter with the special tool **0 490 579 (11 0 070)** and lift the engine (1) off the lifting table.

9 – Mount engine on assembly stand

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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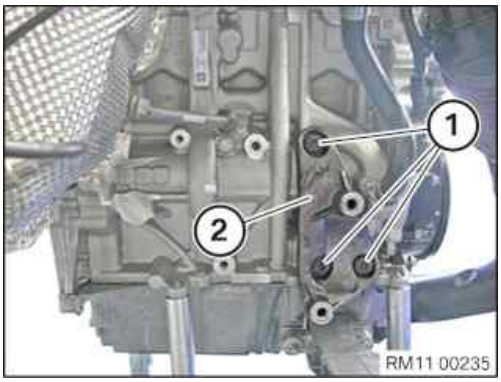
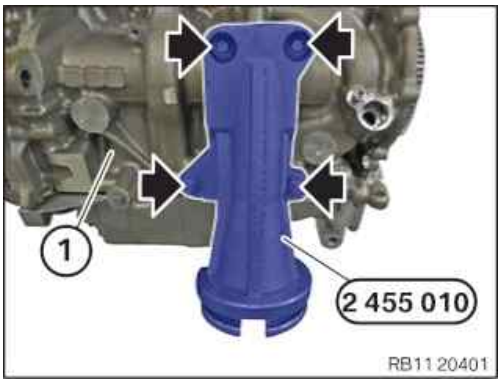


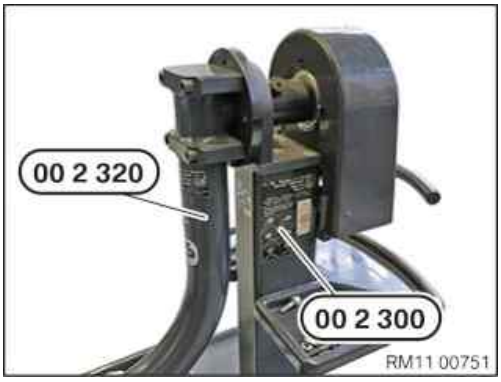
- Loosen screws (1).
- Guide out and remove holder (2).



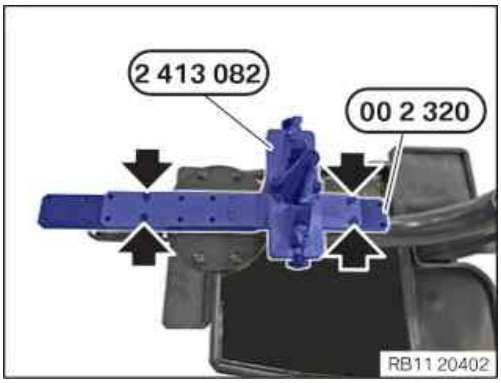
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.

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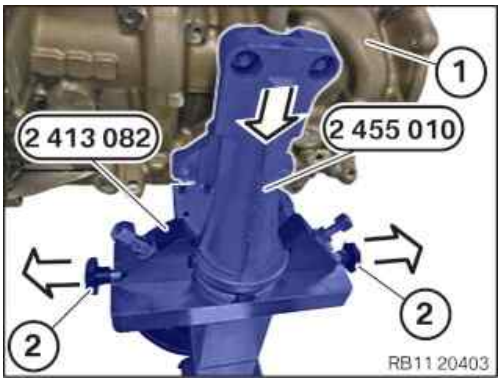
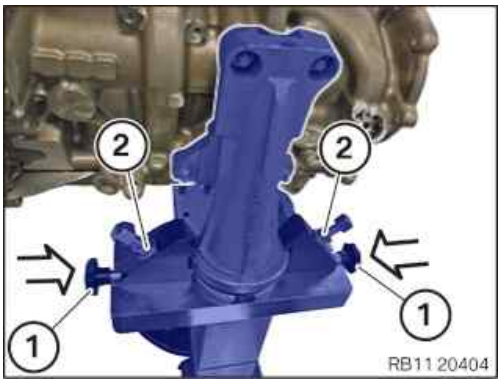


- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



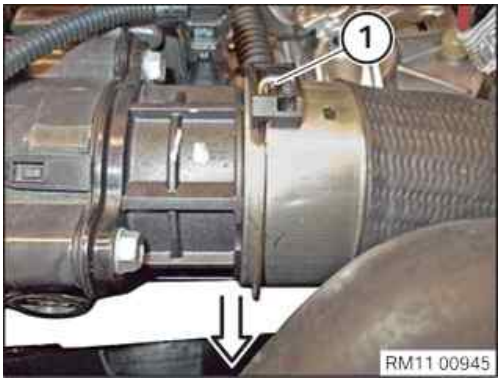
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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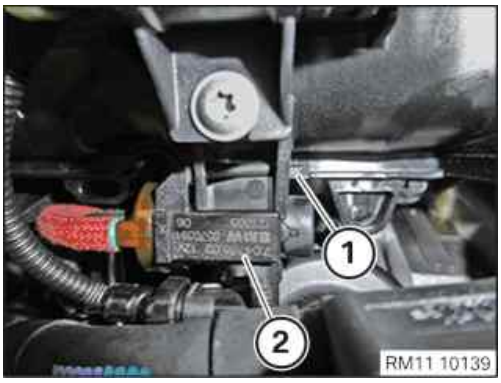
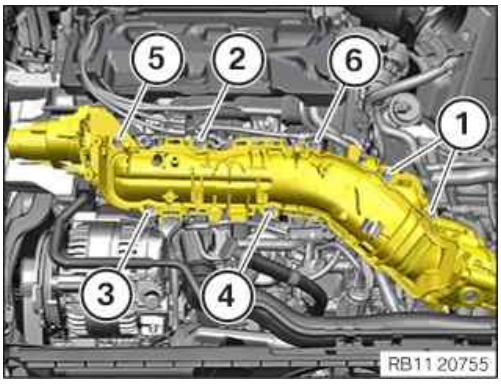
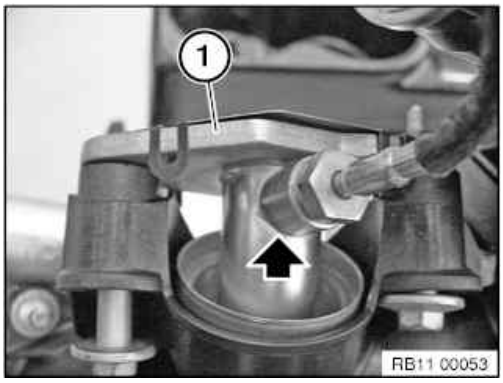


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

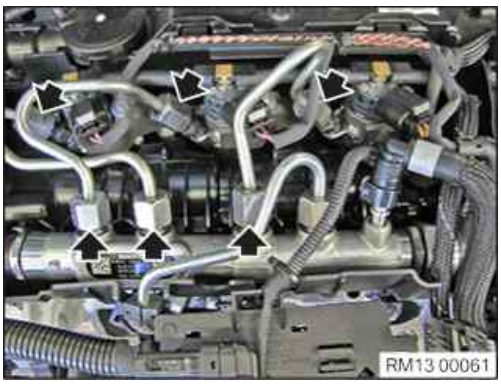
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

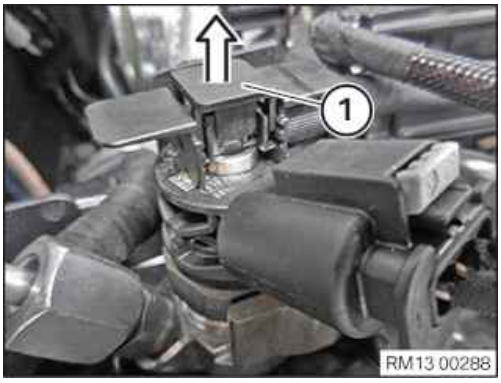
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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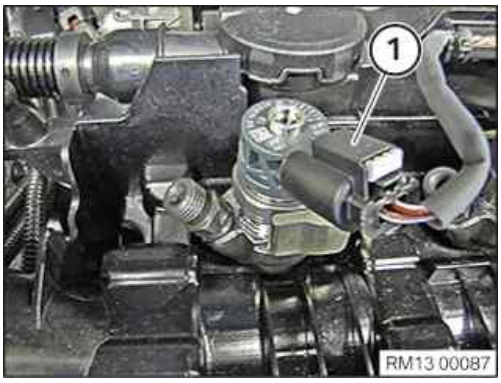
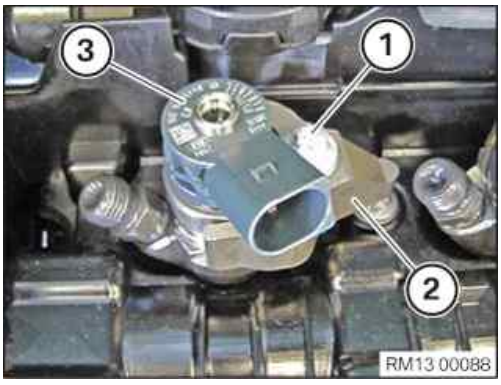


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

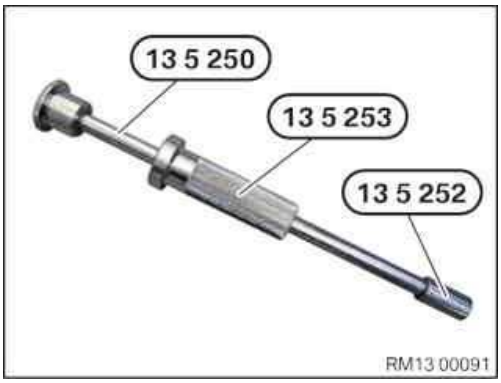
▶ **Loosen stuck injectors**

RISK OF DAMAGE

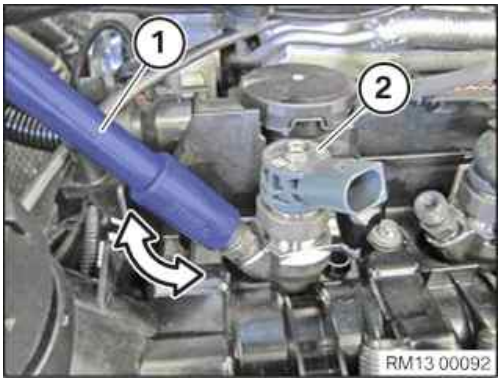
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

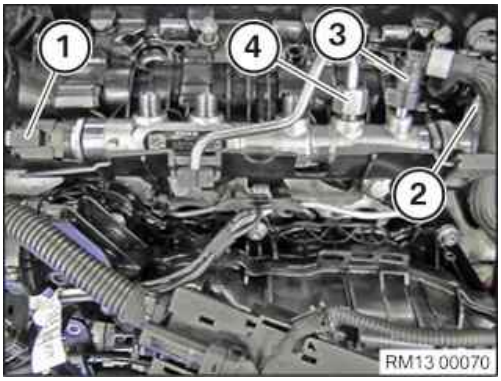
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

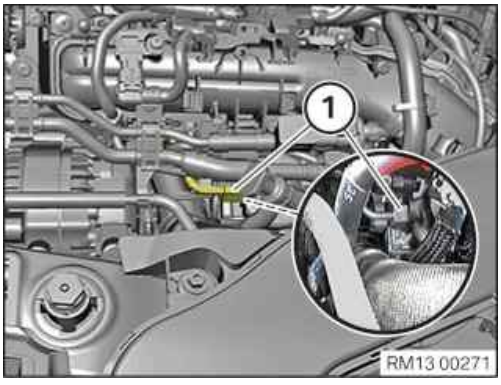
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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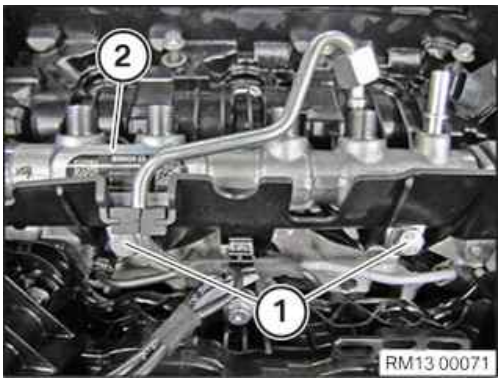
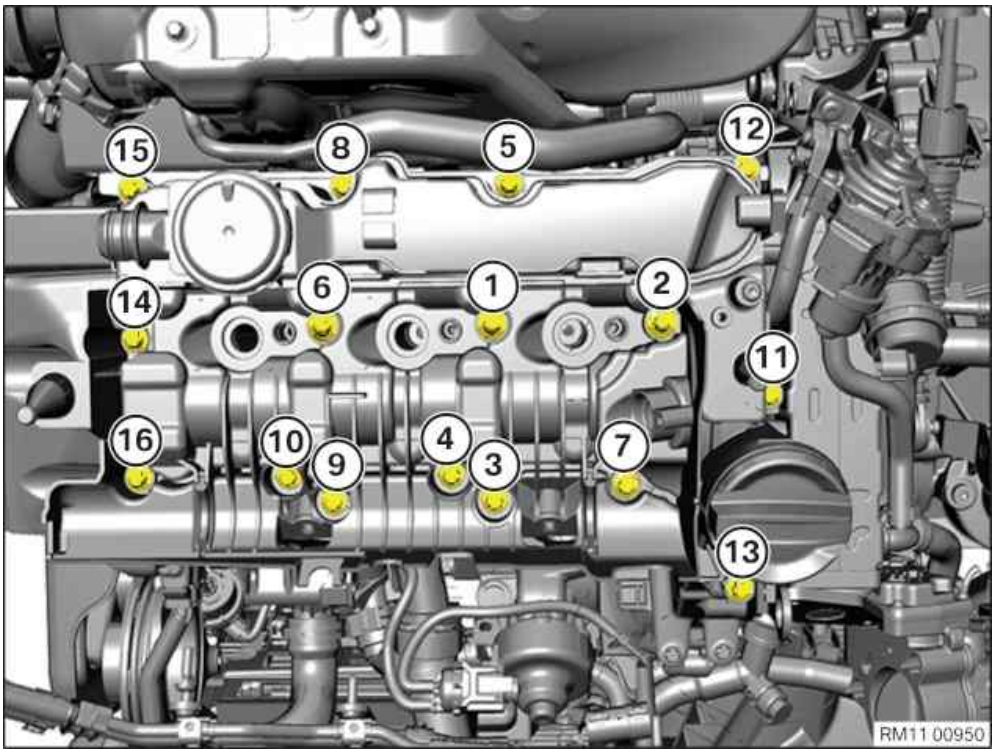


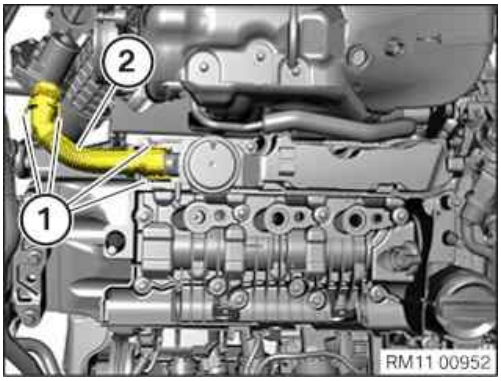
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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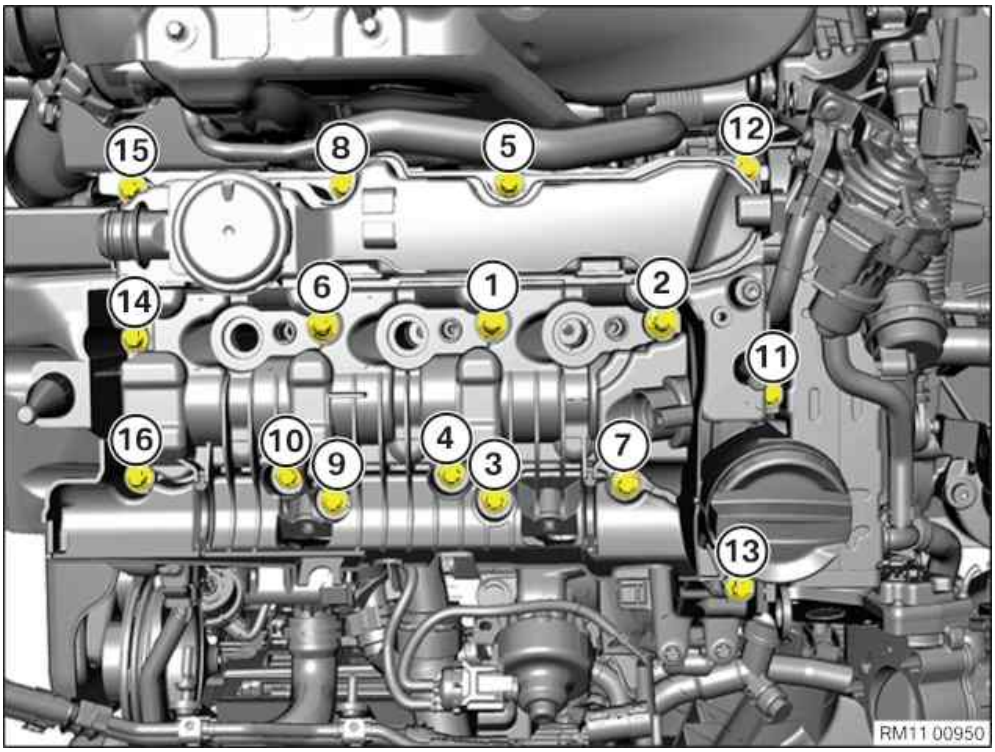

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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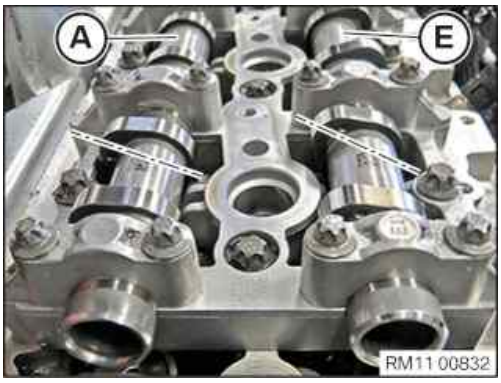
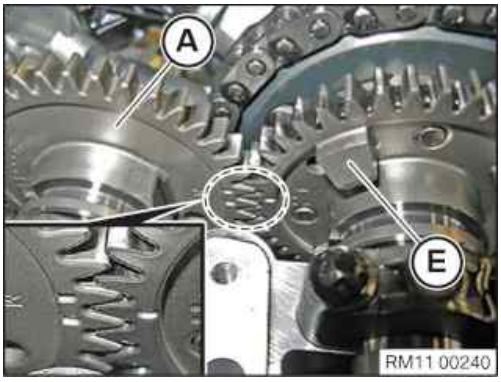


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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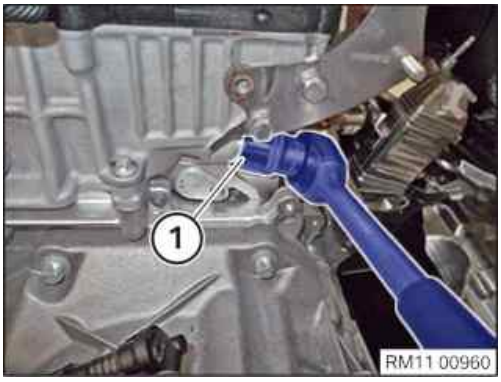
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

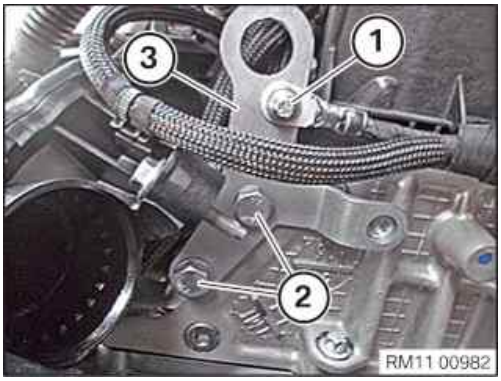


TECHNICAL INFORMATION

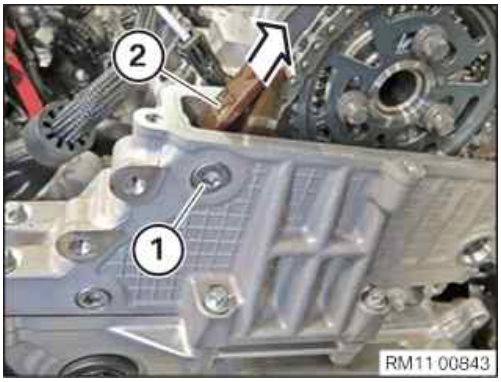
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

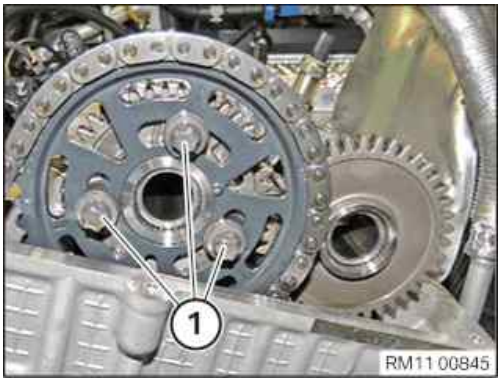


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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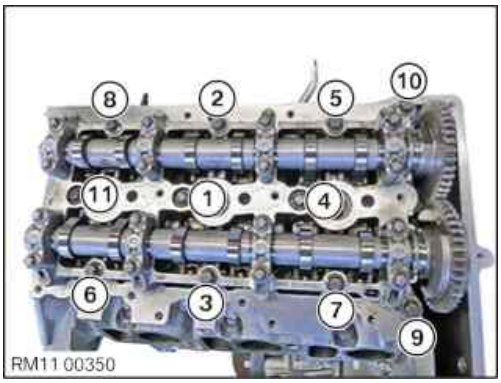
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

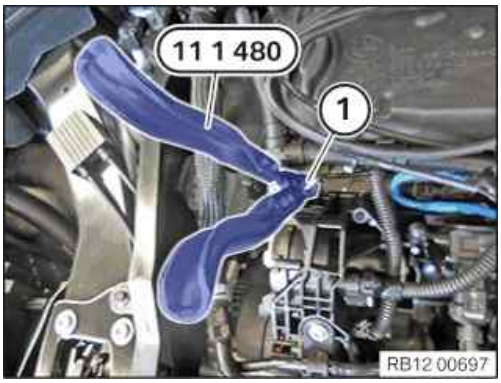
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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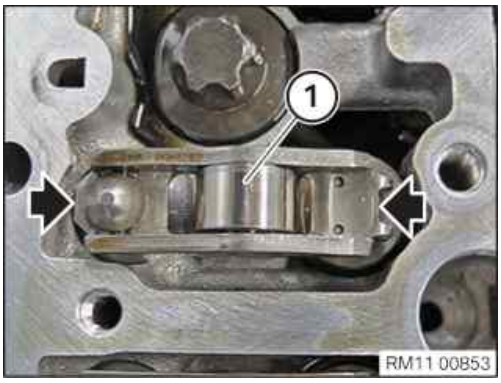


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

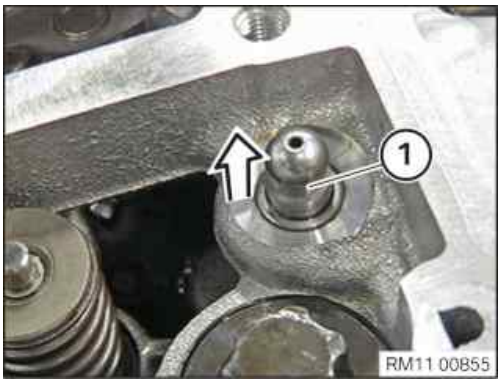
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

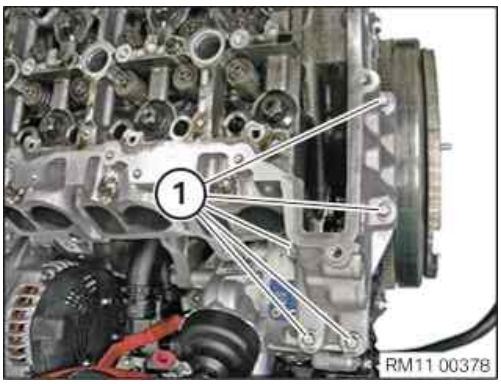
24 – Removing cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Loosen screws (1).

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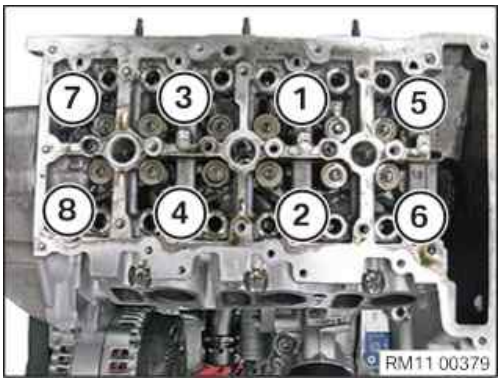
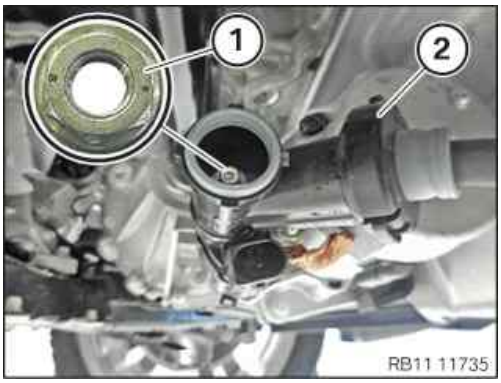


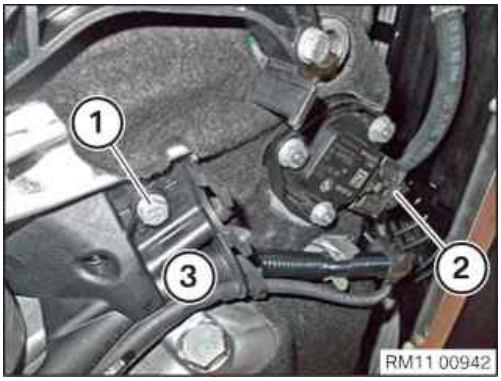
- Loosen the cylinder head bolts in the sequence from (8) to (1).
- Remove cylinder head.

25 – Removing the acoustic cover of the oil sump

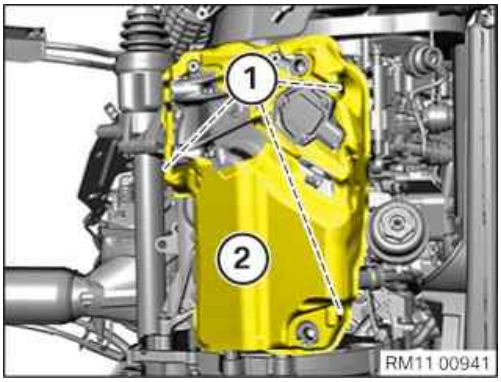
- Unlock connector (1) and pull off.
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Unscrew the screw (1) on the wiring harness to the oil sump.
- Unlock and pull off connector (2) on the oil-level sensor.
- Place wiring harness (3) to one side.



- Remove the expanding rivets (1) on both sides of the acoustic cover.
- Feed out and remove the acoustic cover (2).

26 – Remove oil sump

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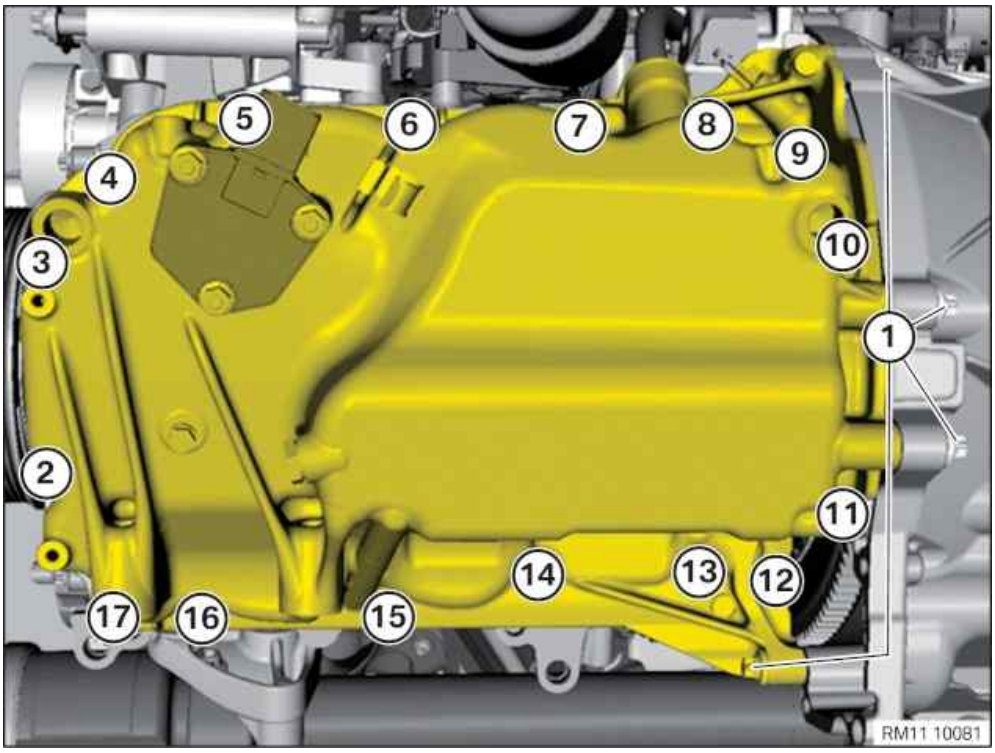
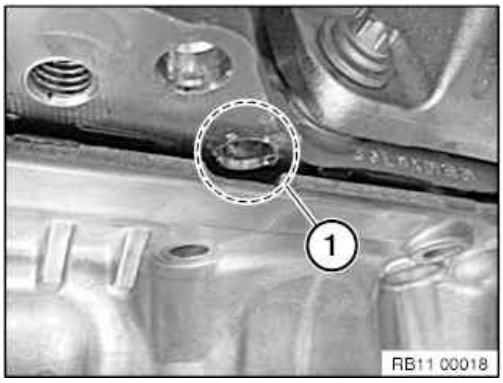
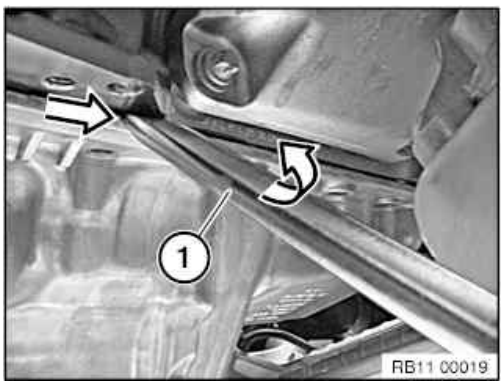
- Loosen screws (1).
- Feed out starter motor and remove.



- Release transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release the oil sump only in area (1).



- Release the oil sump carefully using a suitable mounting lever (1) at the appropriate position in the direction of the arrow.
- Secure the oil sump to prevent it from falling.

27 – Remove the oil vacuum pump

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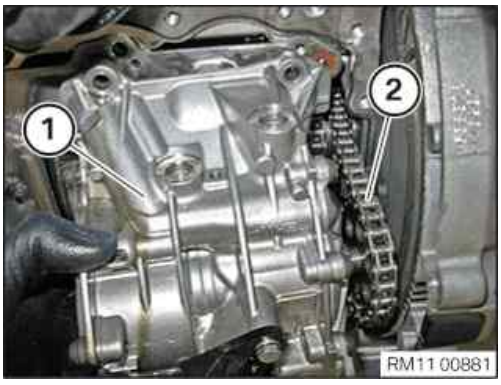
- Loosen screws (1) of the oil vacuum pump (2).



- Remove oil vacuum pump (1) and remove from the drive chain (2).

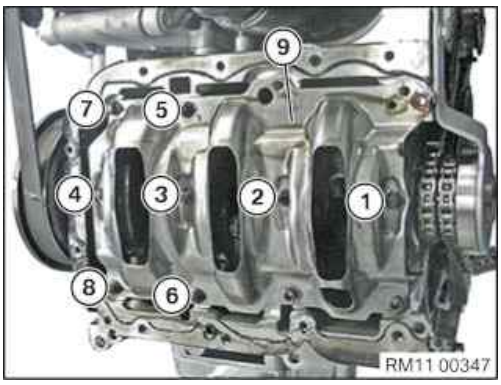
28 – Removing the oil deflector

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen screws in the order (8) to (1).
- Guide out and remove the oil deflector (9).

29 – Remove the connecting rod bearing cap

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

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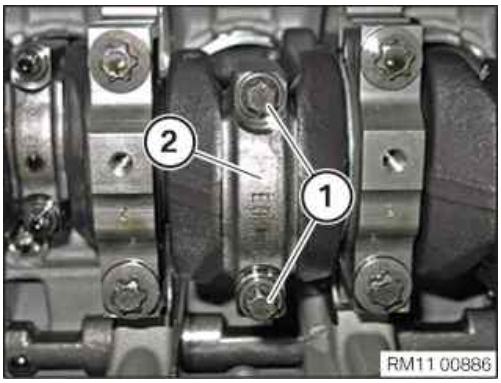
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

- Turn the crankshaft until the connecting rod bearing journal (1) reaches a vertical position.



- Unscrew the connecting rod bolts (1).

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing cap (2) and put to one side in the correct order.

MAIN WORK

30 – Removing the piston with connecting rod

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Screw special tool **0 496 144 (11 8 860)** in at large connecting rod eye.

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RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Remove the piston (1) and connecting rod.

31 – Remove the connecting rod bearing shells

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod (1) and store it properly.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Remove the connecting rod bearing (2) from the connecting rod bearing cap (1) and store it properly.

32 – Measure side clearance of piston rings

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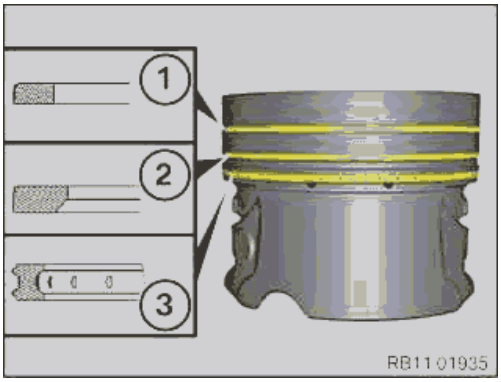
RISK OF DAMAGE

Damage to the piston rings.

Piston rings can bend or break due to large applications of force.

- Handle piston rings carefully.
- Only bend piston ring up lightly.

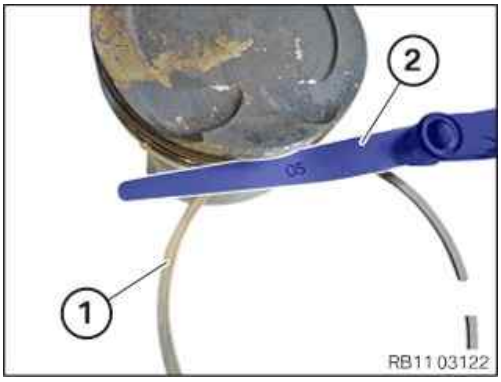


TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

- Mounting orientation of the piston rings

Position number	Description
1	1. Piston ring (plain rectangular compression ring)
2	2. Piston ring (taper faced piston ring)
3	3. Piston ring (oil scraper ring with spiral expander)



Check

- Install all piston rings (1) consecutively as shown in the piston ring groove. Measure the side clearance with a feeler gauge (2).

desired state

- The side clearance of the piston rings is within the tolerance.

Side clearance of piston rings

Clean all components before measuring the side clearance.	
Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

Result

» The side clearance of the piston rings is outside of the tolerance.

Measure

- Renew the piston ring.

33 – Measure the piston diameter

Check

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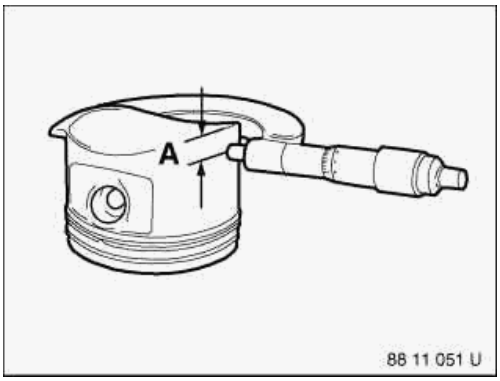


- Position the measuring bolt in the area (A) and measure the piston installation clearance 90 ° transversely to the gudgeon pin.

Piston diameter

Measure the piston diameter at distance (A) from the lower end of the piston skirt.	
Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Result

» The piston does not correspond to the specifications.

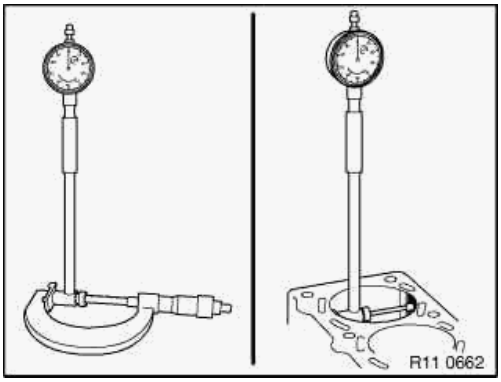
Measure

- Renew the piston.

34 – Measure the cylinder bores

Prerequisite

Cylinder barrel is cleaned.



Check

- Adjusting measuring screw to nominal dimension of cylinder bore.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

- Insert internal measuring device into measuring screw and set to zero.
- With the internal measuring device, measure the cylinder at the following points. Check the deviations from the nominal dimension.
  - Lower third of the cylinder bore in direction of travel,
  - Lower third of the cylinder bore transversely to direction of travel,
  - Middle third of the cylinder bore in direction of travel,
  - Middle third of the cylinder bore transversely to direction of travel,
  - Upper third of the cylinder bore in direction of travel,
  - Upper third of the cylinder bore transversely to direction of travel.

Cylinder bore

Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Result

» Cylinder does not correspond to the specifications.

Measure

- Replace motor.

  Parts: Engine

35 – If necessary: Renew the piston

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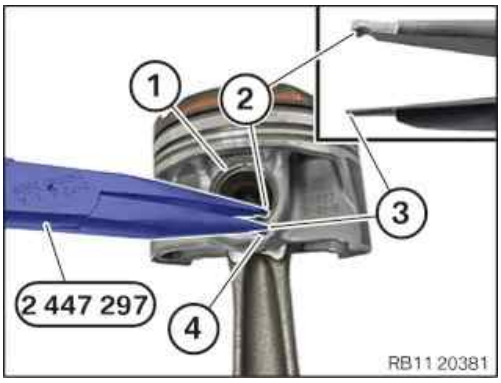


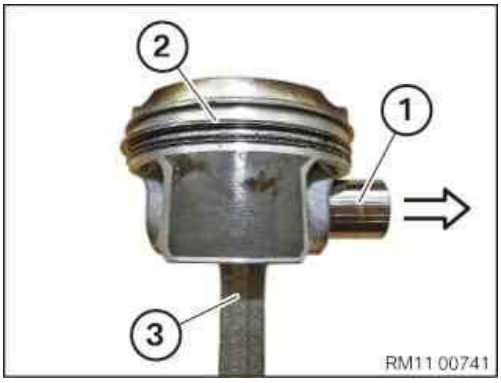
CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

- Use special tool to remove the gudgeon pin circlip.
- Insert the flat side (3) of special tool into the groove (4).
- Grab and remove the gudgeon pin circlip (1) with the arched side (2).



TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Remove the gudgeon pin (1) in the direction of arrow.
- Remove piston (2) from connecting rod (3).

- Renew piston with gudgeon pin.

  Parts: Pistons

TECHNICAL INFORMATION

Piston and gudgeon pin are matched to each other.
Always install piston and gudgeon pin together and do not switch by mistake.

- Position piston (2) on the connecting rod (3).
- Install the gudgeon pin (1) in the direction of arrow.
- You must be able to install the gudgeon pin (1) without major effort.
- Gudgeon pin (1) must be free of play in piston and connecting rod.

- Prepare special tool on the fitting aid .

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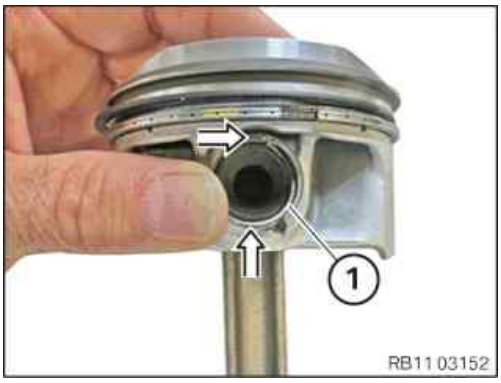
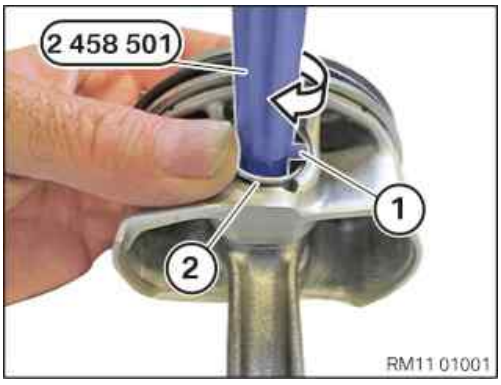
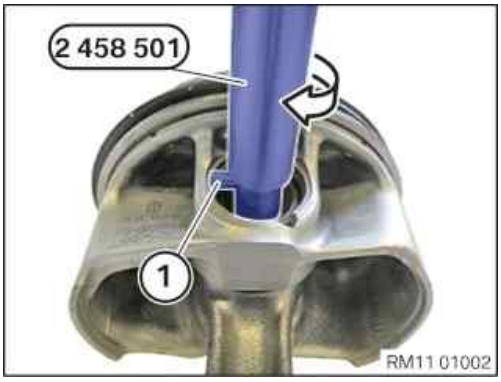


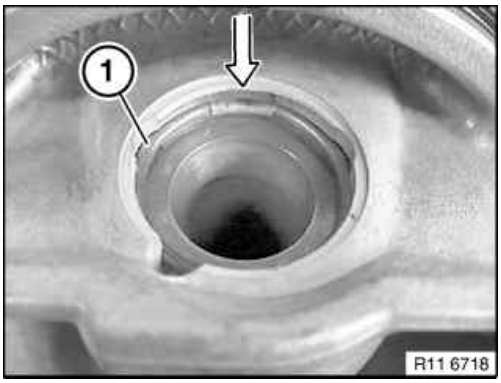
- Insert the gudgeon pin circlip (1) into the groove on the piston (see arrows).



- Screw in the positioned gudgeon pin circlip (2)with and with the guide pin (1) in the direction of the arrow.



- Screw the gudgeon pin circlip with guide pin (1) into the groove of the piston in the direction of the arrow.



- Gudgeon pin circlip (1) must be fitted correctly in the groove (arrow).

36 – Install the connecting rod bearing shell

RISK OF DAMAGE

Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

- Always install all bearing shells and bearing supports in the same position from which they were removed.

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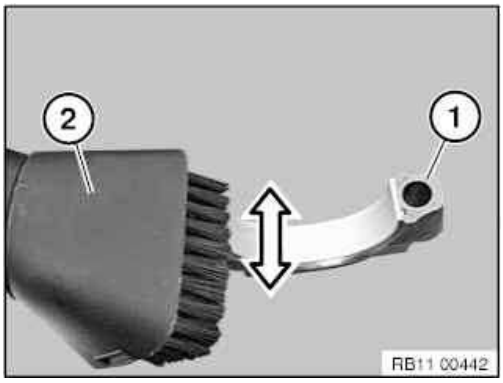
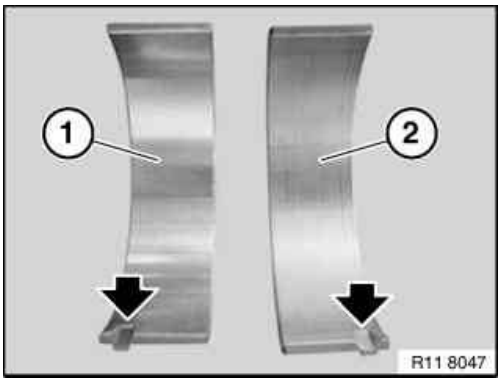
TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.

A single connecting rod is not permitted to be replaced. Always replace all connecting rods.

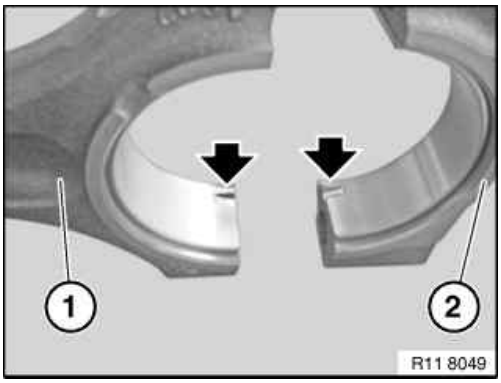


- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



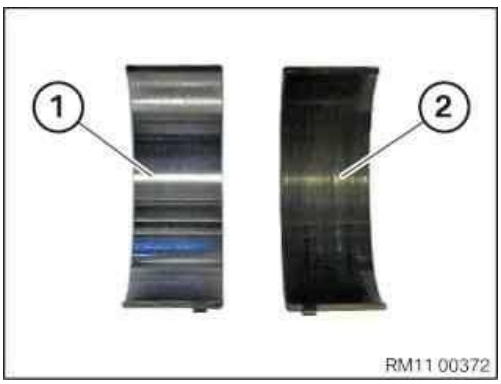
- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing (1) for the connecting rod bearing cap and the connecting rod bearing (2) for the connecting rod are each equipped with protection against incorrect assembly as shown in the marked area.



- To avoid incorrect assembly: Pay attention to marks (arrows).

  The connecting rod bearing cap (2) and the connecting rod (1) are each equipped with protection against incorrect assembly.



- Makes sure that a light connecting rod bearing shell (1) and a dark connecting rod bearing shell (2) are installed for each connecting rod.

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TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Insert the dark connecting rod bearing shell (2) into the connecting rod (1).
- Oil the connecting rod bearing shell (2).

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

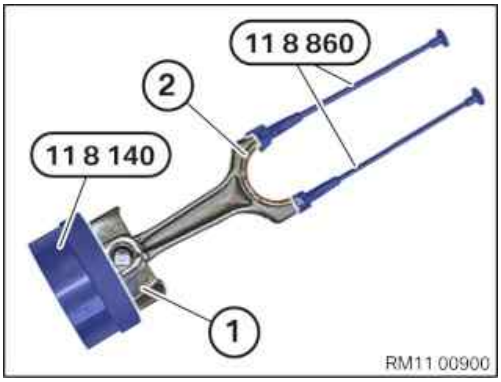
- Insert the light connecting rod bearing shell (2) into the connecting rod bearing cap (1).
- Oil the connecting rod bearing shell (2).

37 – Installing piston with connecting rod

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.

Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.



- Coat the pistons (1) and piston rings lightly with oil.
- Mount the special tool **0 493 582 (11 8 140)** on the piston (1).
- Screw the special tool **0 496 144 (11 8 860)** in on the large connecting rod eye (2).

- Insert the piston with the special tool **0 493 582 (11 8 140)** with the arrow pointing to cylinder 1.

RISK OF DAMAGE

Damage on the cylinder wall and oil spray nozzles.

Major force can scratch the cylinder wall and bend the oil spray nozzles.

- Carefully move the piston and connecting rod in the engine block.

- Install the piston in the crankcase.

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- Remove special tool **0 496 144 (11 8 860)** from large connecting rod eye.

POSTPROCESSES

38 – Install the connecting rod bearing cap

RISK OF DAMAGE

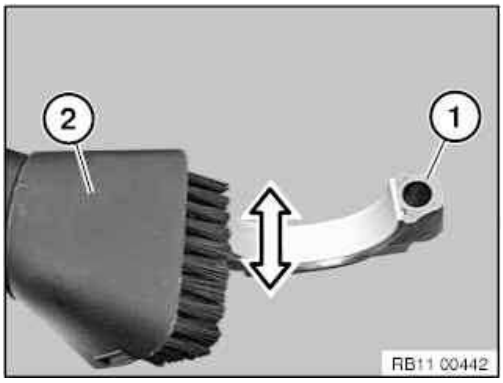
Engine damage caused by incorrectly installed bearing shells and bearing supports.

Engine damage may result from incorrectly installing bearing shells and bearing supports.

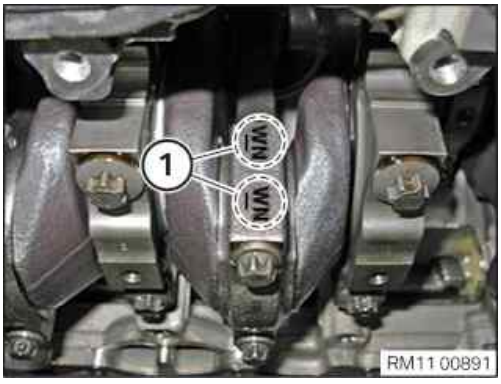
- Always install all bearing shells and bearing supports in the same position from which they were removed.

TECHNICAL INFORMATION

The connecting rods of the engine are balanced and are matched to each other.
A single connecting rod is not permitted to be replaced. Always replace all connecting rods.



- Vacuum the crack surfaces (1) with a conventional vacuum cleaner (2).



- Attach the connecting rod bearing caps to the connecting rod until the designations (1) match.

TECHNICAL INFORMATION

Piston, gudgeon pin, connecting rod and connecting rod bearing shells are matched to each other and balanced.
Always install the piston, gudgeon pin, connecting rod and connecting rod bearing shells in the cylinder from which they were removed.

- Make sure that the connecting rod bearing is attached to the same connecting rod that it was detached from.

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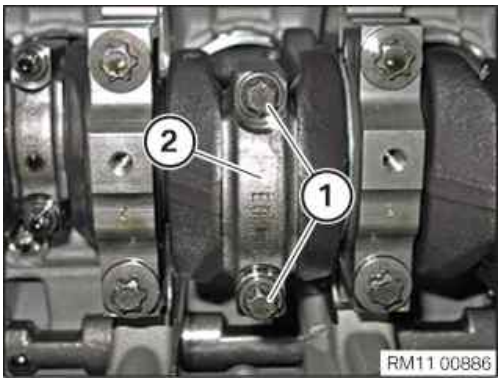
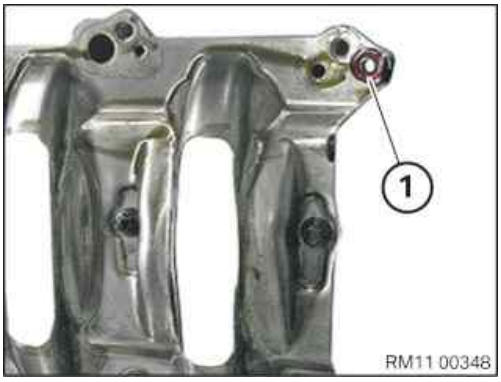


- Position the connecting rod bearing cap (2).
- Tighten the bolts (1) with the special tool **0 490 504 (00 9 120)**.

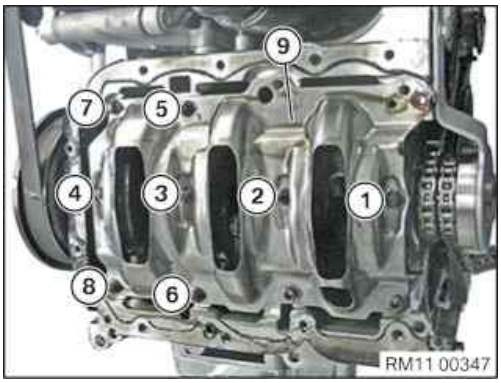
Connecting rod bearing cap to connecting rod

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

39 – Installing the oil deflector



- Check sealing ring (1) for damage and replace oil deflector if necessary.



- Insert and install the oil deflector (9).
- Renew screws (1) to (4).

  Parts: Bolts
- Hand-tighten the bolts (1) to (4).
-
- Tighten the screws (1) to (8).

Oil deflector to crankshaft bearing cap

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

- Tighten the screws (5) to (8).

Oil deflector to crankcase

M8x14		Tightening torque	19 Nm

40 – Install the oil vacuum pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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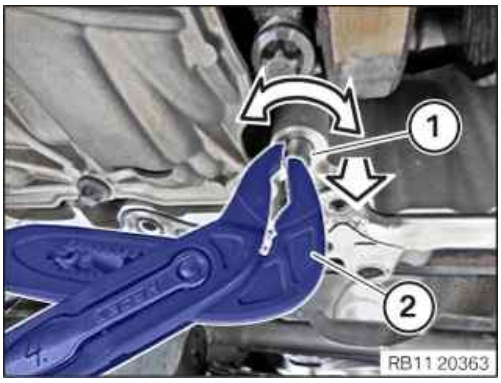
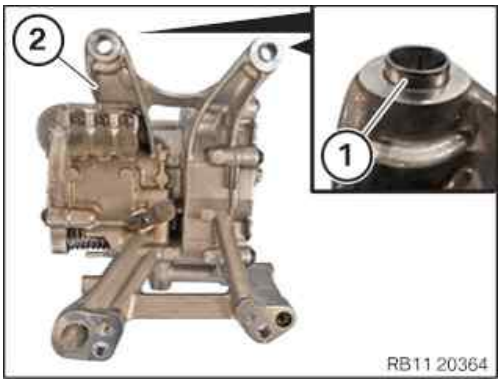
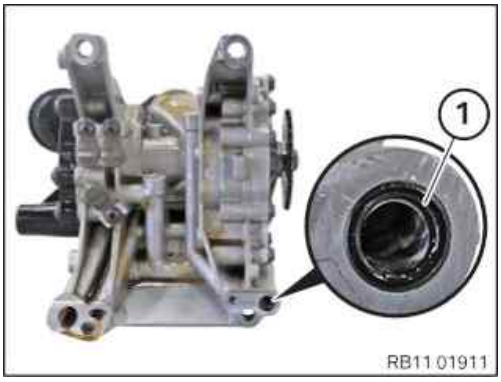


- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

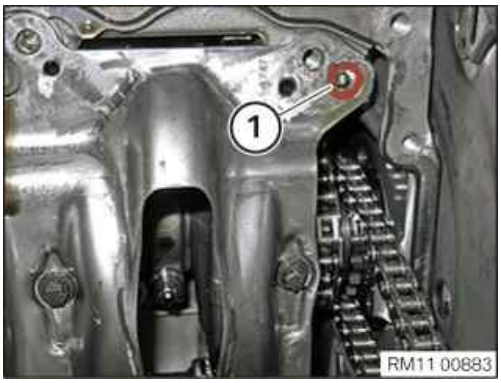
  Parts: Centring sleeves



- Install centering sleeves (1) in the oil vacuum pump (2).

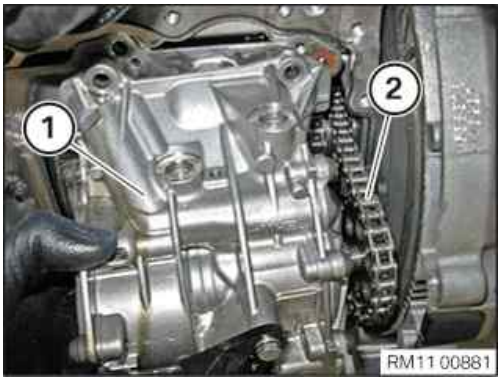


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).

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- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1) of the oil vacuum pump (2).

Oil vacuum pump to crankcaseB37

M8x35	*Renew screws.*	Tightening torque	15 Nm
		Angle of rotation	45 °

41 – Refitting sump

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

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TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

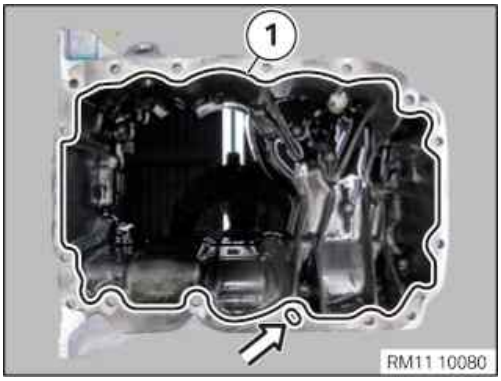
- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)



TECHNICAL INFORMATION

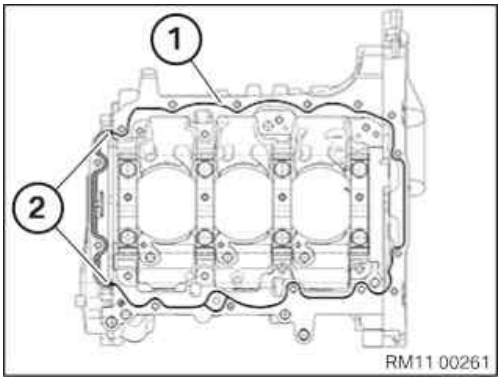
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.

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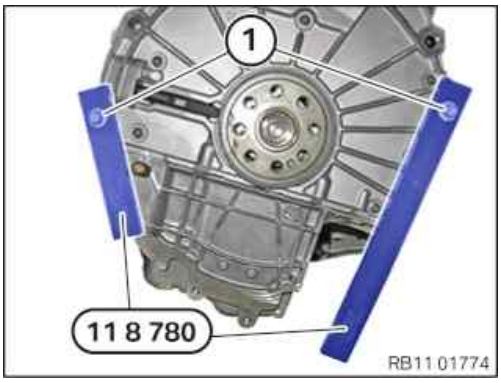
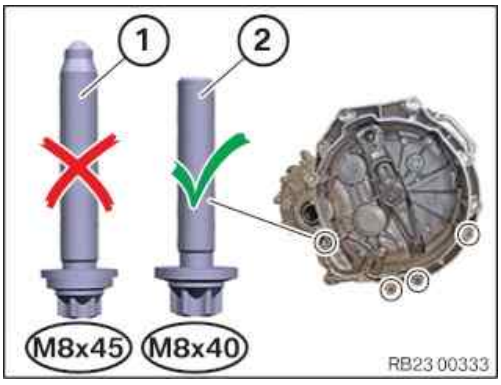


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

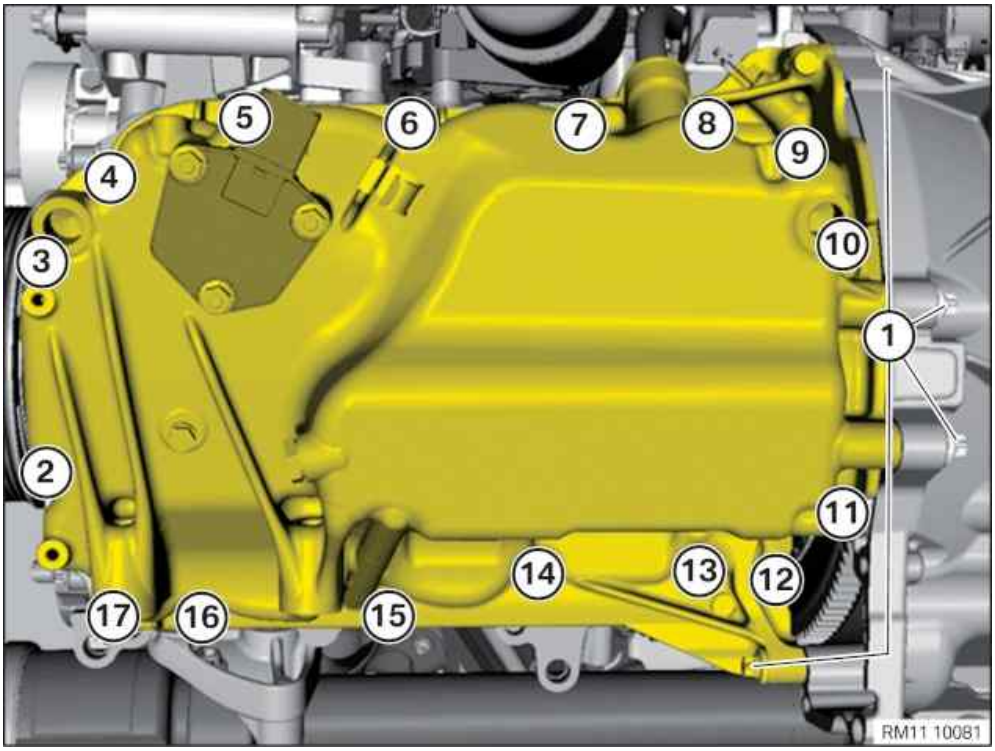
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Tighten screws (2) to (17) **hand-tight**, do **not** tighten fully.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws (2) to (17) on the oil sump.

Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten the transmission bolts (1) on the oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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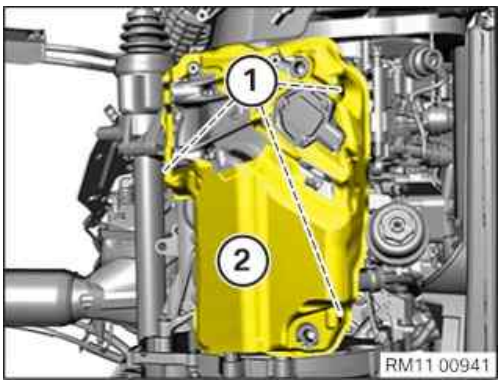
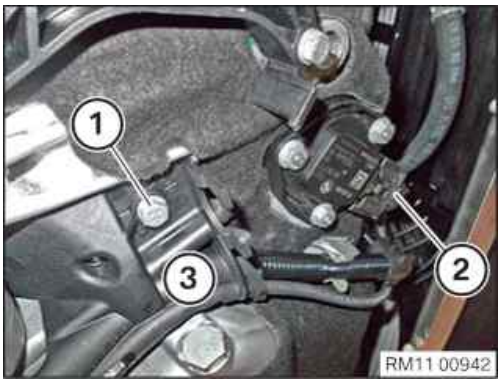
42 – Installing the acoustic cover for the oil sump



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



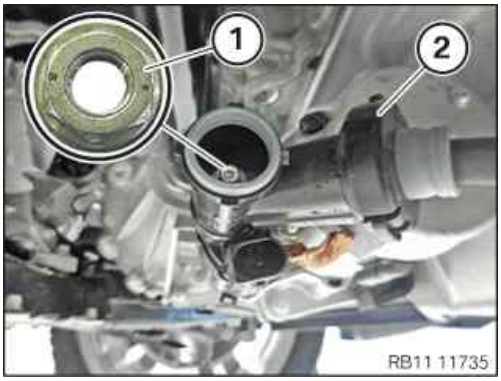
- Position wiring harness (3).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

- Connect and lock the connector (2) on the oil-level sensor.

  The connector must lock audibly.



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).

  The connector must engage audibly.

43 – Mounting the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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RISK OF DAMAGE

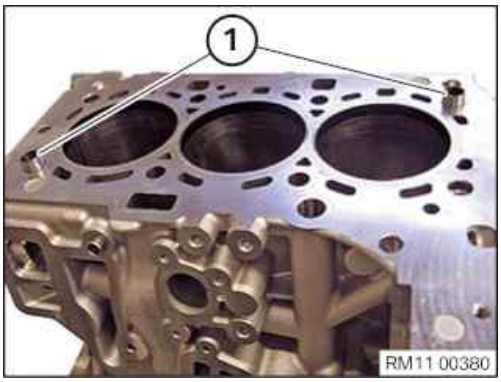
Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

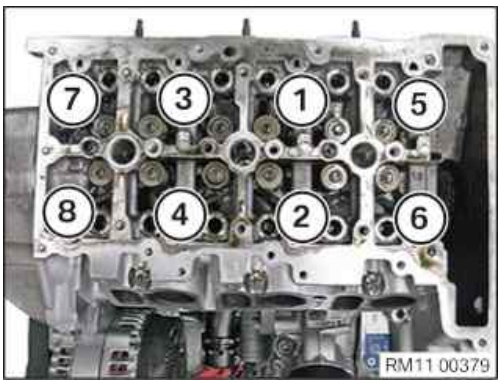
TECHNICAL INFORMATION

Do not remove bolt coating.



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.
- Clean tapped bores.
- Position the cylinder head on the crankcase.



- Fit new cylinder head bolts.

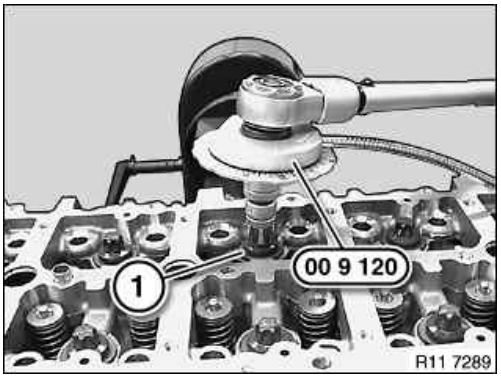
  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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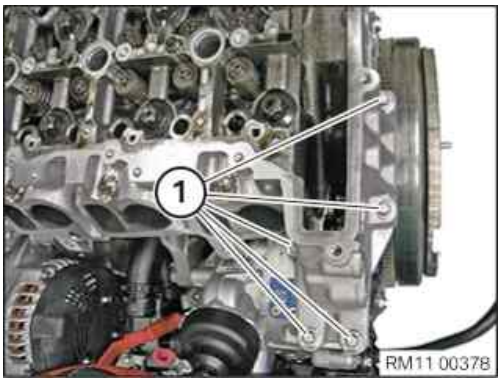


- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

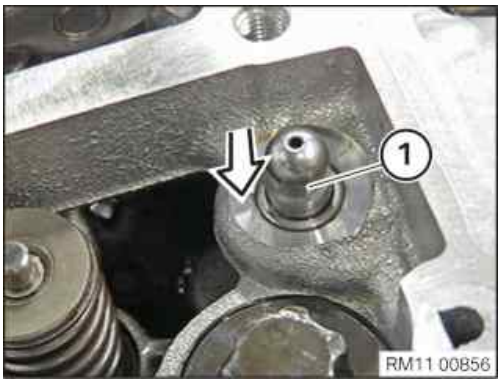
44 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

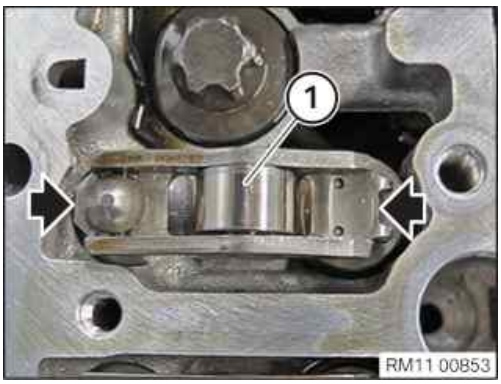


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

45 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.



- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

46 – Install glow elements

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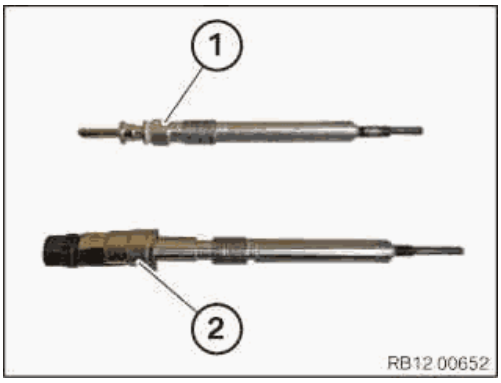
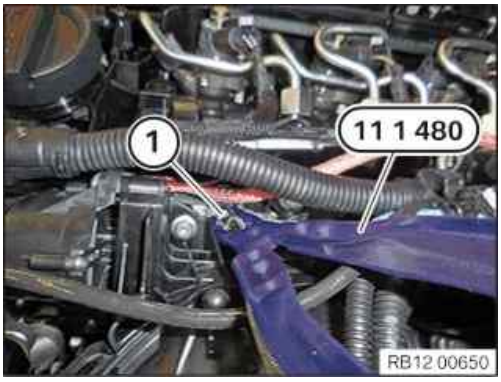


- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

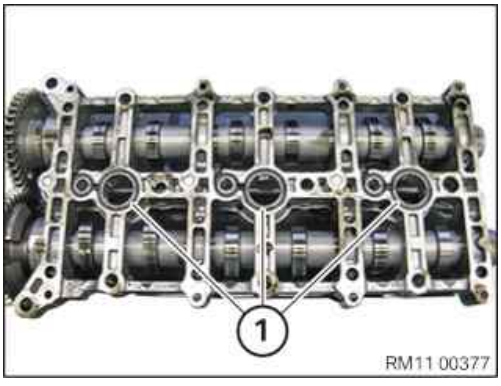
47 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Renew the seals (1) on the camshaft support.

  Parts: Seals

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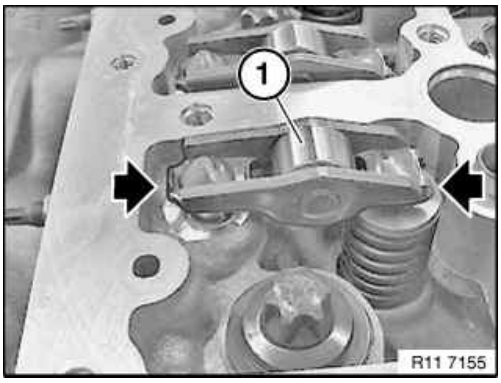
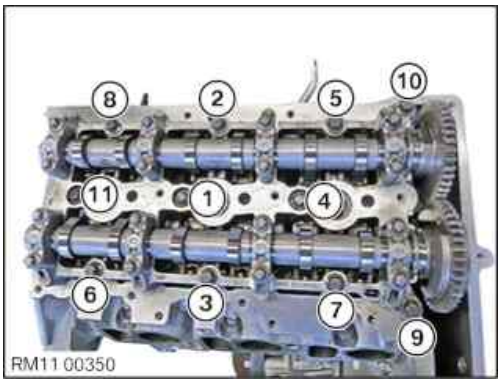


- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

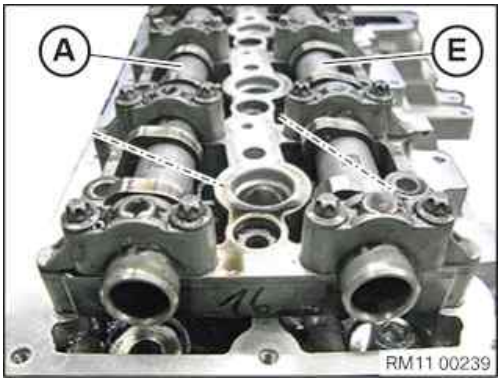
M7x35		Tightening torque	13 Nm

48 – Adjusting the timing of the camshafts

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

▸ **Remove chain tensioner piston**

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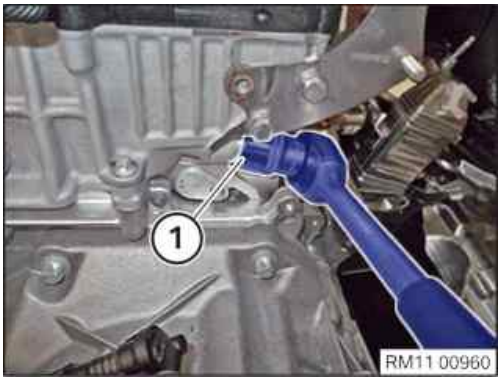
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

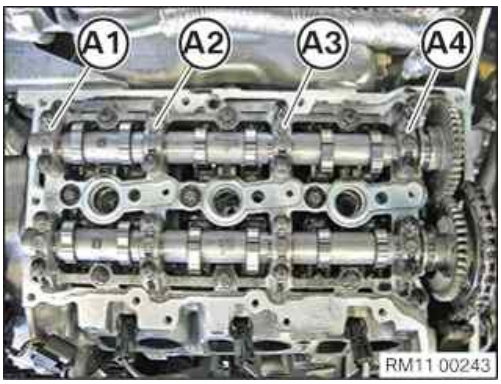
▶ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

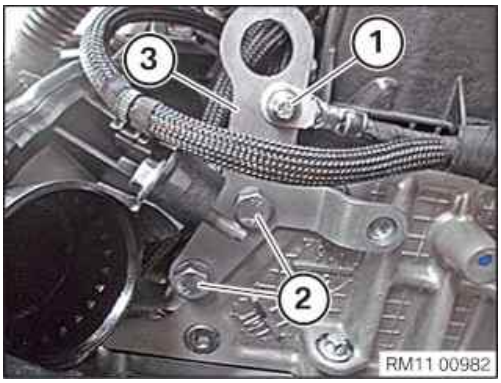


TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▶ **Remove the timing chain guide rail**



- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).

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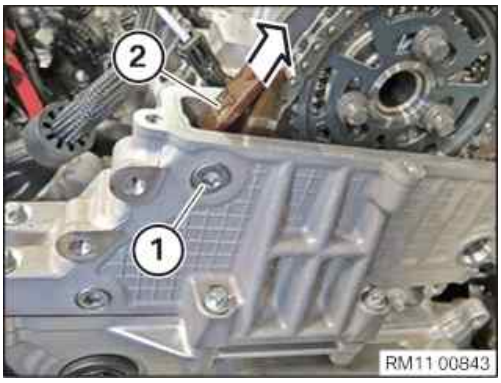
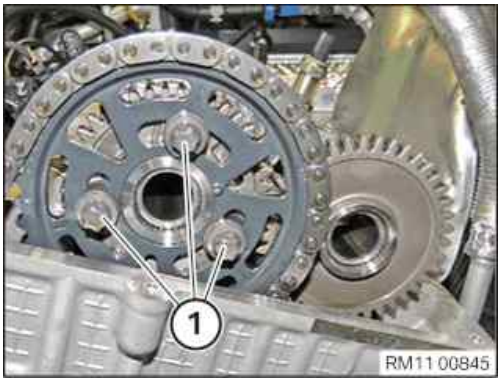


- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

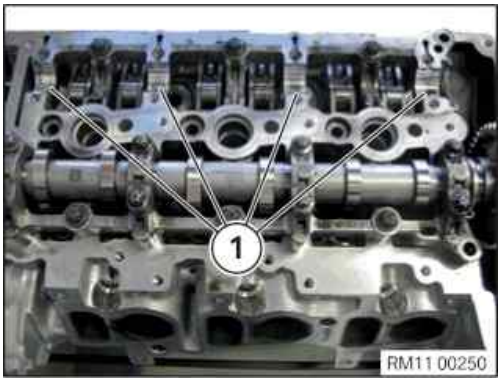
▶ **Installing exhaust camshaft**

RISK OF DAMAGE

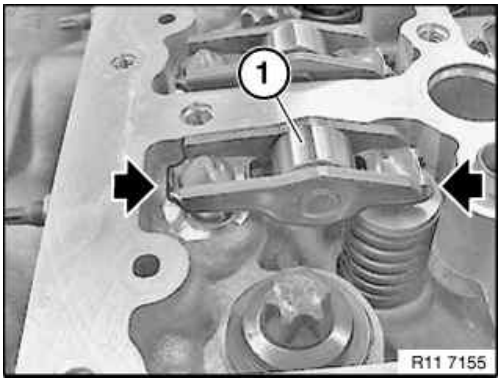
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

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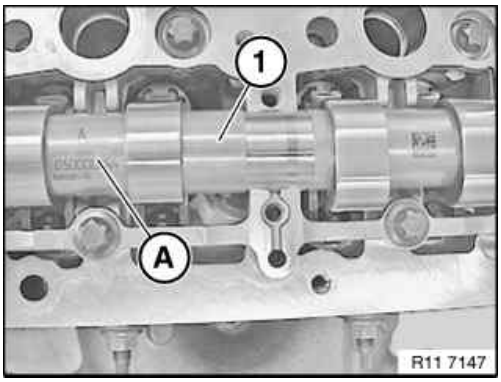
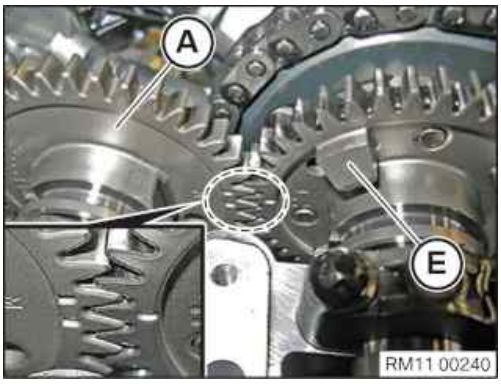
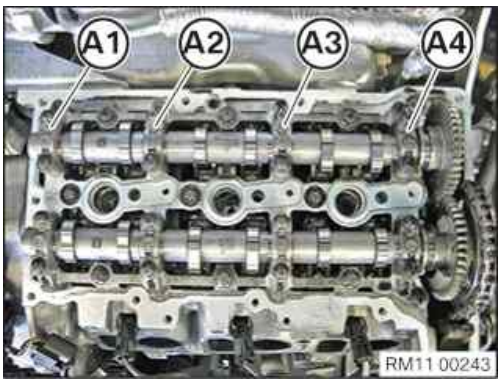


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

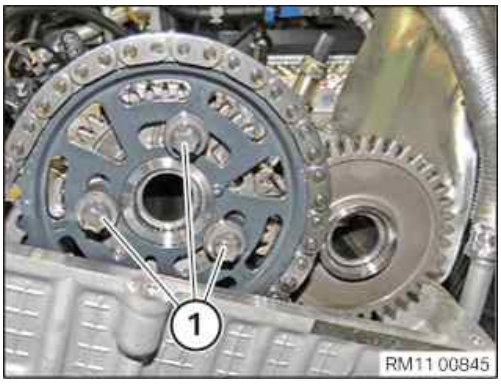
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

► **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

► **Install the timing chain guide rail**

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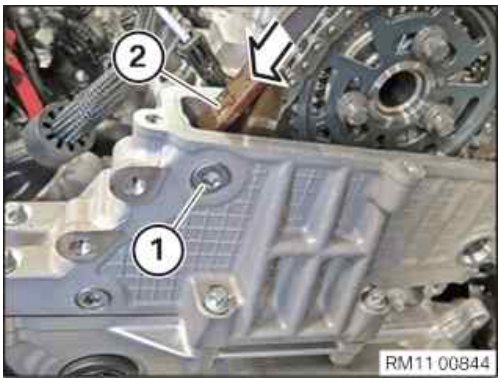


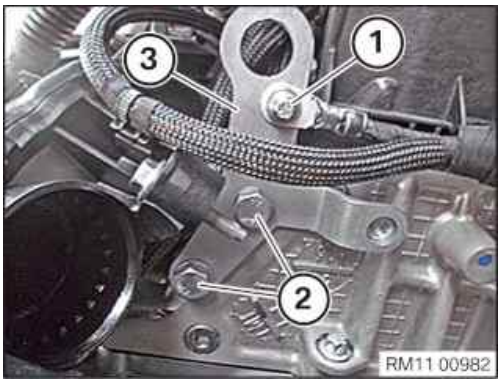
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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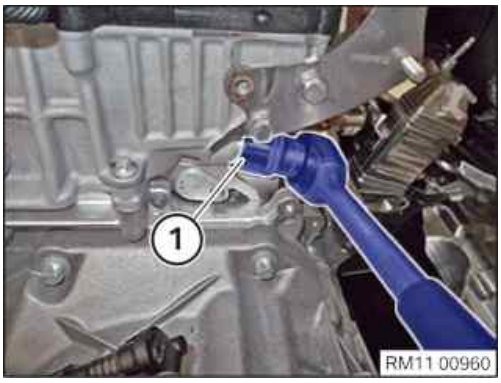
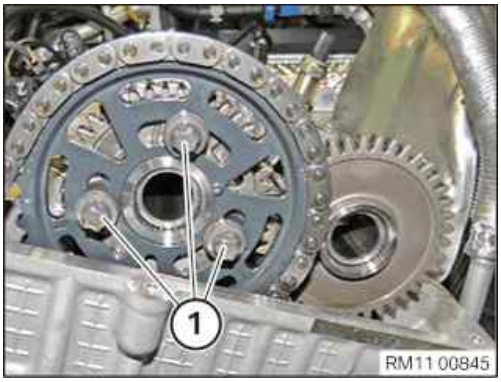


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

49 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

50 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

51 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

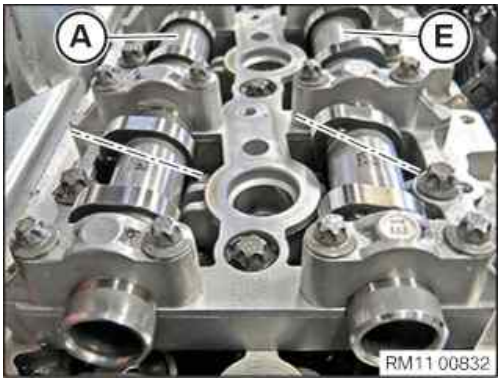
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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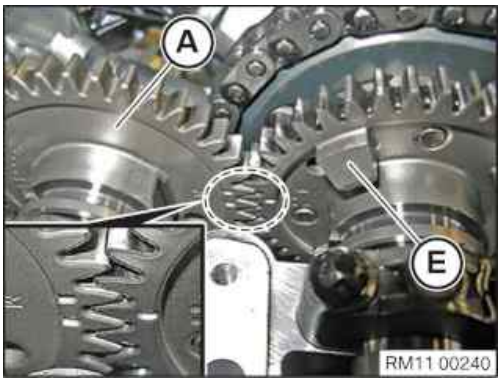


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

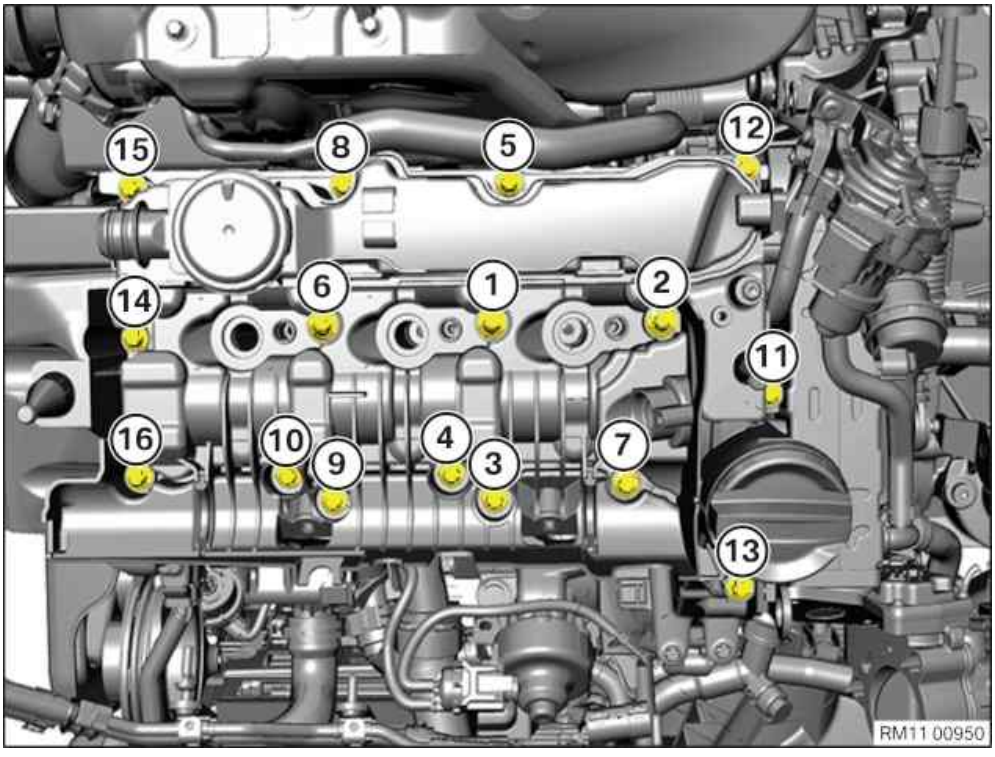
If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

52 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover

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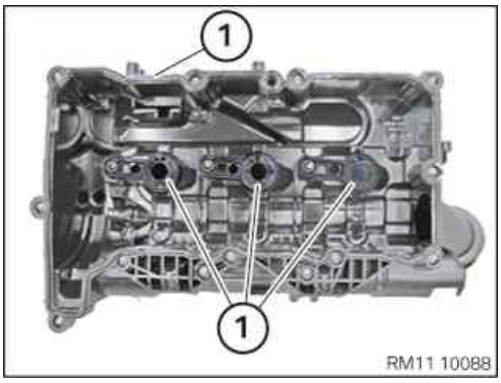
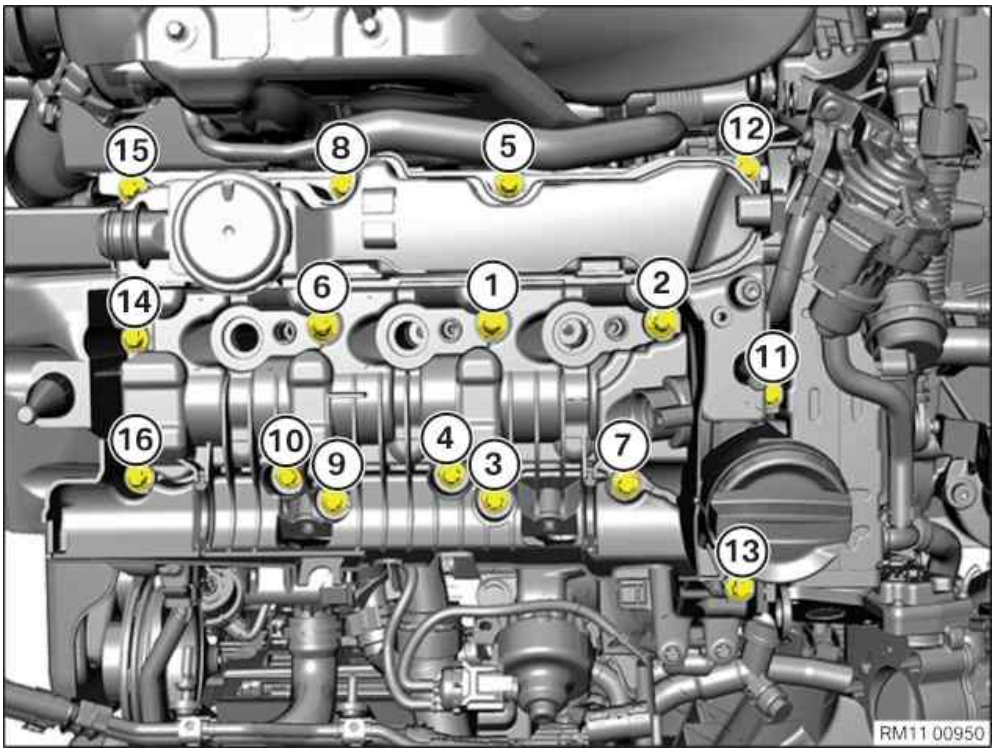


- Renew the gasket (1) of the cylinder head cover.

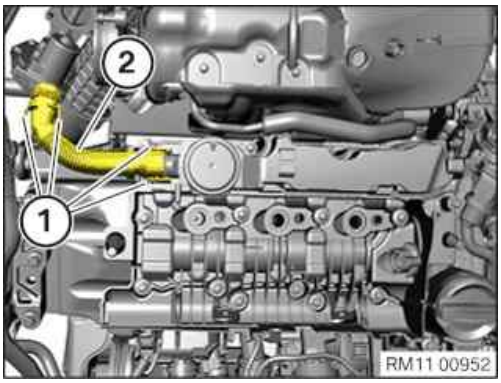
  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nr



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

53 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

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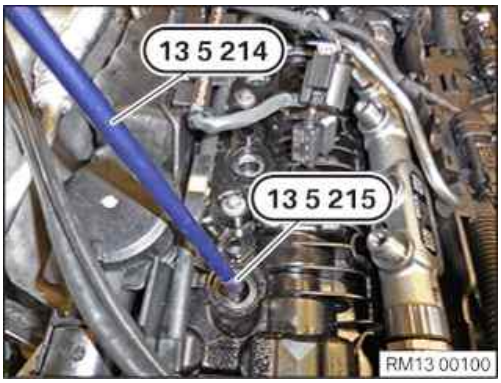
RISK OF DAMAGE

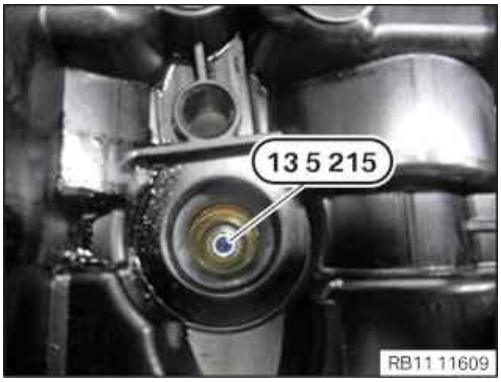
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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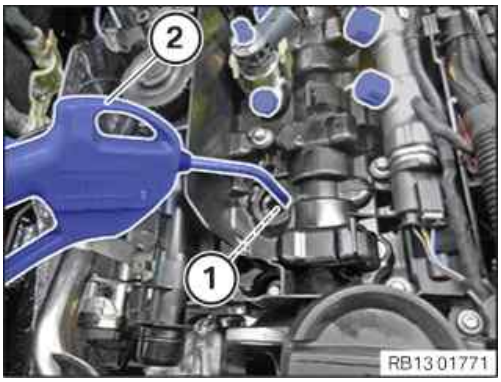
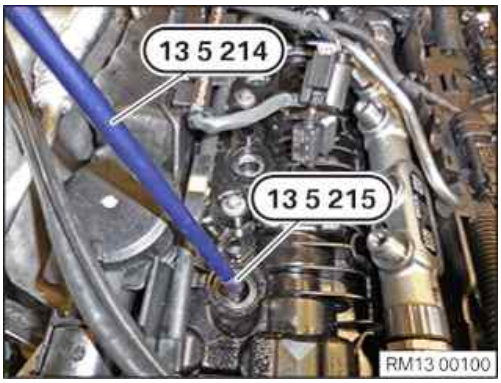


- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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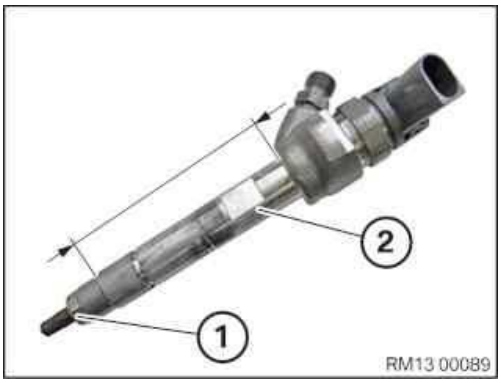
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

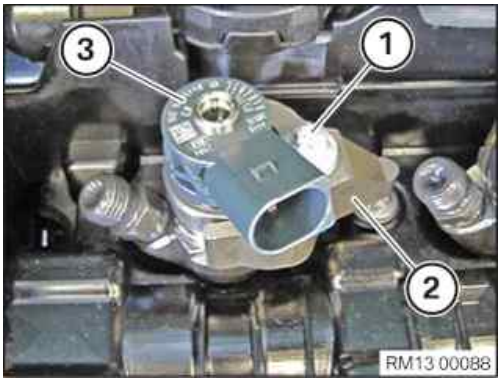


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

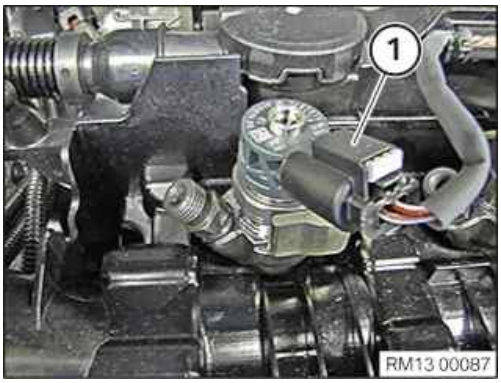
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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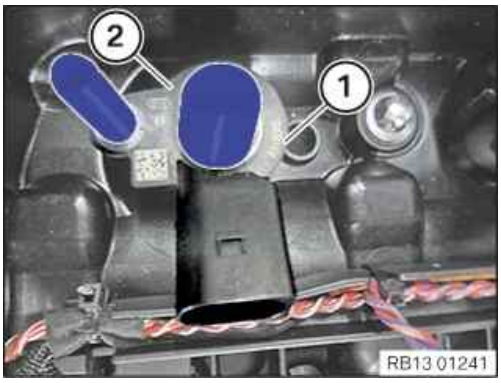
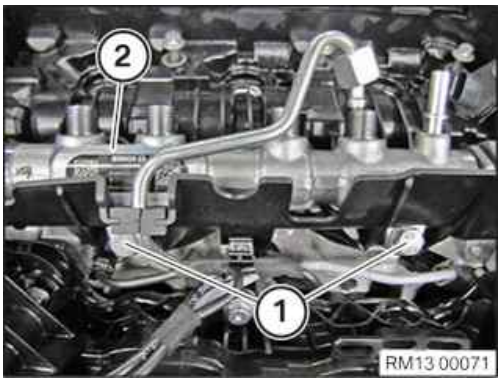


- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

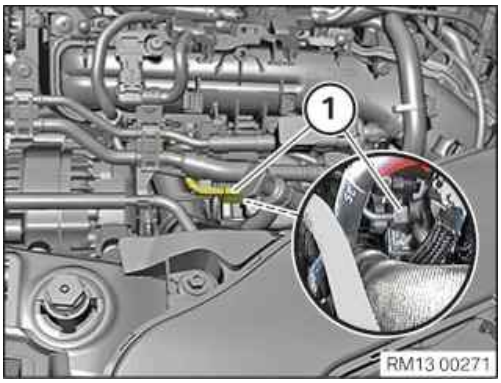
54 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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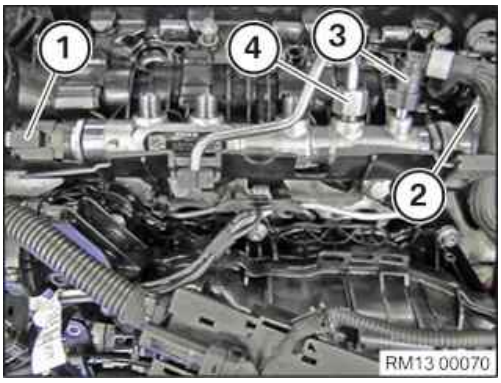

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

55 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

56 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

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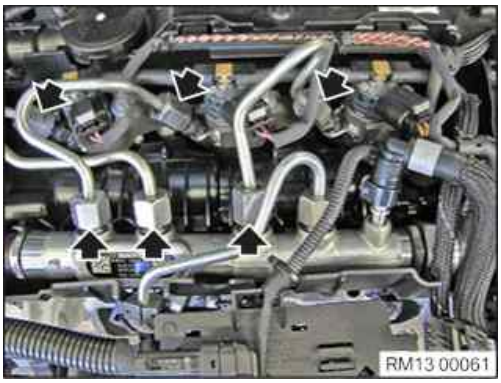
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

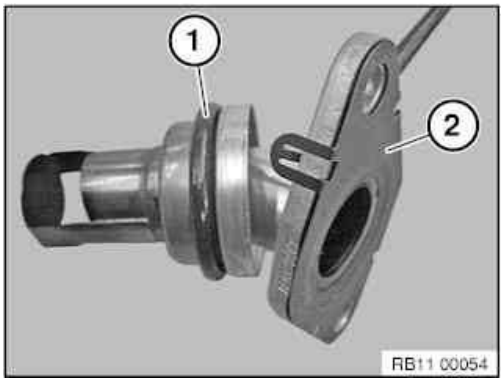
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

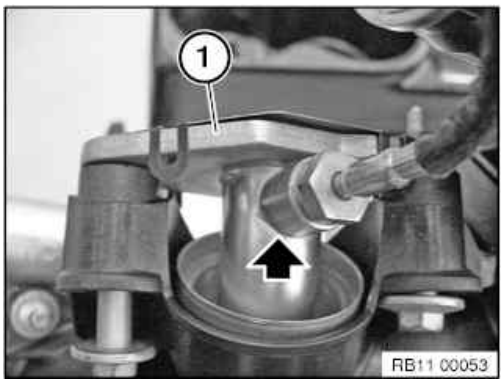
57 – Installing the intake plenum



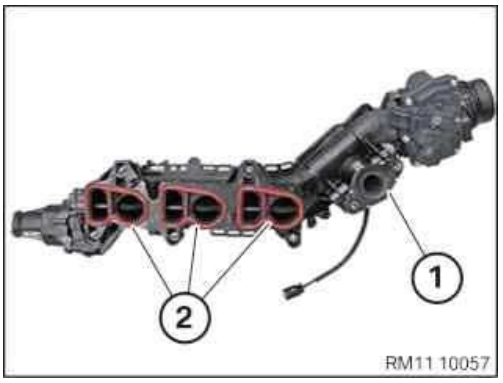
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

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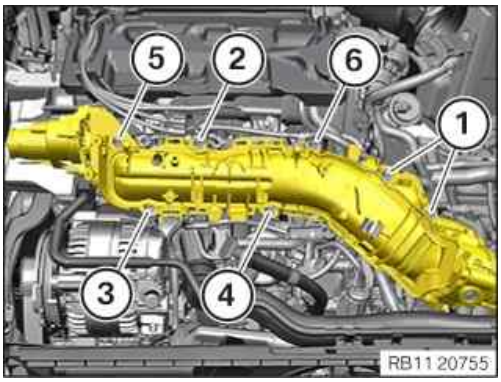
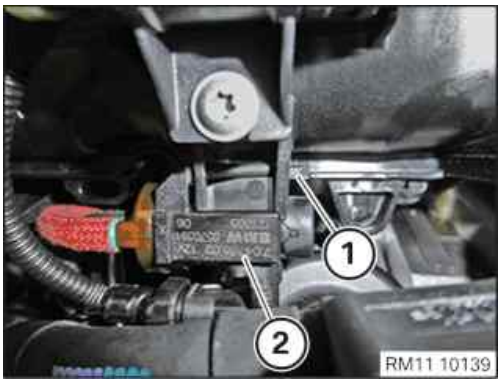


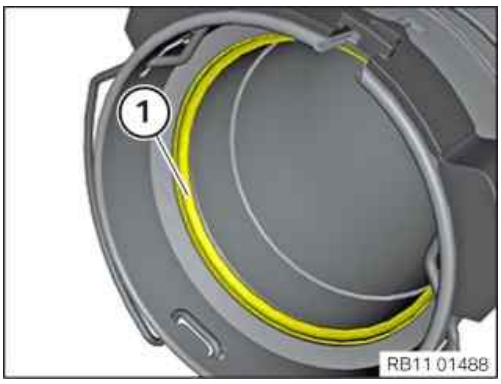
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

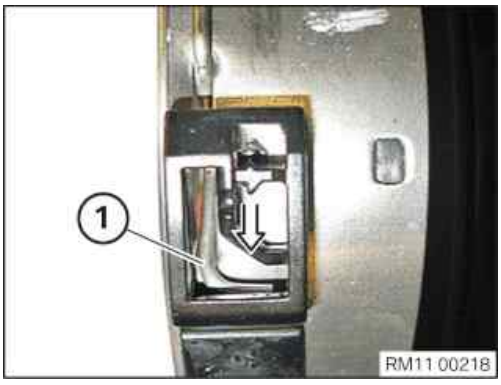


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.

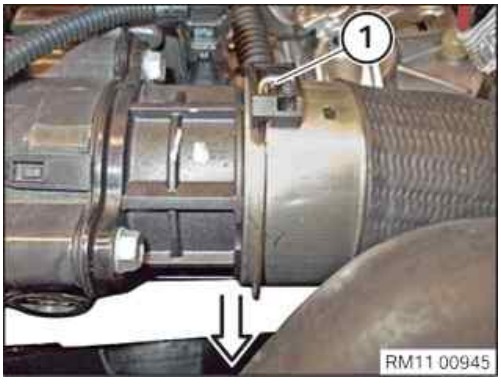


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

58 – Remove the engine from the assembly stand

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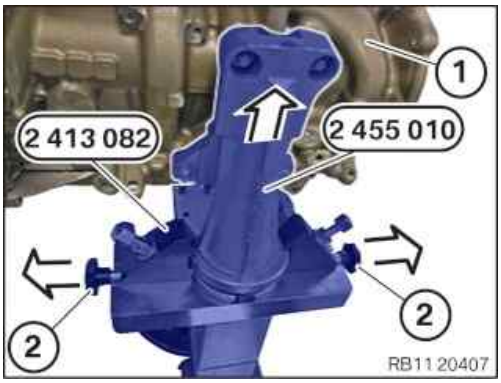
CAUTION

Heavy component.

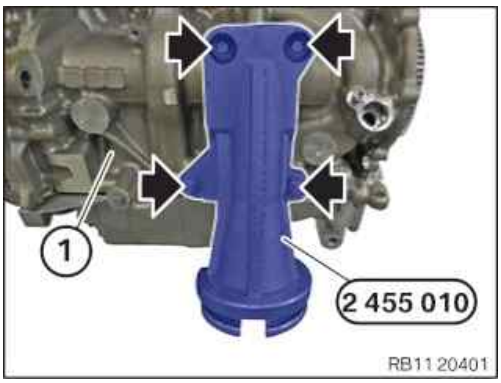
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

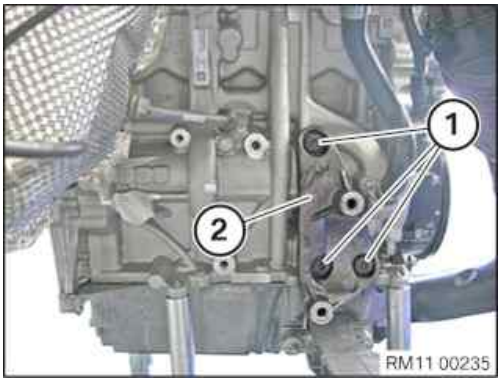
- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.



- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

M10		Tightening torque	38 Nm

59 – Install the engine on the double-clutch transmission (DKG)

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RISK OF DAMAGE

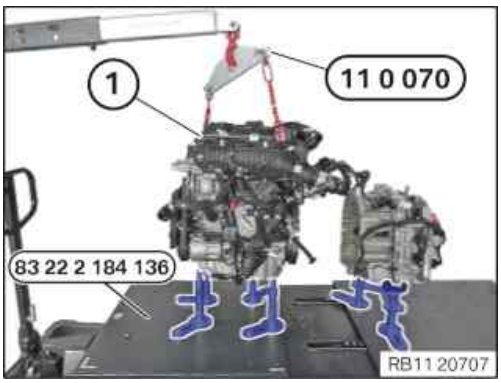
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.

TECHNICAL INFORMATION

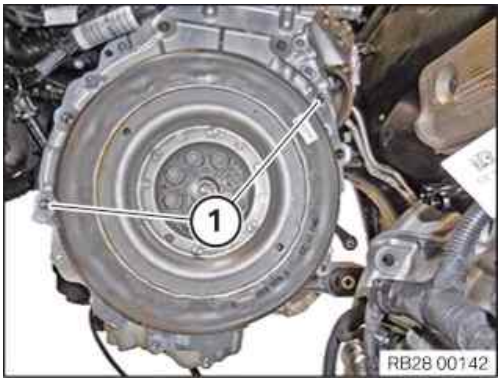
Transmission oil temperature 20 °C up to a maximum 40 °C!
Carry out the "Transmission oil adjustment" service function with the diagnosis system.
The double clutch also needs to be replaced if you exceed the oil change interval by more than 3000 km!
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox (DKG).



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Clean the gearing (1) of the drive shaft.
- Coat the gearing (1) with MI-Setral-43N grease (BMW part number 83 23 2 152 082).

  Tooth gaps must be filled with grease up to tooth height!

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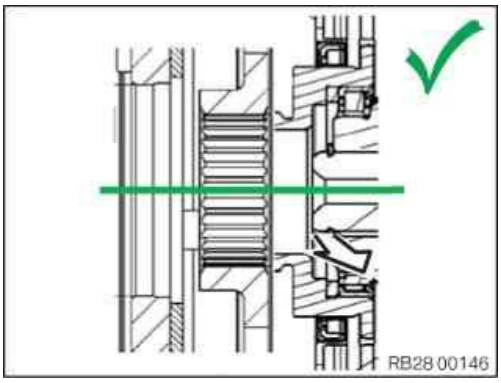
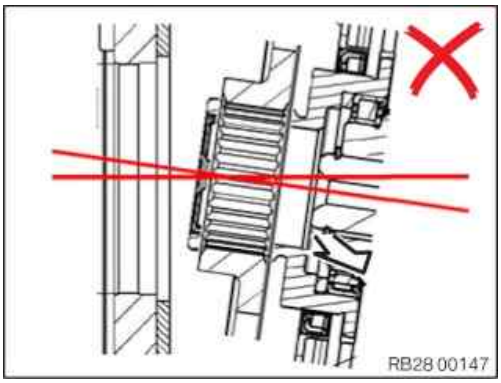
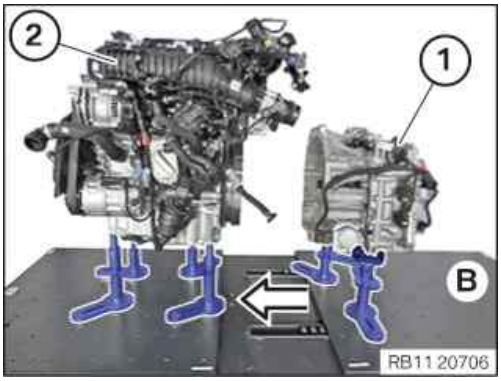


- **Correct:** Insert the double-clutch transmission (DKG) horizontally into the flywheel.



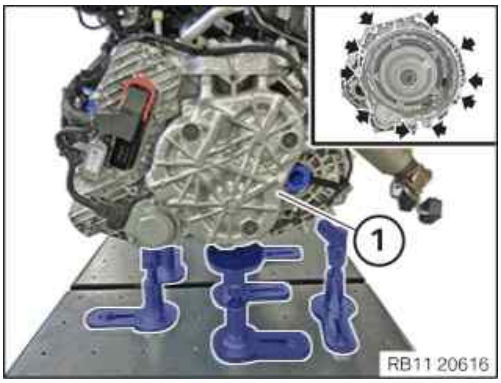
- **Wrong:** Do not tilt the double-clutch transmission (DKG) when inserting it into the flywheel.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table plate (B) in the direction of the arrow and position double-clutch transmission (DKG) (1) **carefully** on the engine (2).



- Flange-mount the double-clutch transmission (DKG) to the engine so that it is **absolutely** horizontal.
- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Connect and lock the coolant lines (1).
- Make sure that you can hear the coolant lines (1) engage.

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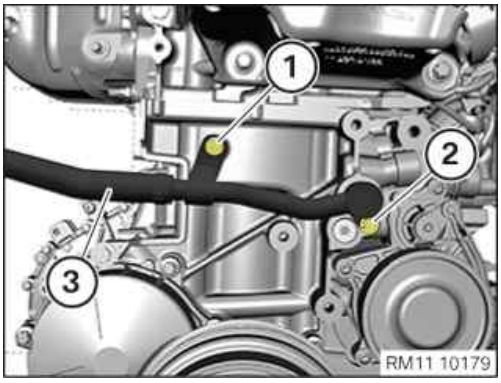
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

60 – Attaching assemblies (on lifting table)

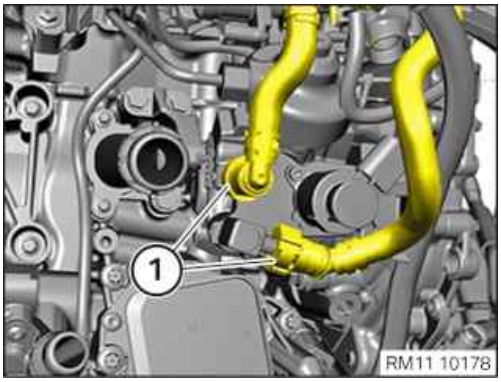


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The locks must engage audibly.

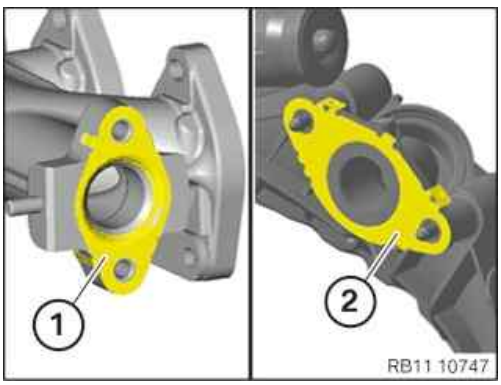
▸ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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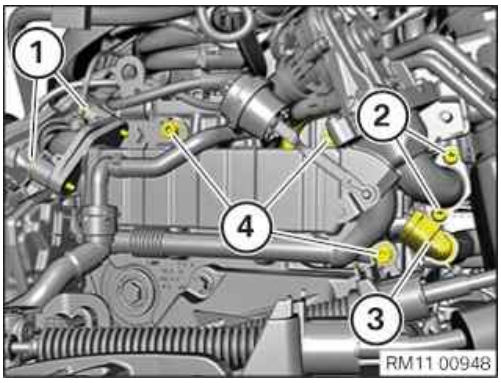


- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

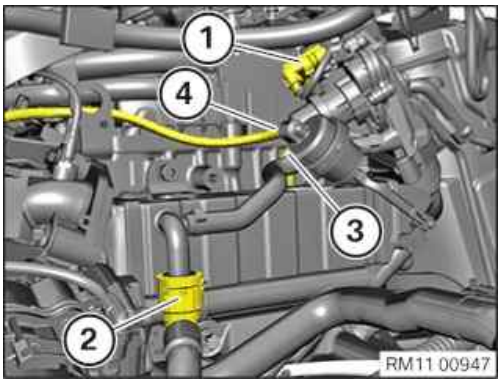
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

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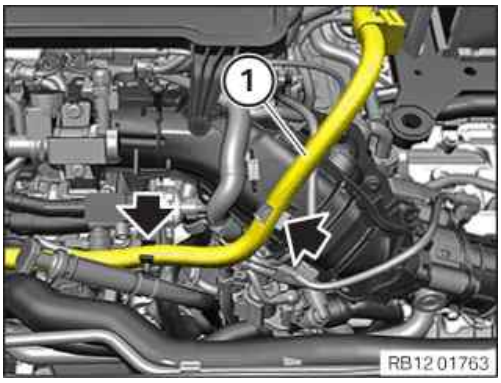


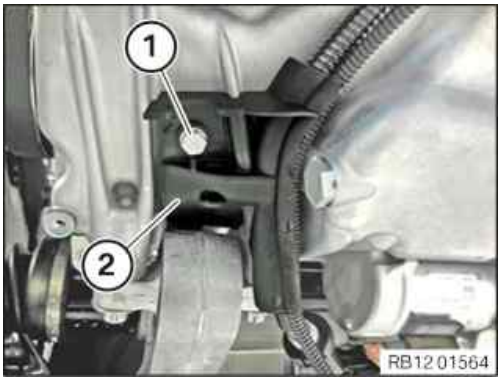
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

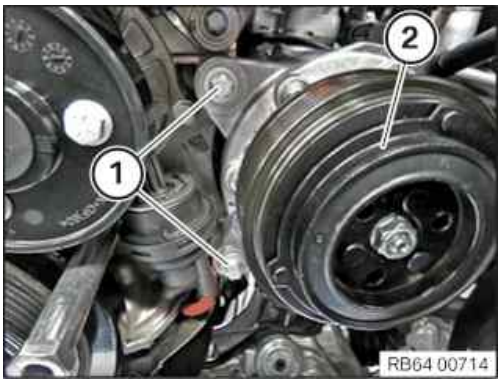
- Insert the positive battery cable (1) into the clamps (arrows).
- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

- Tighten the screws (1).

- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

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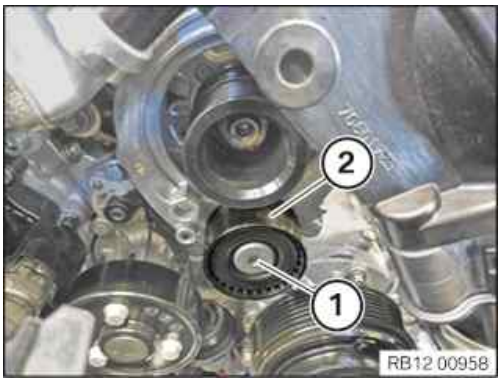
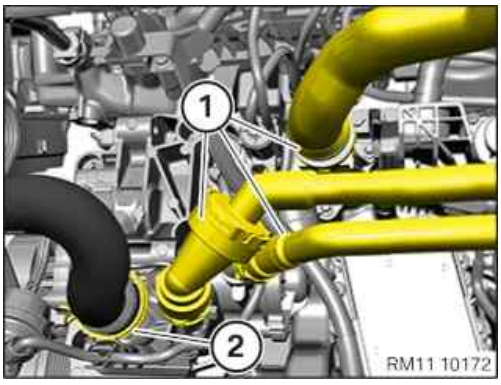


- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

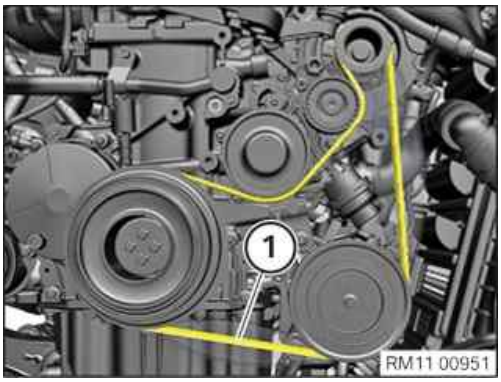
▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ Install the acoustic cover for the engine at the front

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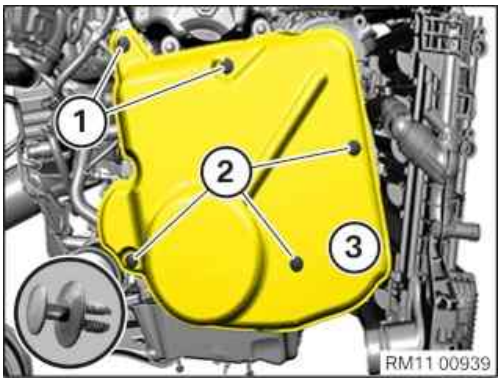
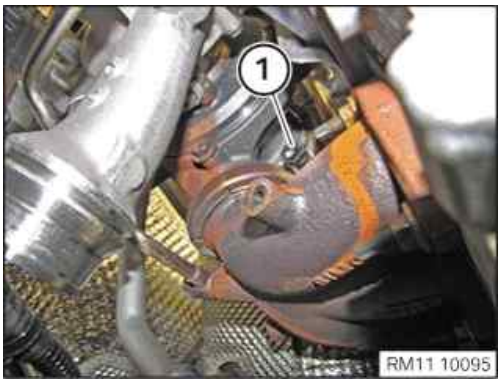


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

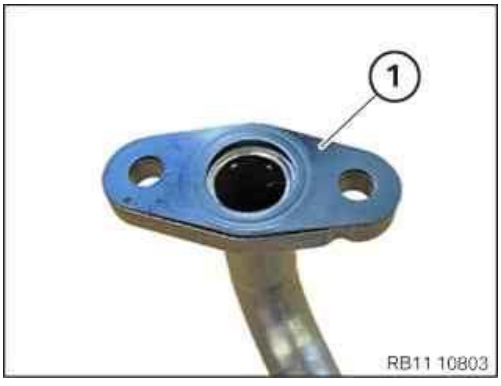
▸ **Installing the oil return line for the exhaust turbocharger**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

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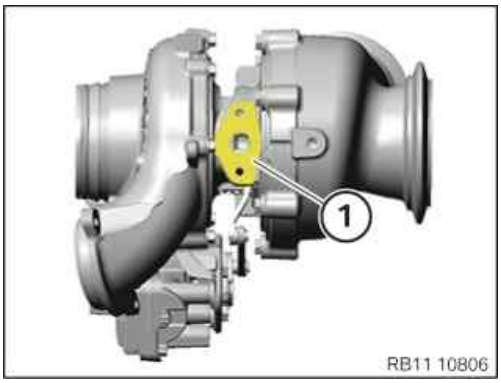
- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

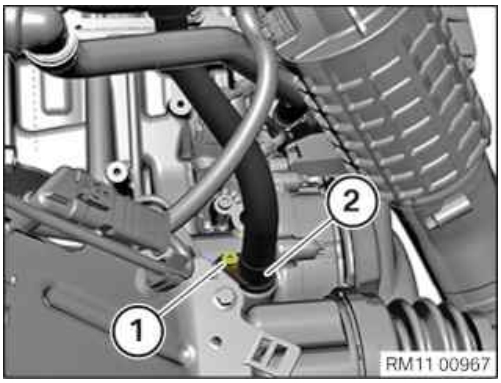
- Do not use any metal-cutting tools.

- Clean sealing surface.

- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm



- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

▸ **Install the oil feed line for the exhaust turbocharger**

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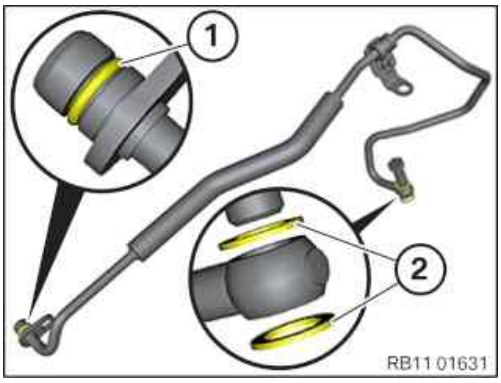
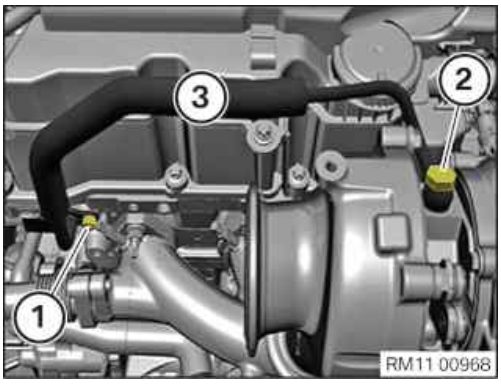


- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

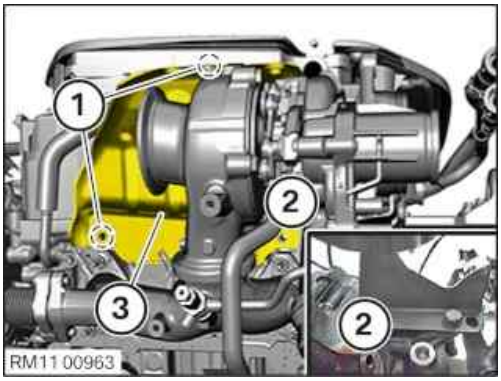
▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

▸ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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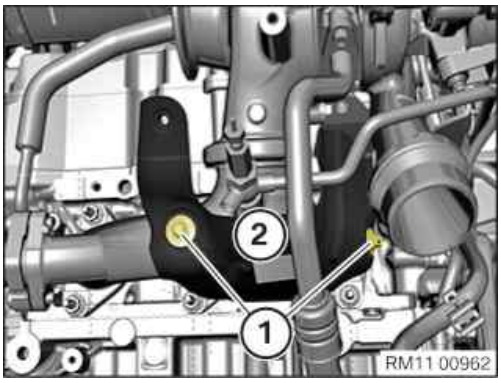


- Feed in and install the heat shield (2).
- Tighten the screws (1).

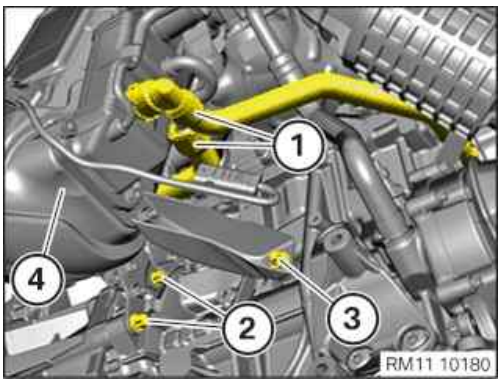
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

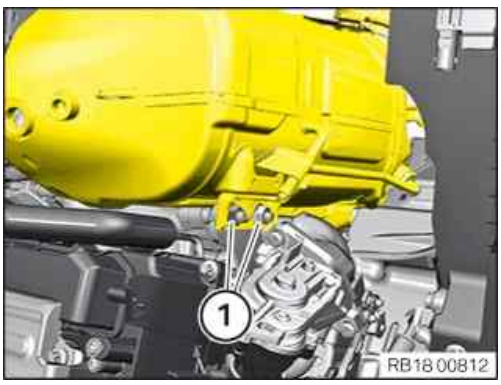
M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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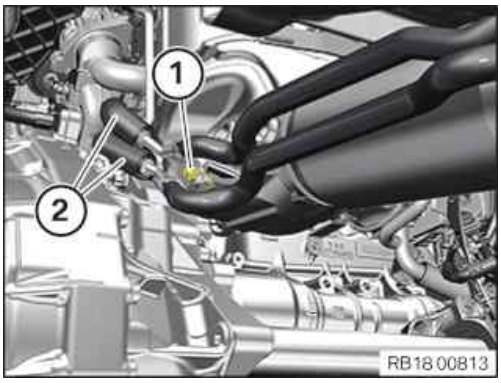


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

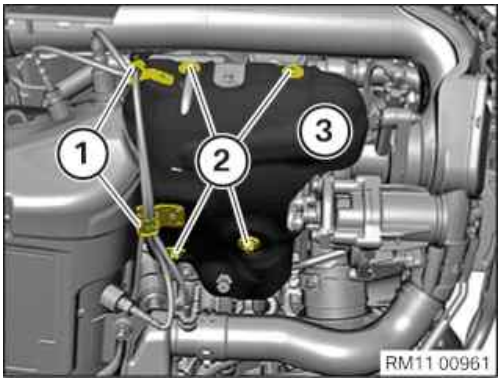
▶ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



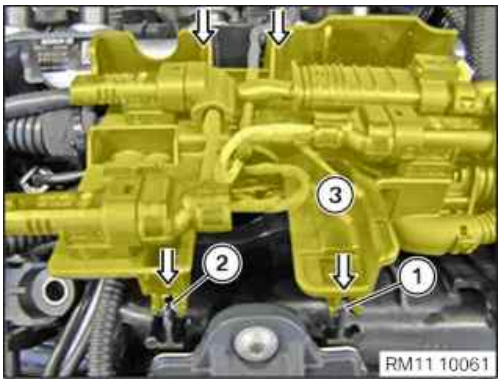
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

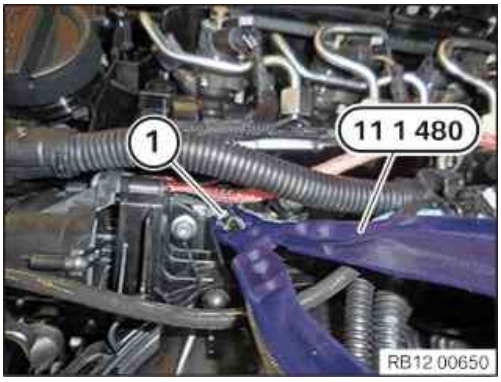
Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▶ **Installing the cable clip for the intake plenum**



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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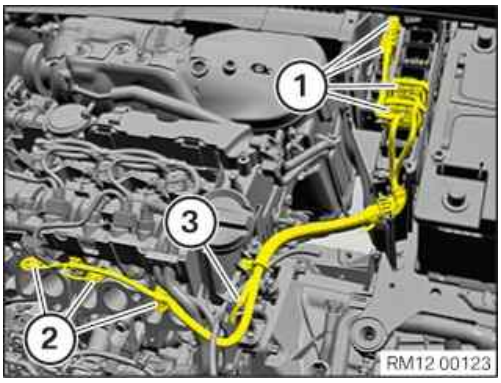
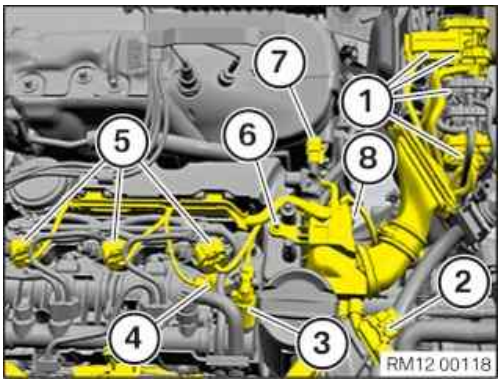


- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

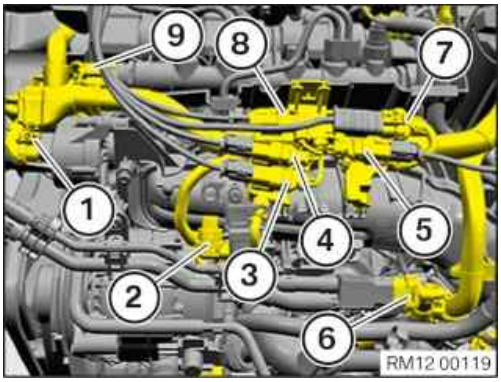


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

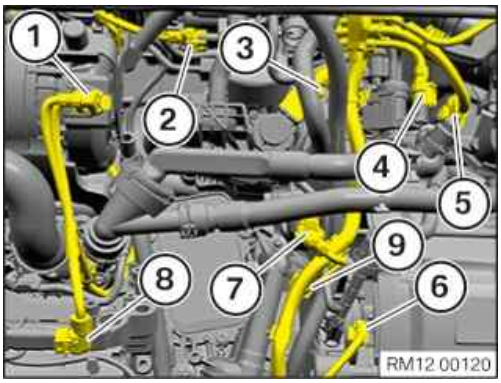
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.

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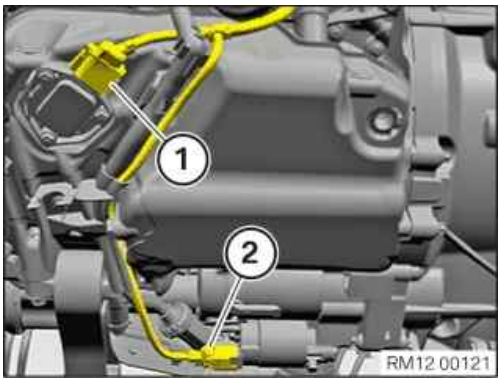
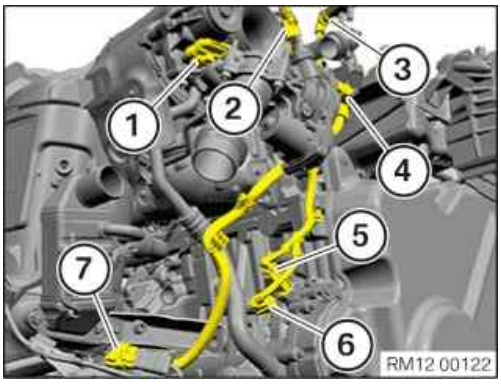
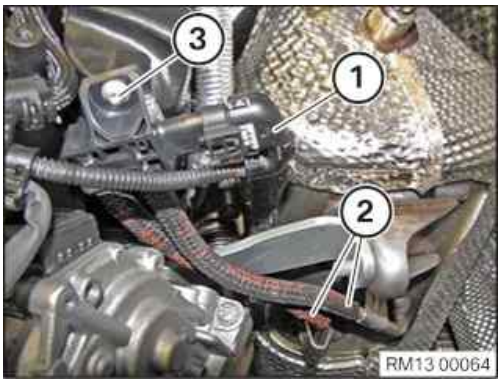


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

61 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

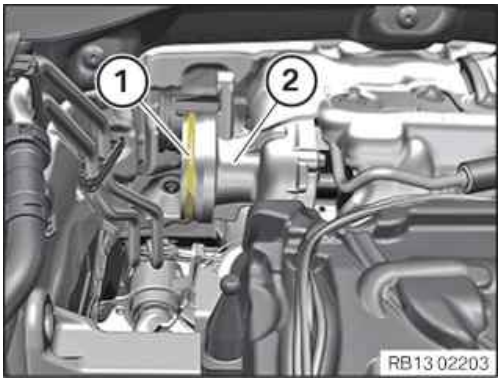
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

62 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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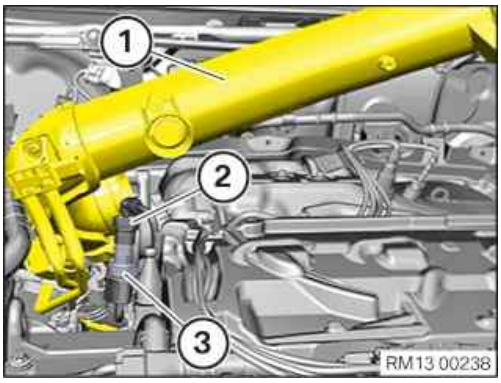


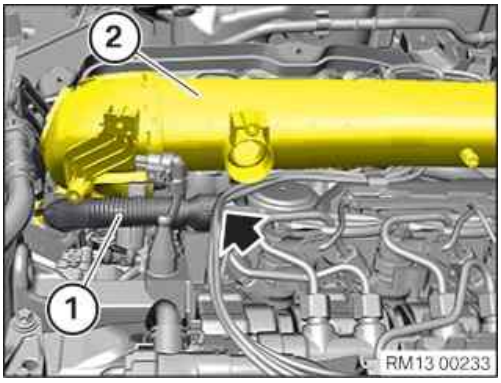
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

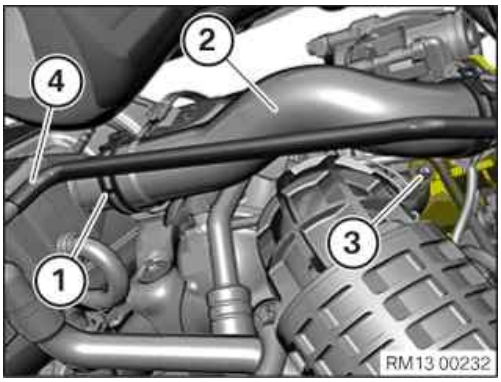
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

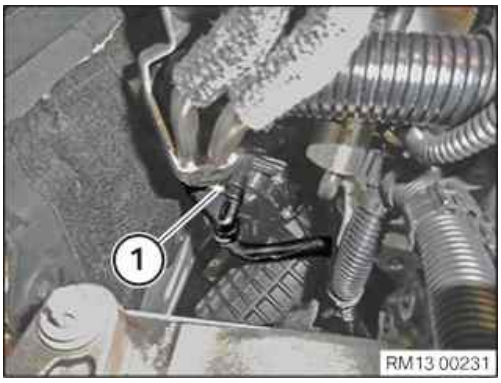
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.

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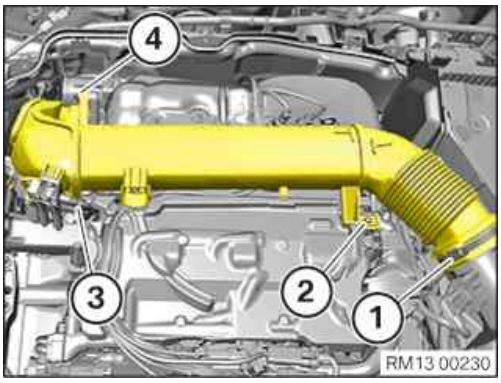


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

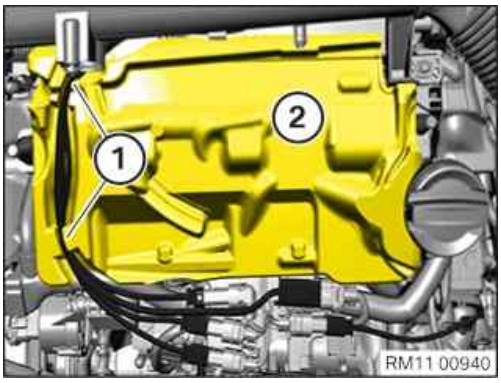
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

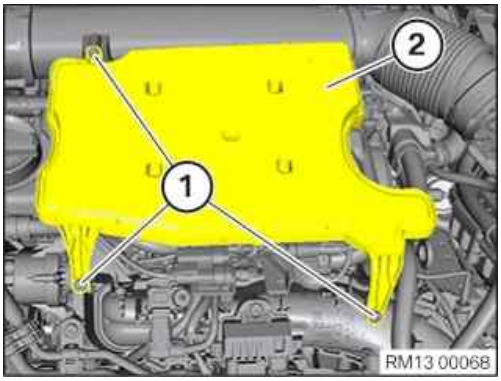
Clamp		Tightening torque	3 Nm

63 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

64 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

65 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

66 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 8

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 9

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 9

M14x35		Tightening torque	160 Nm

Connecting rod bearing cap to connecting rod

Used in step 38

M9x47		Tightening torque	20 Nm
		Angle of rotation 1	70 °
		Angle of rotation 2	70 °

Oil deflector to crankshaft bearing cap

Used in step 39

M8x14	Replace screws.	Tightening torque	35 Nm
		Release	180 °
		Tightening torque	15 Nm
		Angle of rotation	45 °

Oil deflector to crankcase

Used in step 39

M8x14		Tightening torque	19 Nm

Oil vacuum pump to crankcaseB37

Used in step 40

M8x35	*Renewscrews.*	Tightening torque	15 Nm
		Angle of rotation	45 °

Oil sump to crankcase

Used in step 41

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 41

M8		Tightening torque	19 Nm

Starter motor to transmission

Used in step 41

M8x45		Tightening torque	19 Nm

Bracket to oil sump

Used in step 42 60

M6		Tightening torque	8 Nm

Battery positive lead to starter

Used in step 42

M8		Tightening torque	13,5 Nm

Cylinder head to crankcase

Used in step 43

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 43

M8x40		Tightening torque	19 Nm

Glow elements to cylinder head

Used in step 46

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 47

M7x35		Tightening torque	13 Nm

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Intake and exhaust camshaft in camshaft support

Used in step 48

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 48

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 48

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 48 60

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 48

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 48

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 52

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 53

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 53

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 54

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 54

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 56

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 57

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 58 60

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 59 60

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 60

M8x20		Tightening torque	5 Nm
		Release angle	90 °

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Intake plenum to exhaust-gas recirculation cooler

Used in step 60

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 60

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 60

M8x20		Tightening torque	19 Nm

Air conditioning compressor in component carrier

Used in step 60

M10		Tightening torque	38 Nm

Alternator to component carrier

Used in step 60

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner

Used in step 60

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold

Used in step 60

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase

Used in step 60

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger

Used in step 60

M6x12		Tightening torque	8 Nm

Oil return line to crankcase

Used in step 60

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head

Used in step 60

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger

Used in step 60

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger

Used in step 60

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head

Used in step 60

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder

Used in step 60

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 60

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter

Used in step 60

Torx bolt BM6x16		Tightening torque	8 Nm

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Ground cable to cylinder head — Used in step 60

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 60

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 61

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 61 62

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor — Used in step 62

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 62

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 62

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 62

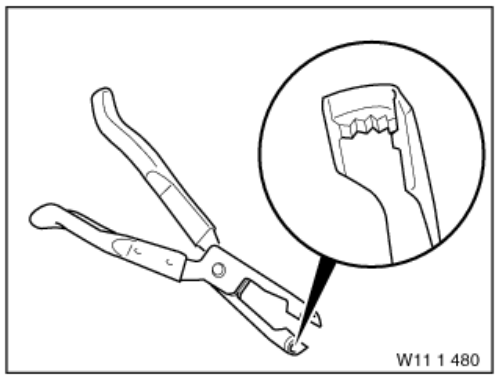
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 64

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder

Common — Used in step 8 59

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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0 490 579 (11 0 070) Lifting gear

Used in step 8 9 58 59

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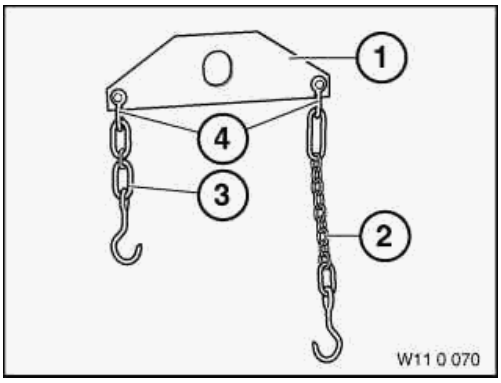

Common

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

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2 455 010 Engine support

Common Used in step 9 58

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 9

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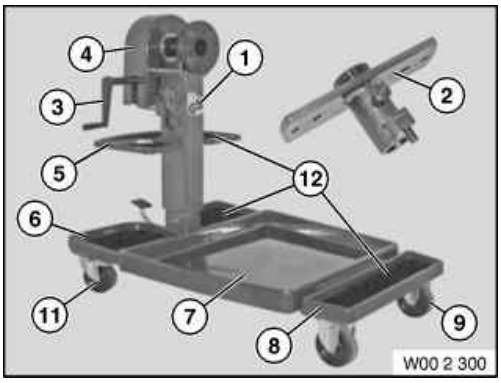

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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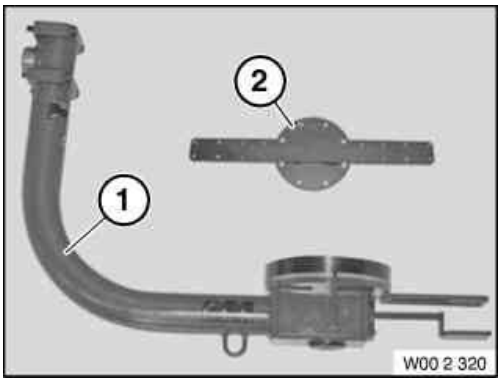
0 495 196 (00 2 320) Support arm



Common

Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common

Used in step 11 14 54 56

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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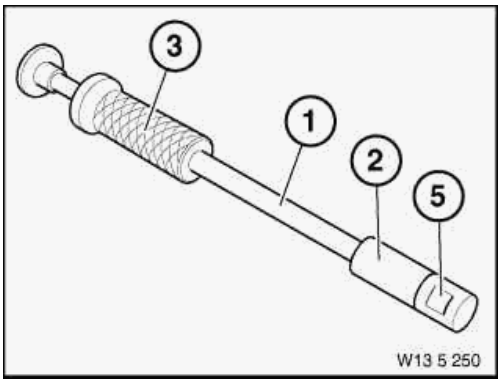
2 413 106 Fastener

Common

Used in step 11 56

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common

Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush

Common Used in step 13

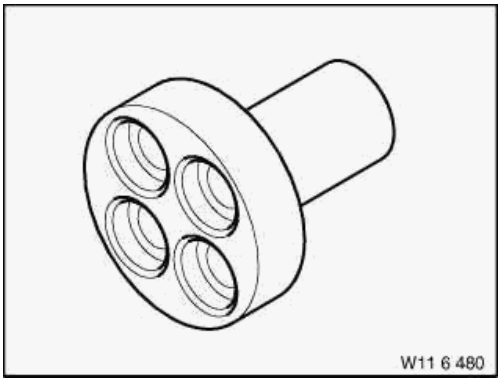
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 13

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 16 48 51

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 288 380 Locating stud

Common Used in step 16 48 49 51

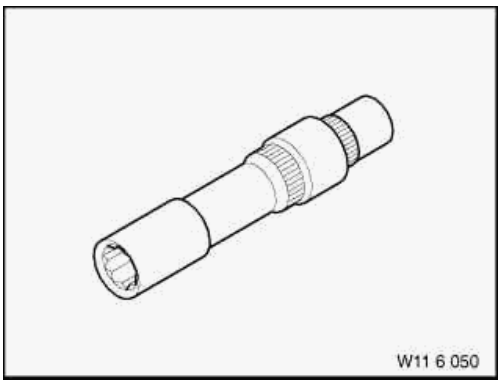
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common Used in step 16 48 50 51

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 21 46

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

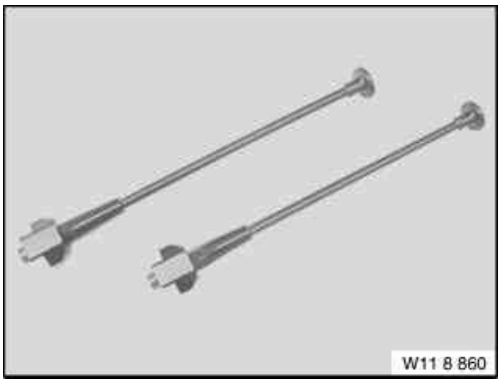
Common Used in step 22 23 48

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 144 (11 8 860) Assembly tool



Common Used in step 30 37

Usage	For installing piston with connecting rod in crankcase.
Included in the tool or work	
Storage location	A23
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 493 582 (11 8 140) Bush

Common

Used in step 37

Usage	(Assembly bushes) For installing the pistons
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 394 (11 8 141)		**Bush** Bush for piston installation 84.00 mm	
2	0 494 395 (11 8 142)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	
3	0 494 396 (11 8 143)		**Bush** Liquidation of existing inventory and then available only as a complete tool set 11 8140 (83 30 0 493 582) - as of 12.03.12.	

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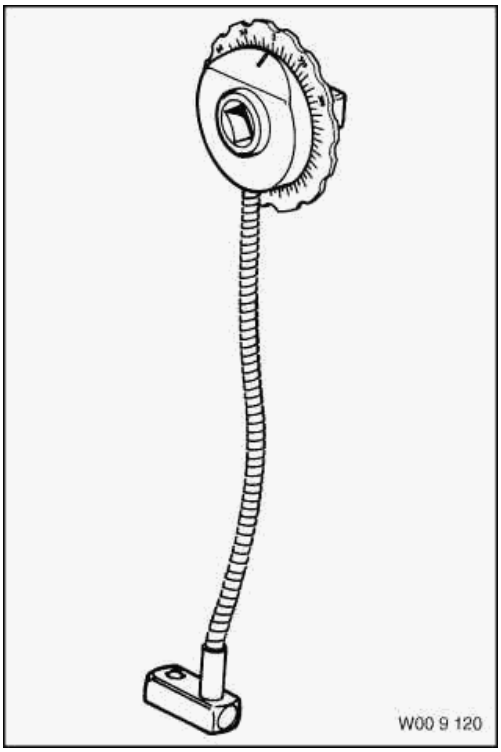
0 490 504 (00 9 120) Torque angle measuring dial



Common

Used in step 38 43

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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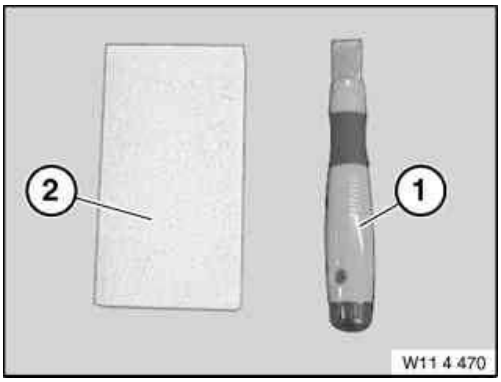
0 495 102 (11 4 470) Tool



Common

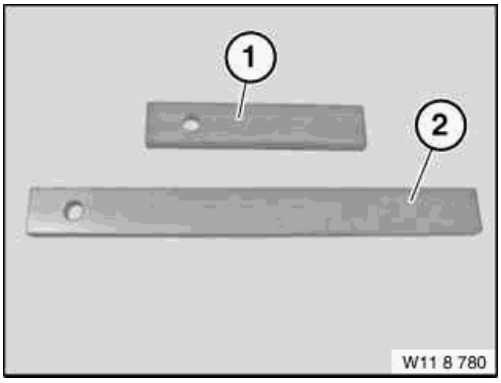
Used in step 41

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 496 120 (11 8 780) Plate



Common

Used in step 41

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

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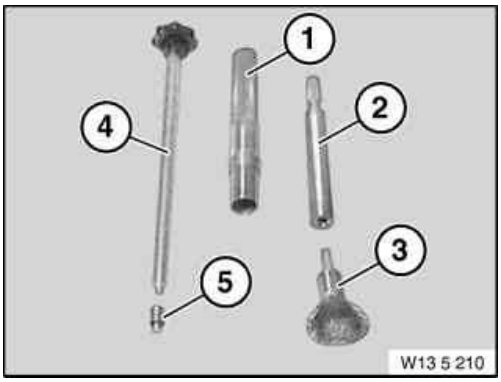
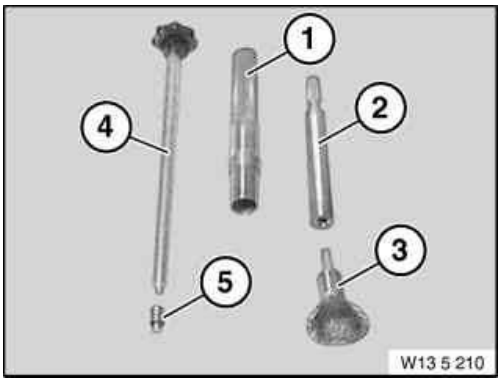
0 493 763 (13 5 215) Plug



Common	Used in step 53
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 53
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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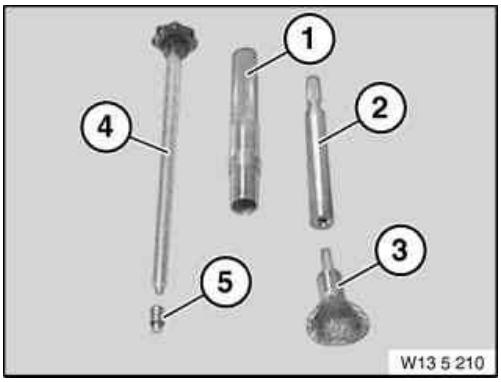
0 493 758 (13 5 210) Tool



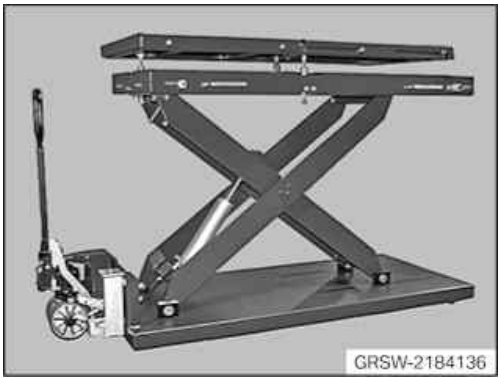
Common Used in step 53

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 59

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

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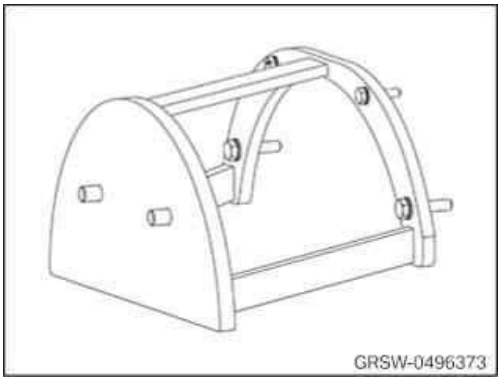
Replacement tools:

2 299 563 Adapter

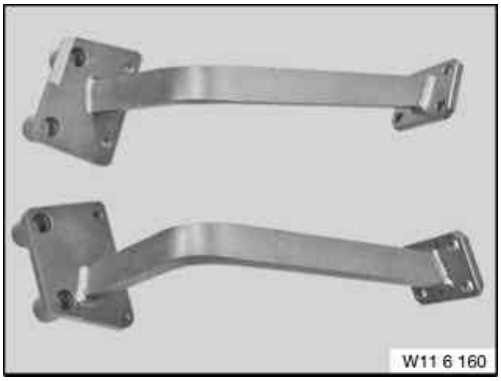
Common	Used in step 9
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 373 (11 5 420) Plate



Common	Used in step 9
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 9
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Side clearance of piston rings

Used in step 32

Clean all components before measuring the side clearance.

Side clearance of the plain rectangular compression ring	0,17 mm ... 0,27 mm
Side clearance of the taper faced piston ring	0,30 mm ... 0,50 mm
Side clearance of the oil scraper ring with spiral expander	0,2 mm ... 0,4 mm

Piston diameter

Used in step 33

Measure the piston diameter at distance (A) from the lower end of the piston skirt.

Distance (A) to the lower end of the piston skirt	17 mm
Nominal dimension of piston diameter	83,936 mm ... 83,954 mm

Cylinder bore

Used in step 34

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Diameter of cylinder bore	84,00 mm ... 84,018 mm
Permitted irregularity of the cylinder bore	0,01 mm
Permitted conicity of the cylinder bore	0,01 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 60
EGR controller	7 60

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	41

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
31 10 001 Completely removing and installing front axle with engine and transmission	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
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11 00 050 Removing and installing engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66

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11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Removing and installing the engine (manual gearbox)	1 66
11 00 050 Remove and install engine (Automatic)	1 66
11 00 050 Remove and install engine	1 66
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11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine \PREMIUM	1 66
11 00 050 Removing and installing/replacing engine (N63)	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Removing and installing engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine (Automatic)	1 66
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11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine (Automatic)	1 66
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11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Remove and install engine	1 66
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 66
11 00 050 Remove and install engine	1 66
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	48
Exhaust-gas recirculation cooler seal on exhaust manifold	60
Exhaust-gas recirculation cooler seal on intake plenum	60

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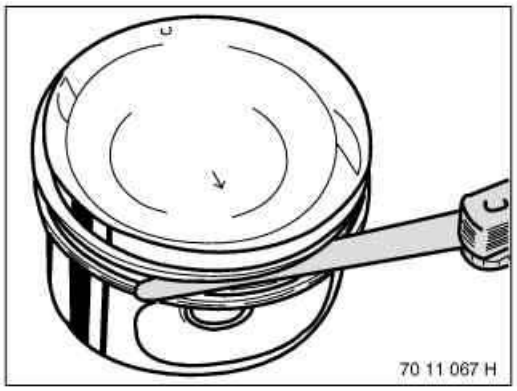
11 25 671 Replacing piston rings on all pistons (B37C)

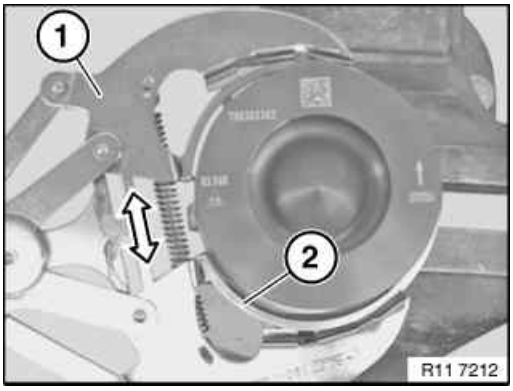
Necessary preliminary tasks:

- Remove pistons.

Removal:

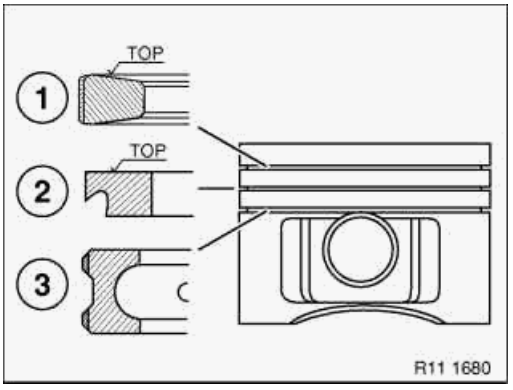


If necessary, measure side clearance.
Refer to Technical Data.



Note:
It might not be possible to find the identification on used piston rings.
Put aside piston rings in correct sequence and installation position.

Remove all piston rings (2) with piston ring pliers (1).



Note:

1. Plain rectangular compression ring
2. Piston ring
3. Oil scraper ring with spiral expander.

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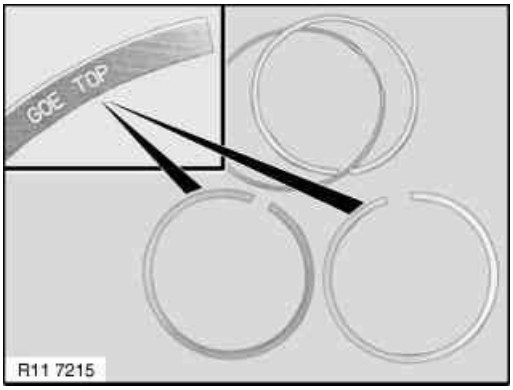
If necessary, measure end clearance.

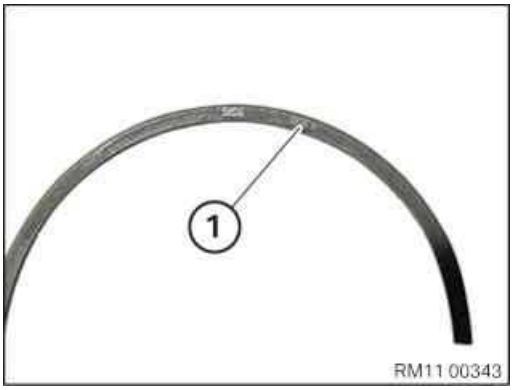
Refer to Technical Data.

Installation:



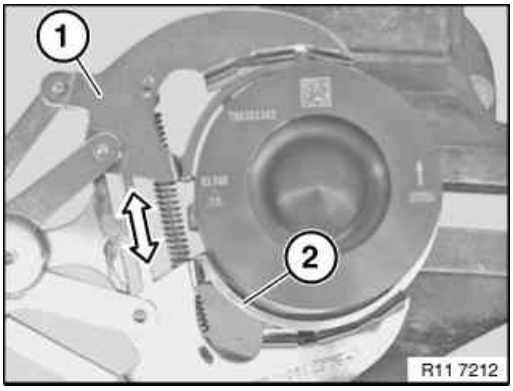
Installation note:
Marking “TOP” must point towards piston crown.

The oil scraper ring has no identification marking and can be installed in any position.



Installation note:
If there is no “TOP” marking, the “GOE” marking (1) must point to the piston crown.

The oil scraper ring has no identification marking and can be installed in any position.



Using piston ring pliers (1), install all piston rings (2) in the correct installation position.

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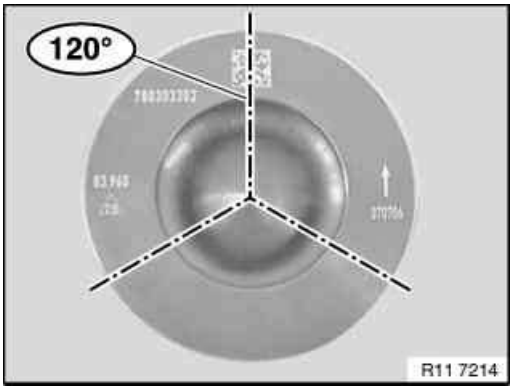

Note:
Piston rings must be arranged with a 120° offset.

Align contact points on piston rings (offset at approx. 120°, but do not arrange over gudgeon pin boss).

Lightly coat pistons and piston rings with oil.

Required follow-up work:

- Install piston.

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11 27 020 Removing and installing/replacing counterbalance shaft (B37C)

Special tools required:

- 2 288 942
- 11 5 370
- 2 288 943

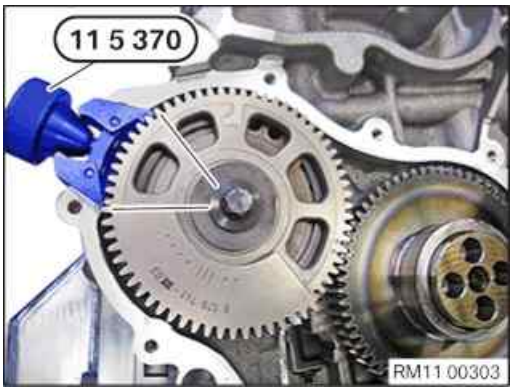
Necessary preliminary tasks:

- Remove engine with gearbox.
- Remove transmission.
- Mount engine on assembly stand.
- Remove cylinder head.
- Remove flywheel.
- Remove oil sump.
- Remove rear timing case cover.
- Remove vibration damper.
- Remove belt tensioner.
- Remove front, lower timing case cover.

Removal:

Use special tool 2 288 942 to fix counterbalance shaft in TDC position of cylinder 1.

Screw special tool 2 288 942 to crankcase (1).



Important!

Ring gear of the counterbalance shaft gear has two sections (fixed gearwheel and free gearwheel).

Ring gear is preloaded and must be blocked before removal.

If the gear must be installed again, the ring gear must remain blocked with special tool 11 5 370 until installation.

If a new gear is being installed, the ring gear must be blocked using the factory fixation until installation.

Block the ring gear of the gear in the position shown using special tool 11 5 370 .

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Note:
When counterbalance shaft is locked, marks on crankshaft and gear of counterbalance shaft must align.

Release screw (1).

Loosen screw connection (1) on special tool 2 288 942 .

Remove special tool 2 288 942 .

Screw special tool 2 288 943 into the counterbalance shaft as far as the limit position.

Important!

If the gear must be installed again, the ring gear must remain blocked with special tool 11 5 370 until installation.

If a new gear is being installed, the ring gear must be blocked using the factory fixation until installation.

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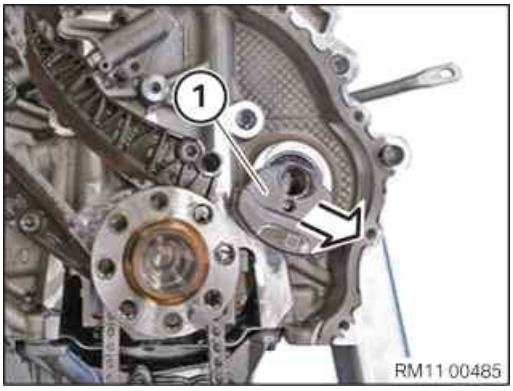
Separate the counterbalance shaft from gear (1) with hammer blows on special tool 2 288 943 .

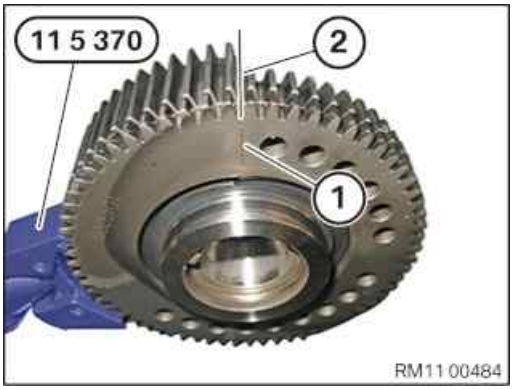
Remove special tool 2 288 943 .

Note:
If necessary, secure the counterbalance shaft against falling.



Remove counterbalance shaft (1) in direction of arrow.*Note:*
If necessary, secure gear of the counterbalance shaft against falling.

Remove gear of the counterbalance shaft in direction of arrow.*Note:*
Figure B38.



Important!

If the gear must be installed again, the ring gear must remain blocked with special tool 11 5 370 until installation.

Installation:

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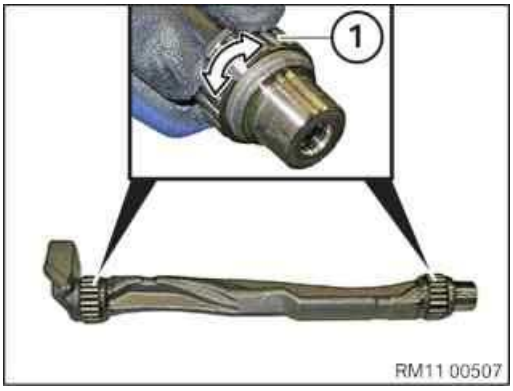
Important!

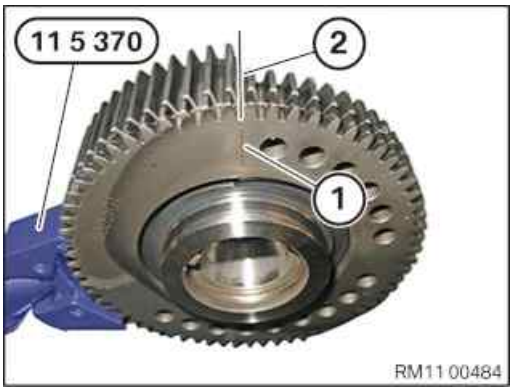
If a new gear is being installed, the ring gear must be blocked using the factory fixation until installation.



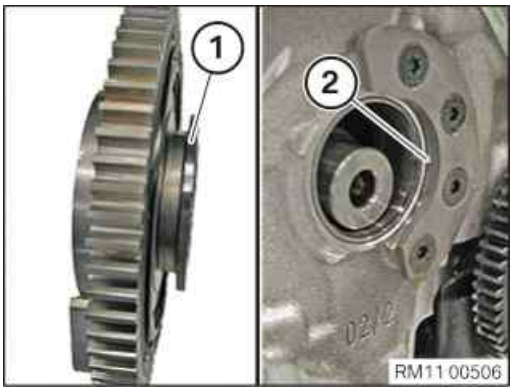
Check needle bearing (1) of the counterbalance shaft.

If necessary, pull needle bearing (1) off the counterbalance shaft and replace it.

Note:
Picture shows B38



Note:
With correct preload, the mark (1) on the free gearwheel and the section (2) of the fixed gearwheel are aligned.



Note:
Gear is guided over guide ring (1) in crankcase (2).

Figure B38.

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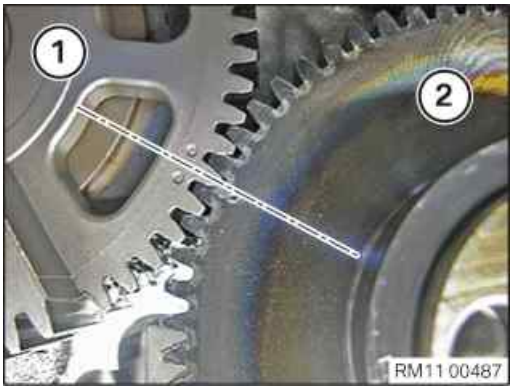
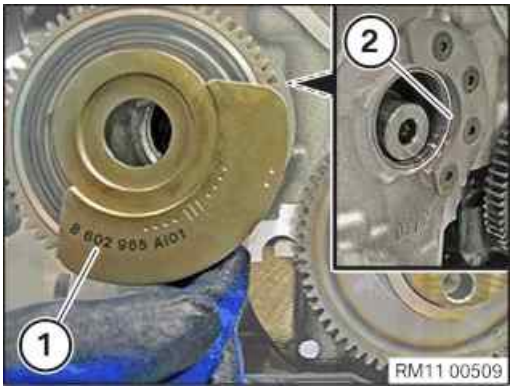


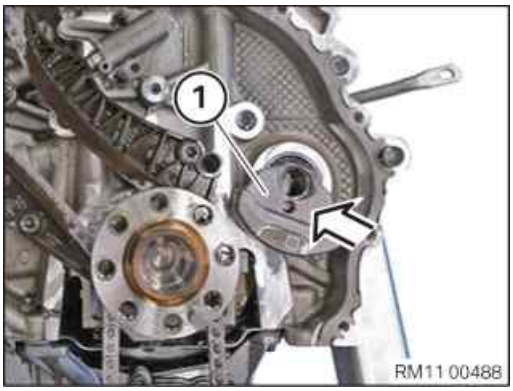
Important!

The marks on the gear (1) of the counterbalance shaft and the crankshaft (2) must align.

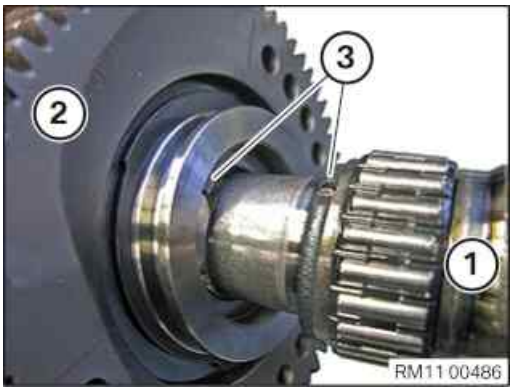


Insert gear (1) of the counterbalance shaft into the guide of the crankcase.*Note:*
Secure counterbalance shaft gear (1) against falling if necessary.

Figure B38.



Install counterbalance shaft (1) in the crankcase in direction of arrow.



Important!

Counterbalance shaft (1) can only be installed in the gear (2) in one position.

Pay attention to encoding (3).

Note:
For purposes of clarity, picture shows component removed.

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Bring counterbalance shaft (1) into contact in gear (2).

Note:
Parts: Replace screw (1).

Insert screw (1) and tighten until it makes contact.

Use special tool 2 288 942 to fix counterbalance shaft in TDC position of cylinder 1.

Screw special tool 2 288 942 to crankcase (1).

Tighten screw (1).

Tightening torque: 11 27 1AZ.

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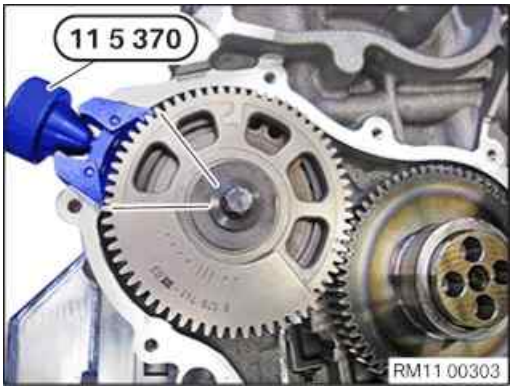

Remove special tool 11 5 370 .

With new gear:

Remove factory retainer.

Loosen screw connection (1) on special tool 2 288 942 .

Remove special tool 2 288 942 .

Required follow-up work:

- Install front lower timing case cover.
- Install belt tensioner.
- Install vibration damper.
- Install rear timing case cover.
- Install oil sump.
- Install flywheel.
- Install cylinder head.
- Remove engine from assembly stand and place on table lift.
- Attach transmission.
- Install engine with transmission.

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This documentation refers to special tools that were not yet available when going to press.

11 27 020 Removing and installing/replacing the counterbalance shaft

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

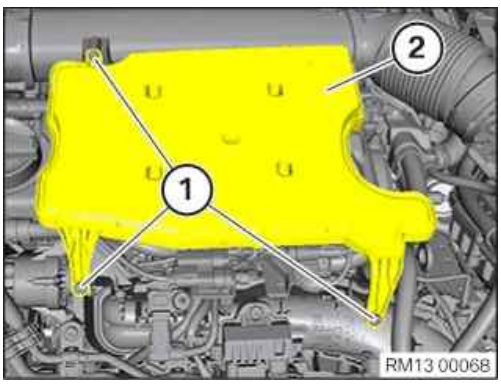
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

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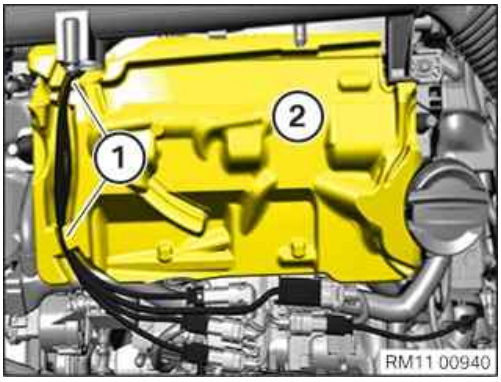
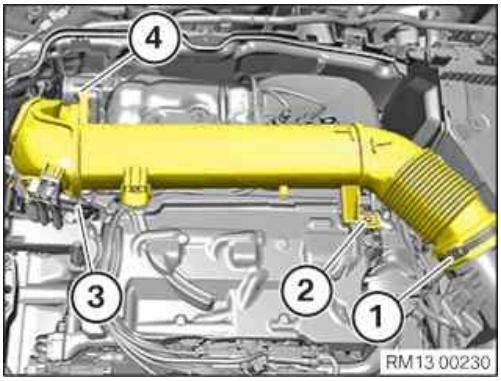
4 – Remove the acoustic cover for the injectors

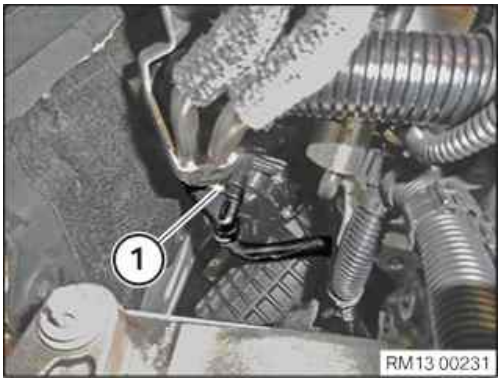


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

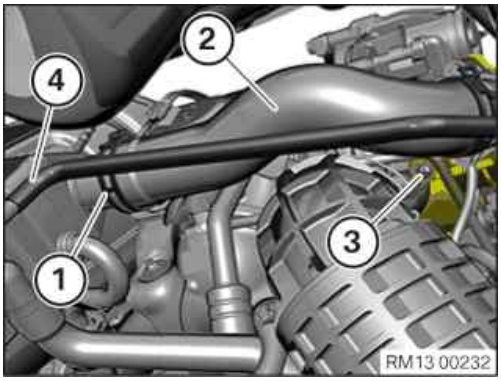
5 – Removing clean air pipe



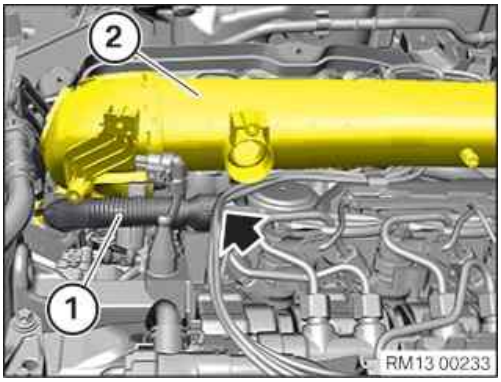
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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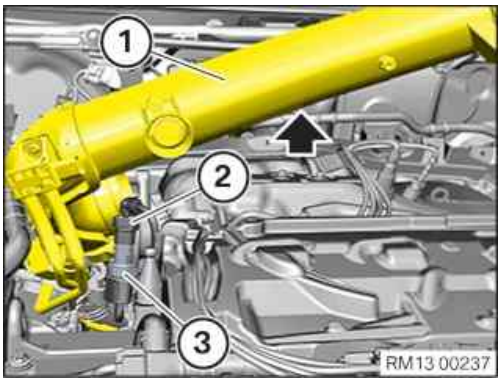


- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

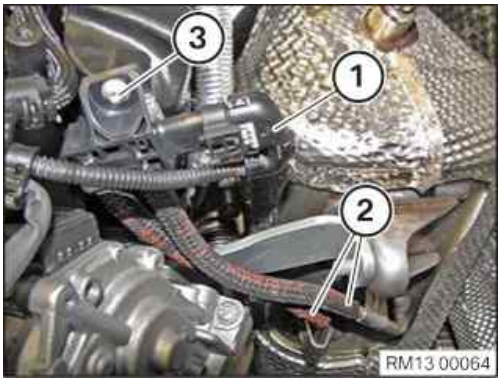
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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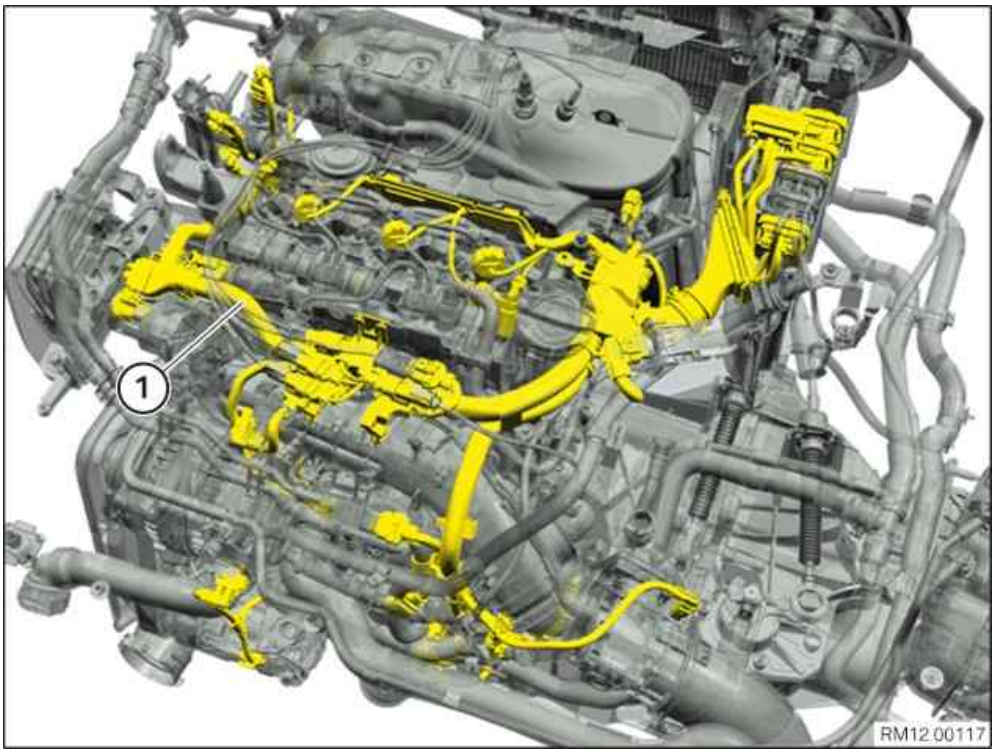
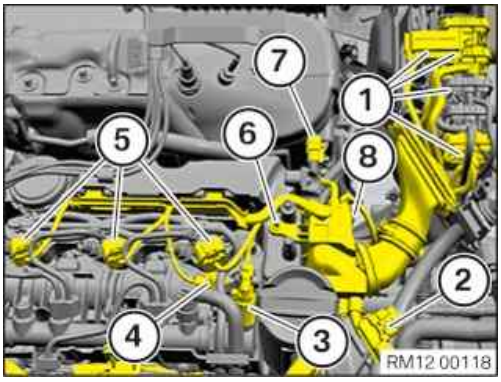
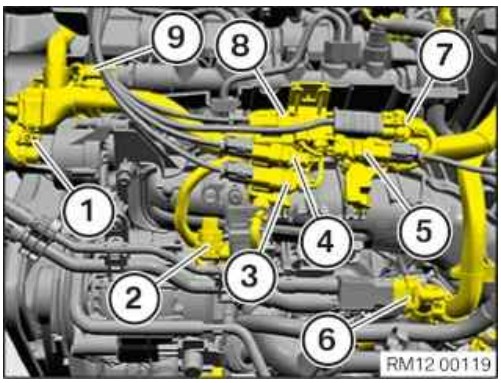
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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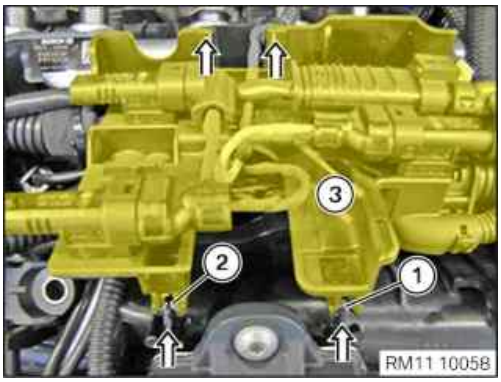
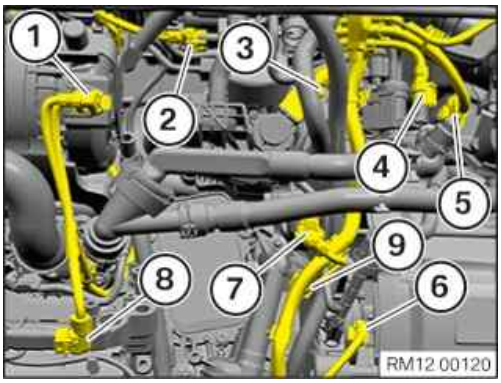
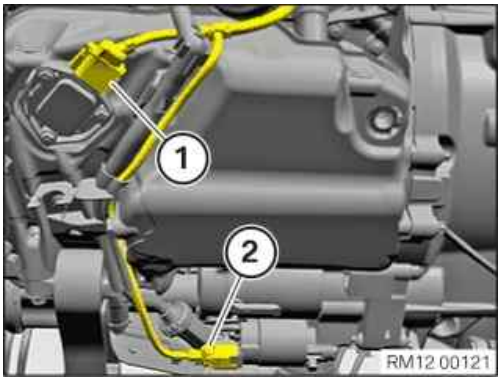


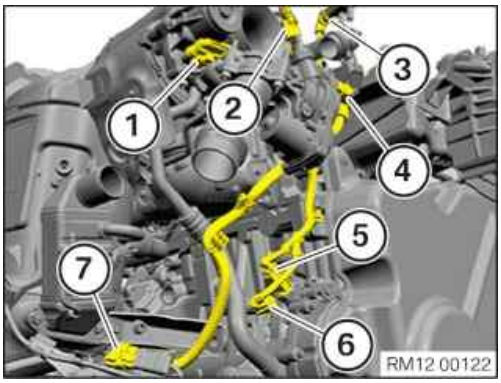
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



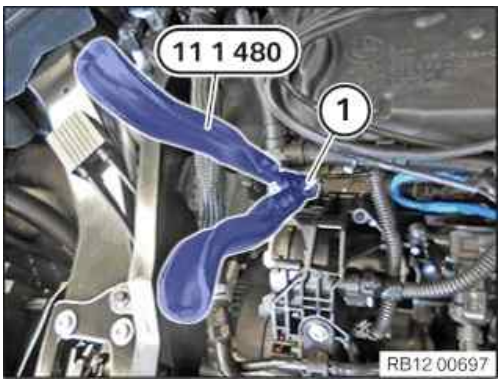
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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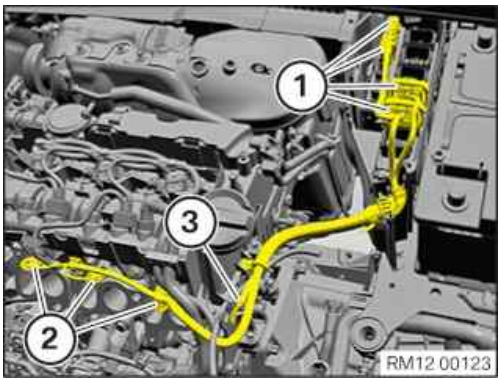


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

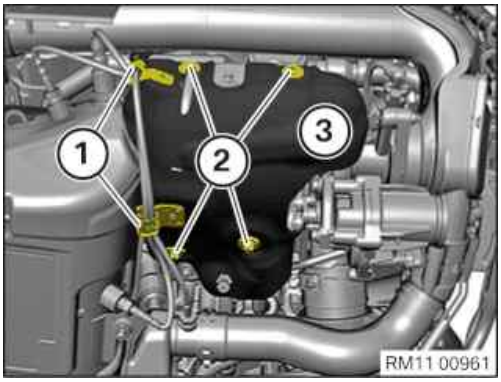
▶ Removing heat shield from top exhaust turbocharger

WARNING

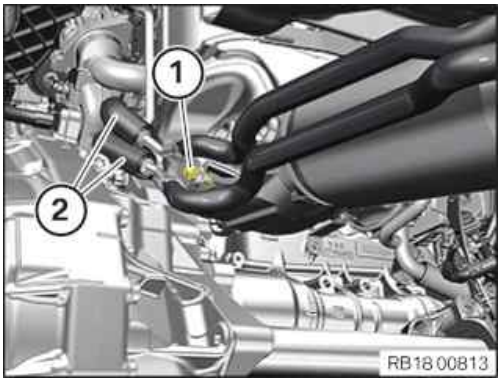
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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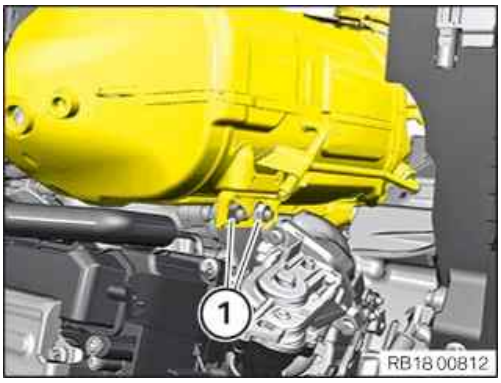
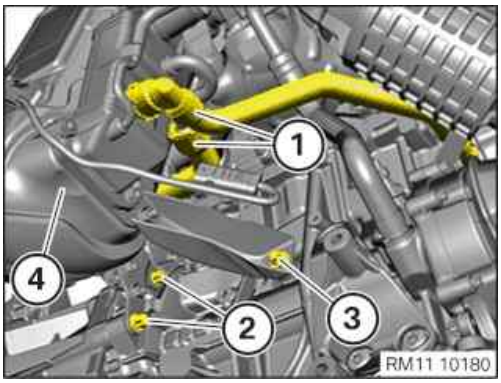


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

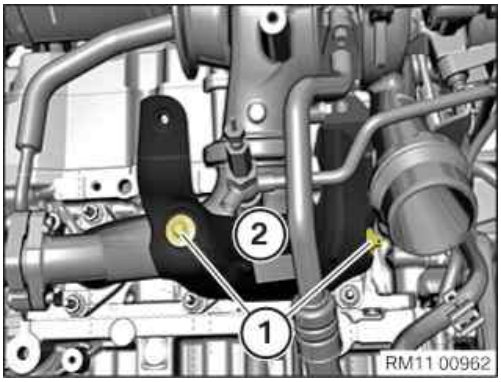
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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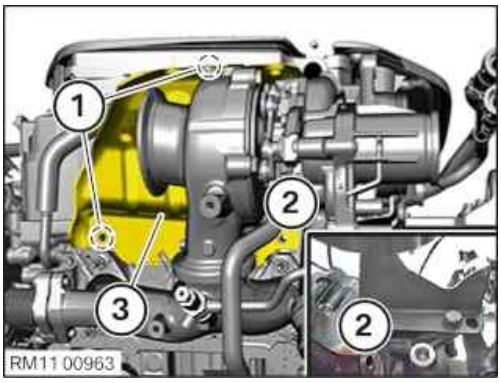


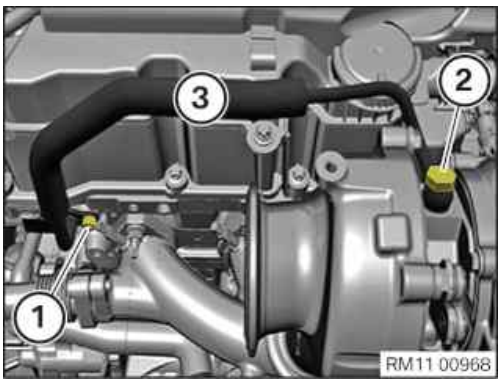
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

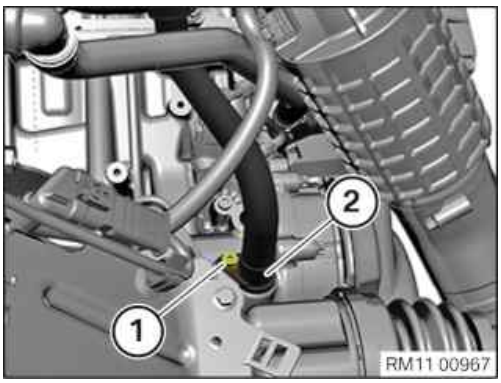
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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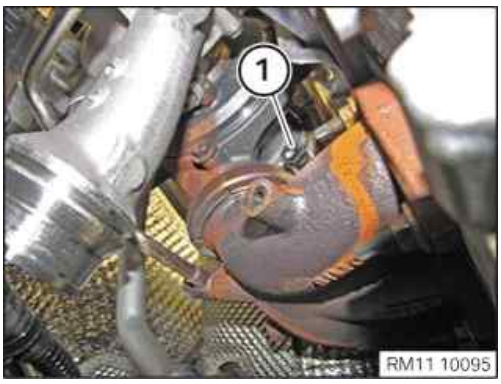
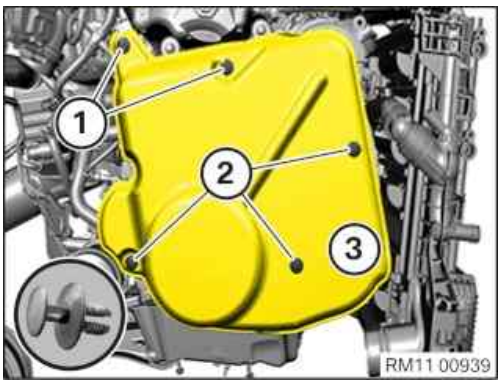
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

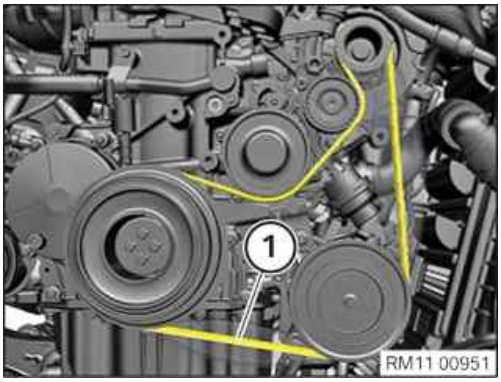
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

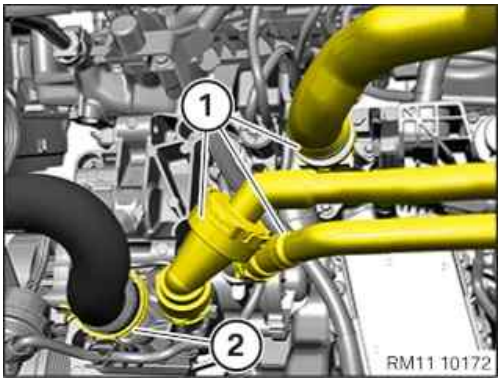
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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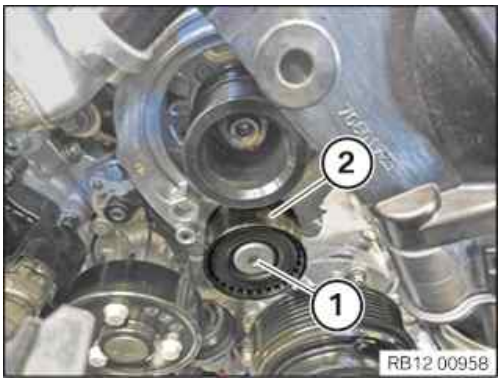
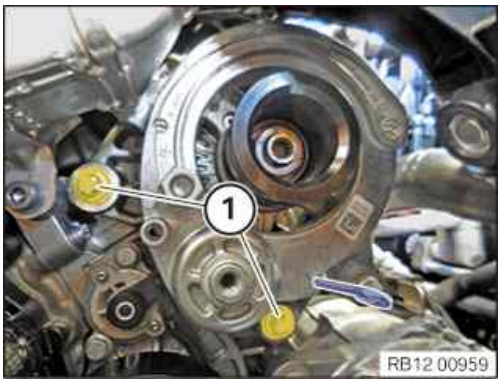
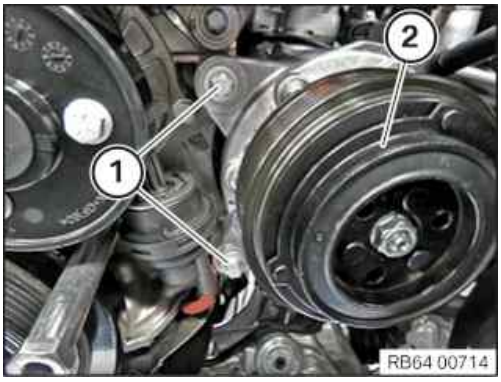


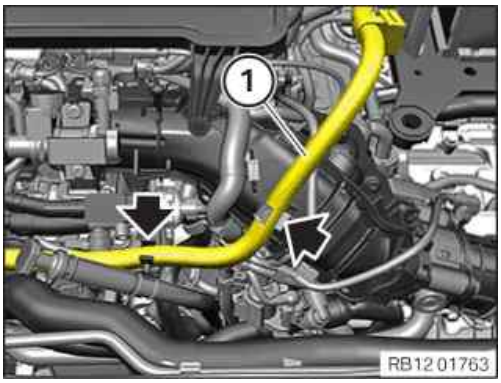
- Loosen screw (1).
- Remove the deflecting element (2).



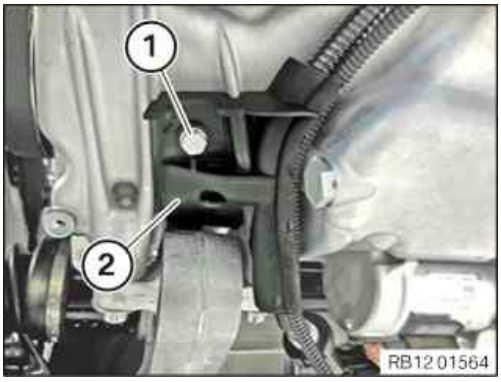
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

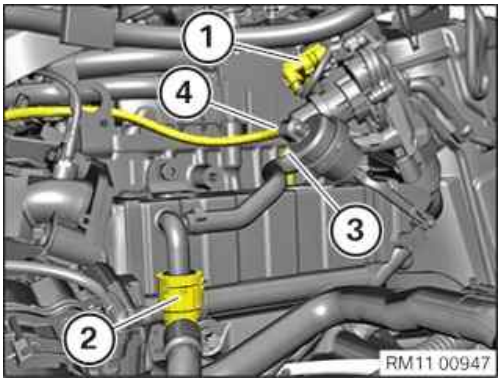
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

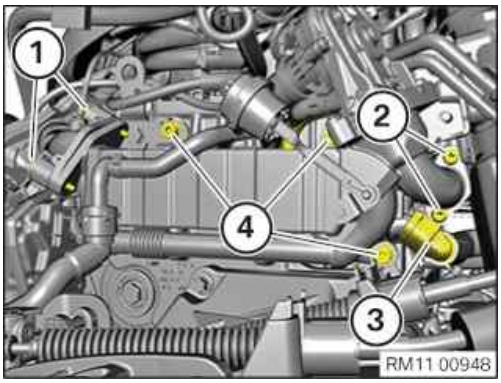
- Perform all work only on components that have cooled down.



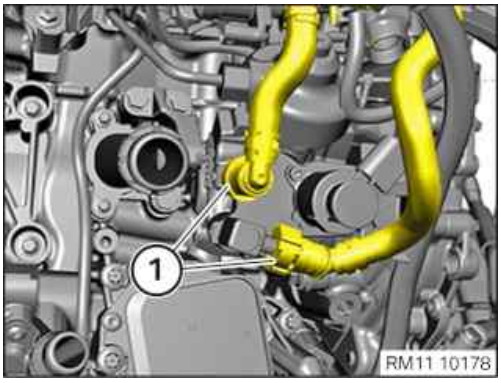
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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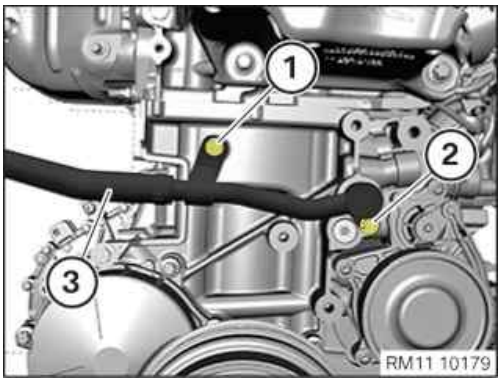


- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Detach the engine from the manual gearbox

Prerequisite

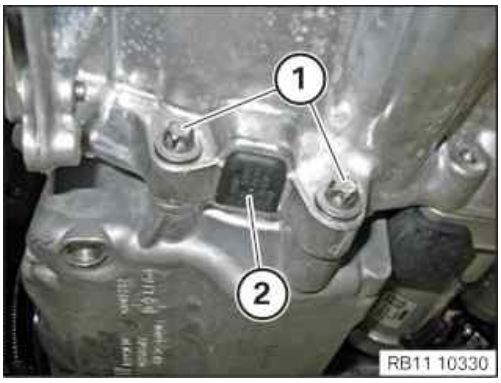
Engine has been removed.

CAUTION

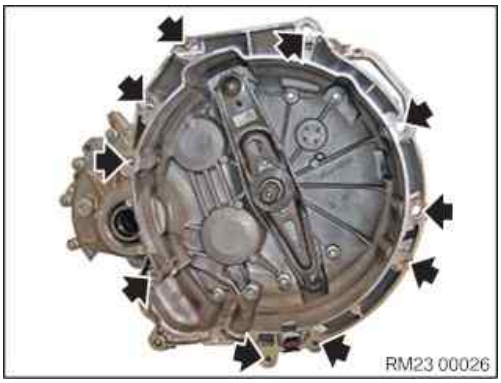
Heavy component.

Heavy components can lead to injury or damage.

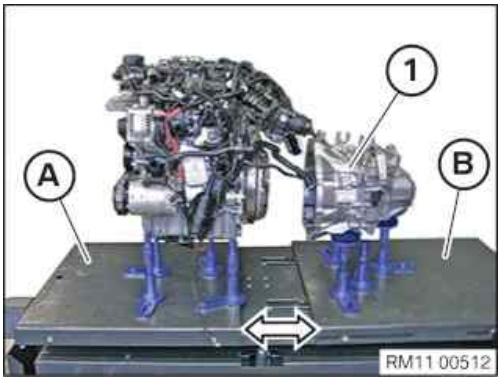
- Remove and install heavy components with the aid of another person/other persons.



- Loosen screws (1).
- Remove protective cap (2).



- Remove screws (arrows).



- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.

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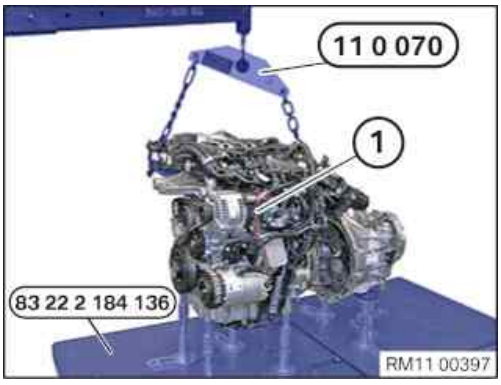
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool **0 490 579 (11 0 070)** and lift engine (1) off lifting table.

9 – Mount engine on assembly stand

CAUTION

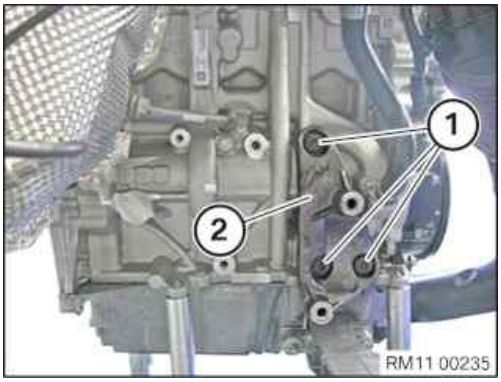
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

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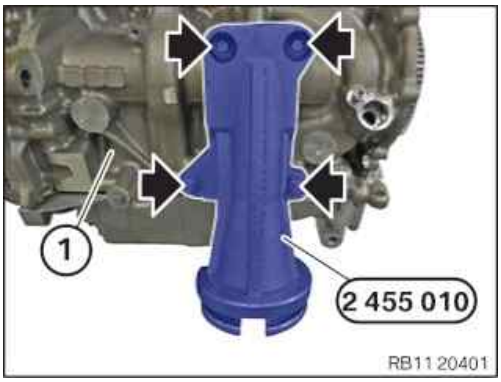
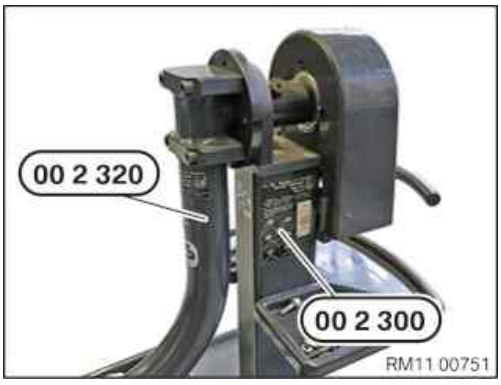


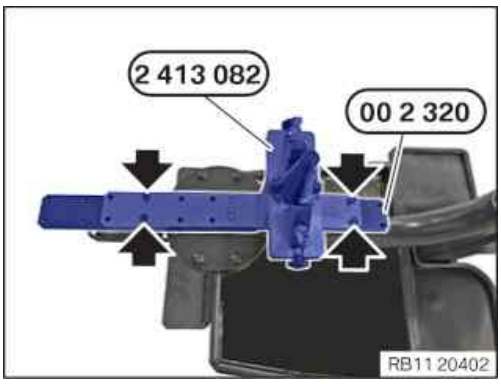
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.

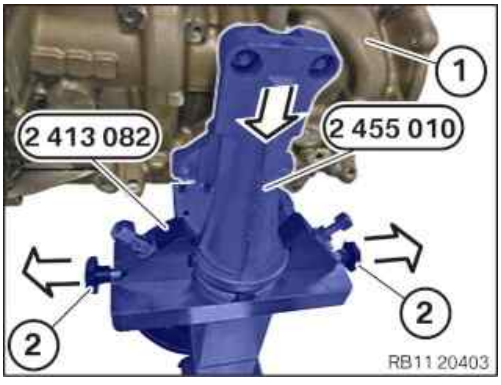


- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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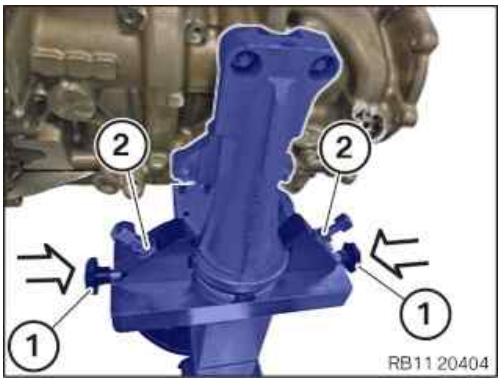


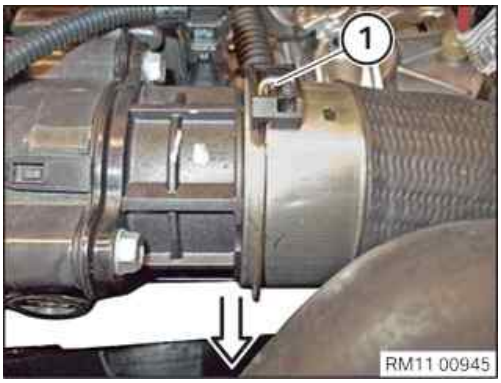
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

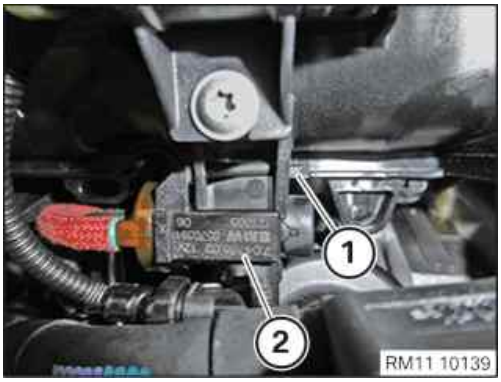
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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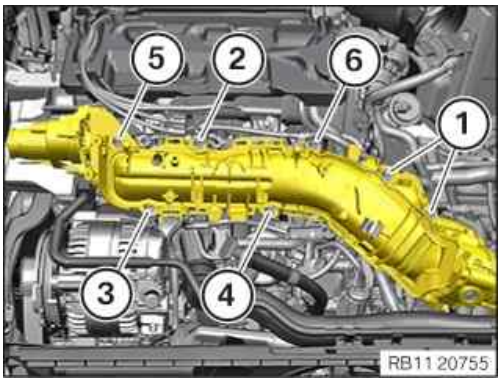
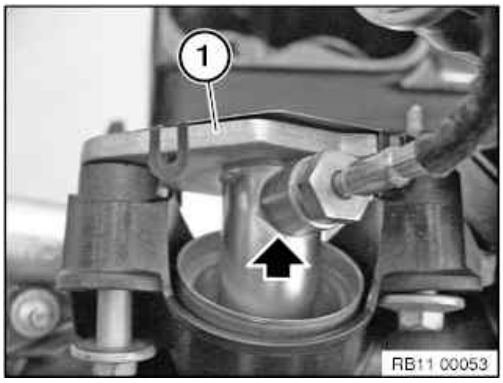


- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

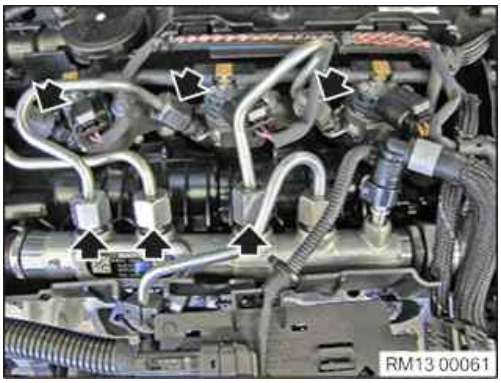
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

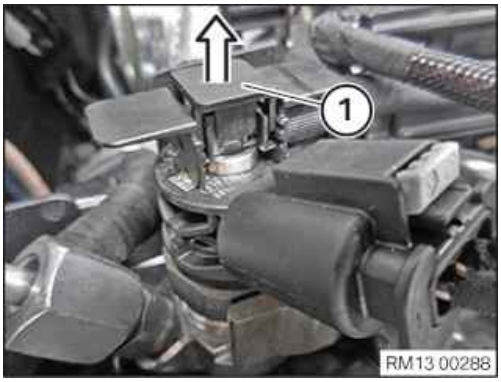
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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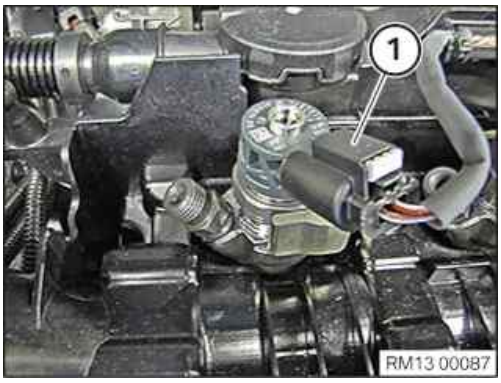
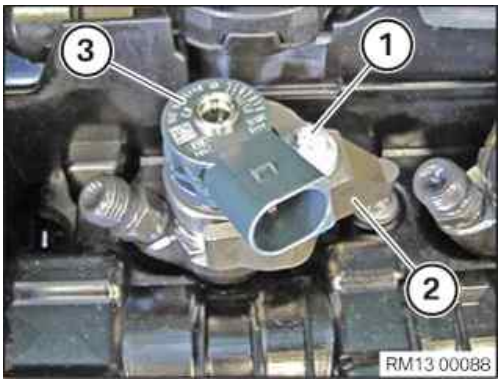


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

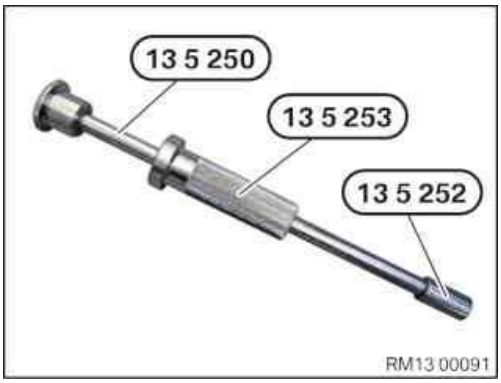
▶ **Loosen stuck injectors**

RISK OF DAMAGE

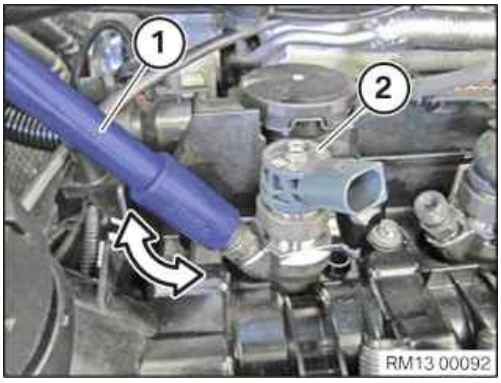
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

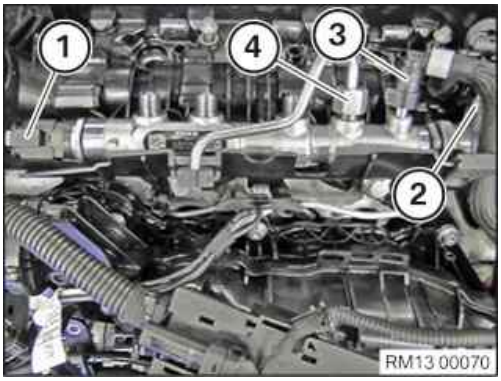
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

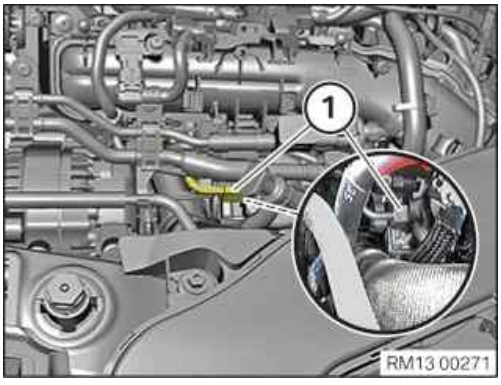
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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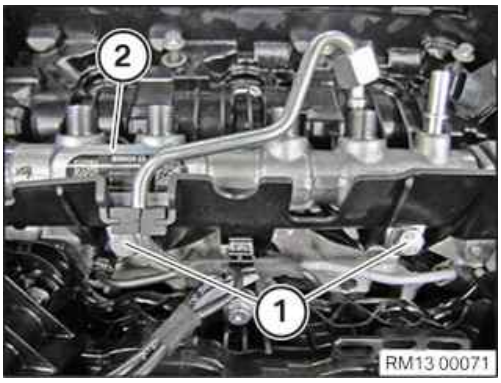
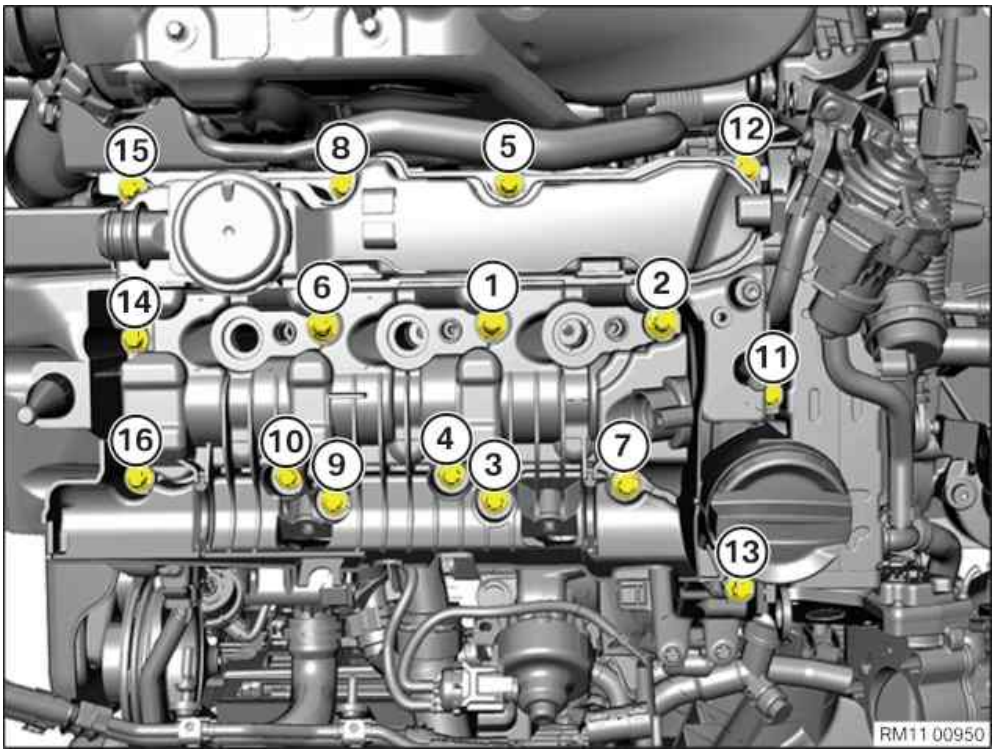


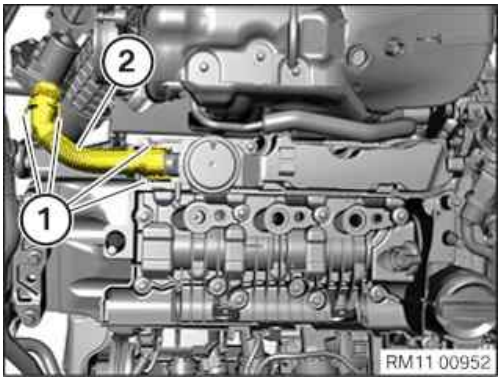
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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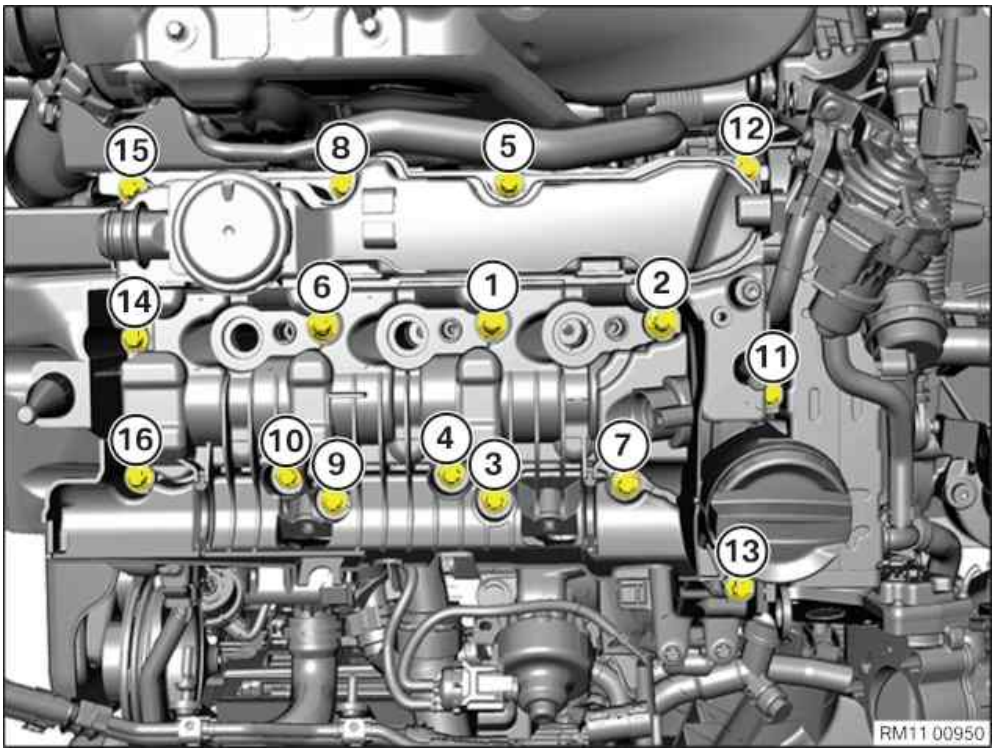

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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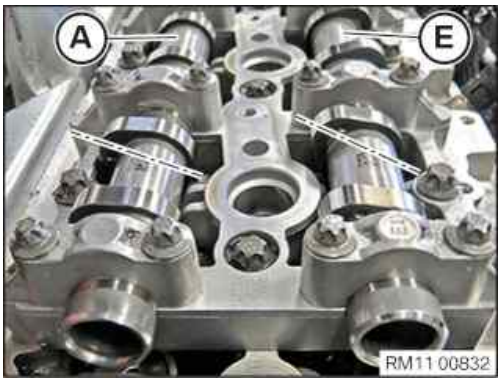
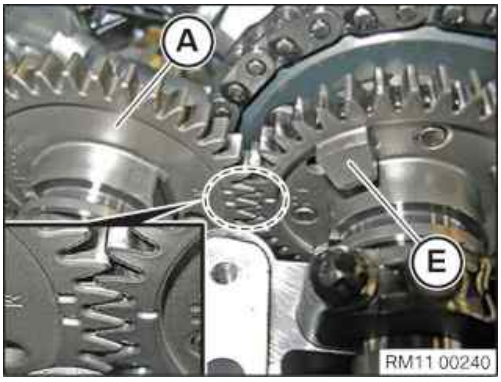


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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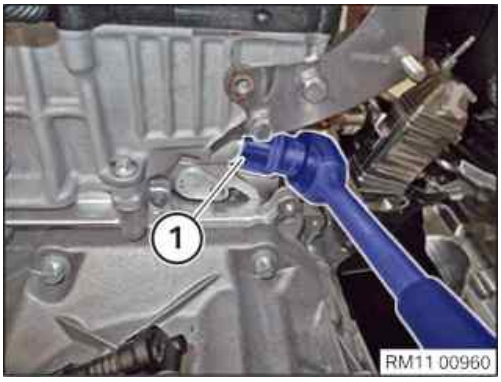
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

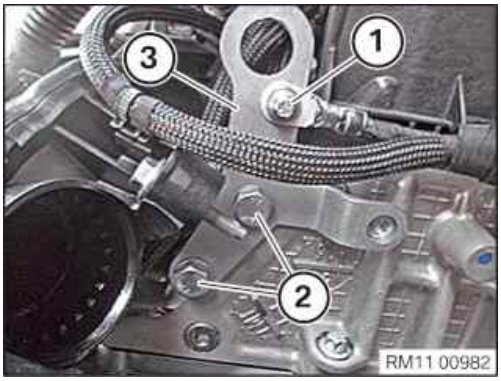


TECHNICAL INFORMATION

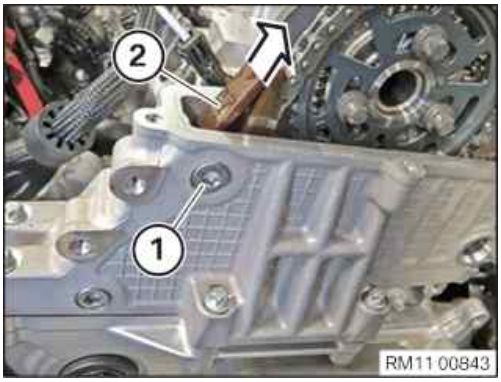
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

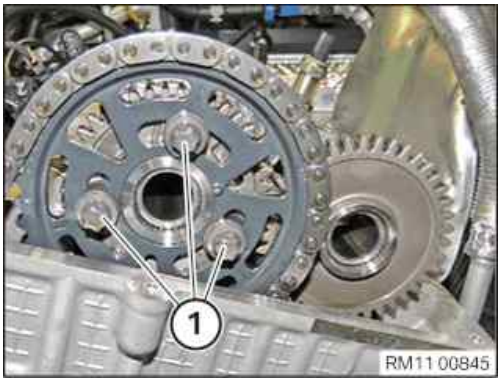


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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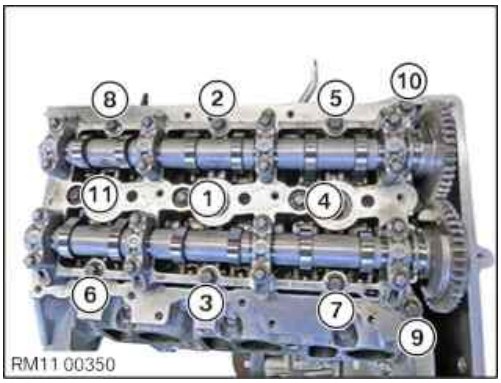
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

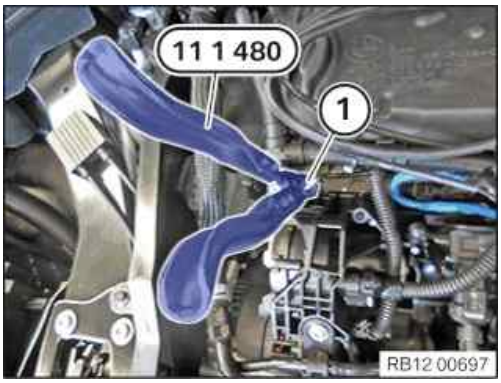
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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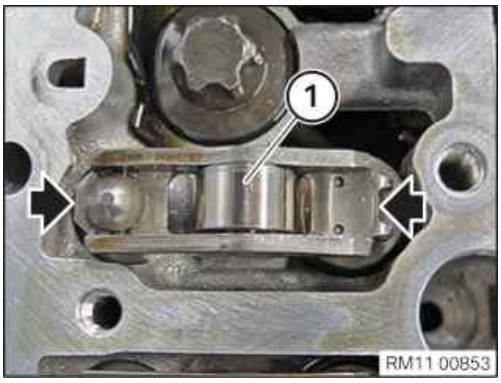


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

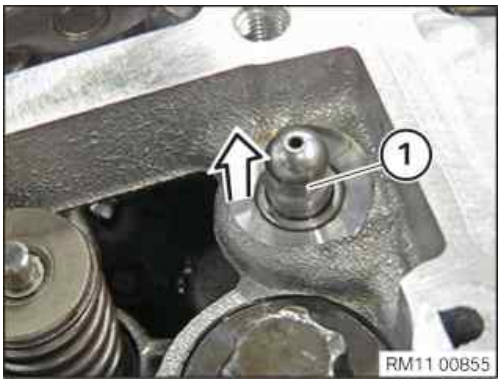
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

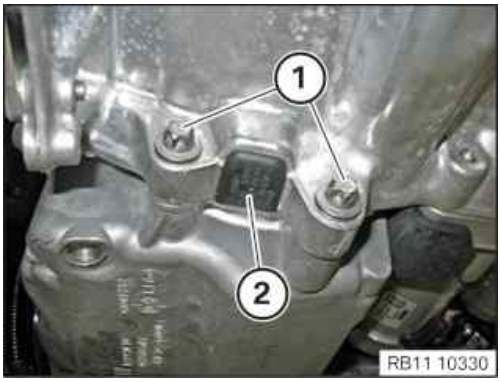
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

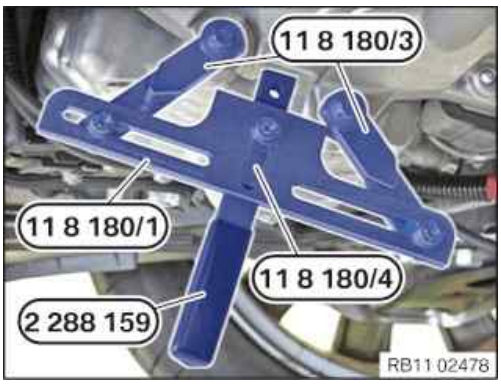


- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

24 – Removing the vibration damper



- Release the transmission bolts (1).
- Remove the protective cap (2).



- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.

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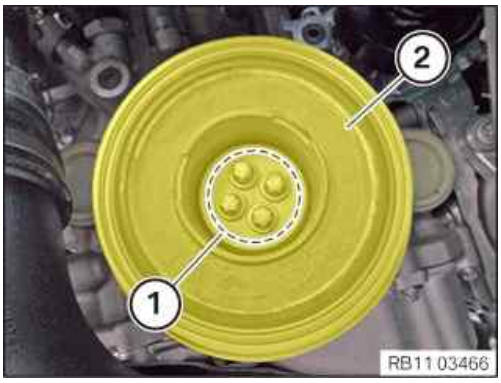
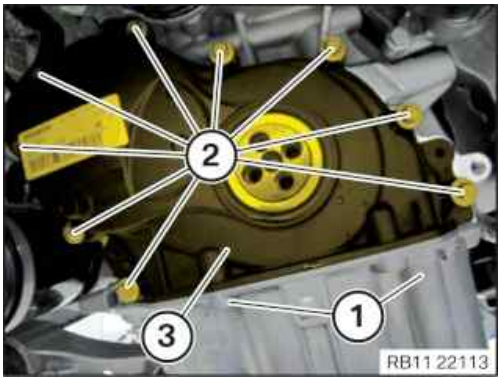


- Loosen screws in the area (1).
- Remove the vibration damper (2).

25 – Remove gear case cover



- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove timing case cover (3).

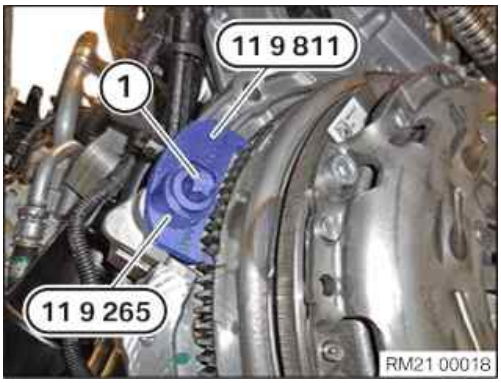
26 – Remove clutch

CAUTION

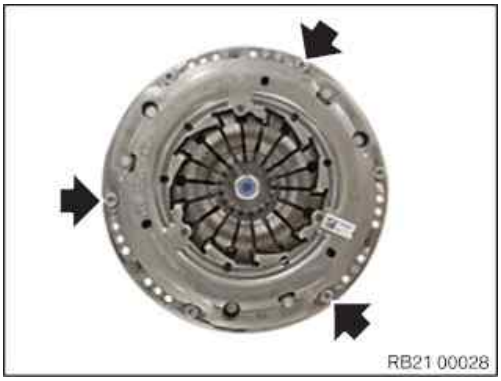
Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.



- Detach 3 screws to attach special tool **0 493 839 (21 2 170)** and **2 288 165**.

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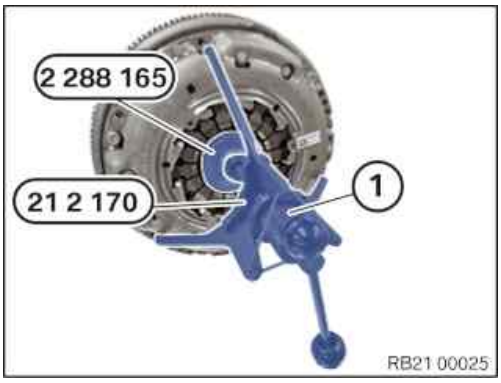
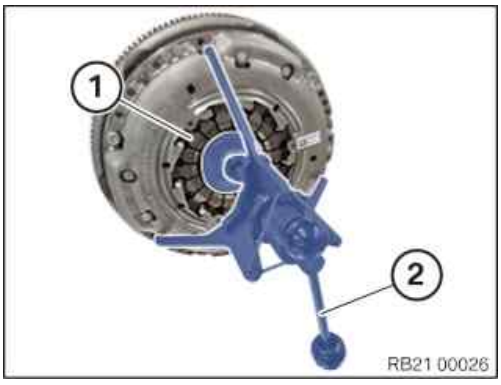
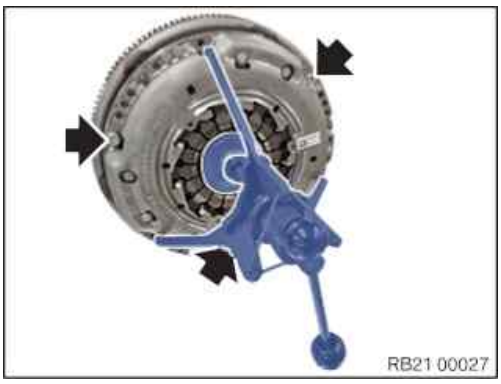


- Position special tool **0 493 839 (21 2 170)** and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

27 – Removing flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.

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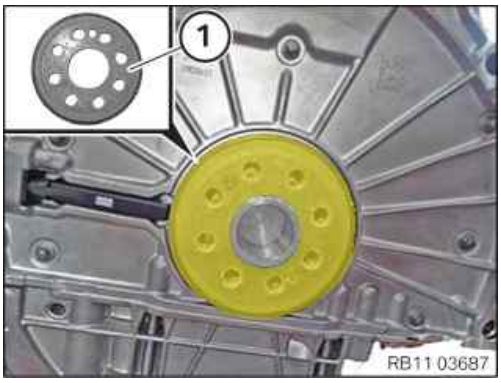


RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

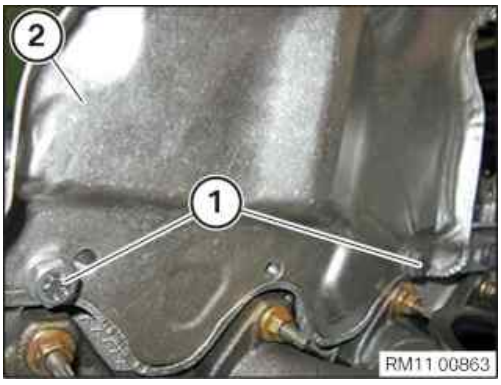
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

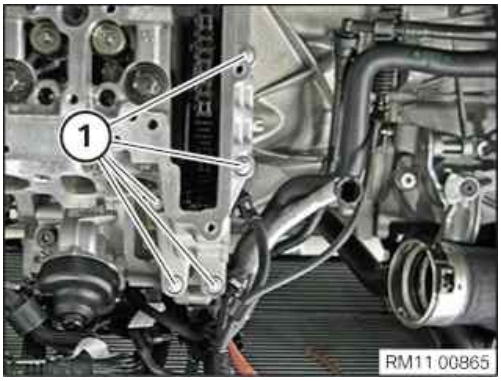
28 – Remove rear timing case cover

Prerequisite

Transmission is removed.



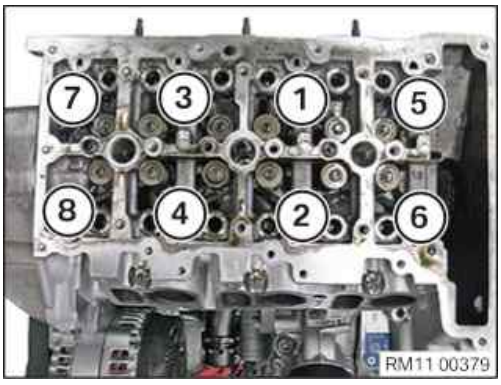
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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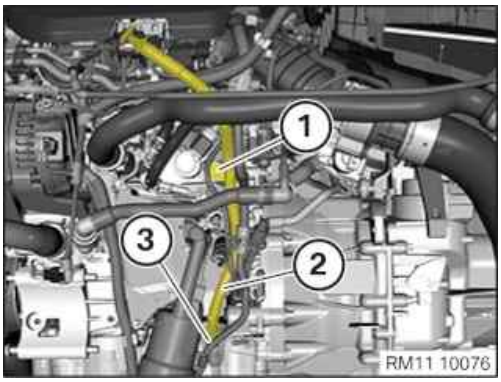
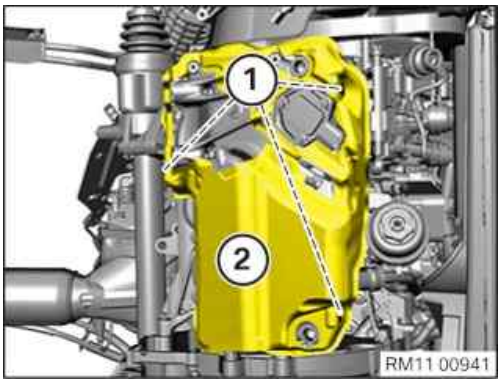
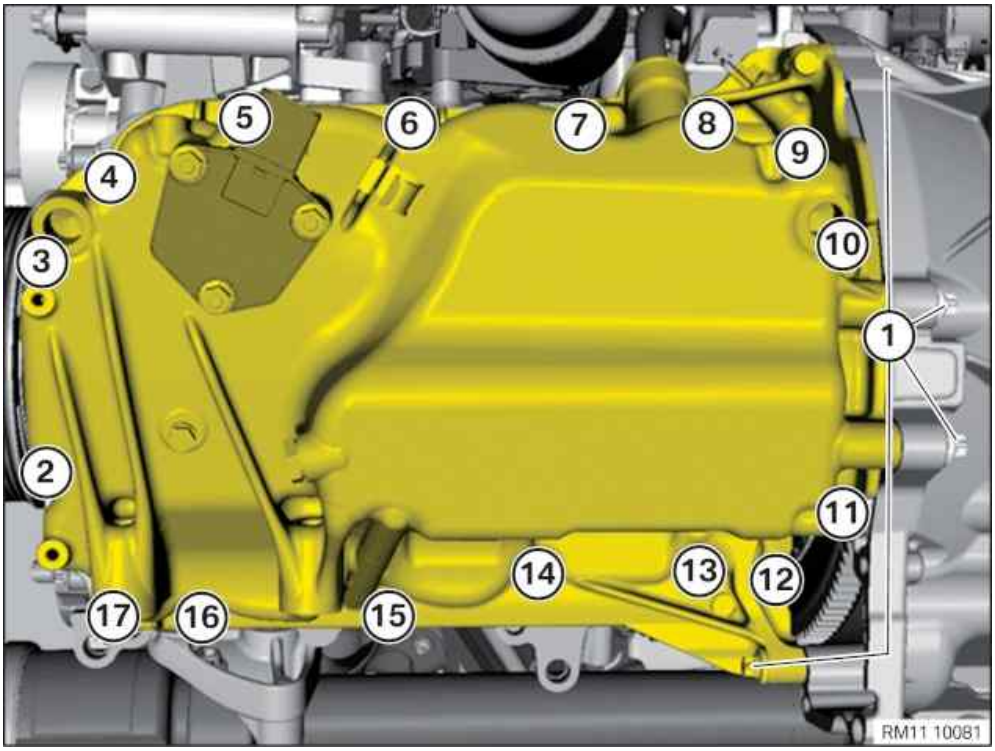


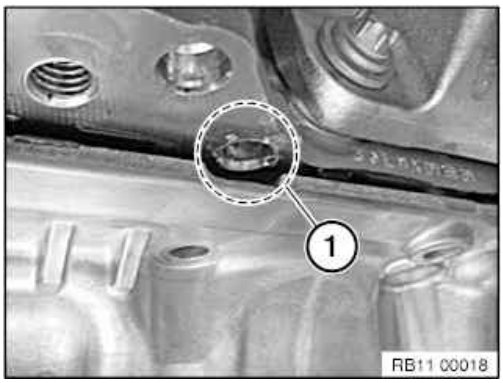
- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- If required, remove sealing ring (3) from oil sump.



- Remove the expanding rivet (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).



- Tighten the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release oil sump only in area (1).

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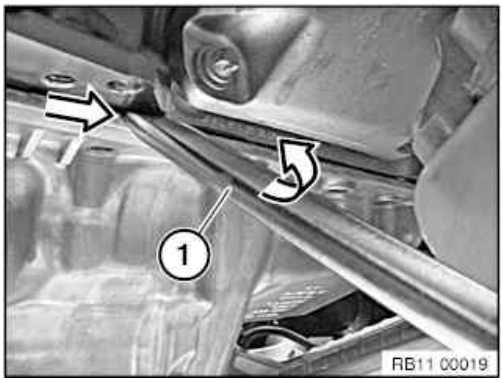
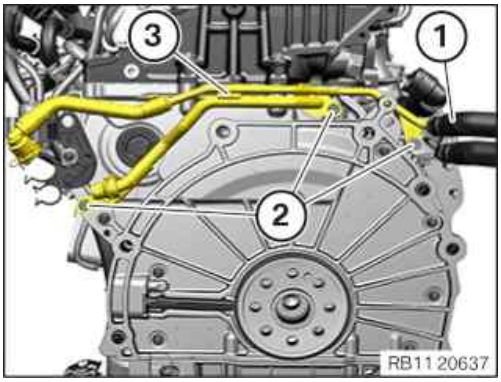
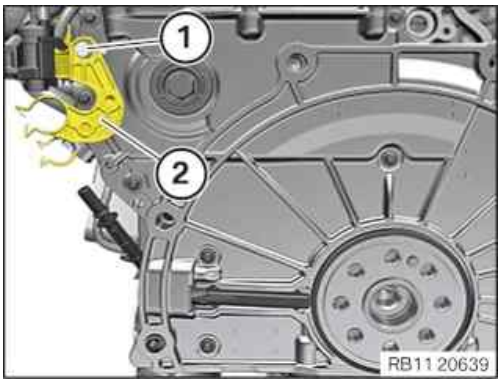


- Release the oil sump using a suitable mounting lever (1) carefully at the position intended for that.
- If required, secure the oil sump against falling.

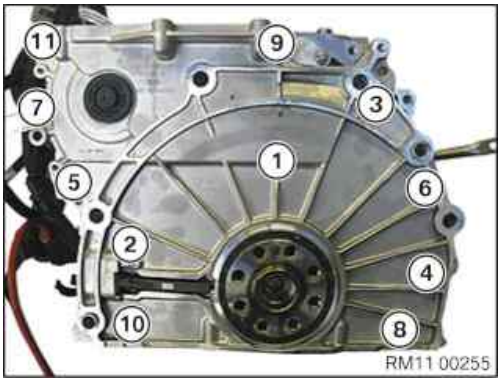
► **If installed: Remove coolant line of the SCR metering module**



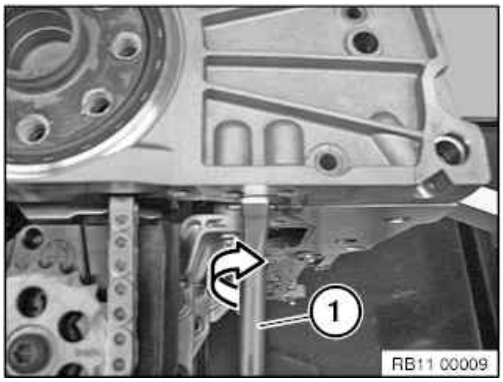
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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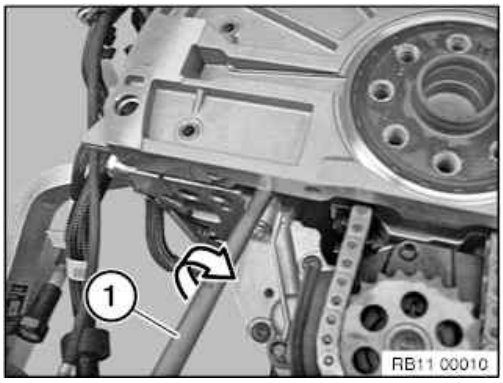


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

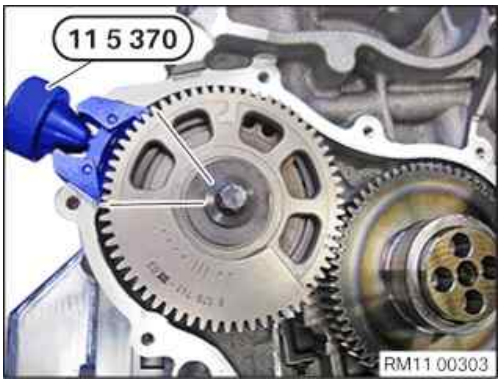
MAIN WORK

29 – Remove counterbalance shaft

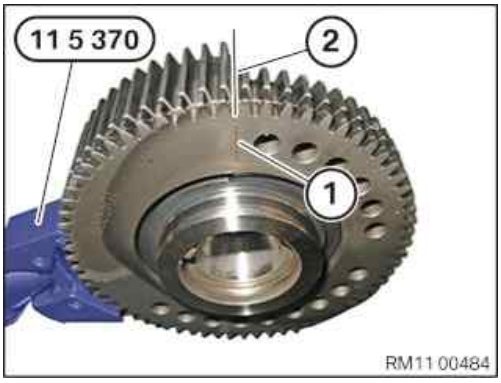
- Fasten counterbalance shaft with special tool in the TDC position of cylinder no. 1.
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



- Ensure that the gear of the counterbalance shaft is pretensioned and blocked before removal.
- Install the special tool **0 495 131 (11 5 370)** as shown and pre-load the gear.



- Block gear wheels (1) and (2) until re-installation with the special tool **0 495 131 (11 5 370)**.

- Check whether the marks on the counterbalance shaft gear are aligned with the marks on the crankshaft gear.
- Loosen screw (1).

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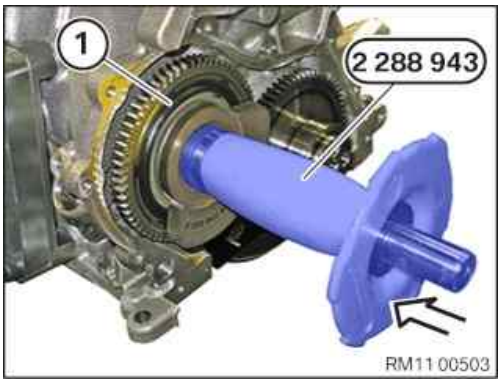
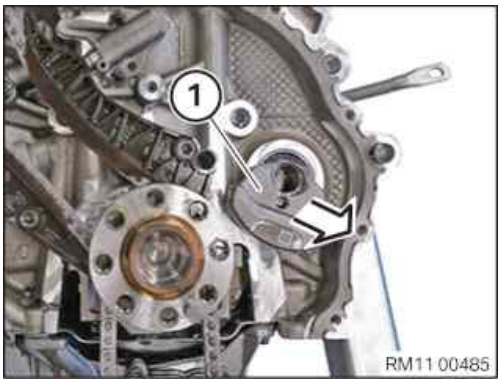
- Loosen screws (1).
- Remove special tool .



- Screw the special tool **2 288 943** far as it will go into the counterbalance shaft.
- Secure counterbalance shaft and gear against falling down!
- By means of targeted hammer blows on the special tool **2 288 943** in the direction of the arrow, loosen the counterbalance shaft from gear (1) .
- Remove special tool **2 288 943**.

- Remove the counterbalance shaft gear in the direction of the arrow.



- Remove counterbalance shaft (1) in direction of arrow.

30 – Install counterbalance shaft

- If a new gear is installed, the ring gear must remain blocked until installation using the factory-mounted fixation (1) .

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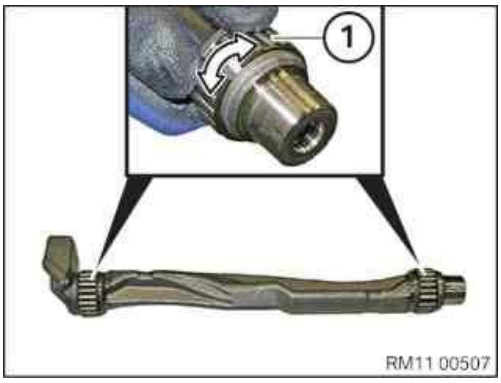
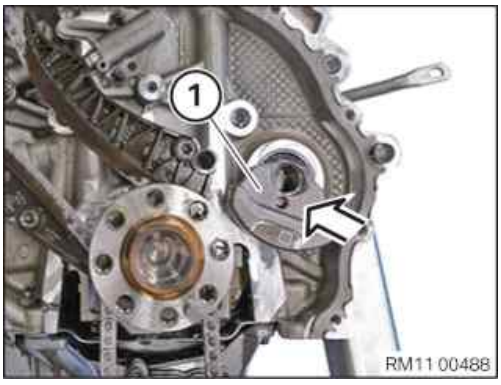


- Check both needle bearings (1) of counterbalance shaft for damage.
- Pull off damaged needle bearing (1) from the counterbalance shaft and renew it.

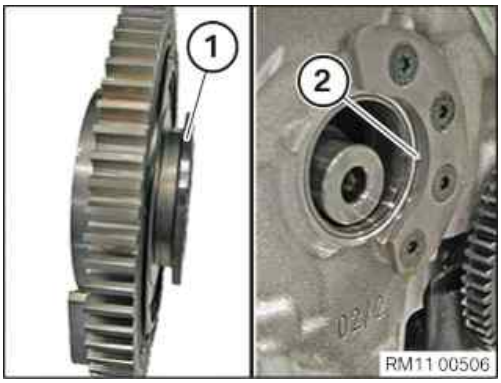


- Install counterbalance shaft (1) in direction of arrow into crankcase.

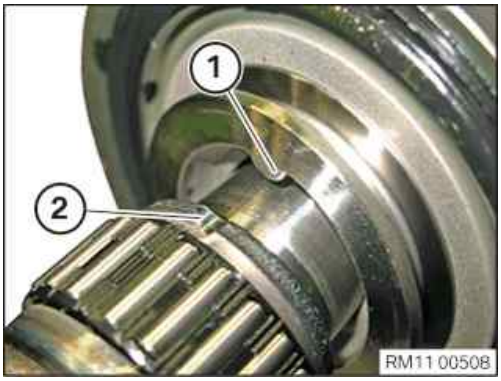
- Fix the counterbalance shaft in the TDC setting of the first cylinder using the special tool .
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



- On installation, make sure that ring (1) of gear is guided in crankcase (2).



NOTICE

For a better overview the removed condition is shown here.

- On installation of counterbalance shaft in gear, make sure that lug (1) on gear is inserted into groove (2) of counterbalance shaft.

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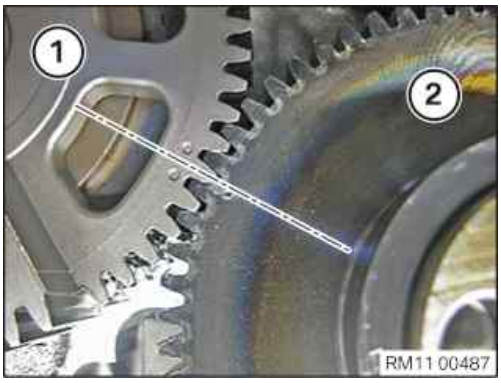


- Bring gear (1) of counterbalance shaft into contact in correct installation position (mark) relative to crankshaft (2).

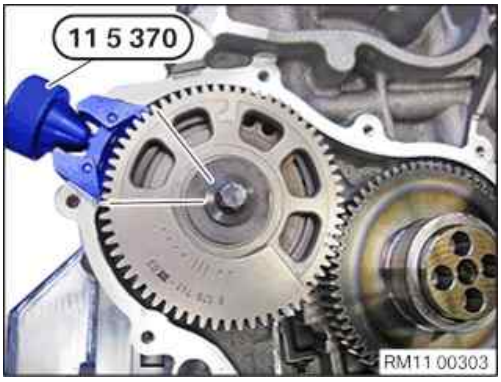
- Renew the screw (1).

  Parts: Screw

- Tighten down screw (1).

Gear to counterbalance shaft

	Renew screw.	Tightening torque	20 Nm
		Angle of rotation	60 °



- Remove special tool **0 495 131 (11 5 370)**.

- Loosen screws (1).
- Remove special tool .

POSTPROCESSES

31 – Install the rear timing case cover

Prerequisite

Transmission is removed.

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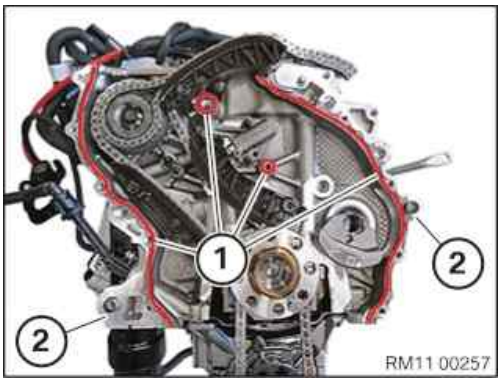


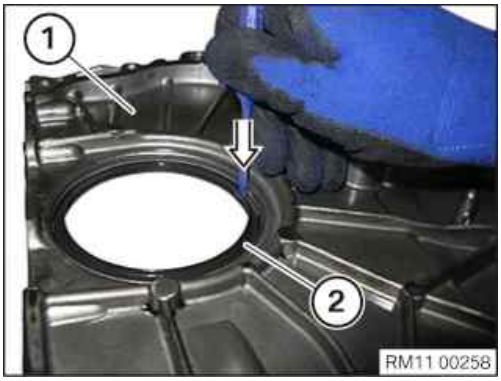
RISK OF DAMAGE

Damage to the surface.

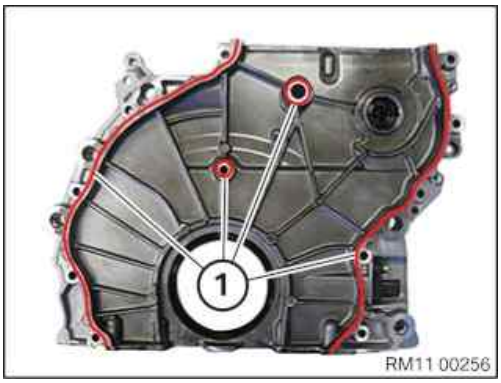
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

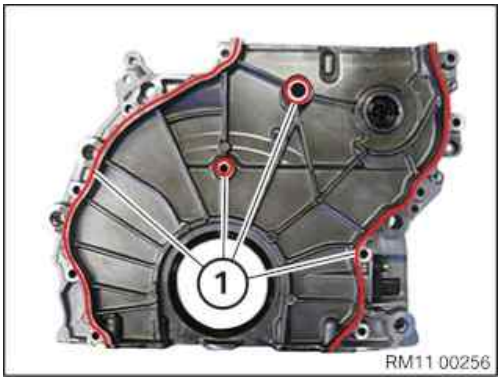
- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.



- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

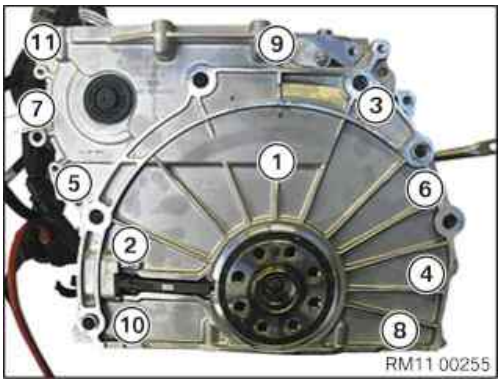


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

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RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

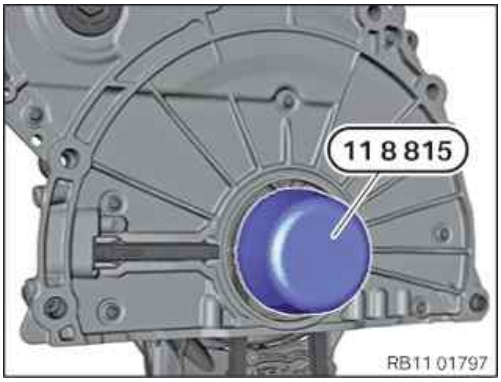
- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

RISK OF DAMAGE

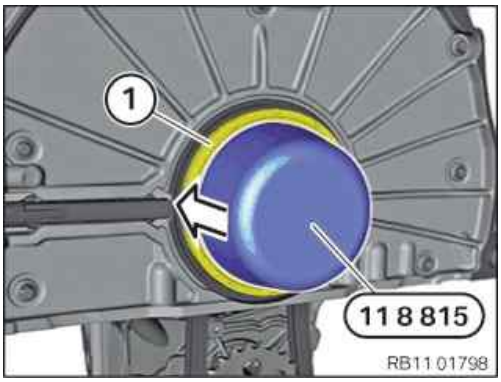
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

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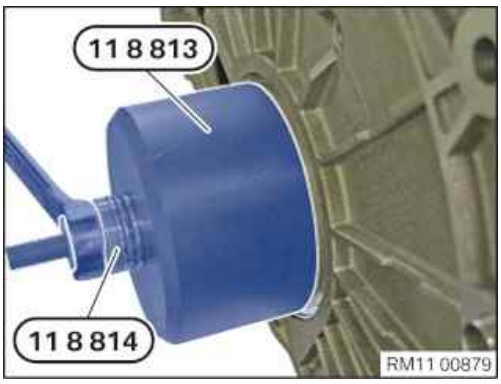
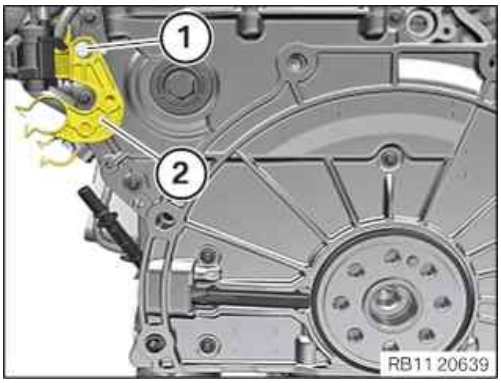
- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

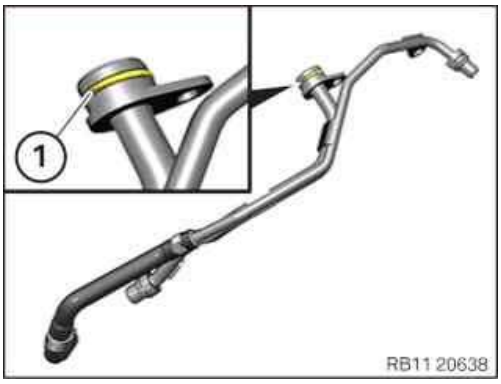


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



- Insert and install the holder (2).

► **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring

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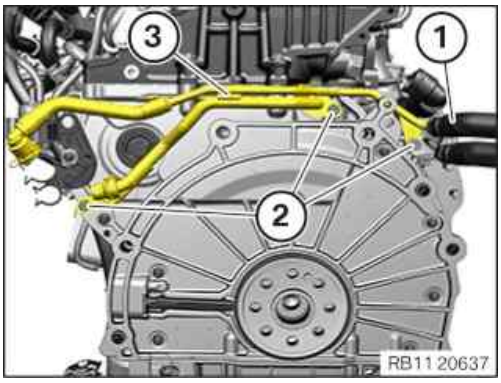


- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

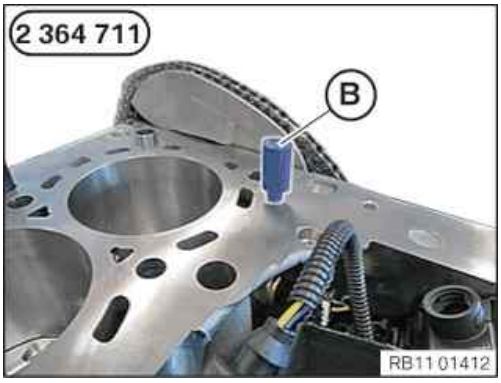
▶ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.

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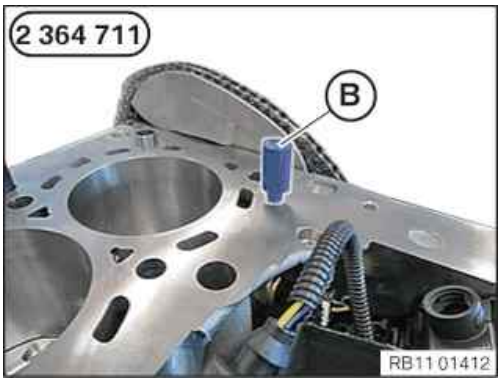
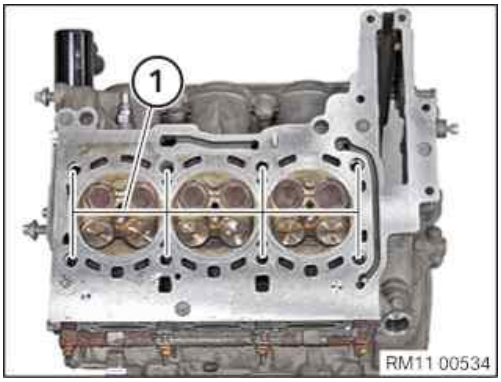


- Remove special tool (B).

▶ **Renewing the cylinder head gasket**



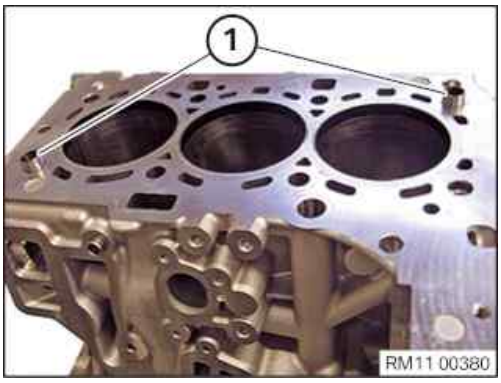
RISK OF DAMAGE

Damage to the surface.

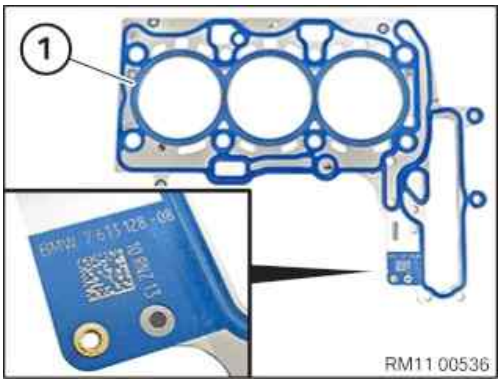
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

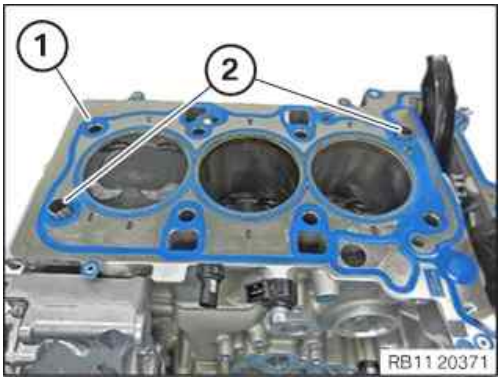
- Remove oil and dirt residue from the blind holes (1).



- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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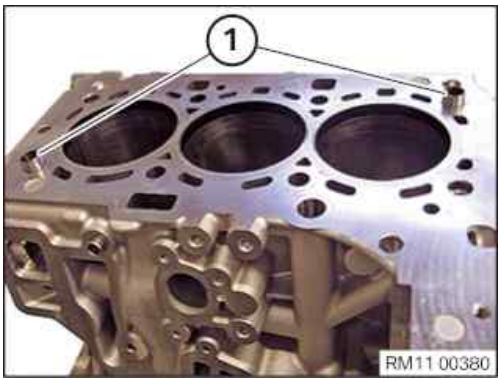
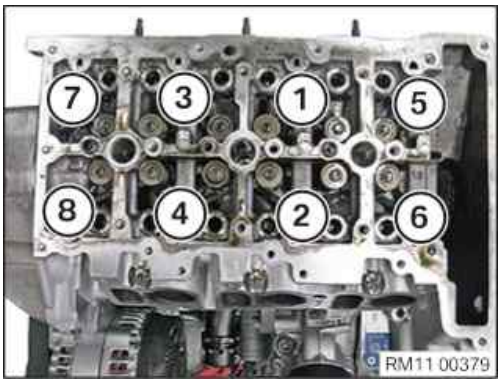


- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.

- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Fit new cylinder head screws.

  Parts: Cylinder head bolts

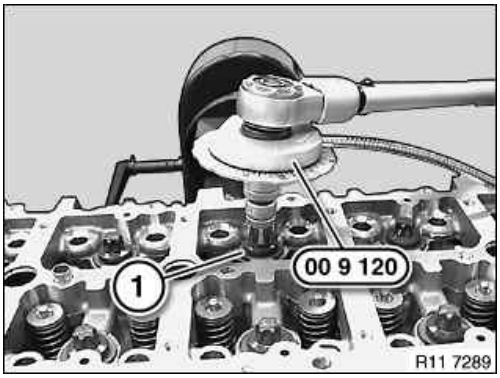
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

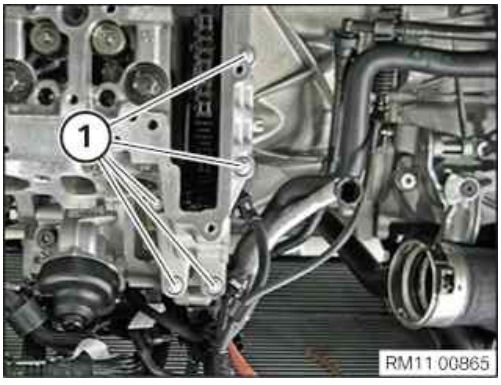
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolts in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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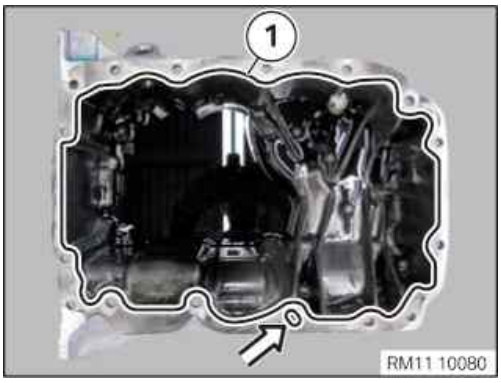


TECHNICAL INFORMATION

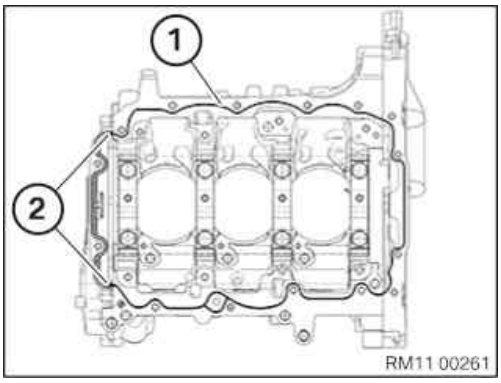
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

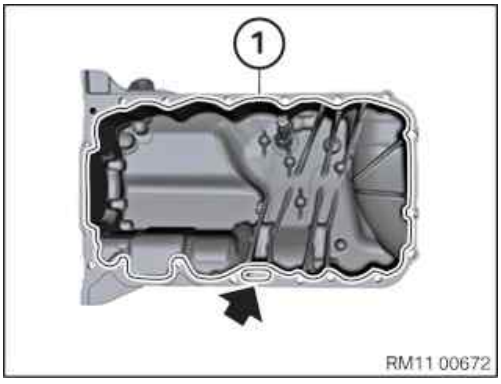
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

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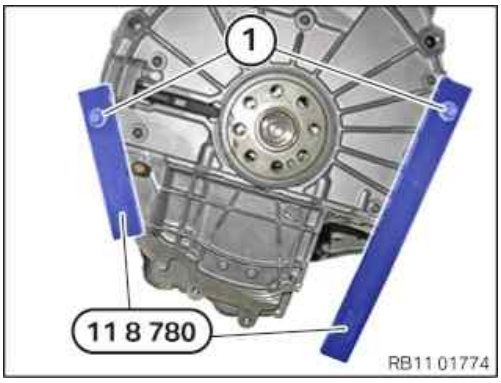
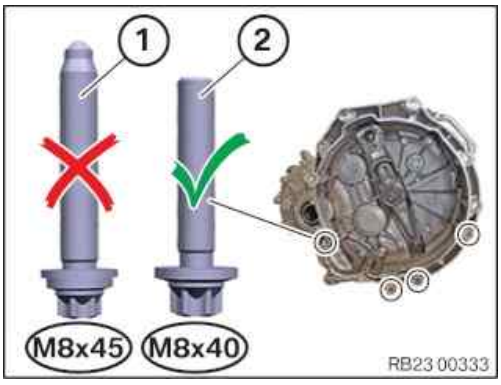


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

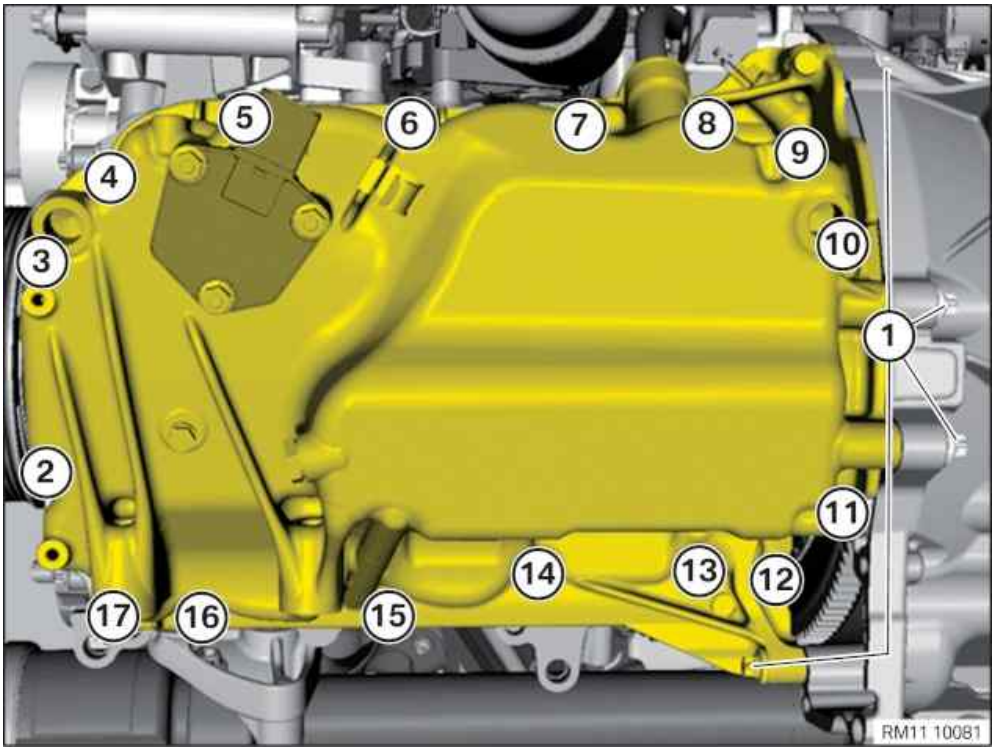
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Hand tighten the screws of oil sump (2) to (17) , but do **not** tighten completely yet.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

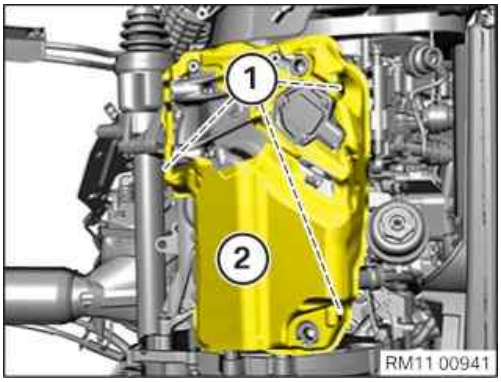
Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

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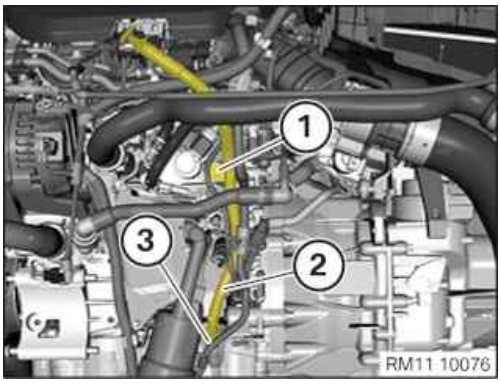
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

32 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).

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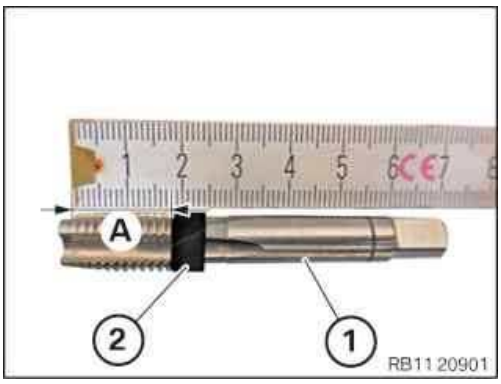
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

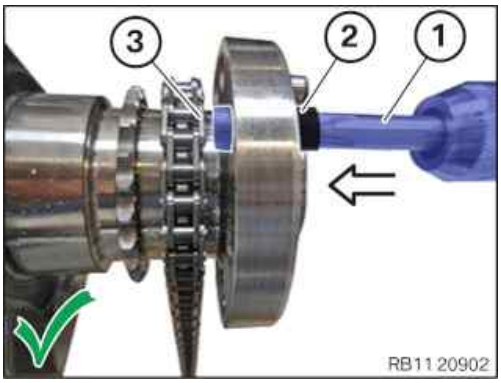
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

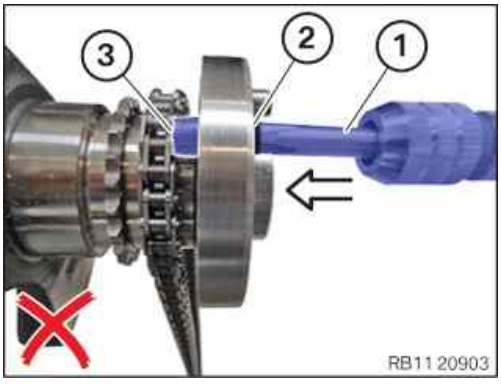
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).



TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).

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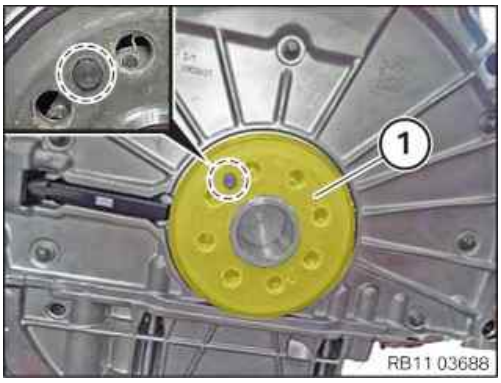
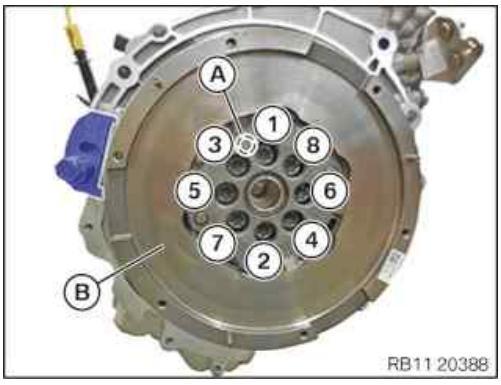


- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

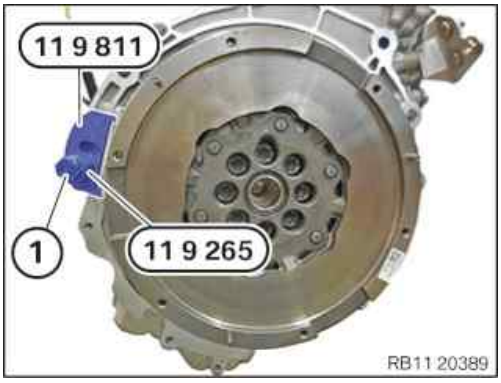


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

33 – Install clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.

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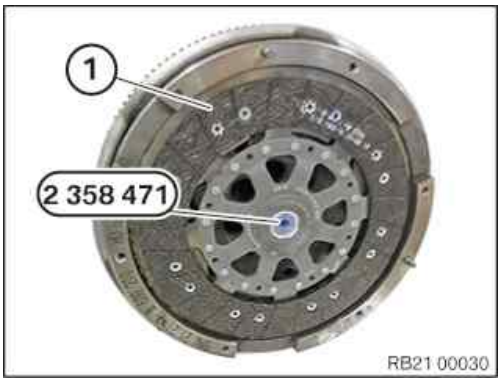
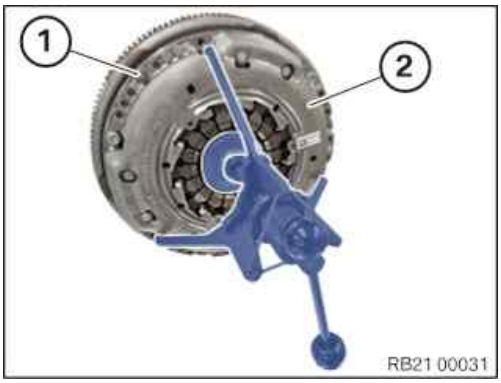
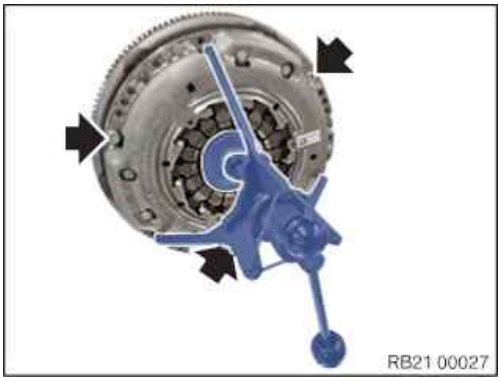


- Centre the clutch disc (1) using special tool **2 358 471**.



- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

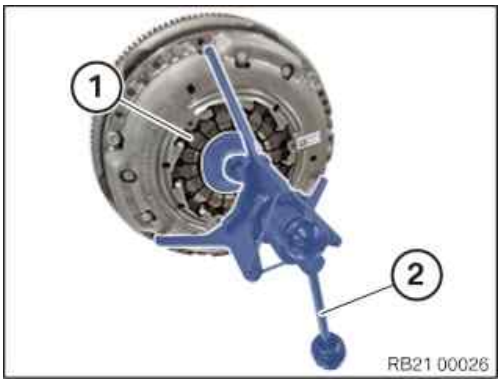


- Renew the bolts (arrows).

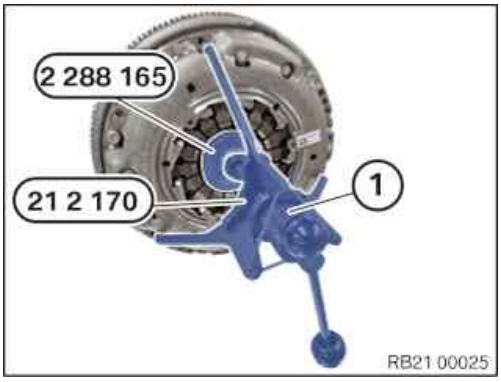
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool **0 493 839 (21 2 170)** with **2 288 165** from the clutch.

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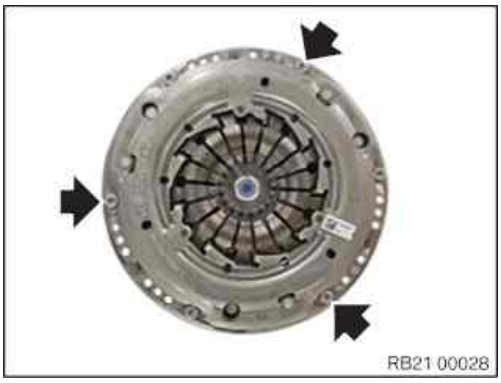


- Renew the bolts (arrows).

  Parts: Bolts

- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

- Withdraw special tool **2 358 471** from clutch disc with aid of accompanying screw.

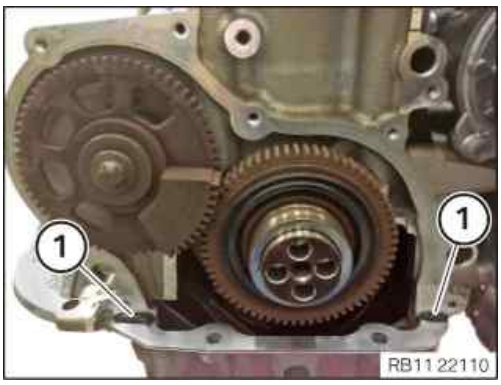
34 – Installing the timing case cover

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply sealing compound (1) approx. **5 mm** as shown.

  The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.

- Assemble special tool **2 357 900** as shown.
- Please note that no greases or lubricants may be used on the special tool **2 357 900**.

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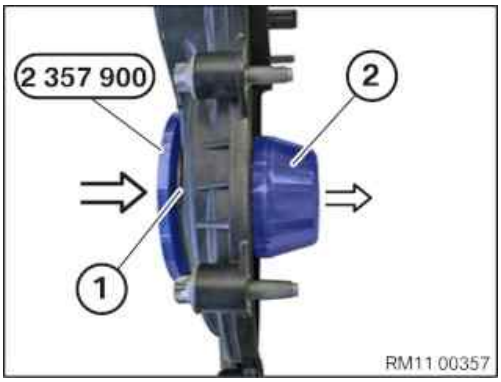
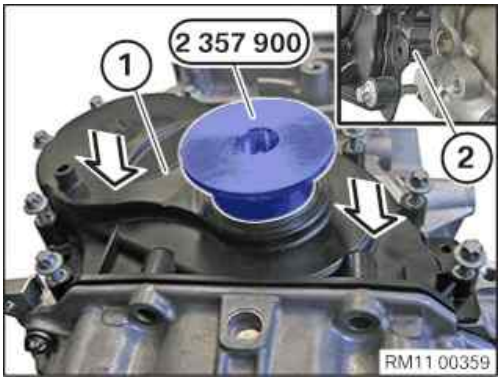


- Carefully slide the special tool **2 357 900** in the direction of the arrow through the sealing ring into the timing case cover (1).
- Make sure that the special tool **2 357 900** rests flat against the timing case cover (1).
- Remove the fitting aid (2).

- Connect special tool **2 357 900** to the timing case cover (1) on the hub of the crankshaft (2).



- Feed in and install timing case cover (1) in the direction of the arrow.
- Ensure the guide pins (2) are fitted correctly.
- Tighten screws hand-tight.
- Remove special tool **2 357 900**.

- Make sure that the air guide (1) faces out.

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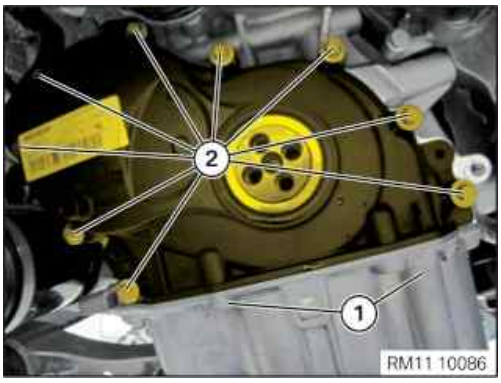


- Hand-tighten the bolts (1).
- Tighten the screws (2) in a crosswise sequence with a tightening torque.

Timing case cover, front, to crankcase

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

- Tighten the screws (1).

Oil sump to crankcase

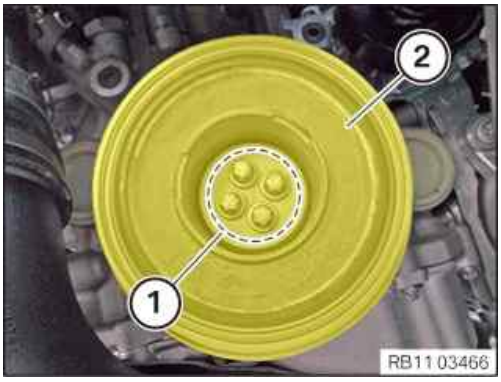
M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

- Tighten the screws (2) in a crosswise sequence with an angle of rotation.

Timing case cover, front, to crankcase

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

35 – Installing the vibration damper

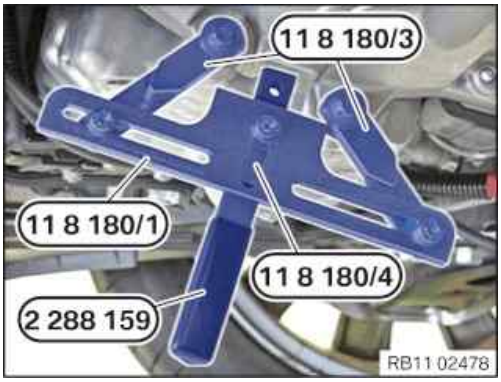


- Position vibration damper (2).
- Renew screws (1).

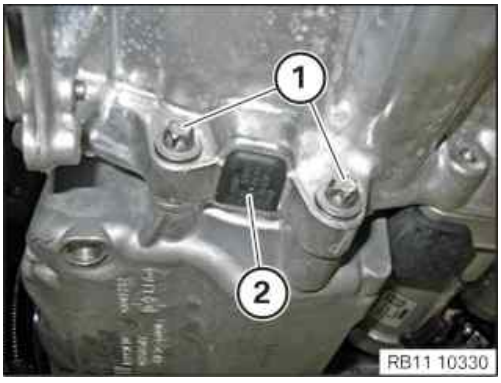
  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

Vibration damper with belt pulley to crankshaft

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.



- Tighten transmission screws (1).

Transmission to oil sump

M8			19 Nm

- Install protective cap (2).

36 – Installing the hydraulic valve clearance compensating element

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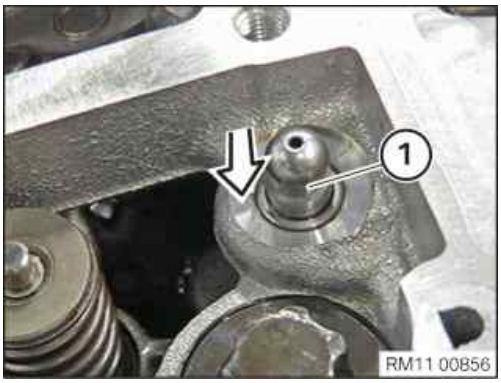
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

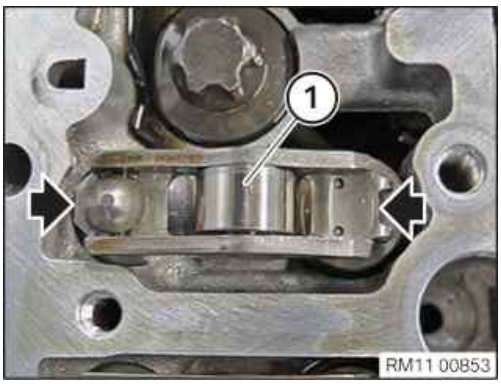


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

37 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

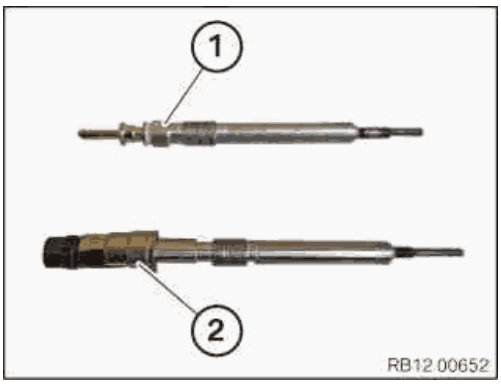


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

38 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

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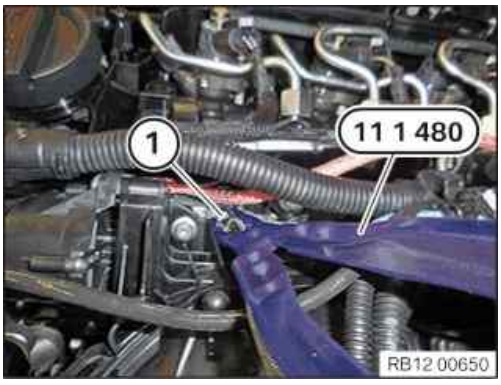
- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

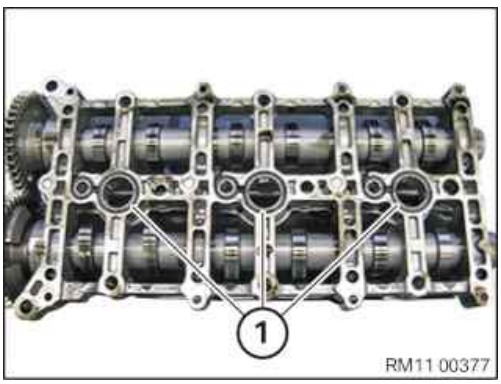
39 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

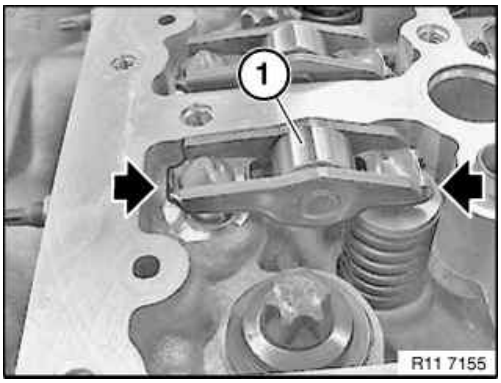
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.

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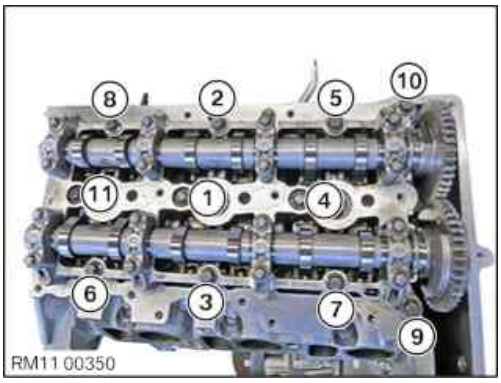


- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

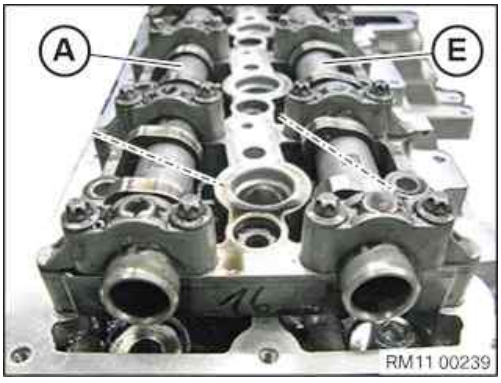
M7x35		Tightening torque	13 Nm

40 – Adjusting the timing of the camshafts

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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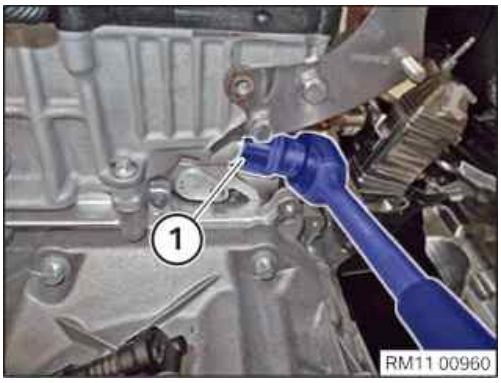


TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

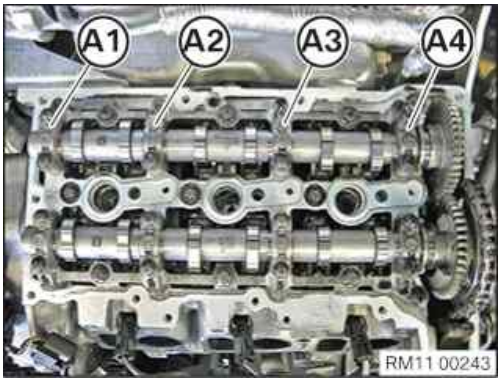
▶ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

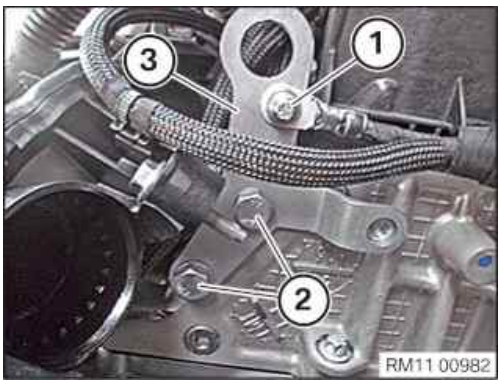


TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▶ **Remove the timing chain guide rail**



- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).

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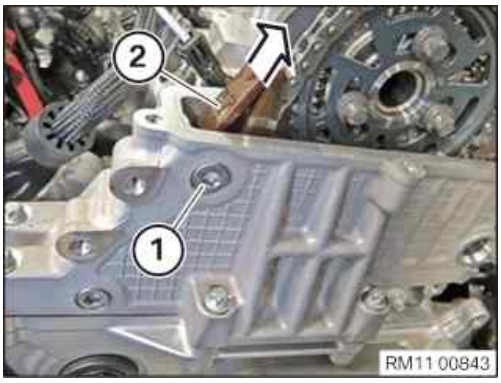
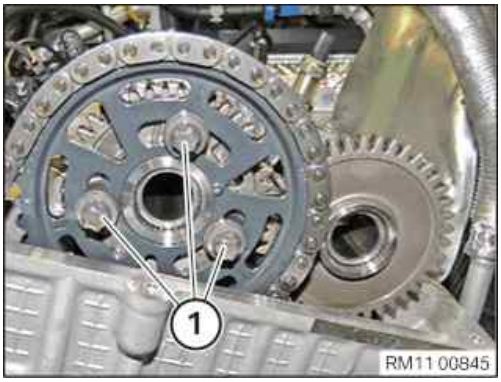


- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

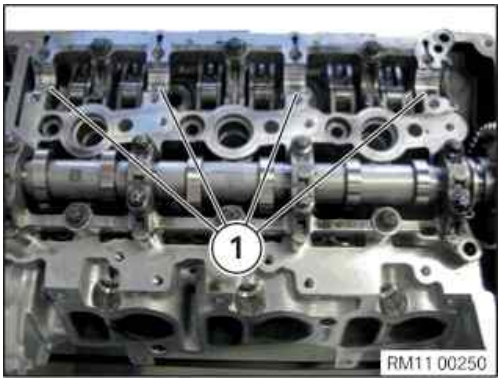
▶ **Installing exhaust camshaft**

RISK OF DAMAGE

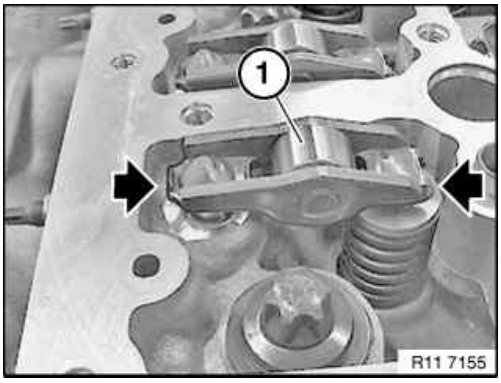
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

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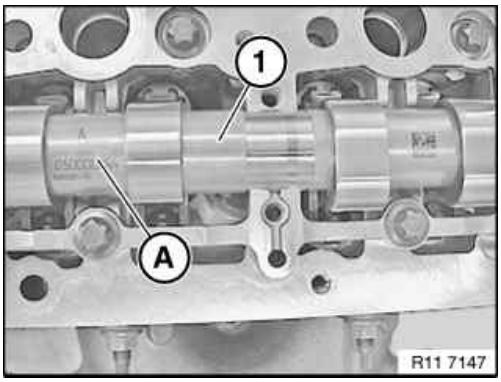
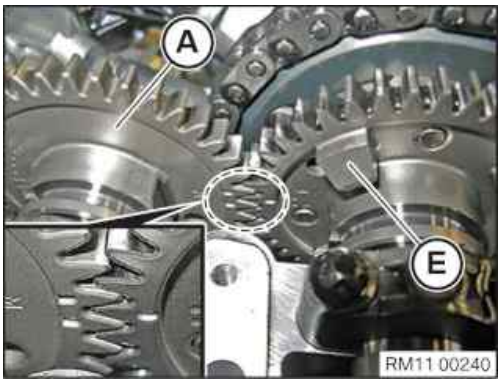
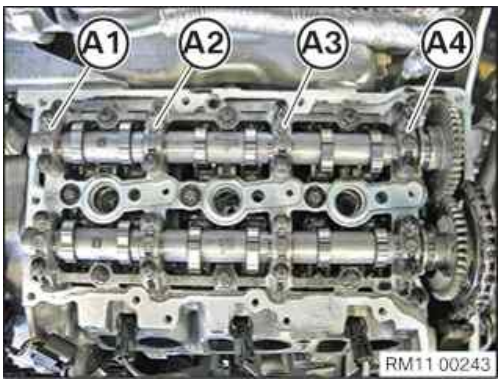


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

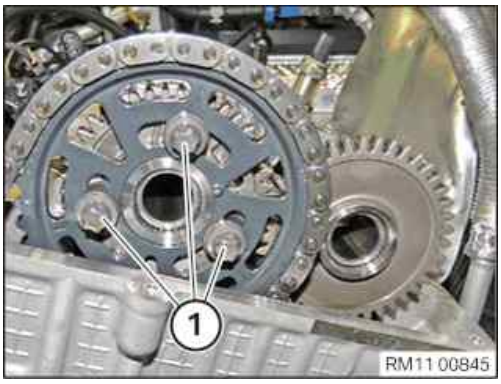
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

► **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

► **Install the timing chain guide rail**

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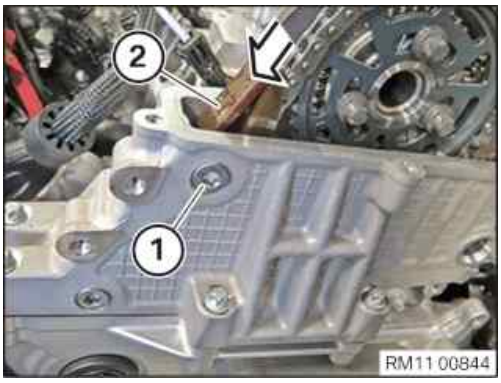


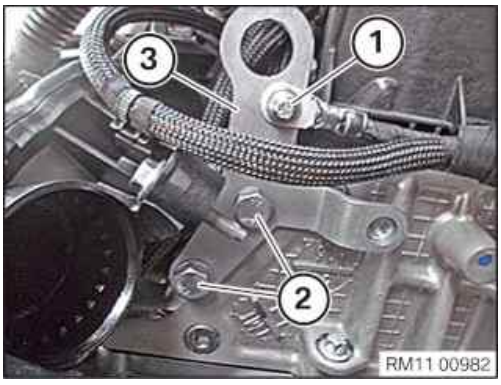
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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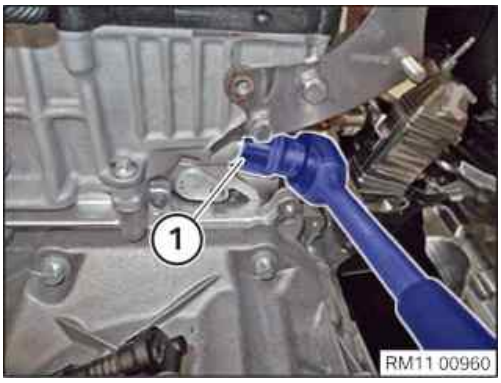
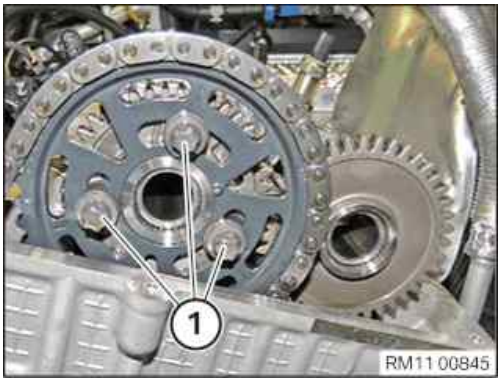


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

41 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

42 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

43 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

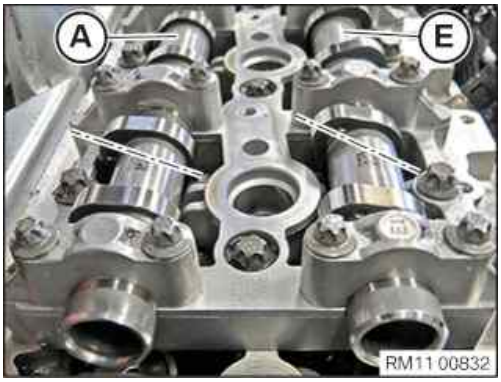
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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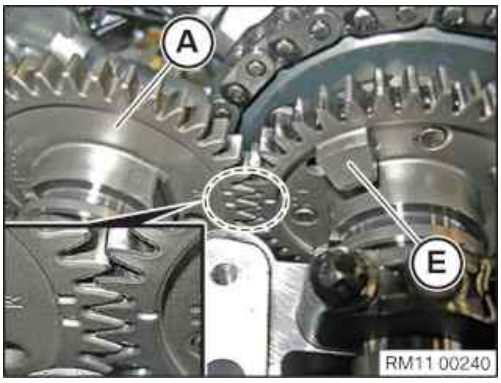


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

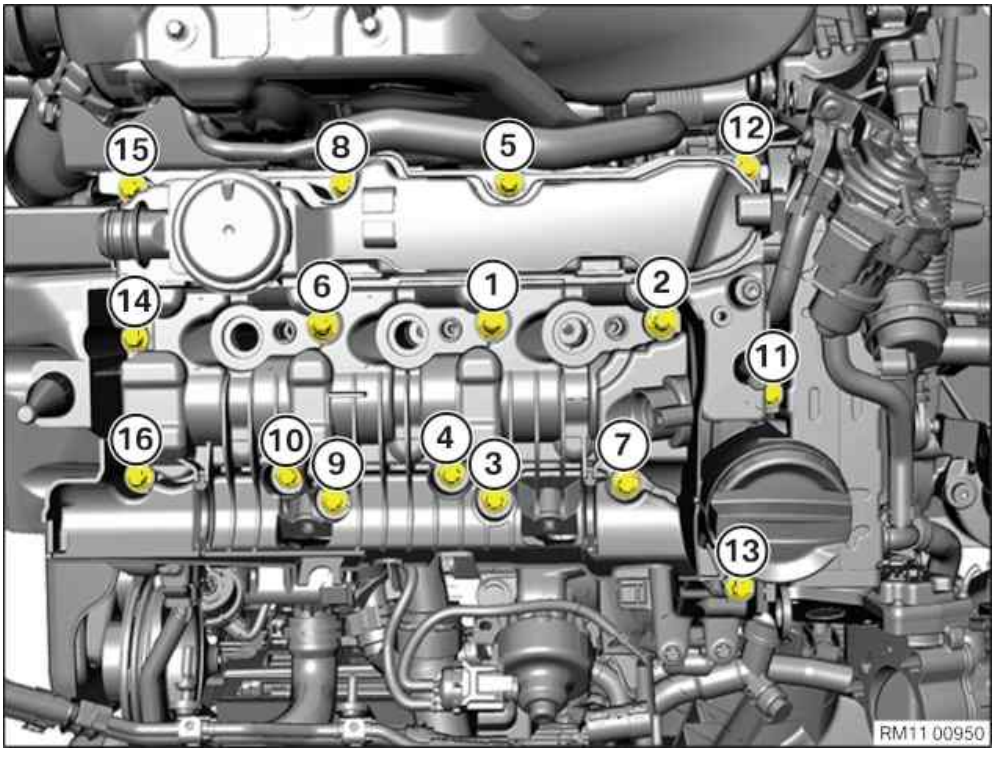
If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

44 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover

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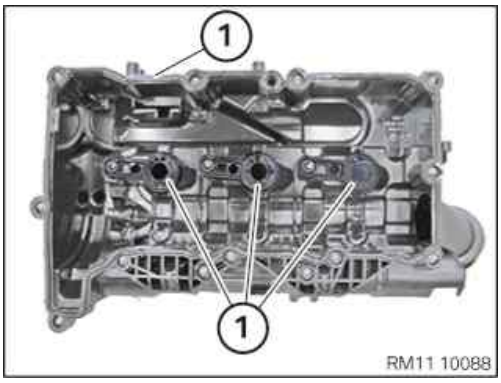
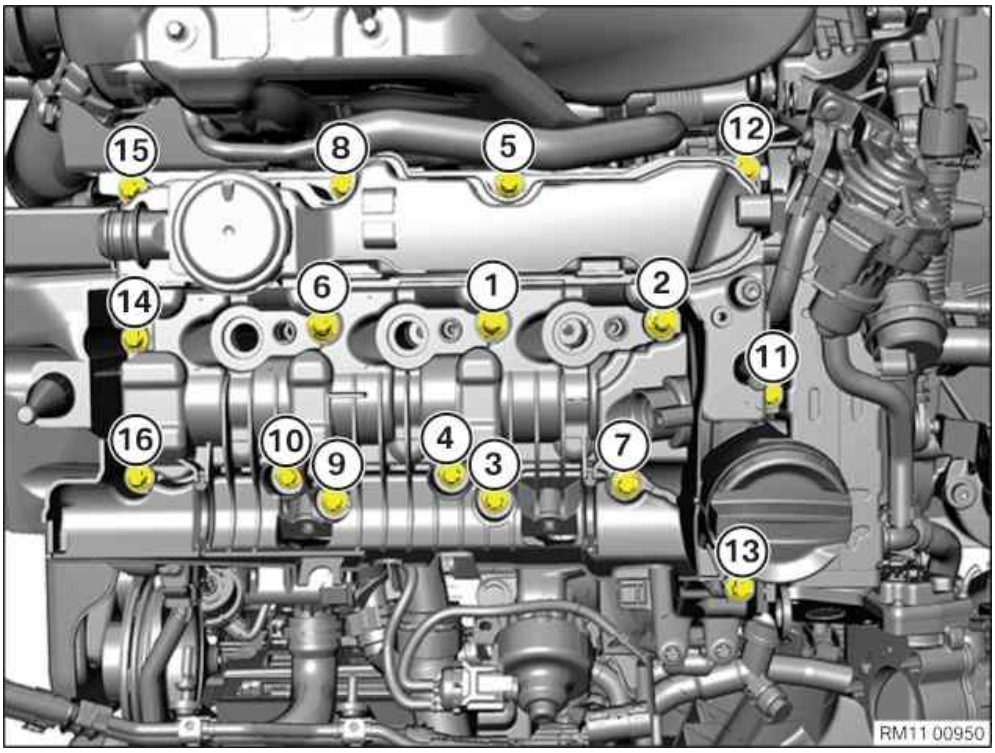


- Renew the gasket (1) of the cylinder head cover.

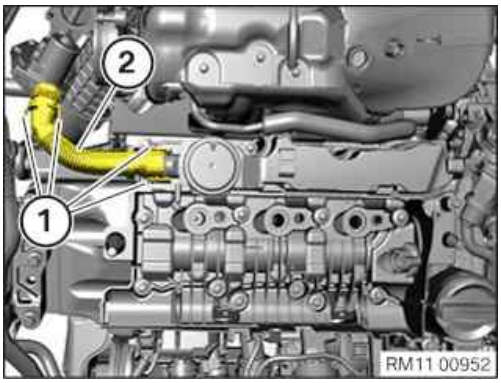
  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nn



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

45 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

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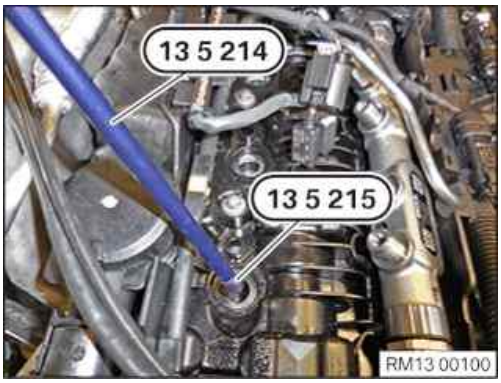
RISK OF DAMAGE

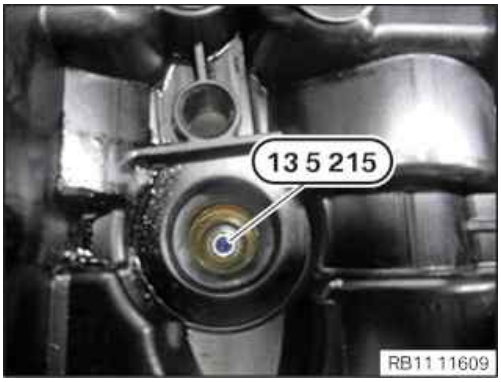
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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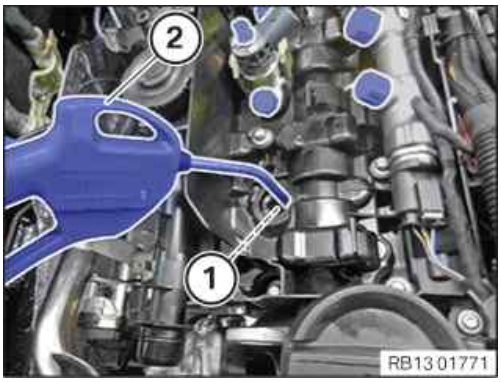
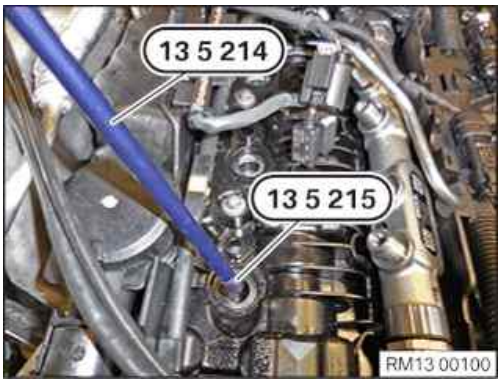


- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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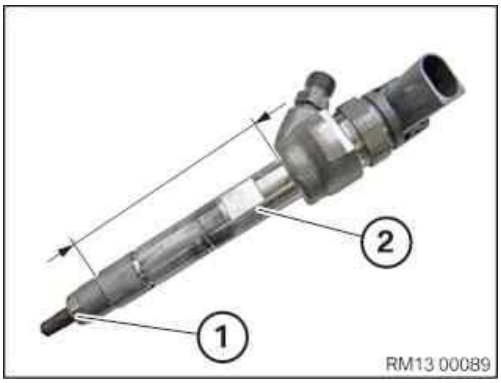
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

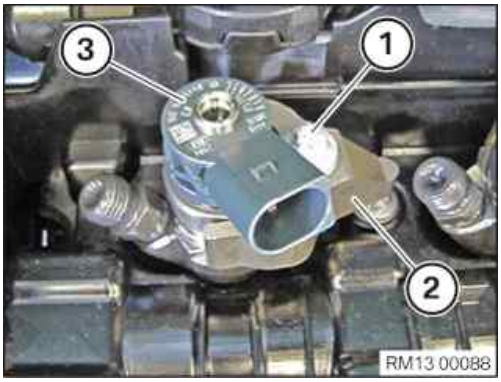


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

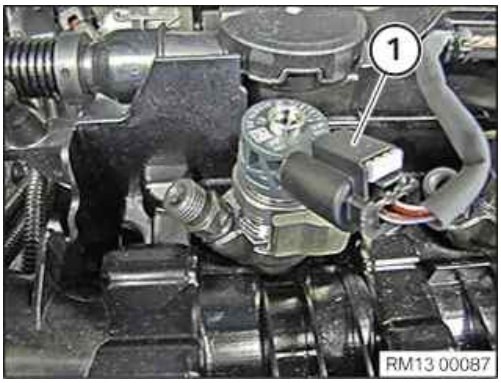
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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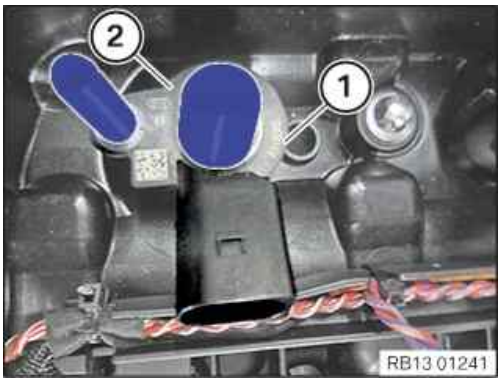
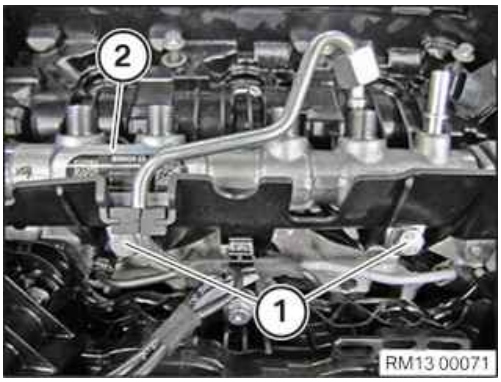


- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

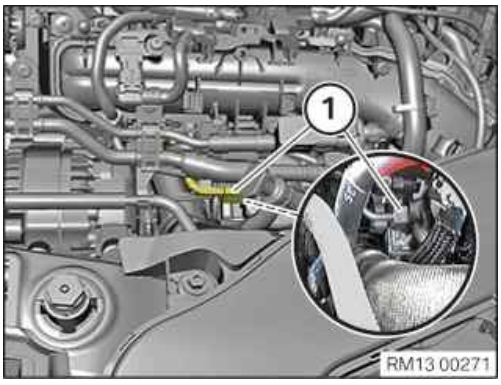
46 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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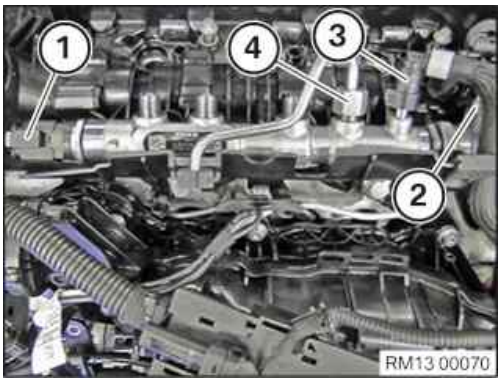

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

47 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

48 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

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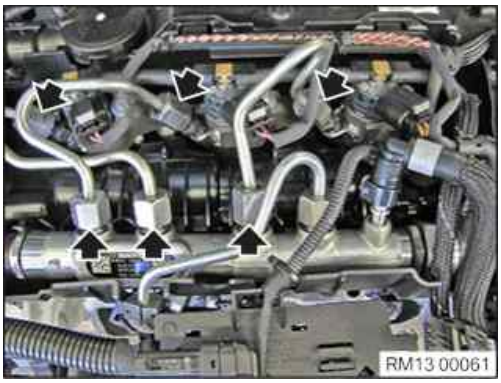
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

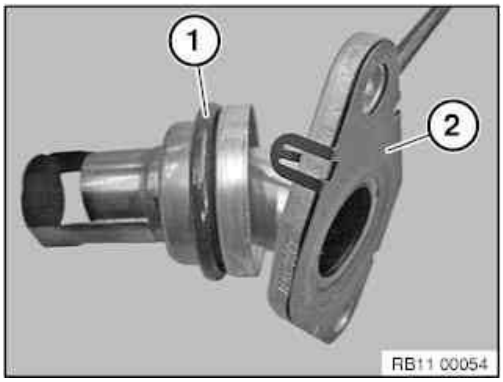
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

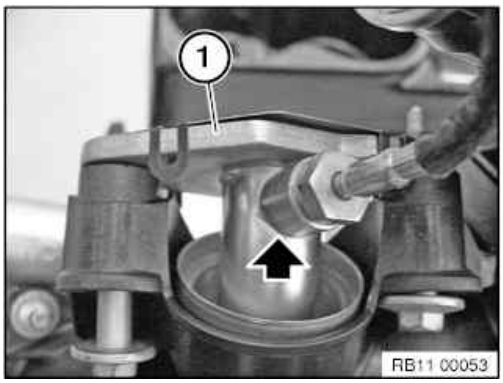
49 – Installing the intake plenum



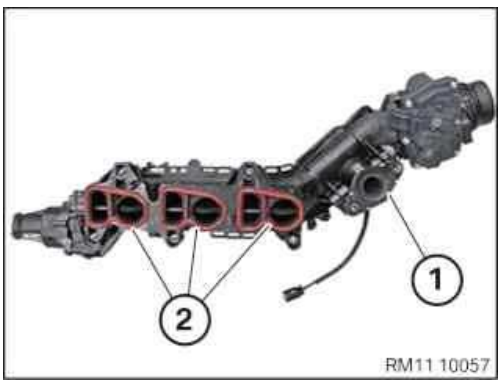
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

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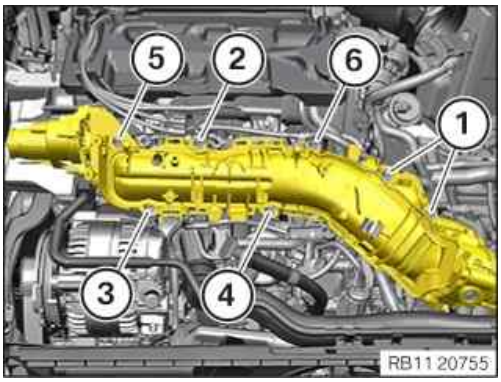
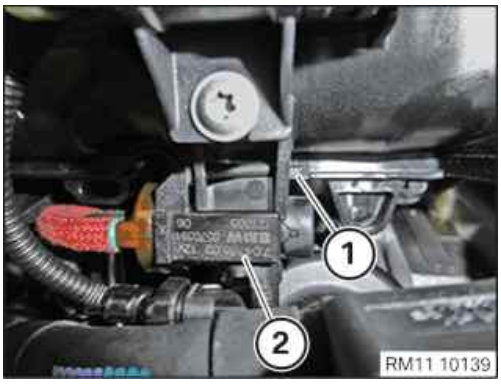


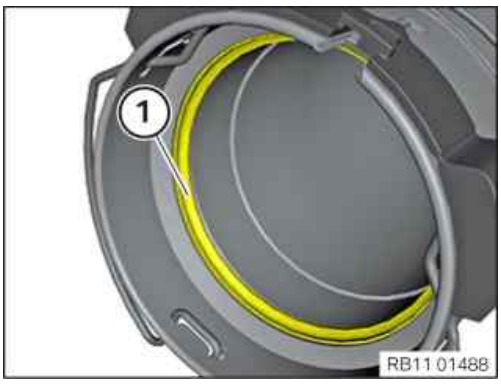
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

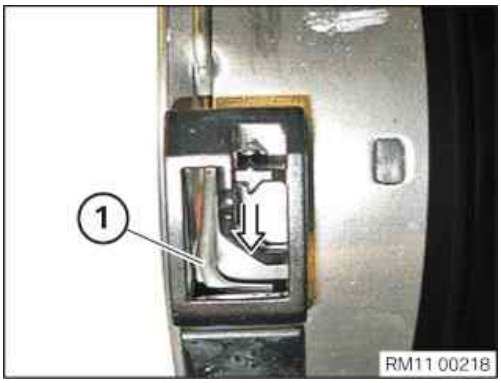


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.

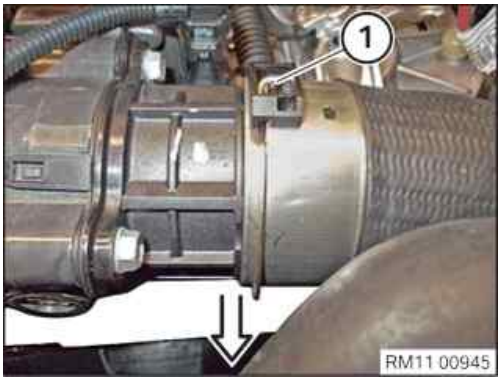


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

50 – Remove the engine from the assembly stand

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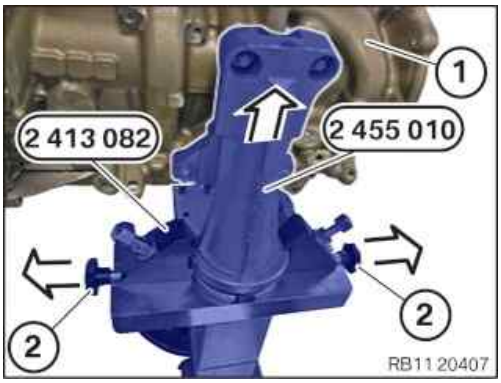
CAUTION

Heavy component.

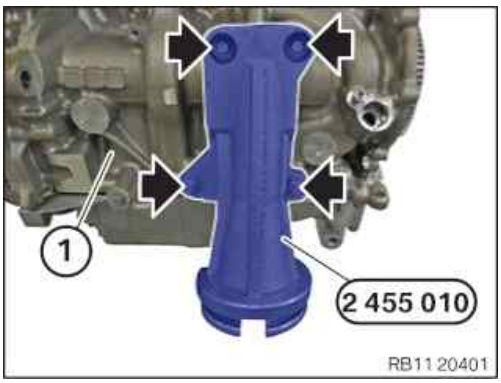
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

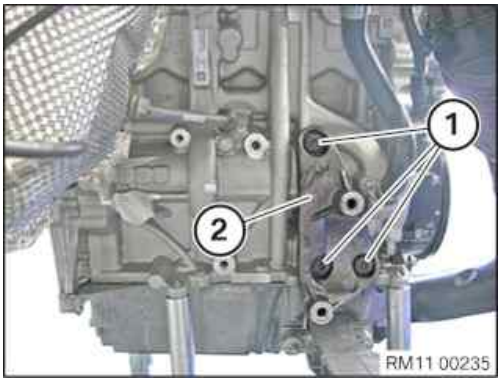
- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.



- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

M10		Tightening torque	38 Nm

51 – Mounting engine on manual gearbox

Prerequisite

Engine has been removed.

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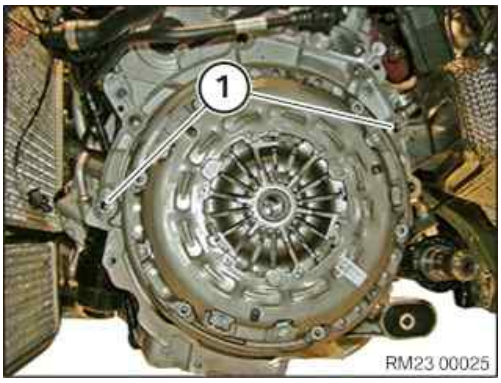
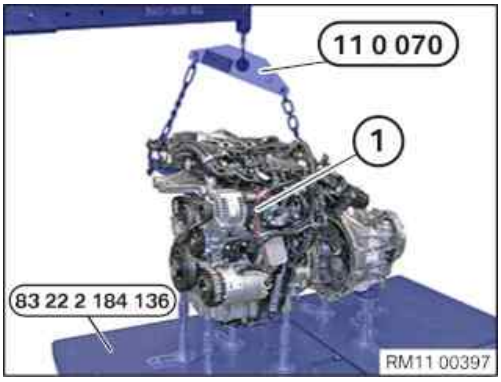
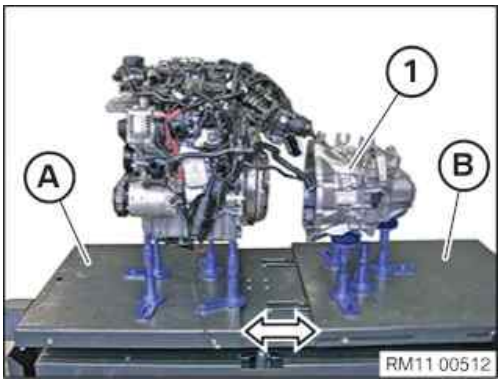


- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

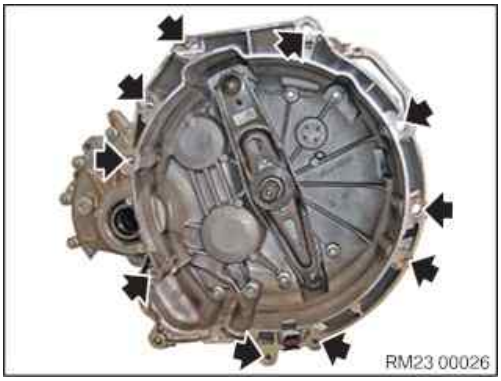
- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.



- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.



- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

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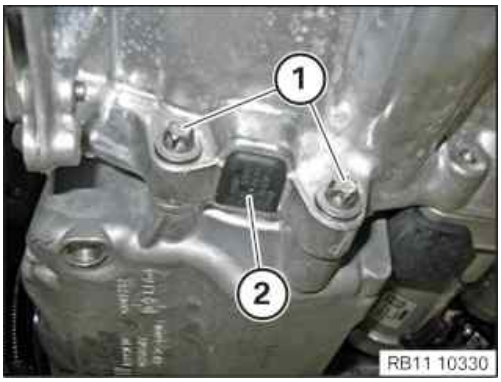


- Tighten the screws (1).

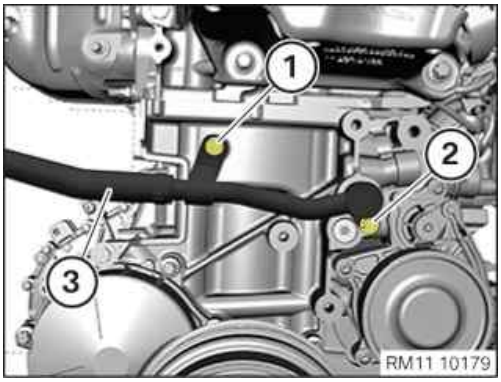
Transmission to oil sump

M8		Tightening torque	19 Nm

- Install the protective cap (2).

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

52 – Attaching assemblies (on lifting table)

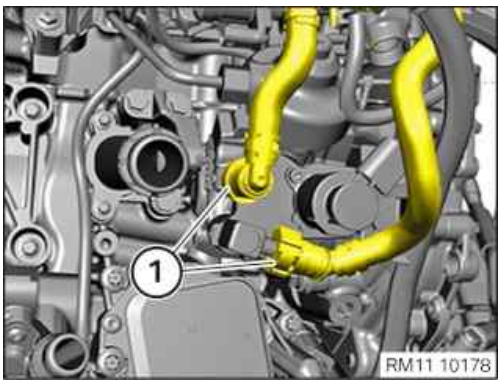


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The locks must engage audibly.

▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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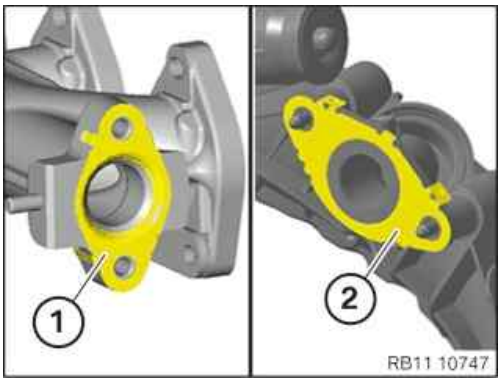
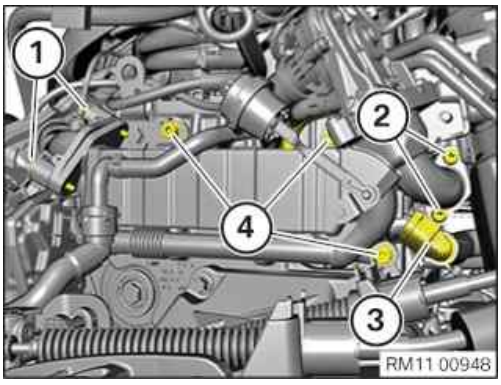


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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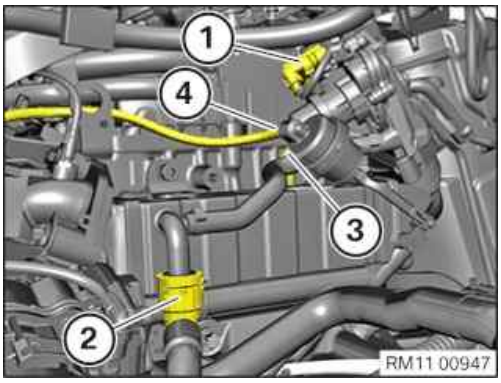
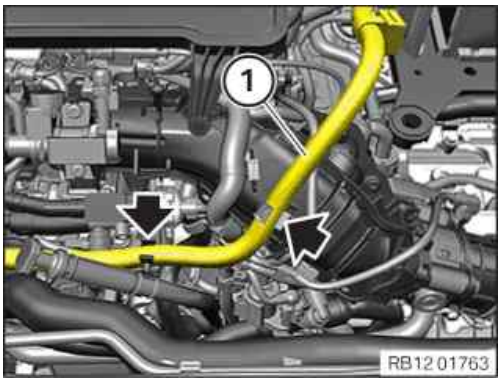


TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.



CAUTION

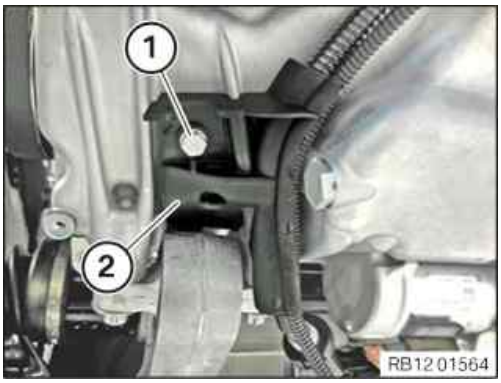
Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).

- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

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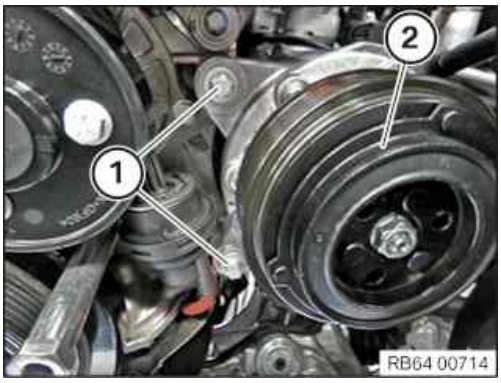
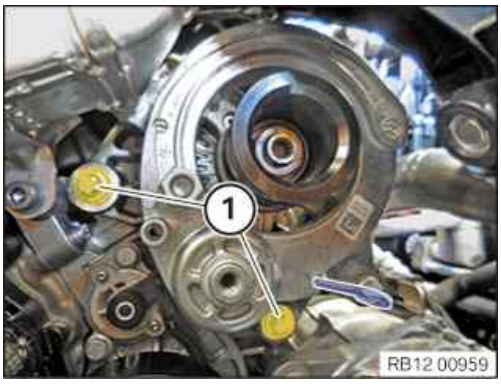


- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

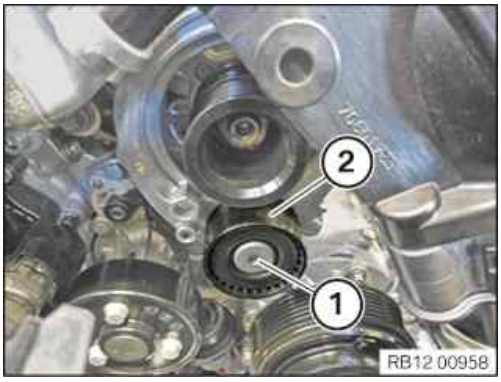
- Tighten the screws (1).



- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

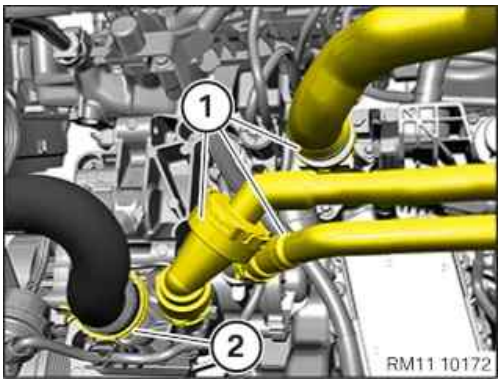
M10x75 / M10x125		Tightening torque	38 Nm



- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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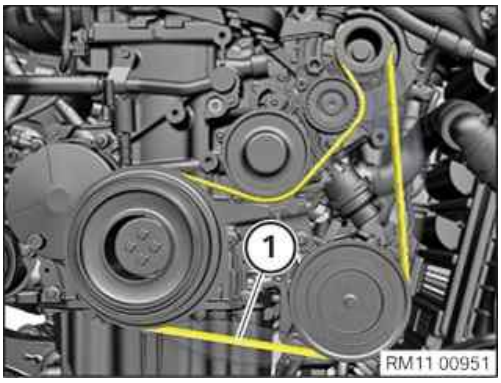
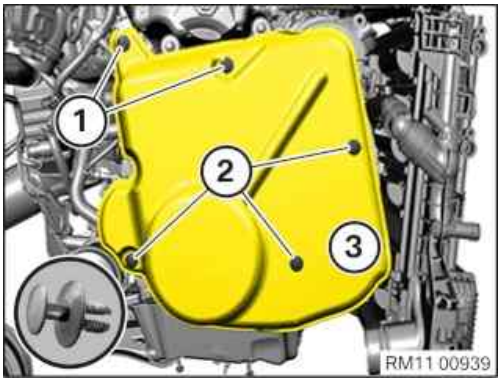


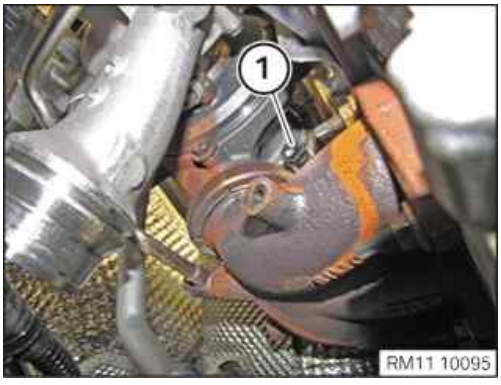
- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ **Install the acoustic cover for the engine at the front**



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

▸ **Installing the oil return line for the exhaust turbocharger**

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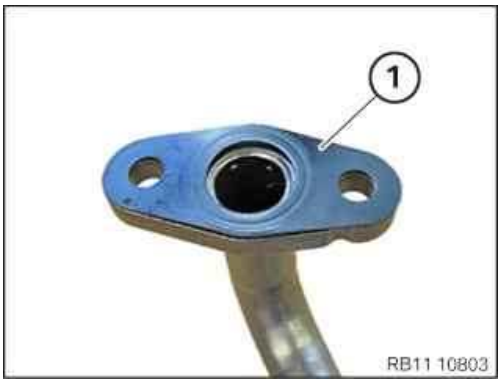
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

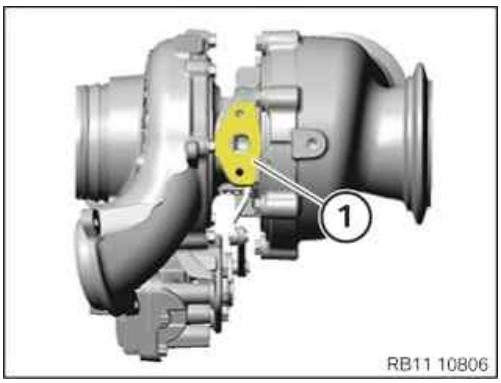
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface.

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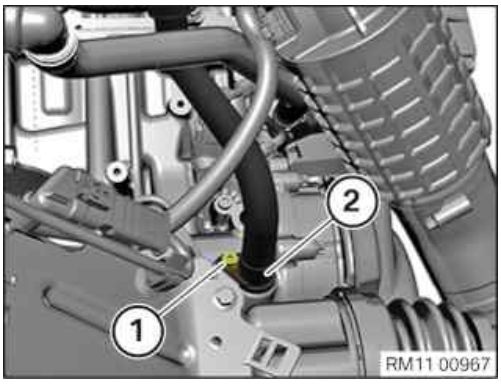
- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

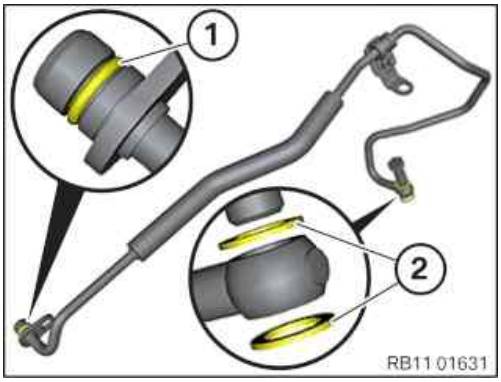


- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

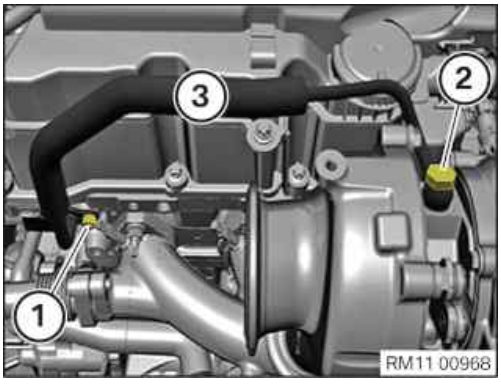
▸ **Install the oil feed line for the exhaust turbocharger**



- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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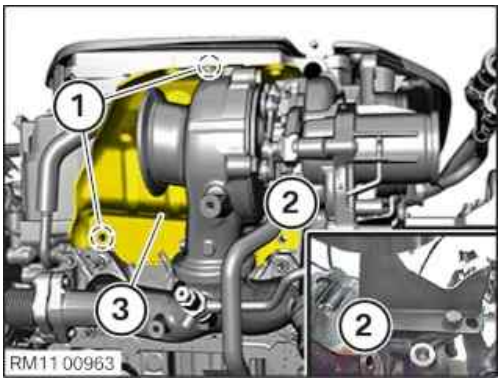


- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

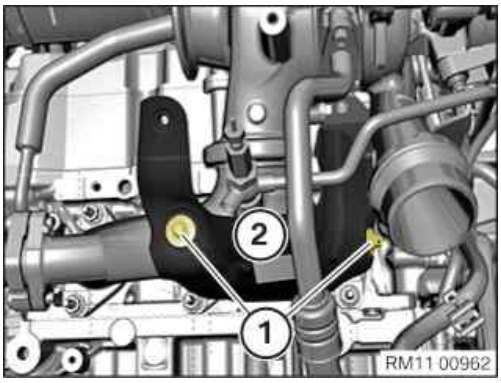
▶ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

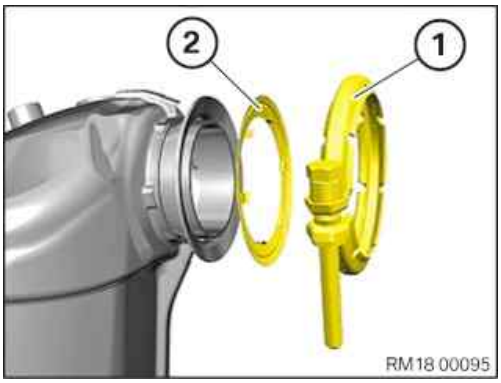
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

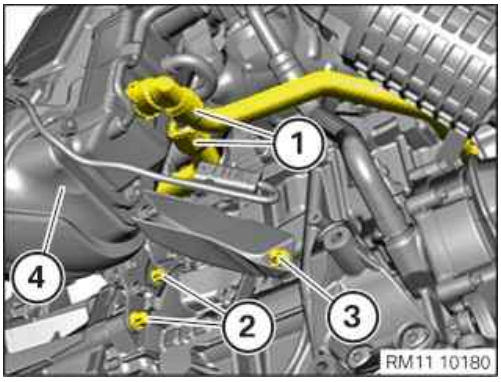
Torx screw BM 6x12		Tightening torque	10 Nm



- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).

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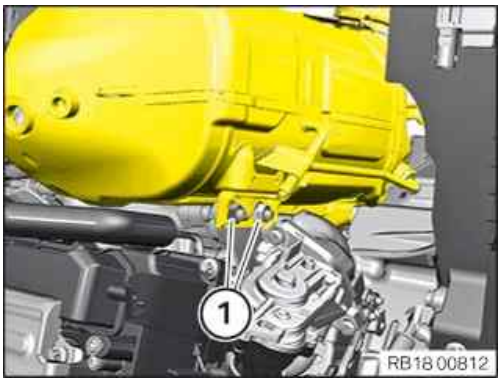


- Tighten nuts (1).

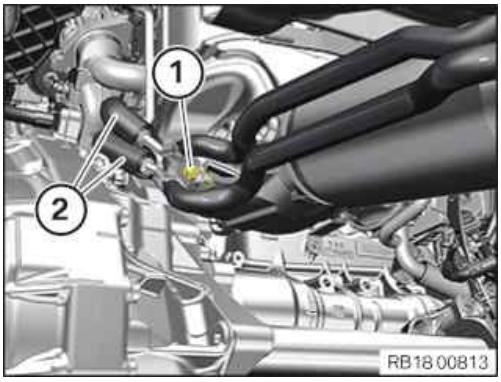
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

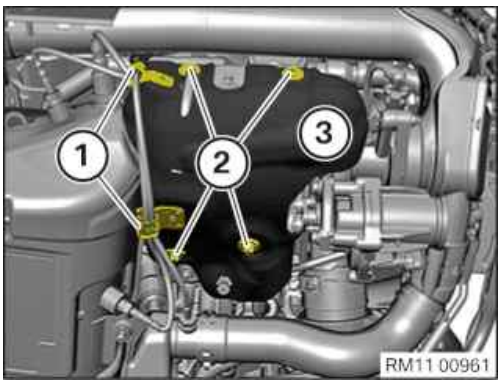
▸ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▸ **Installing the cable clip for the intake plenum**

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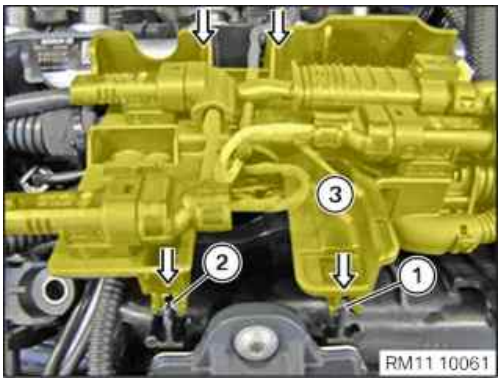
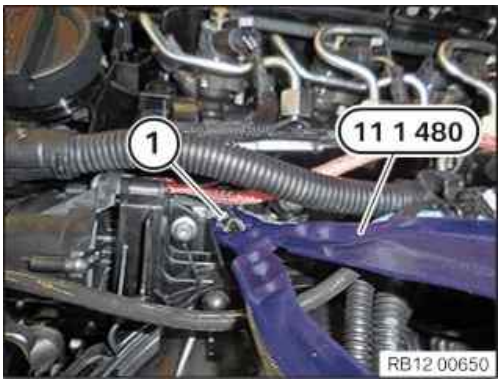
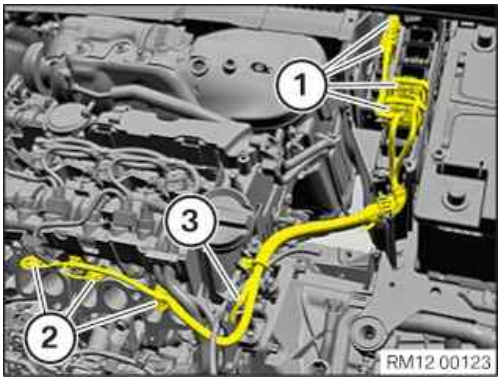


- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

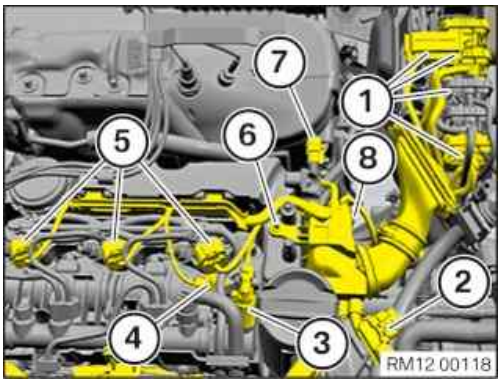
  The connector (1) must engage audibly.



- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm



- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.

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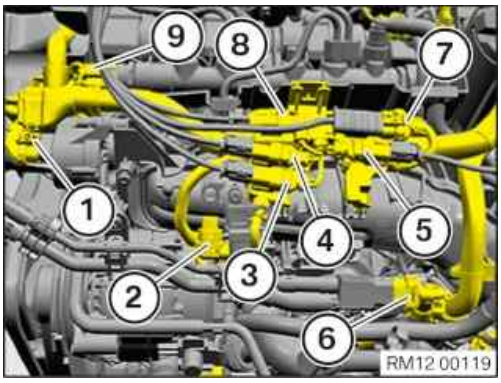
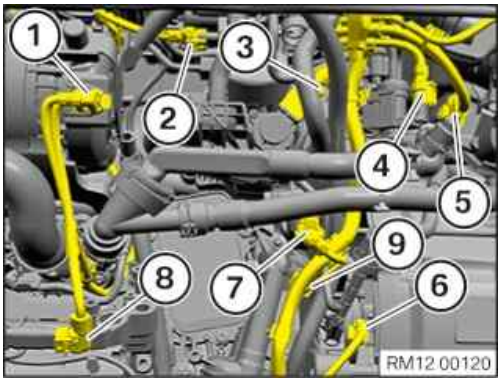
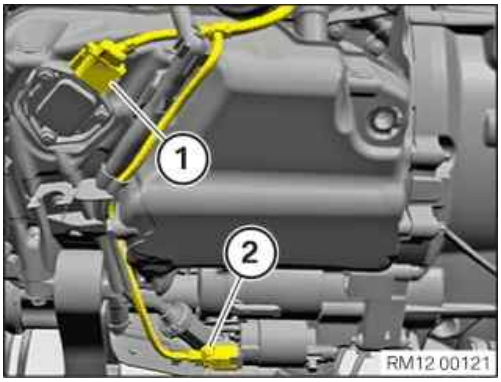


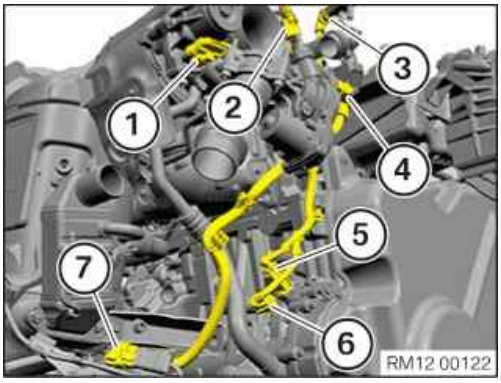
- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.



- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

53 – Installing differential pressure sensor

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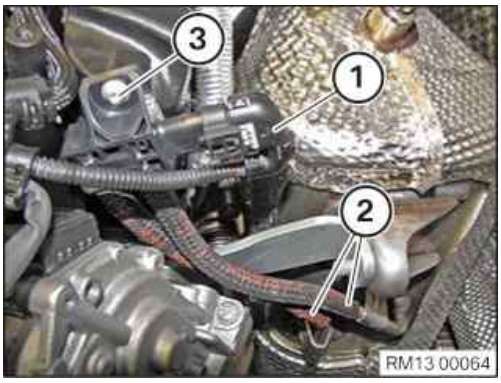


- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

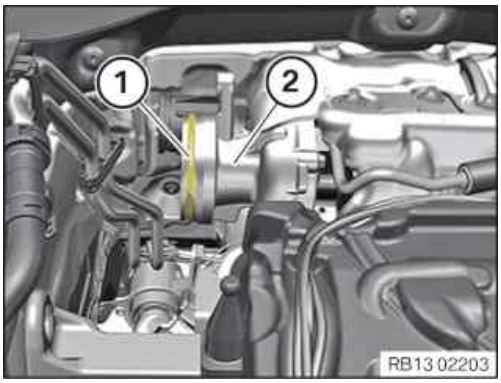
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

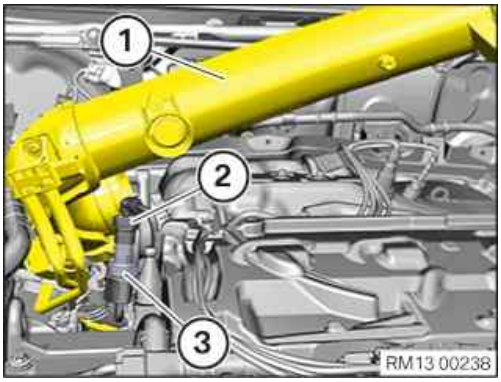
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

54 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



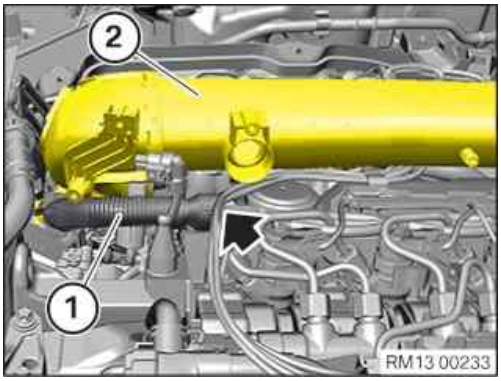
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.

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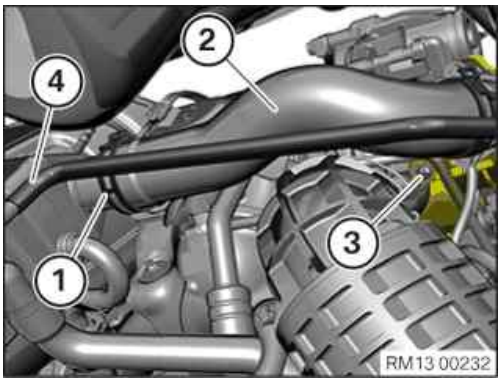


- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

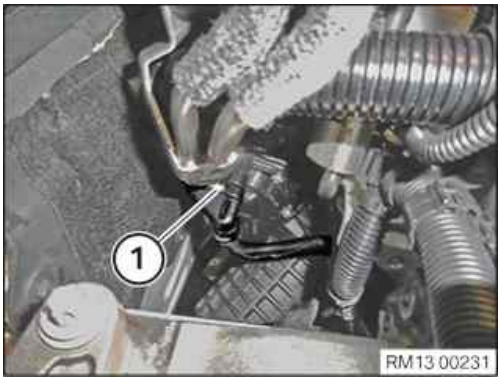
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

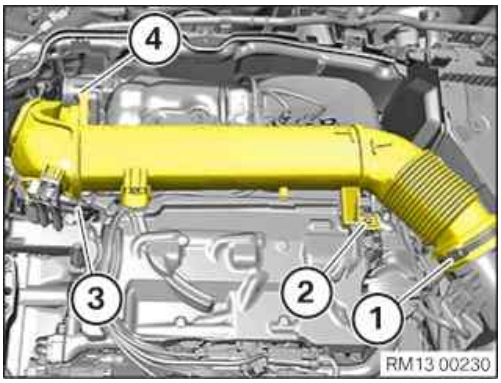
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

55 – Install the acoustic cover for the injectors

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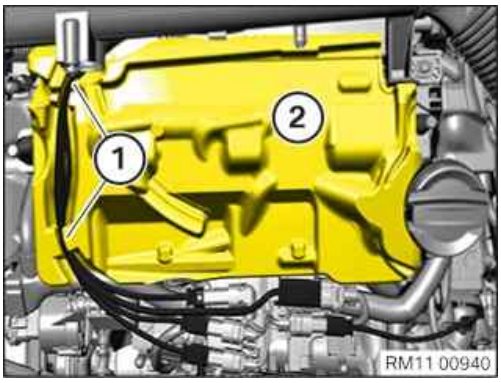
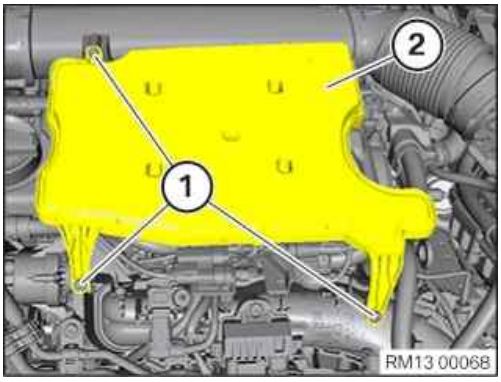


- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

56 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

57 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

58 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head			Used in step 8
M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase			Used in step 9
M10x30		Tightening torque	38 Nm

Special tool 11 8 930 to special tool 00 2 320			Used in step 9
M14x35		Tightening torque	160 Nm

Standard screw connection M6			Used in step 29 30 40 52
M6			8 Nm

Gear to counterbalance shaft			Used in step 30
	Renew screw.	Tightening torque	20 Nm
		Angle of rotation	60 °

Rear timing case cover to crankcase			Used in step 31
M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover			Used in step 31
Hexagon screw M6x16		Tightening torque	8 Nm

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Cylinder head to crankcase — Used in step 31

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 31

M8x40		Tightening torque	19 Nm

Oil sump to crankcase — Used in step 31 34

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump — Used in step 31 51

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine — Used in step 31

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft — Used in step 32

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel — Used in step 33

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Timing case cover, front, to crankcase — Used in step 34

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

Vibration damper with belt pulley to crankshaft — Used in step 35

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °

Transmission to oil sump — Used in step 35

M8			19 Nm

Glow elements to cylinder head — Used in step 38

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head — Used in step 39

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support — Used in step 40

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head — Used in step 40

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8 — Used in step 40

M8		Tightening torque	19 Nm

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Chain tensioner piston to cylinder head

Used in step 40

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 40

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 44

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 45

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 45

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 46

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 46

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 48

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 49

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 50 52

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 51 52

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 52

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 52

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 52

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 52

M8x20		Tightening torque	19 Nm

Bracket to oil sump

Used in step 52

M6		Tightening torque	8 Nm

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Air conditioning compressor in component carrier — Used in step 52

M10		Tightening torque	38 Nm

Alternator to component carrier — Used in step 52

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner — Used in step 52

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold — Used in step 52

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase — Used in step 52

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger — Used in step 52

M6x12		Tightening torque	8 Nm

Oil return line to crankcase — Used in step 52

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head — Used in step 52

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger — Used in step 52

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger — Used in step 52

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 52

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder — Used in step 52

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 52

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter — Used in step 52

Torx bolt BM6x16		Tightening torque	8 Nm

Ground cable to cylinder head — Used in step 52

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 52

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 53

Screw		Tightening torque	4 Nm

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Clamp for the pressure hose on the differential pressure sensor

Used in step 53 54

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor

Used in step 54

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger

Used in step 54

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover

Used in step 54

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 54

Clamp		Tightening torque	3 Nm

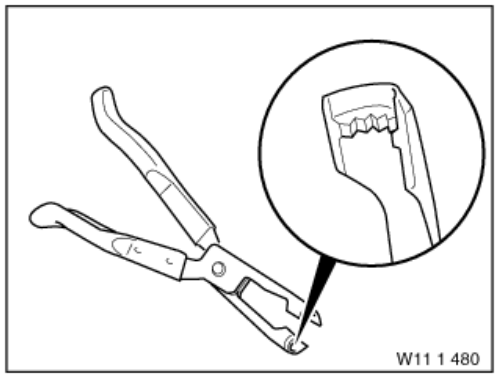
Resonator to manifold and clean air pipe

Used in step 56

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder

Common Used in step 8 51

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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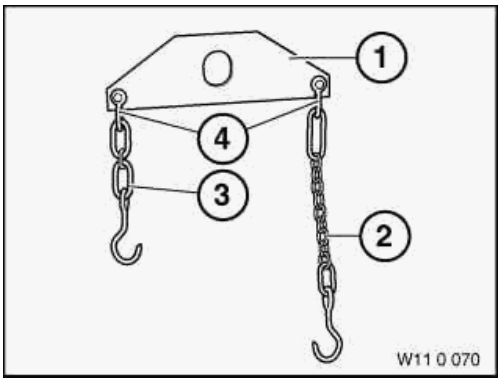
0 490 579 (11 0 070) Lifting gear



Common Used in step 8 9 50 51

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

2 455 010 Engine support

Common Used in step 9 50

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 9

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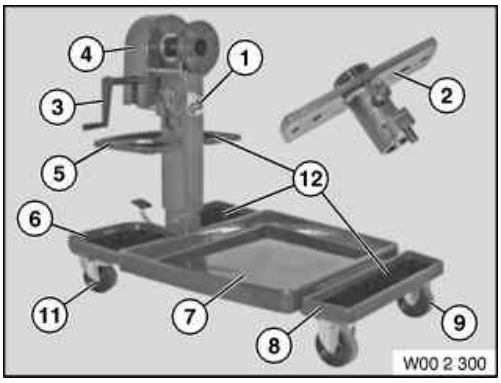

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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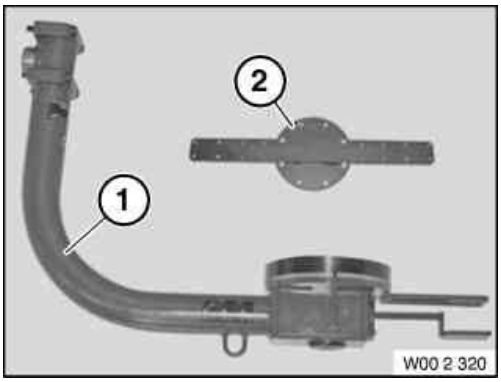
0 495 196 (00 2 320) Support arm



Common

Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common

Used in step 11 14 46 48

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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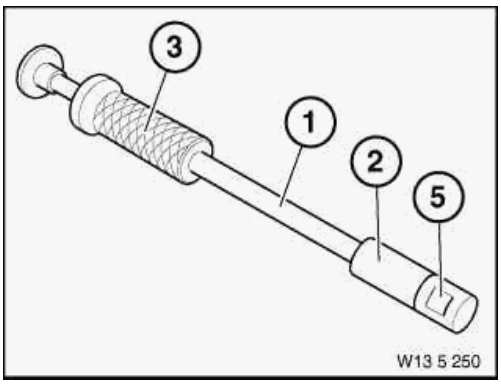
2 413 106 Fastener

Common Used in step 11 48

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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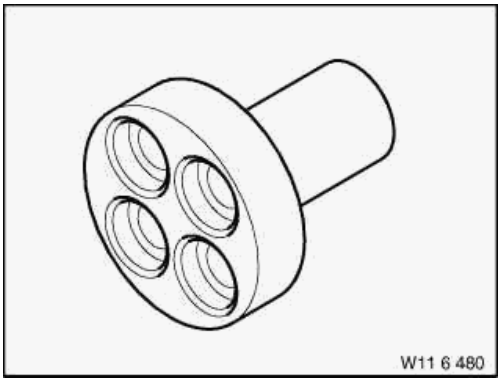
0 493 339 (13 5 252) Bush

Common	Used in step 13
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common	Used in step 13
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 16 40 43
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 288 380 Locating stud

Common Used in step 16 40 41 43

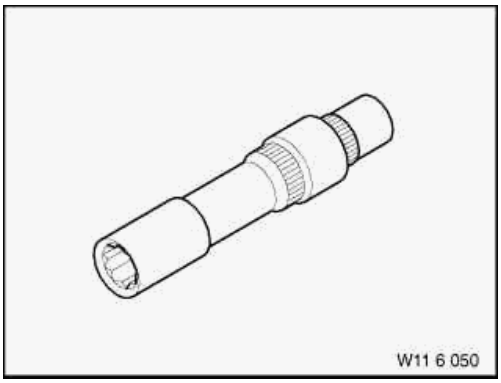
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common Used in step 16 40 42 43

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 21 38

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 22 23 40

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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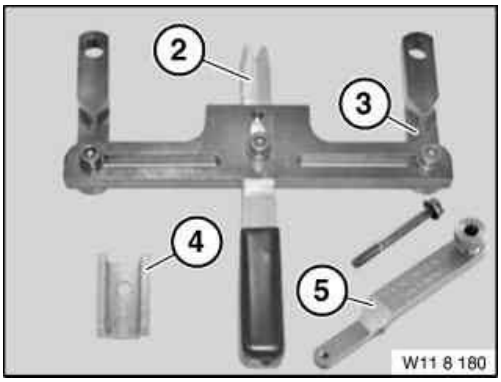
0 493 587 (11 8 180) Holder



Common

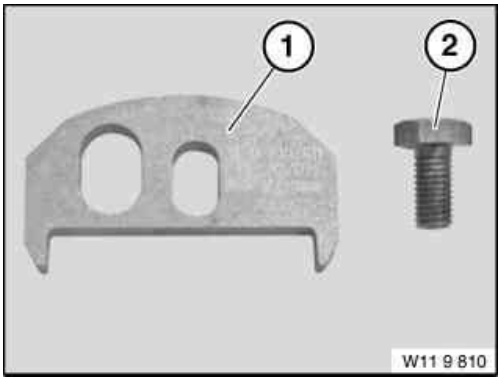
Used in step 24 35

Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

0 496 171 (11 9 811) Holder



Common

Used in step 26 27 32

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

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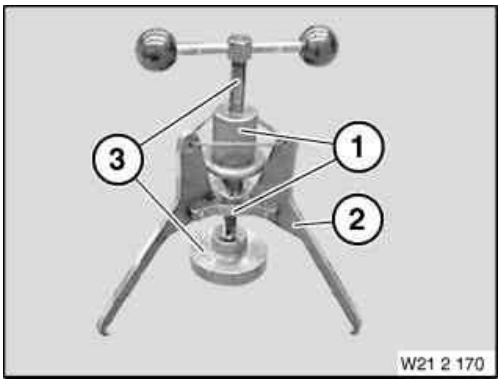
0 494 793 (11 9 265) Bush

Common Used in step 26 27 32

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

0 493 839 (21 2 170) Device



Common Used in step 26 33

Usage	(tensioning device) For resetting adjusting ring and installing self-adjusting clutch on flywheel without tension.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 00 (622)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 558 (21 2 171)		**Basic body** (Basic body) Basic body with adjusting spindle Deletion, only available via tool set	
2	0 494 559 (21 2 172)		**Claw** (Clamping claw (1 piece)) Available as part of complete tool set 0493839 only.	
3	0 494 560 (21 2 173)		**Spindle** (Pressure spindle with washer) Available as part of complete tool set 0493839 only.	

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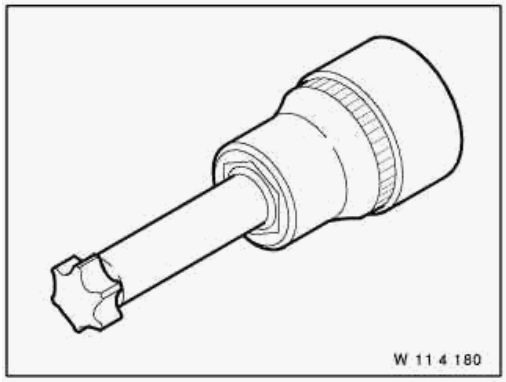
2 288 165 Synchronising key

Common Used in step 26 33

Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

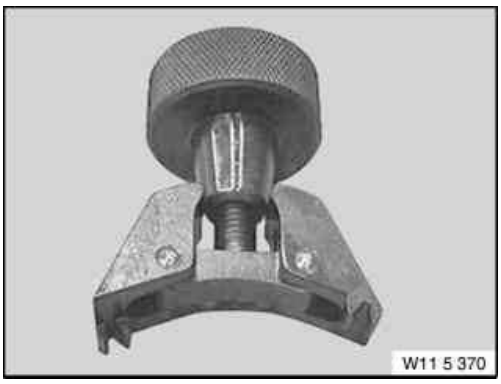
0 491 018 (11 4 180) Socket WAF 46



Common Used in step 27 32

Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

0 495 131 (11 5 370) Tool



Common Used in step 29 30

Usage	(Locating tool) For VANOS exhaust camshaft gear setting.
Included in the tool or work	
Storage location	A71
Replaced by	
In connection with	
SI-Number	01 02 05 (173)

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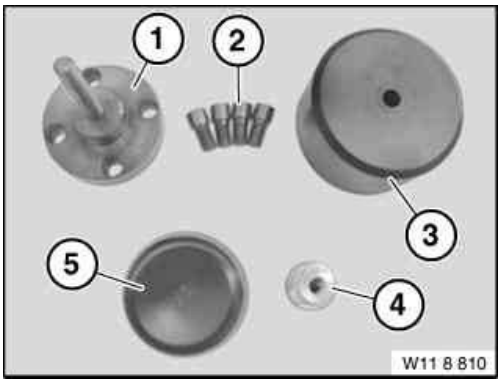
2 288 943 Striking tool

Common Used in step 29

Usage	For dismantling the ring gear of the counterbalance shaft.. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

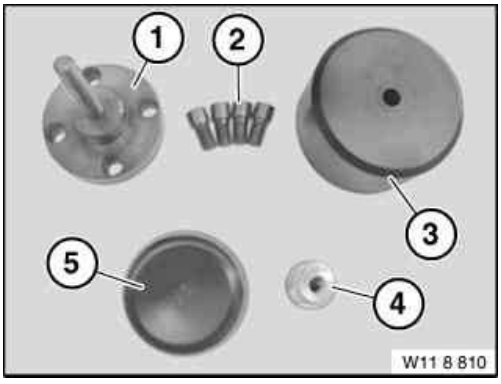
0 496 137 (11 8 815) Holding sleeve



Common Used in step 31

Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body



Common Used in step 31

Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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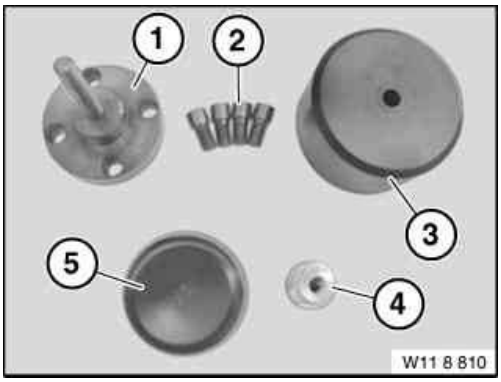
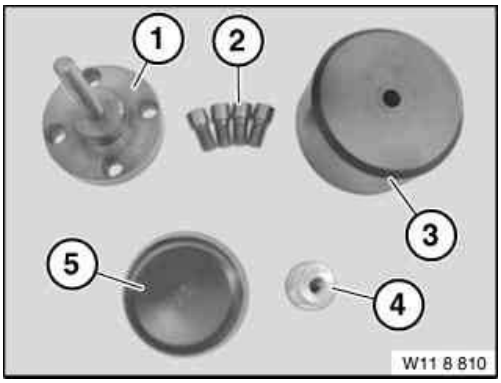
0 496 134 (11 8 812) Screw



Common Used in step 31

Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

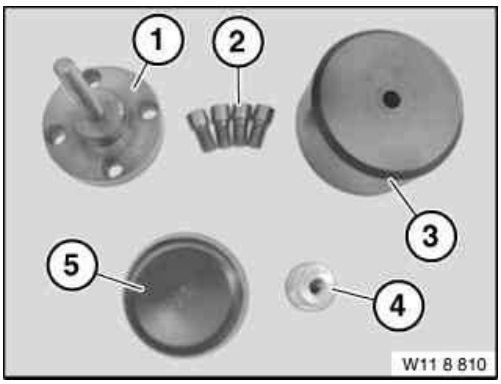
0 496 135 (11 8 813) Holding sleeve



Common Used in step 31

Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut



Common Used in step 31

Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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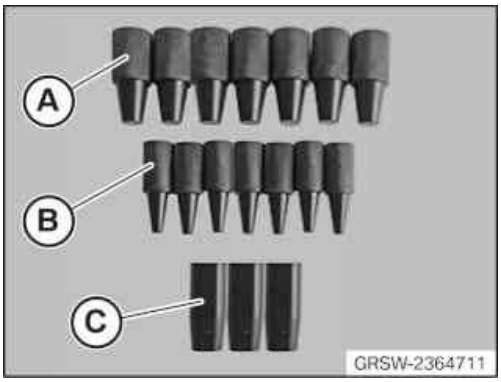
2 364 711 Plug

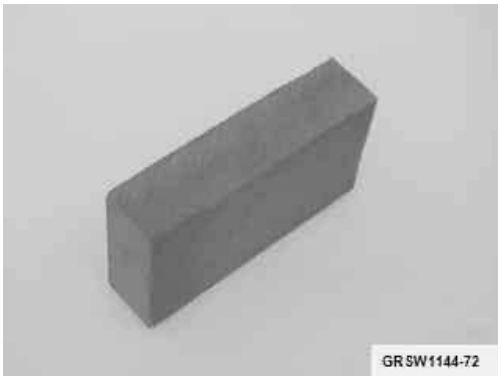


Common	Used in step 31
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common	Used in step 31
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 31
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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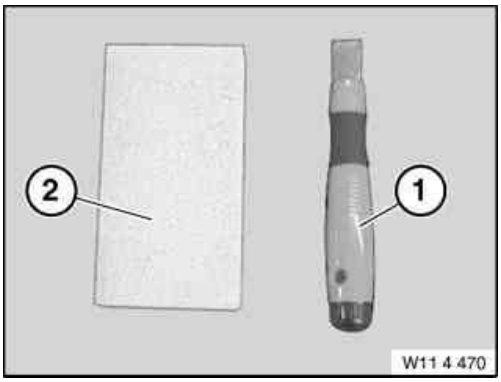
0 495 102 (11 4 470) Tool



Common

Used in step 31

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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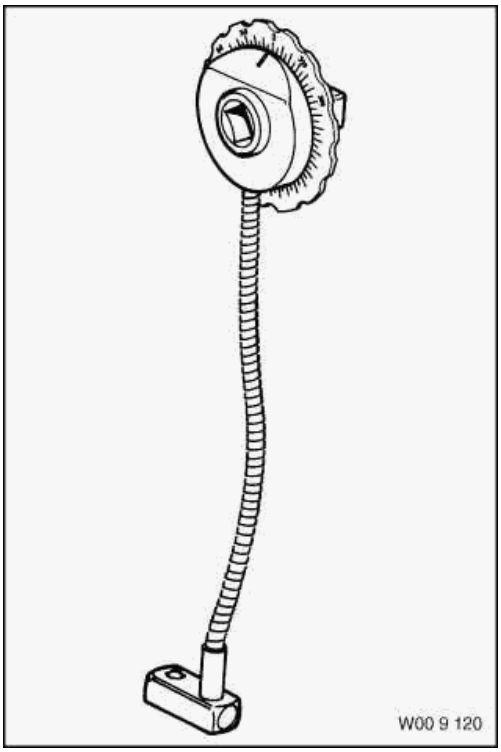
0 490 504 (00 9 120) Torque angle measuring dial



Common

Used in step 31

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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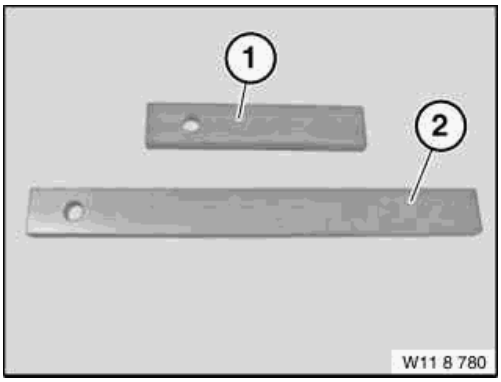
0 496 120 (11 8 780) Plate



Common Used in step 31

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set

Common Used in step 32

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

2 358 471 Clutch tool

Common Used in step 33

Usage	For installation of coupling drive plate.. (Getrag transmission) . Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A55
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

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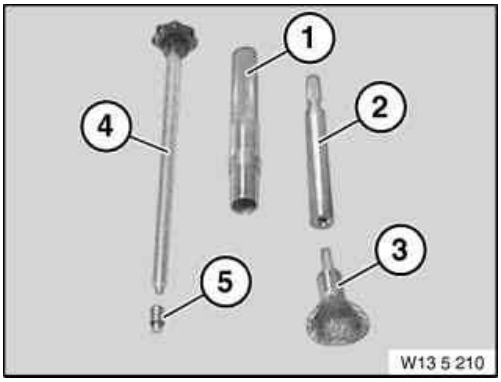
2 357 900 Fitting aid

Common Used in step 34

Usage	For installation of the front radial shaft seal incl. lid.
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

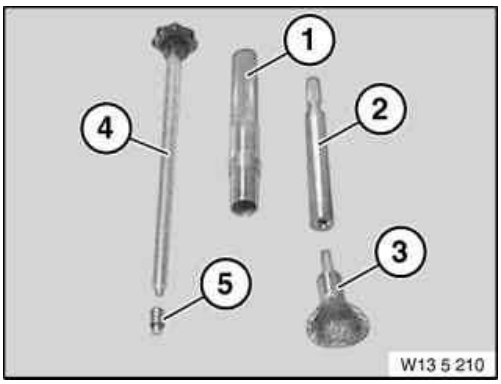
0 493 763 (13 5 215) Plug



Common Used in step 45

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common Used in step 45

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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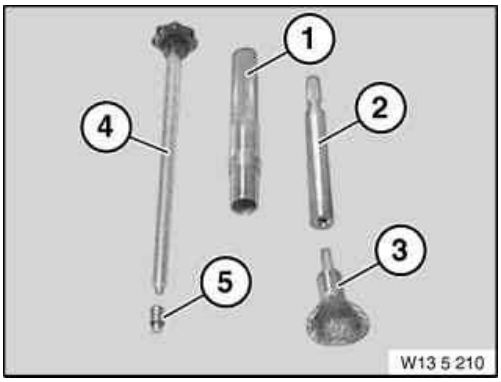
0 493 758 (13 5 210) Tool



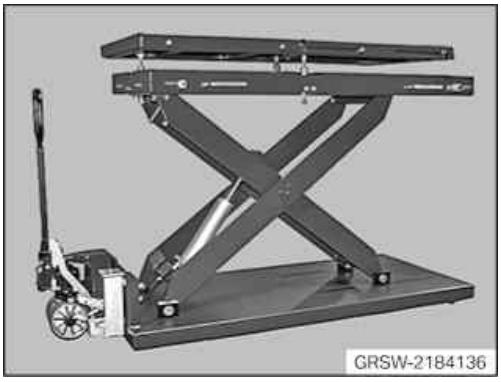
Common Used in step 45

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 51

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

Replacement tools:

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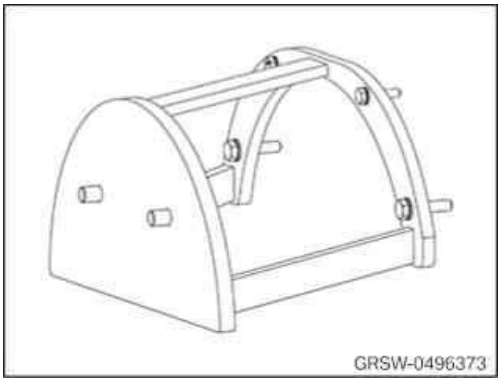
2 299 563 Adapter

Common Used in step 9

Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

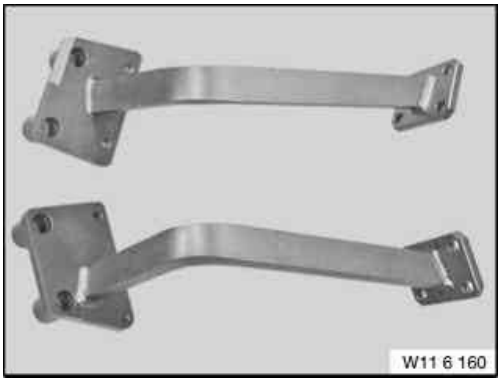
0 496 373 (11 5 420) Plate



Common Used in step 9

Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common Used in step 9

Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

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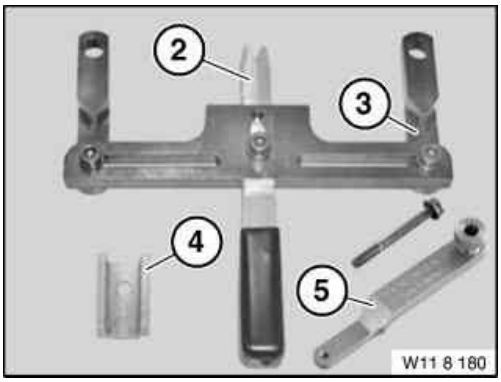
0 494 434 (11 8 183) Basic body



Common	Used in step 24 35
Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Screw-in depth of thread cutter	Used in step 32
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 52
EGR controller	7 52

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	31 34

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
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11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
31 10 001 Completely removing and installing front axle with engine and transmission	1 58
11 00 050 Removing and installing engine	1 58
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11 00 050 Removing and installing engine	1 58
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11 00 050 Remove and install engine	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Removing and installing the engine (manual gearbox)	1 58
11 00 050 Remove and install engine (Automatic)	1 58
11 00 050 Remove and install engine	1 58
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11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine \PREMIUM	1 58
11 00 050 Removing and installing/replacing engine (N63)	1 58
11 00 050 Removing and installing engine	1 58

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11 00 050 Removing and installing engine	1 58
11 00 050 Removing and installing engine	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Remove and install engine (Automatic)	1 58
11 00 050 Remove and install engine (Automatic)	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Remove and install engine (Automatic)	1 58
11 00 050 Remove and install engine (Automatic)	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Remove and install engine	1 58
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 58
11 00 050 Remove and install engine	1 58
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21 31
61 35 ... Notes on ESD protection (Electro Static Discharge)	31

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	40
Exhaust-gas recirculation cooler seal on exhaust manifold	52
Exhaust-gas recirculation cooler seal on intake plenum	52

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This documentation refers to special tools that were not yet available when going to press.

11 27 020 Removing and installing/replacing the counterbalance shaft

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

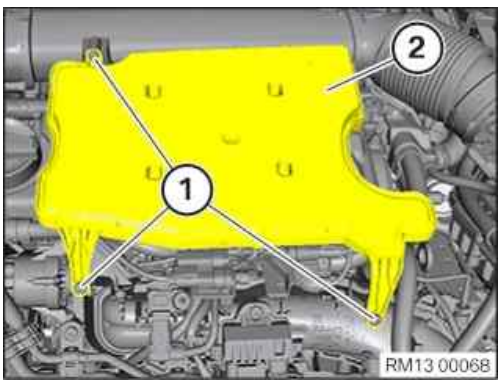
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

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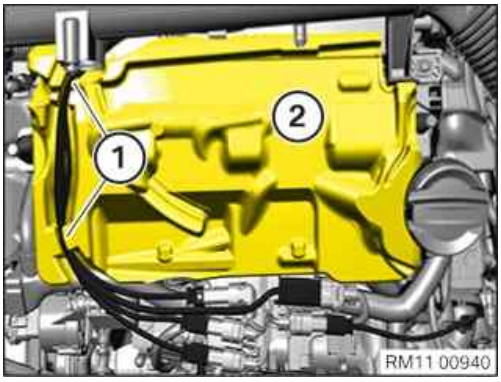
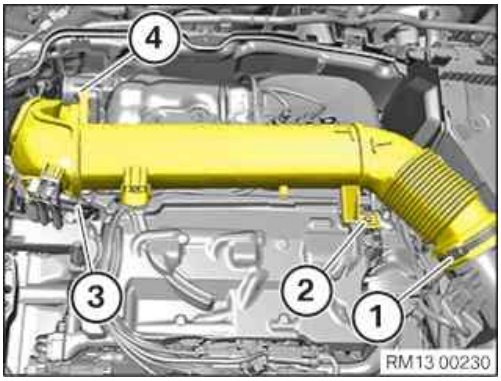
4 – Remove the acoustic cover for the injectors

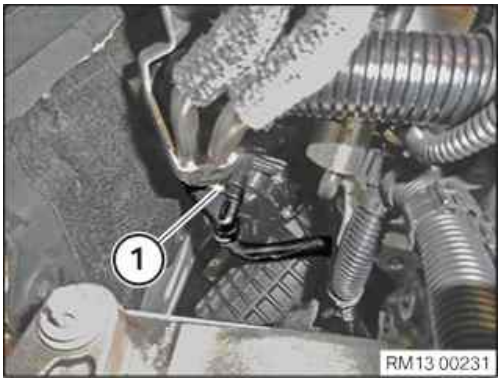


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

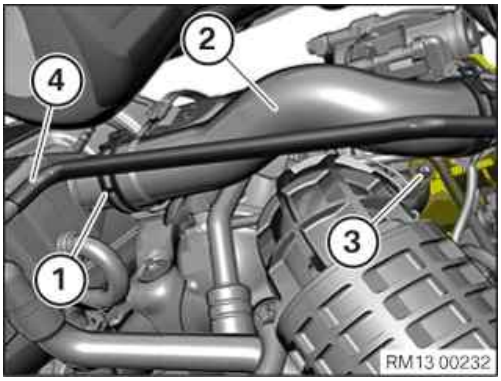
5 – Removing clean air pipe



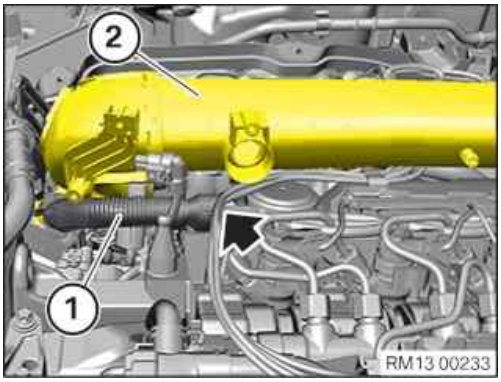
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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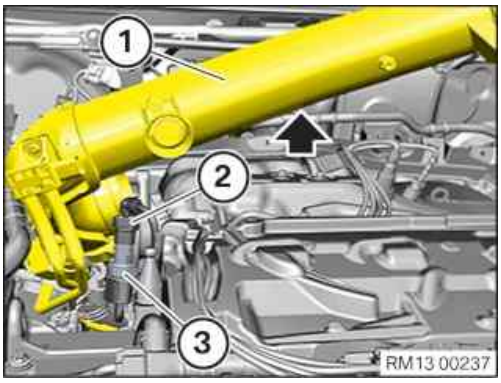


- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

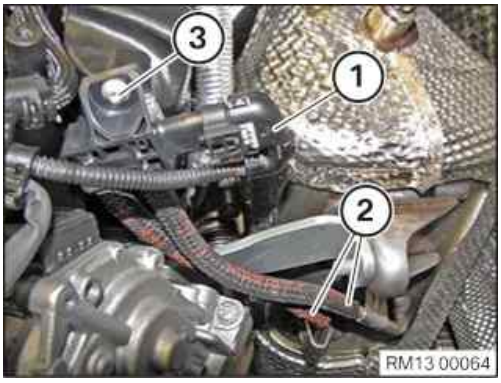
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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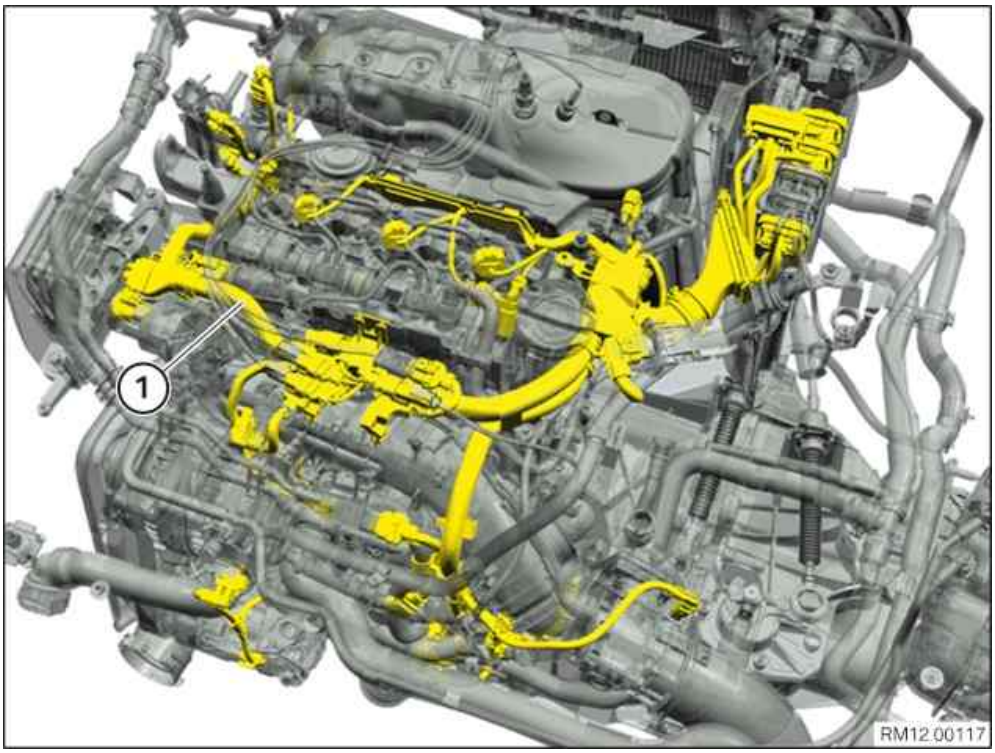
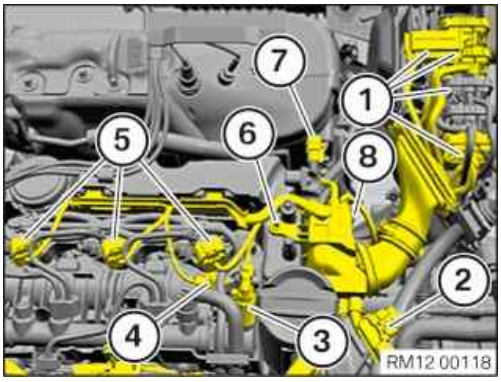
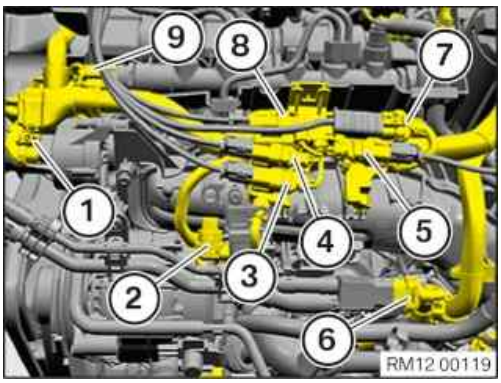
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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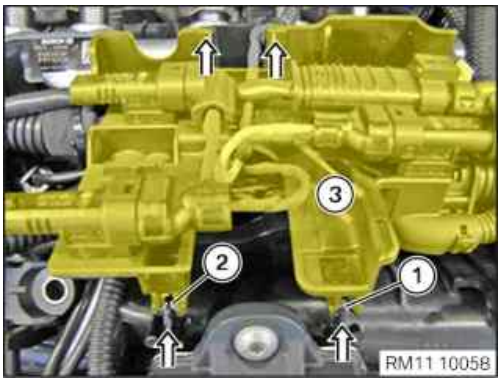
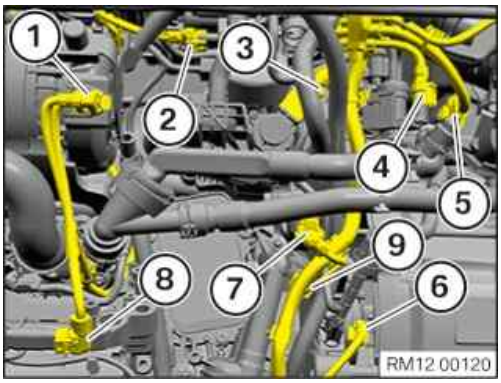
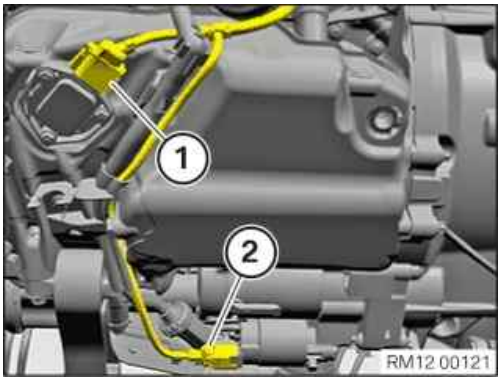


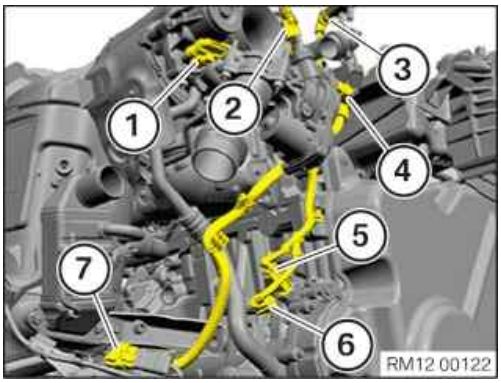
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



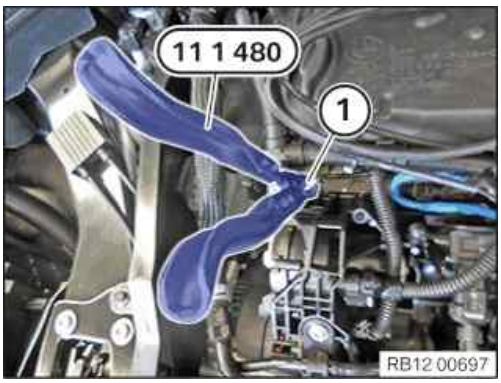
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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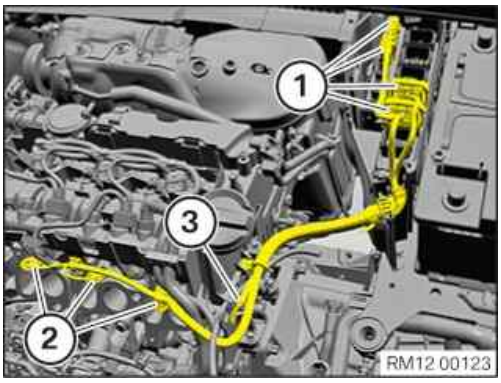


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

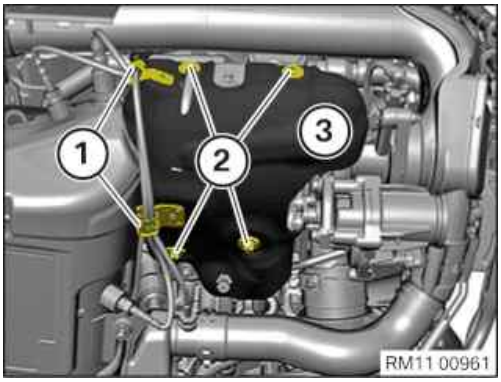
▶ Removing heat shield from top exhaust turbocharger

WARNING

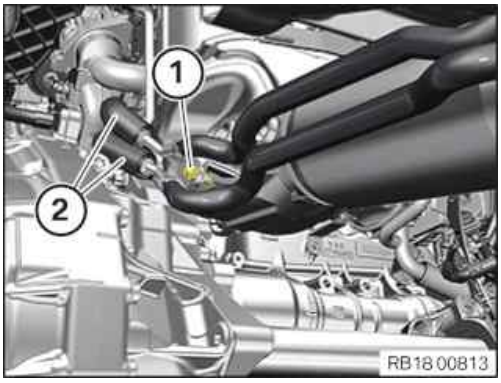
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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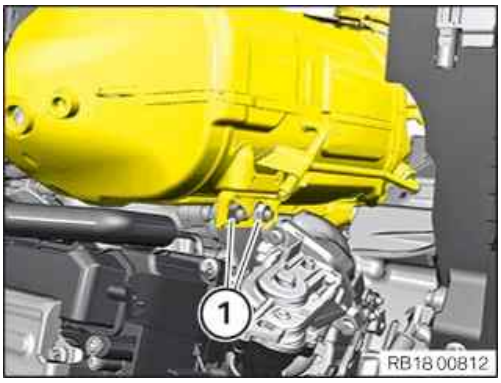
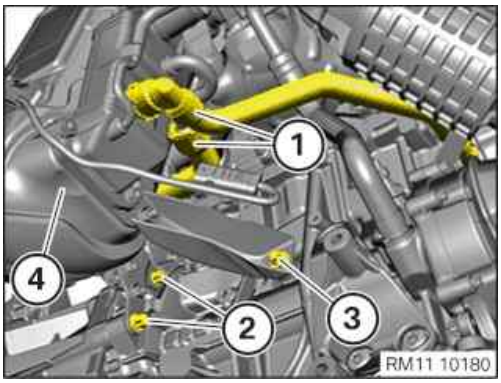


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

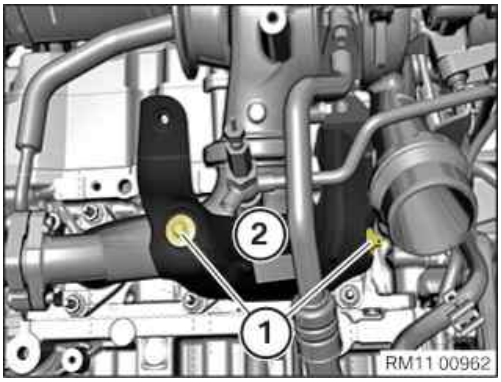
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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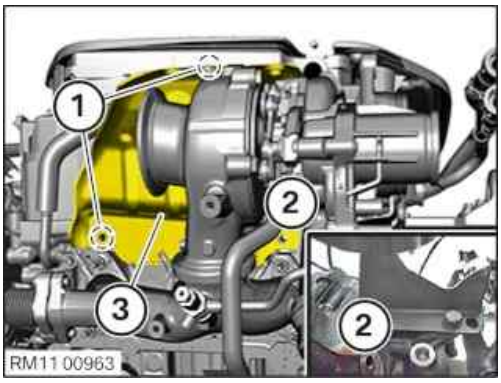


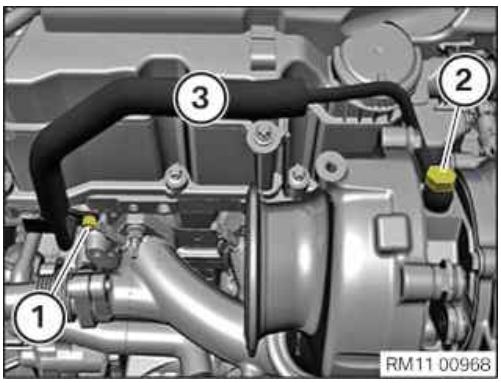
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

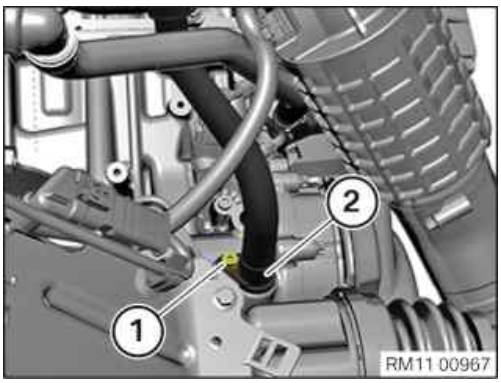
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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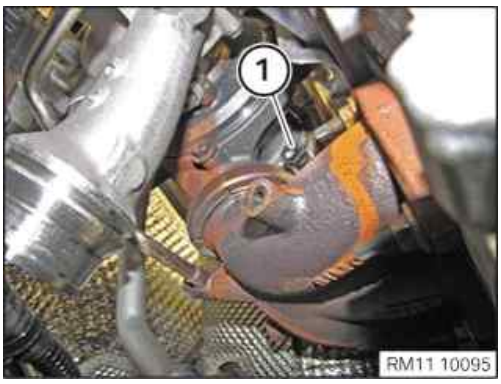
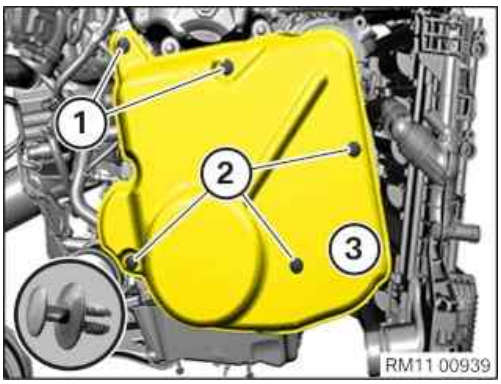
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

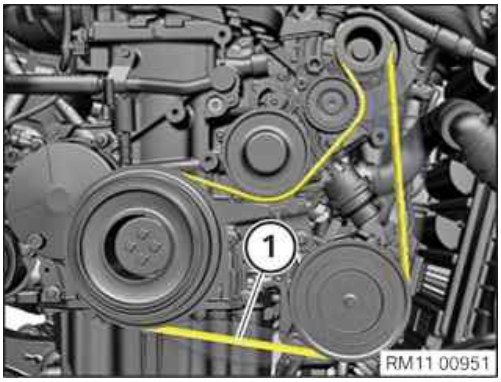
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

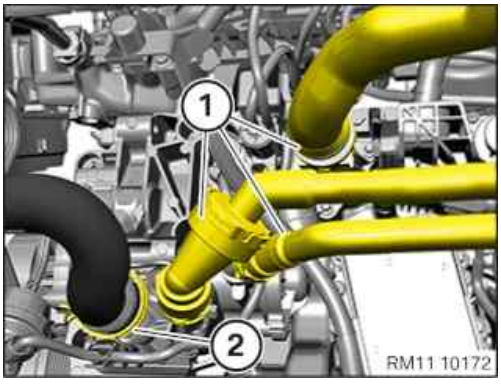
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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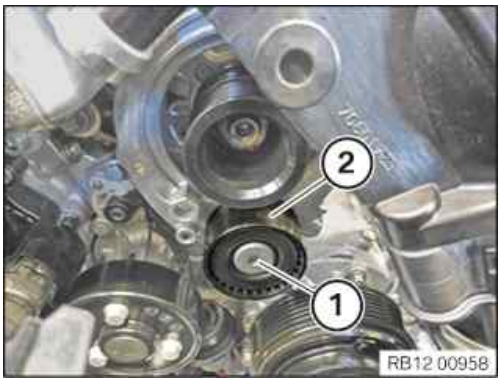
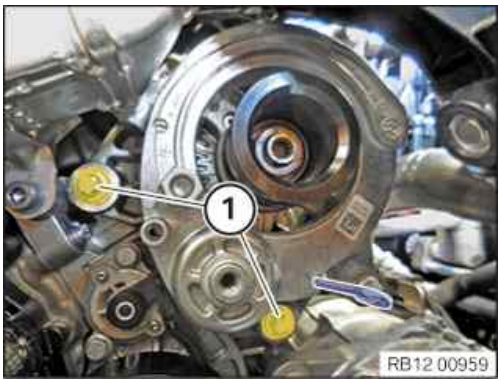
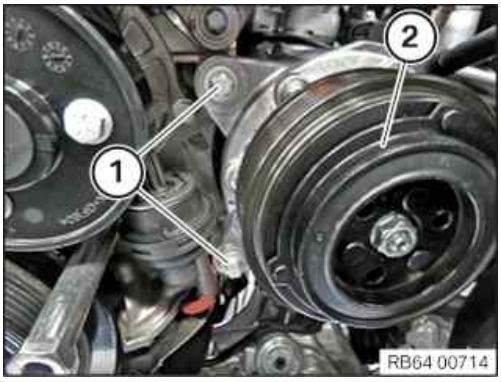


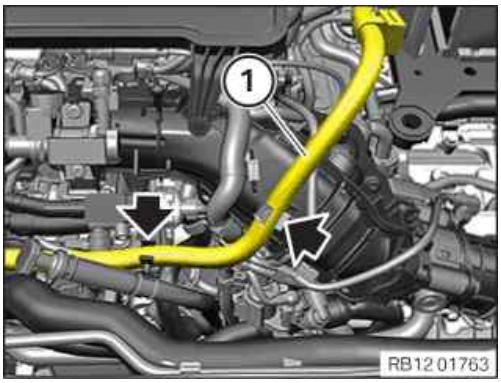
- Loosen screw (1).
- Remove the deflecting element (2).



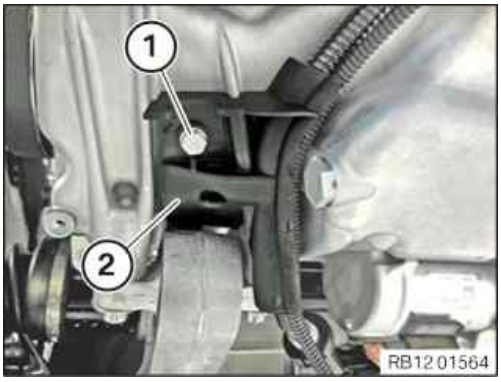
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

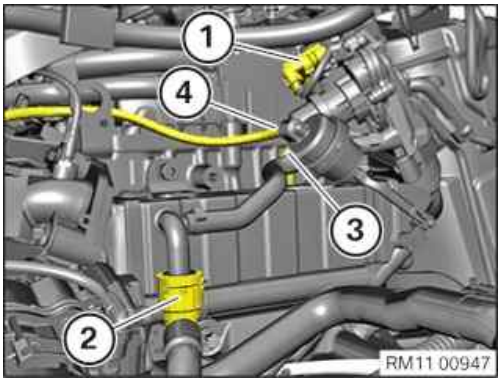
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

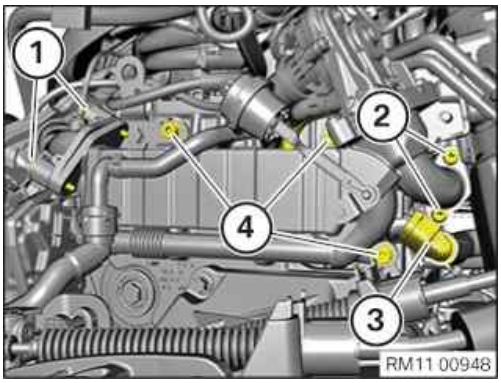
- Perform all work only on components that have cooled down.



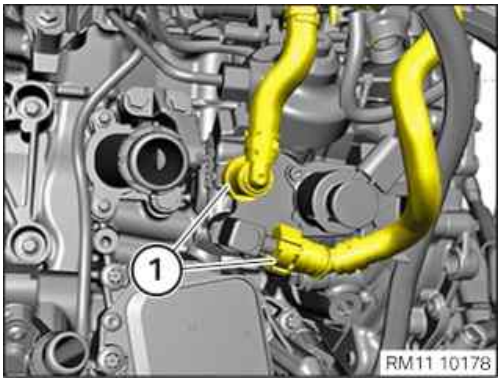
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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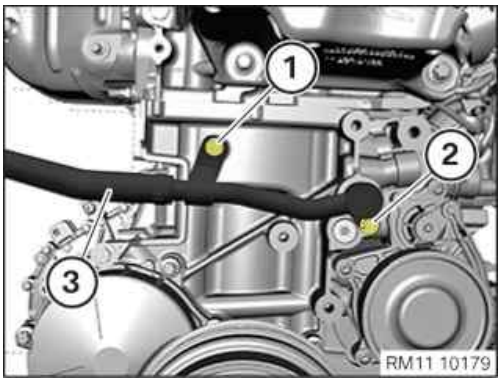


- Loosen screws (1) and (2).
- Remove coolant line (3).

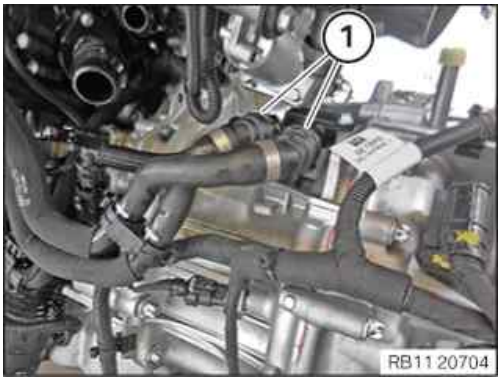
8 – Disconnect the engine from the double-clutch transmission (DKG)

RISK OF DAMAGE

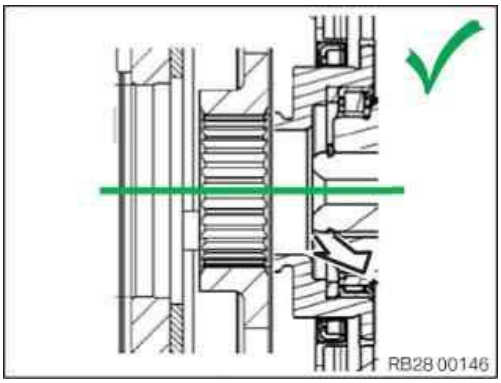
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

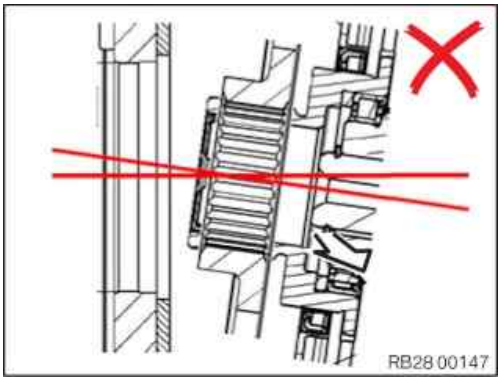
- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.



- Unlock and release coolant line (1).
- Catch and dispose of escaping coolant.



- **Correct:** Pull the double-clutch transmission (DKG) horizontally off the flywheel.



- **Wrong:** Do not pull the double-clutch transmission (DKG) off the flywheel if it is tilted.

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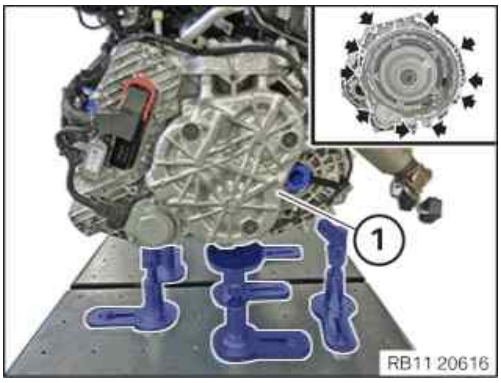
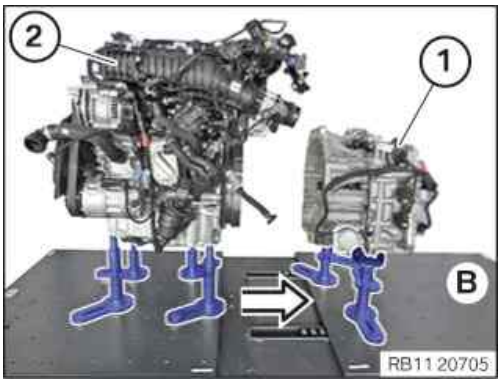


- Remove screws (arrows).
- Pull the double-clutch transmission (DKG) (1) off the flywheel when it is **absolutely** horizontal.



NOTICE

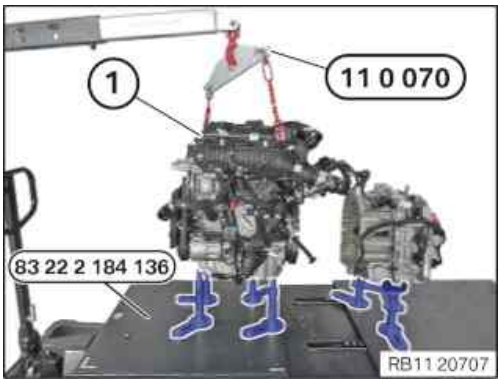
Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table top (B) in the direction of arrow and disconnect double-clutch transmission (DKG) (1) from the engine (2).

- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach the engine lifter with the special tool **0 490 579 (11 0 070)** and lift the engine (1) off the lifting table.

9 – Mount engine on assembly stand

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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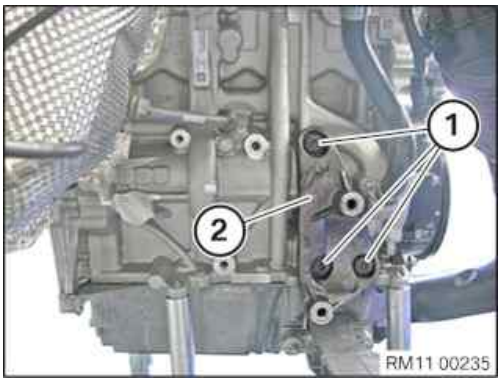
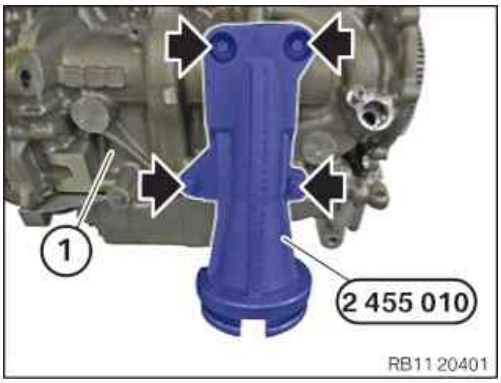


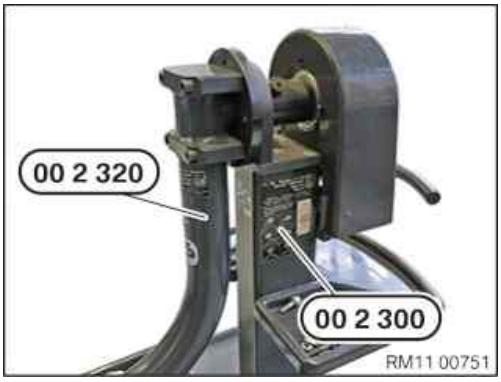
- Loosen screws (1).
- Guide out and remove holder (2).



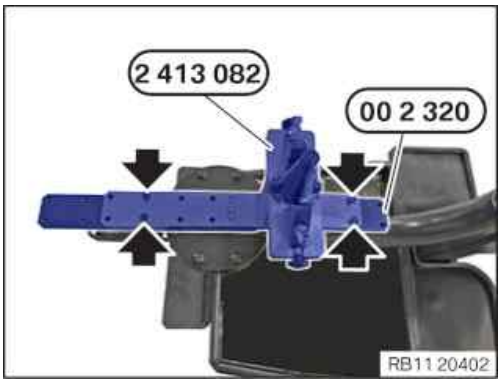
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.

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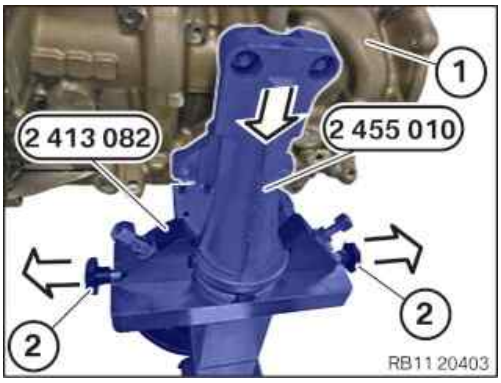
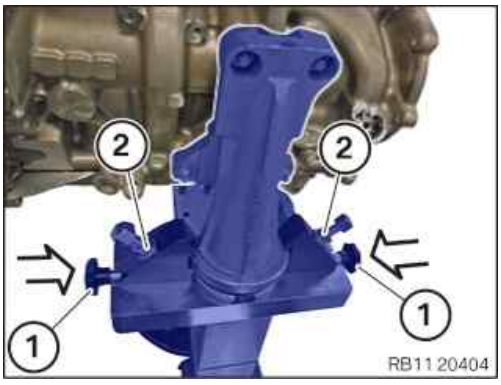


- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



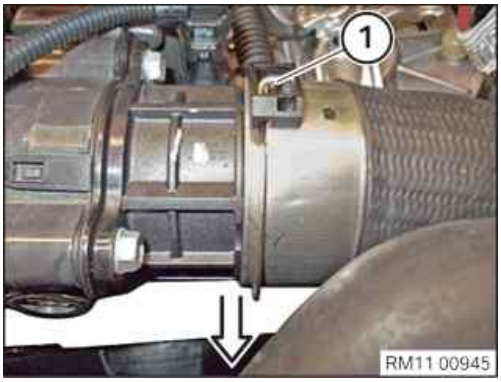
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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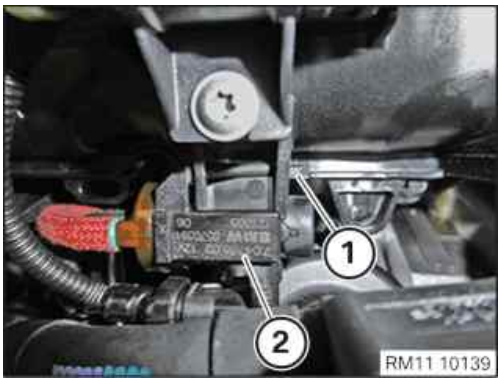
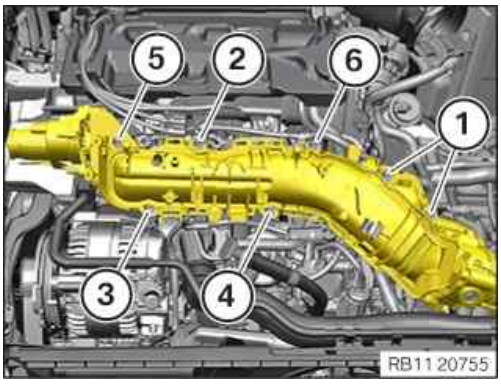
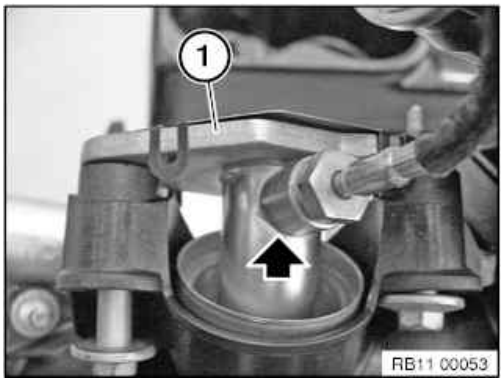


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

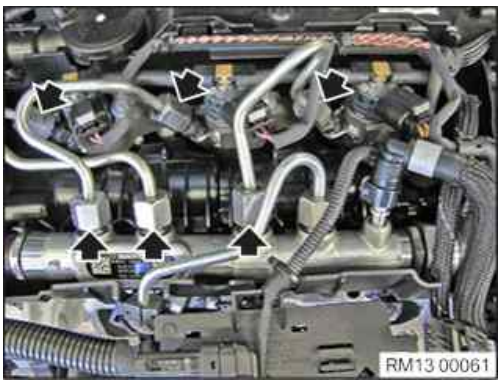
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

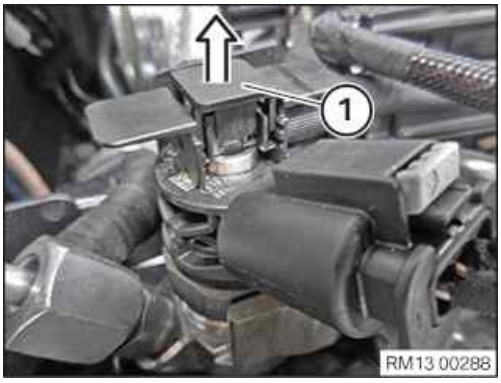
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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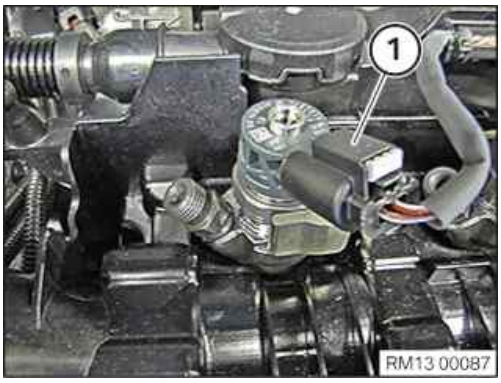
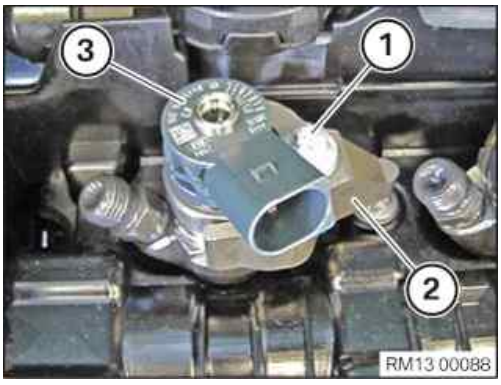


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

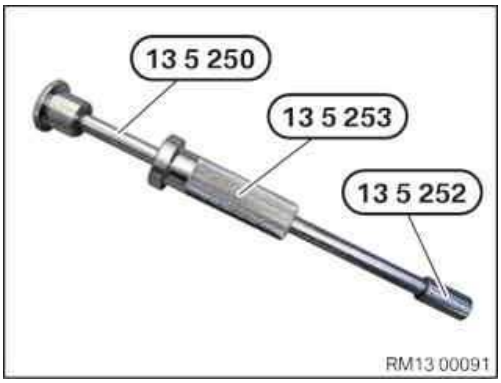
▶ **Loosen stuck injectors**

RISK OF DAMAGE

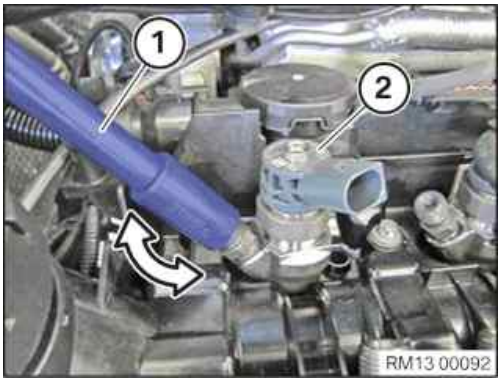
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

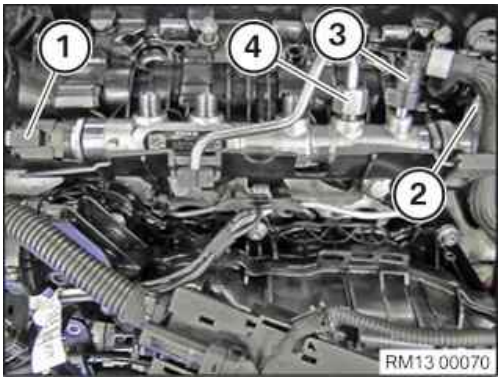
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

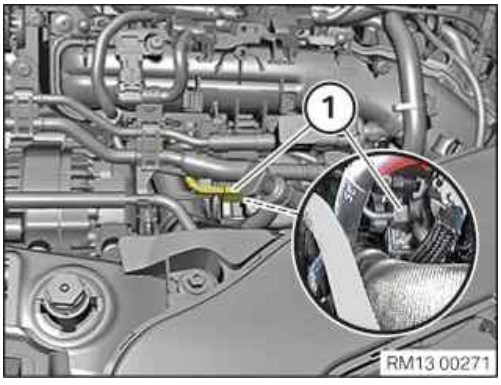
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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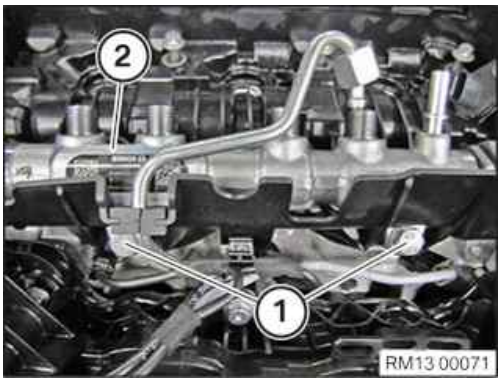
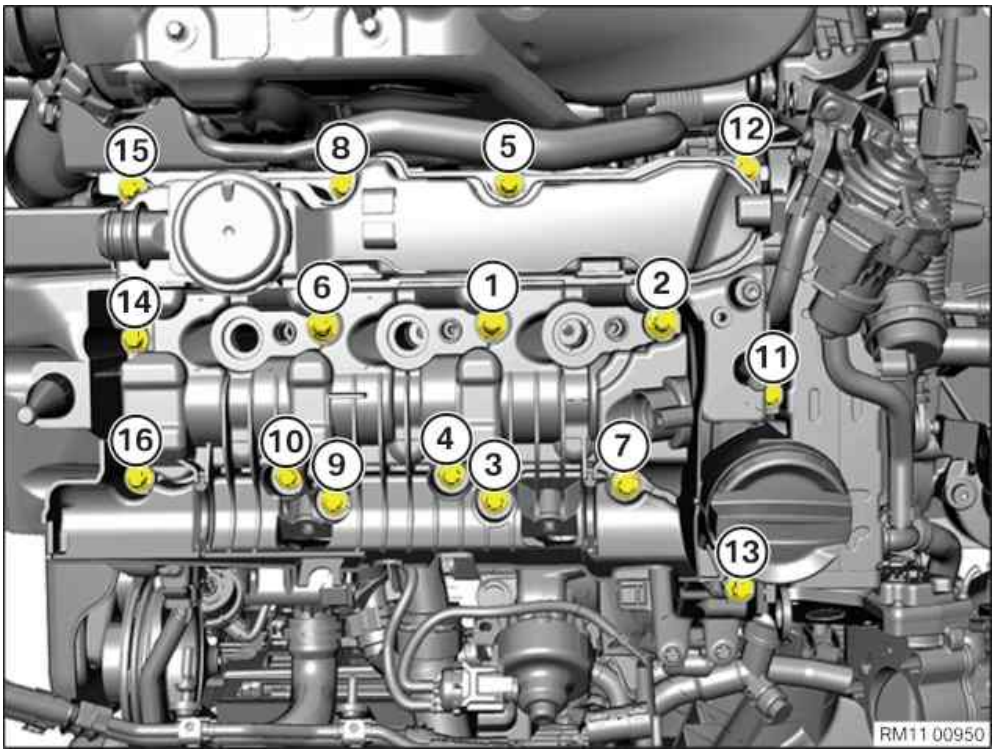


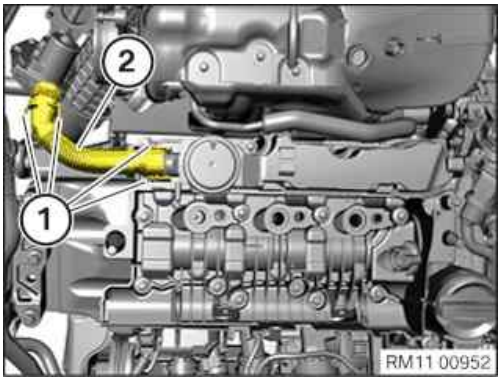
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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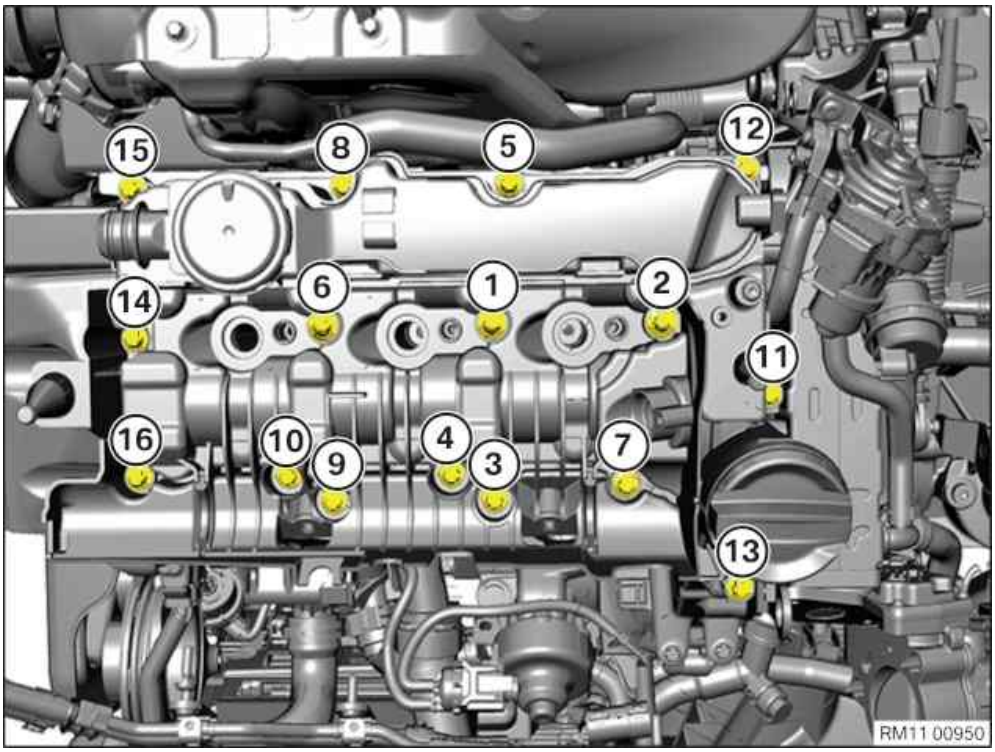

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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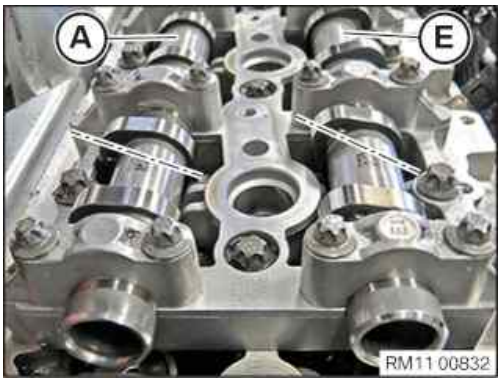
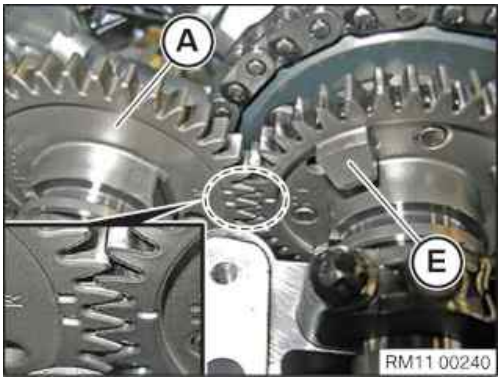


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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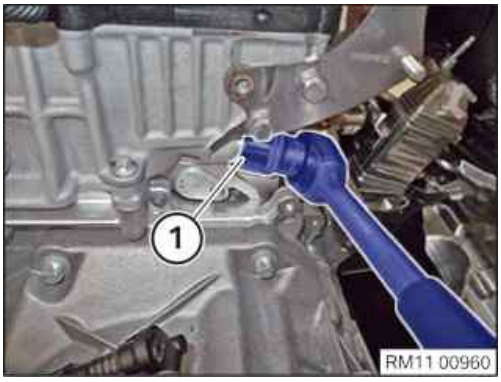
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

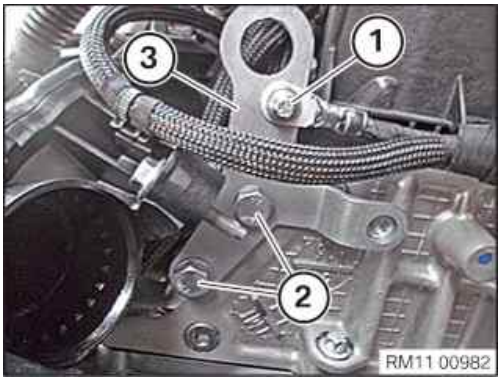


TECHNICAL INFORMATION

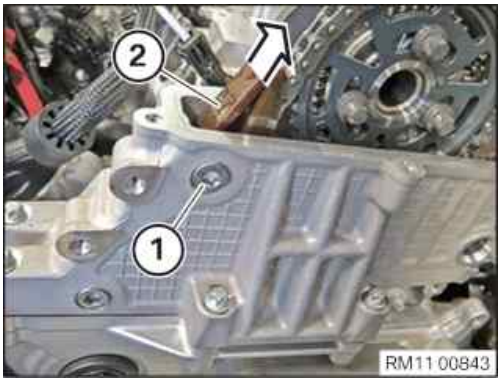
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

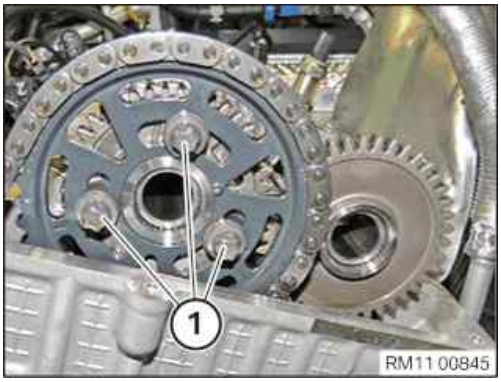


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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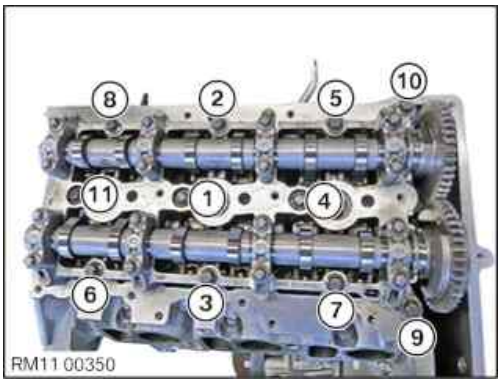
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

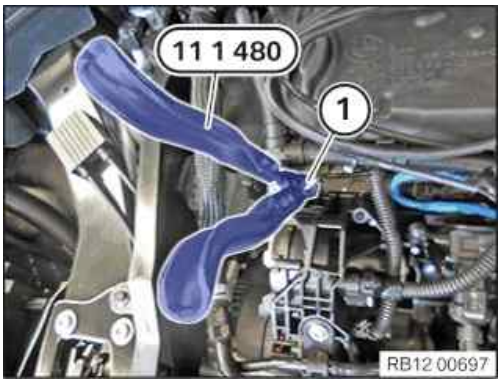
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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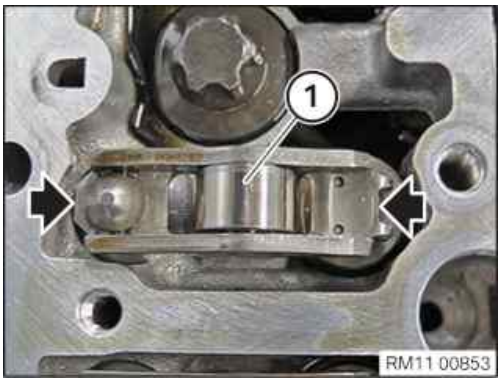


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

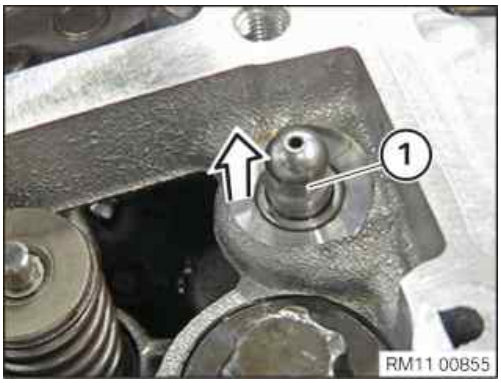
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

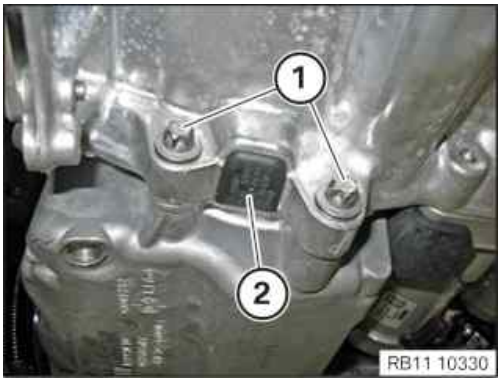
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

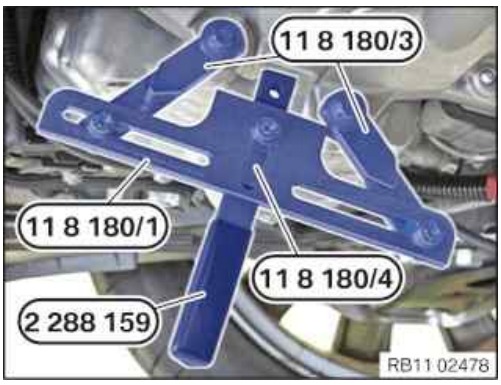


- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

24 – Removing the vibration damper



- Release the transmission bolts (1).
- Remove the protective cap (2).



- Position special tool **0 493 587 (11 8 180)** as illustrated.
- Fasten the special tool **0 493 587 (11 8 180)** to the transmission with transmission bolts.

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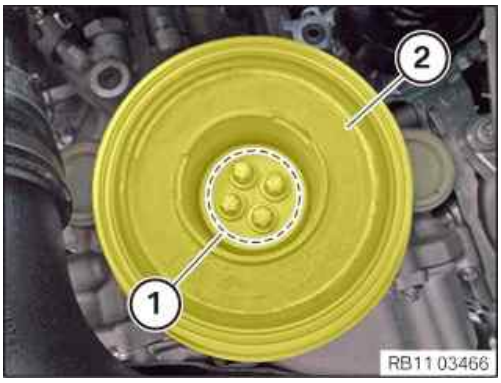
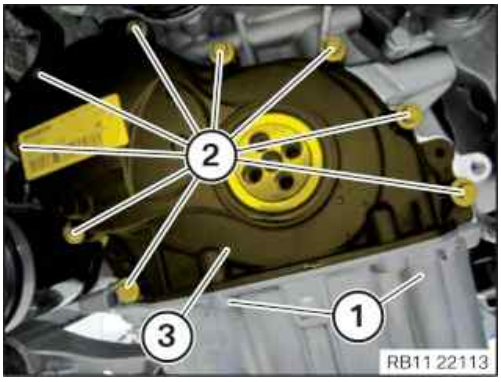


- Loosen screws in the area (1).
- Remove the vibration damper (2).

25 – Remove gear case cover



- Loosen screws (1).
- Loosen screws (2).
- Guide out and remove timing case cover (3).

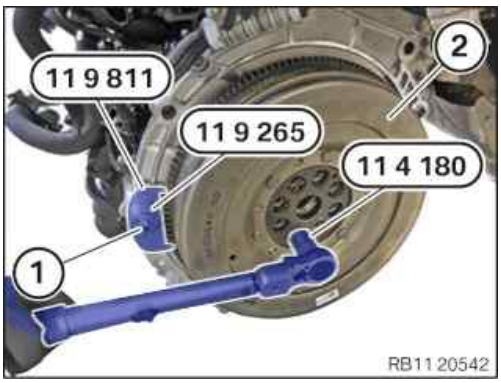
26 – Remove flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Position special tool **0 496 171 (11 9 811)** with a **standard** 5 mm thick washer between the crankcase and the flywheel.

  The 5 mm thick washer must be mounted between the crankcase and special tool **0 496 171 (11 9 811)** .
- Secure the special tool **0 494 793 (11 9 265)** with the transmission bolt (1).
- Protect the flywheel (2) from falling.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Guide out the flywheel (2) and remove.

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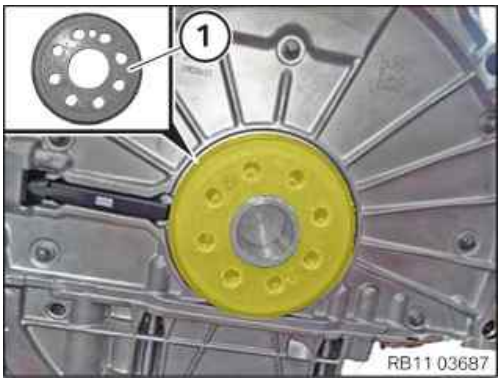


RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

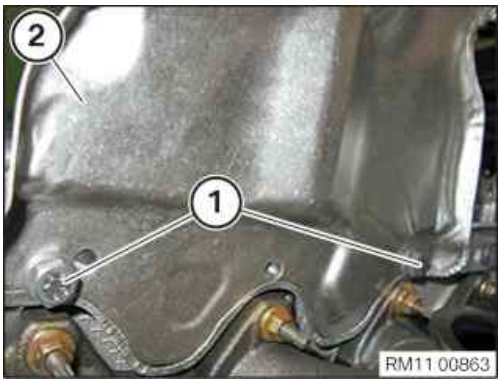
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove increment wheel (1) from the crankshaft and set it aside properly.

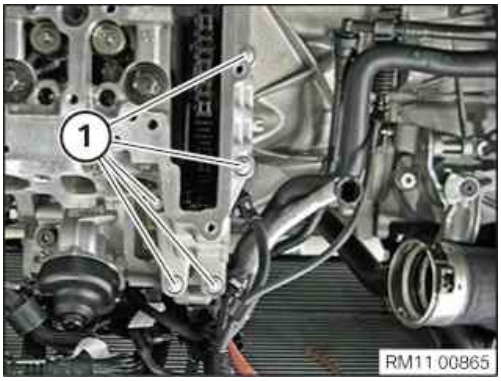
27 – Remove rear timing case cover

Prerequisite

Transmission is removed.



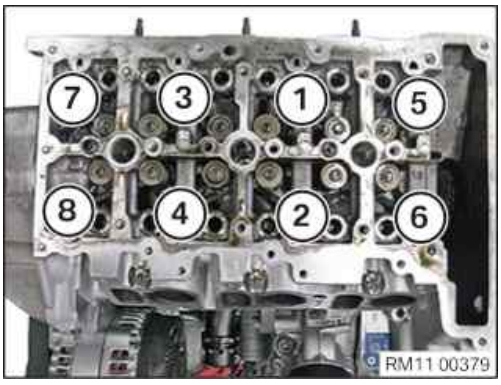
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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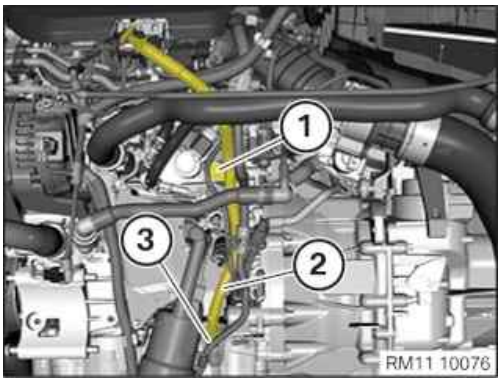
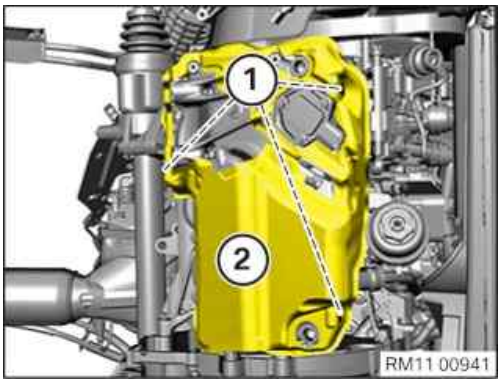
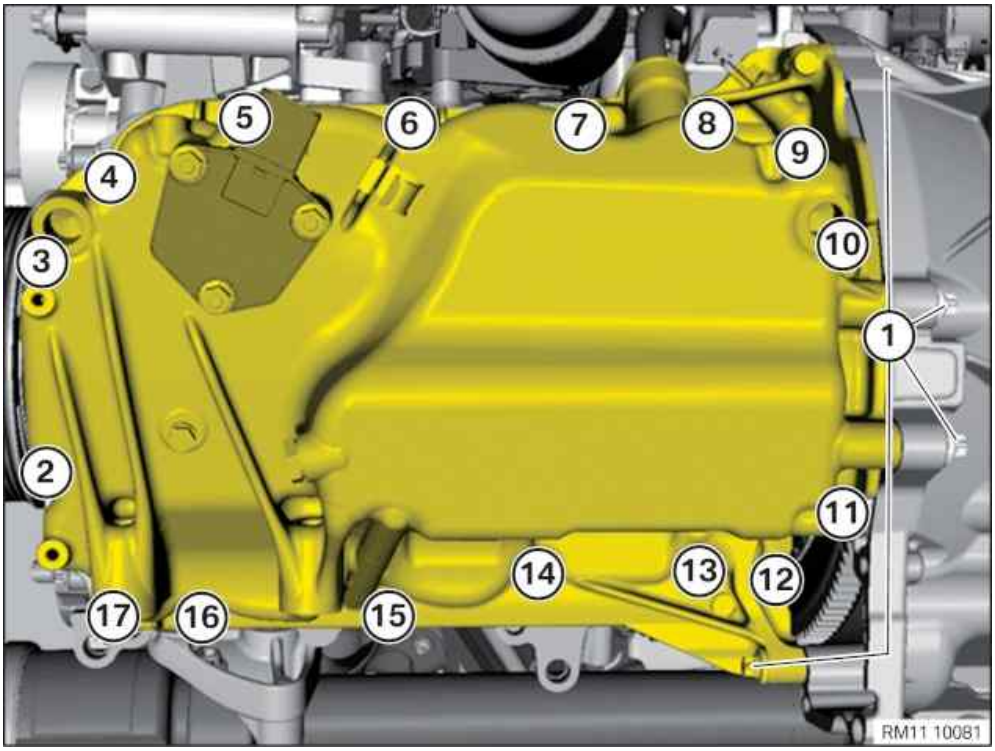


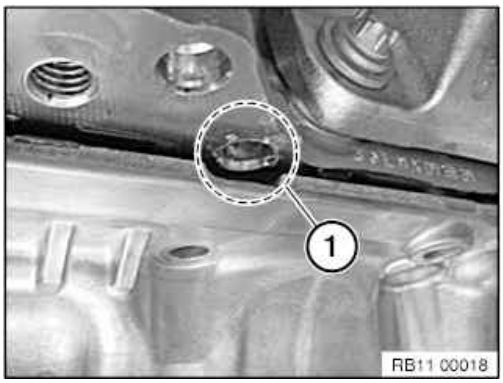
- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- If required, remove sealing ring (3) from oil sump.



- Remove the expanding rivet (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).



- Tighten the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release oil sump only in area (1).

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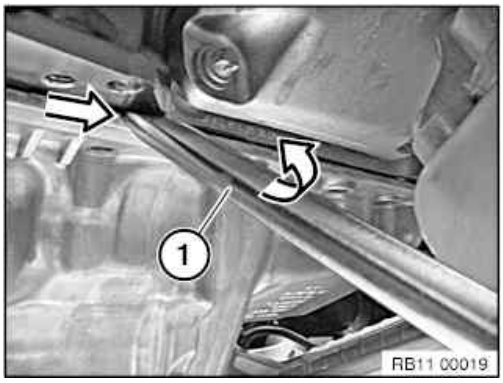
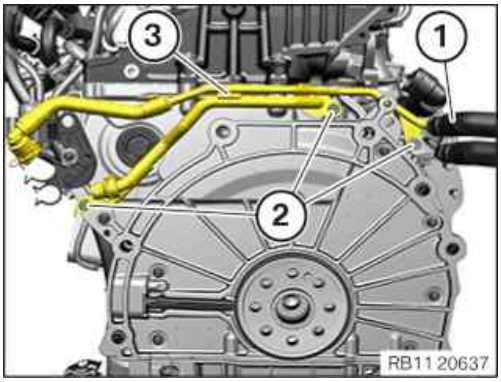
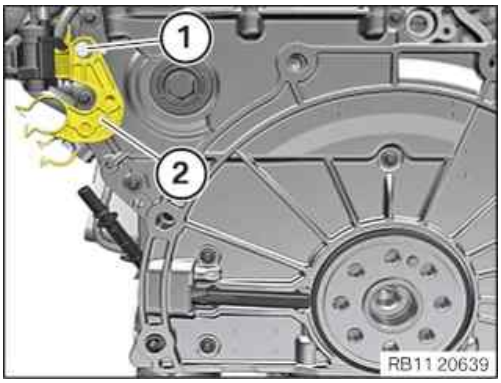


- Release the oil sump using a suitable mounting lever (1) carefully at the position intended for that.
- If required, secure the oil sump against falling.

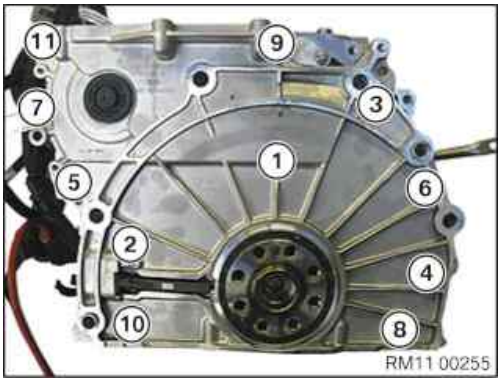
► **If installed: Remove coolant line of the SCR metering module**



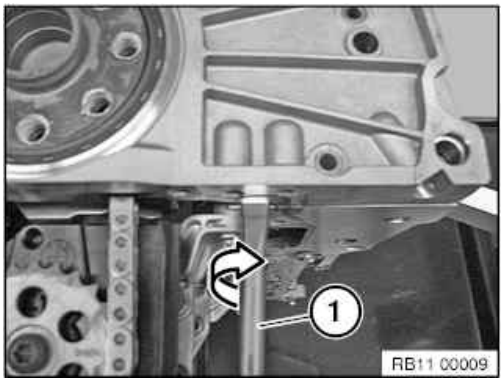
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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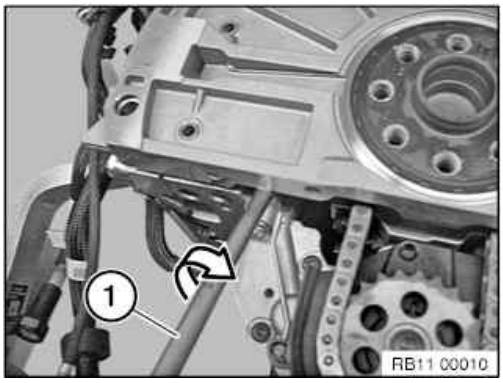


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

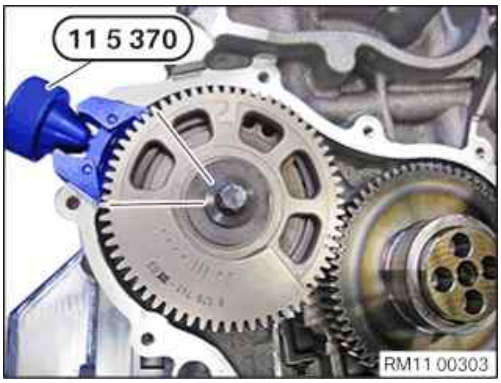
MAIN WORK

28 – Remove counterbalance shaft

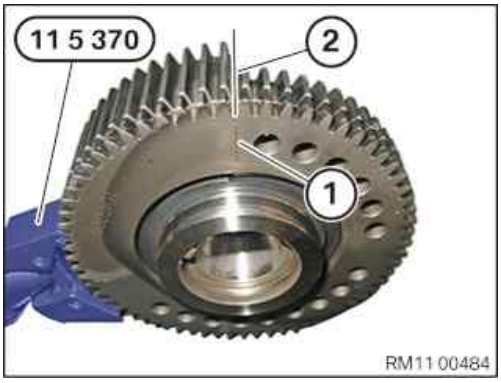
- Fasten counterbalance shaft with special tool in the TDC position of cylinder no. 1.
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



- Ensure that the gear of the counterbalance shaft is pretensioned and blocked before removal.
- Install the special tool **0 495 131 (11 5 370)** as shown and pre-load the gear.



- Block gear wheels (1) and (2) until re-installation with the special tool **0 495 131 (11 5 370)**.

- Check whether the marks on the counterbalance shaft gear are aligned with the marks on the crankshaft gear.
- Loosen screw (1).

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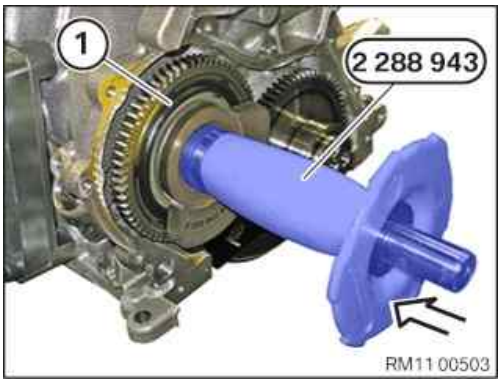
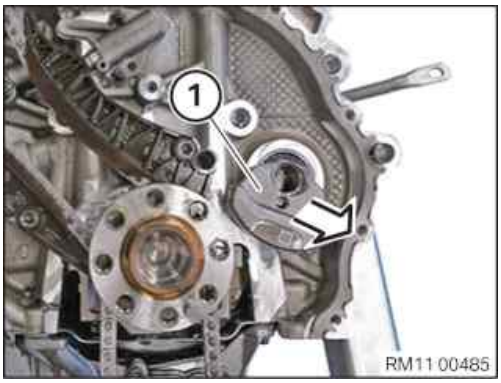
- Loosen screws (1).
- Remove special tool .



- Screw the special tool **2 288 943** far as it will go into the counterbalance shaft.
- Secure counterbalance shaft and gear against falling down!
- By means of targeted hammer blows on the special tool **2 288 943** in the direction of the arrow, loosen the counterbalance shaft from gear (1) .
- Remove special tool **2 288 943**.

- Remove the counterbalance shaft gear in the direction of the arrow.



- Remove counterbalance shaft (1) in direction of arrow.

29 – Install counterbalance shaft

- If a new gear is installed, the ring gear must remain blocked until installation using the factory-mounted fixation (1) .

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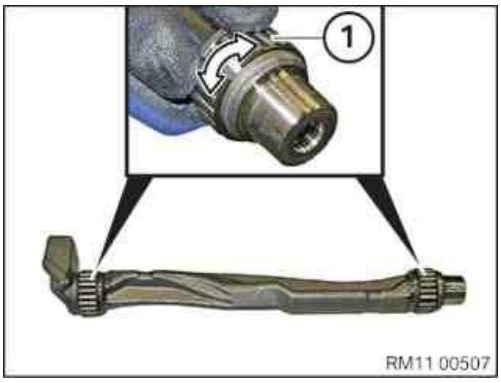
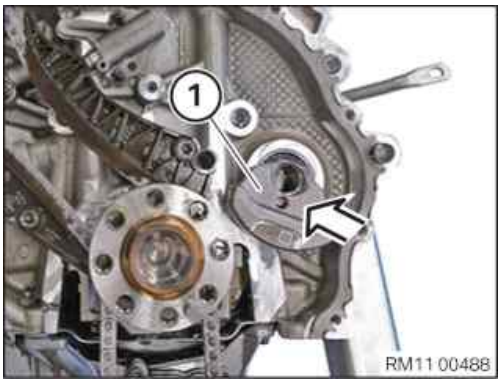


- Check both needle bearings (1) of counterbalance shaft for damage.
- Pull off damaged needle bearing (1) from the counterbalance shaft and renew it.

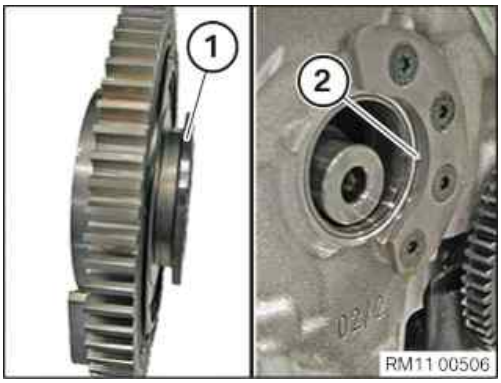


- Install counterbalance shaft (1) in direction of arrow into crankcase.

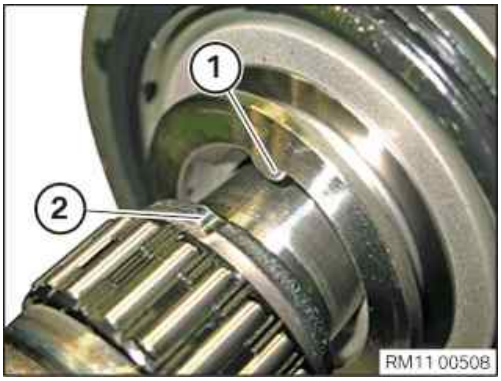
- Fix the counterbalance shaft in the TDC setting of the first cylinder using the special tool .
- Tighten the screws (1).

Standard screw connection M6

M6		8 Nm



- On installation, make sure that ring (1) of gear is guided in crankcase (2).



NOTICE

For a better overview the removed condition is shown here.

- On installation of counterbalance shaft in gear, make sure that lug (1) on gear is inserted into groove (2) of counterbalance shaft.

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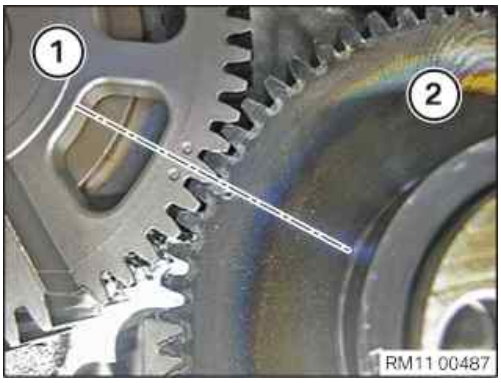


- Bring gear (1) of counterbalance shaft into contact in correct installation position (mark) relative to crankshaft (2).

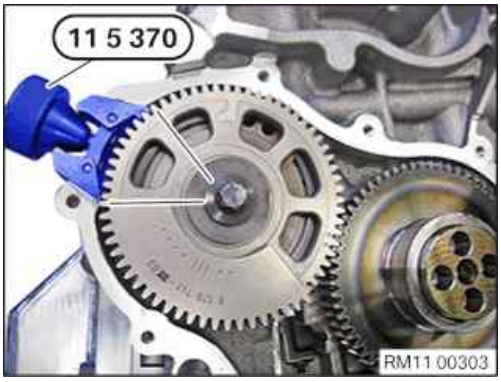
- Renew the screw (1).

  Parts: Screw

- Tighten down screw (1).

Gear to counterbalance shaft

	Renew screw.	Tightening torque	20 Nm
		Angle of rotation	60 °



- Remove special tool **0 495 131 (11 5 370)**.

- Loosen screws (1).
- Remove special tool .

POSTPROCESSES

30 – Install the rear timing case cover

Prerequisite

Transmission is removed.

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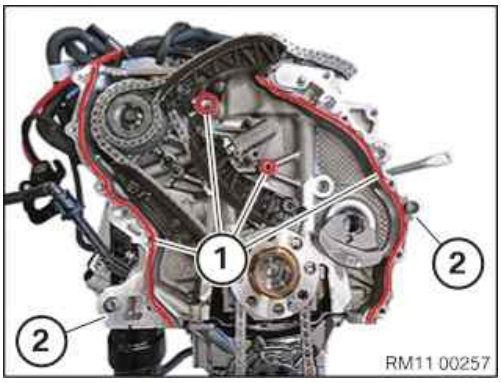


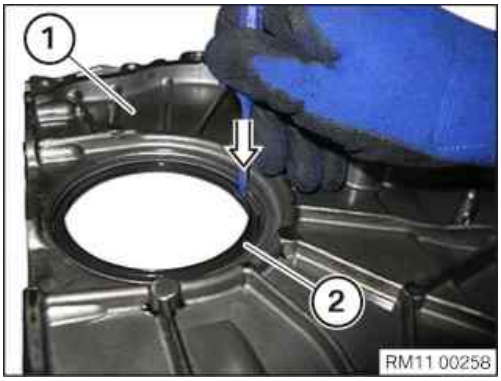
RISK OF DAMAGE

Damage to the surface.

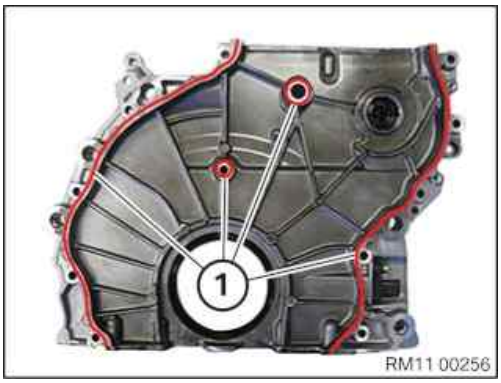
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

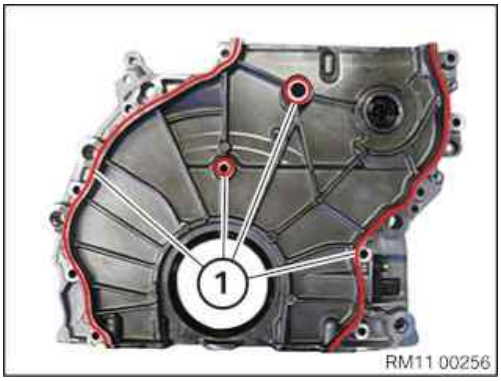
- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.



- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

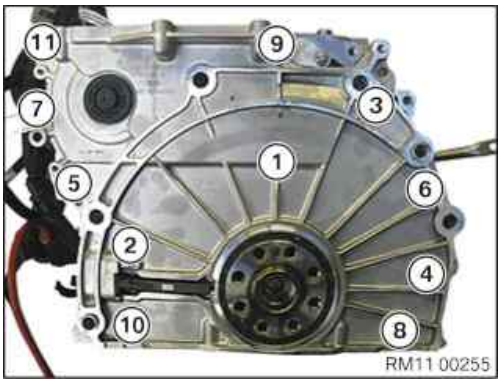


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

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RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

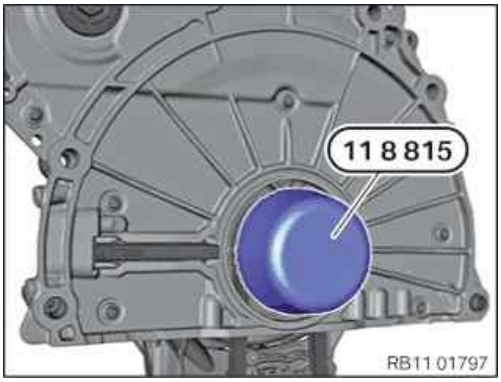
- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

RISK OF DAMAGE

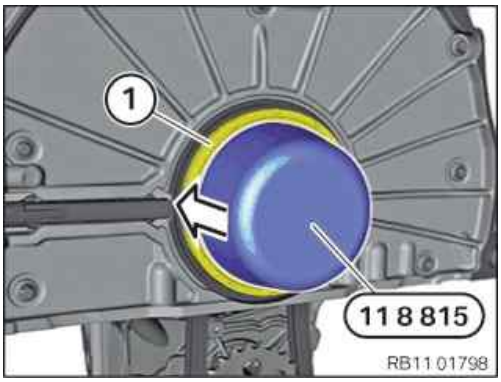
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

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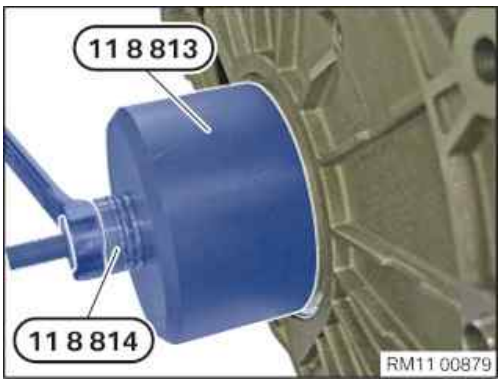
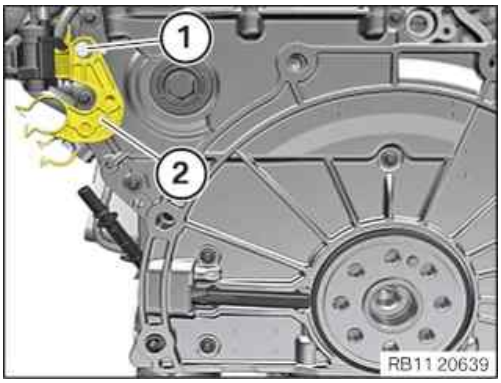
- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

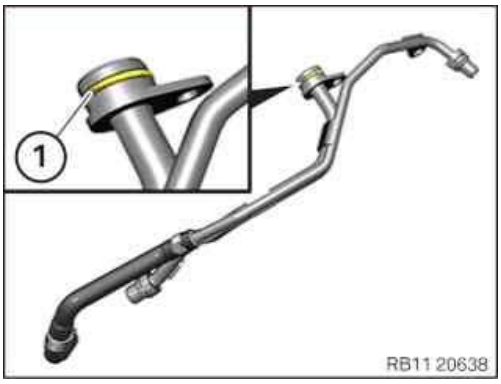


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



- Insert and install the holder (2).

► **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring

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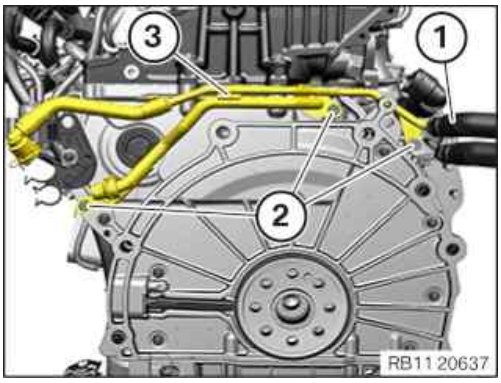


- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

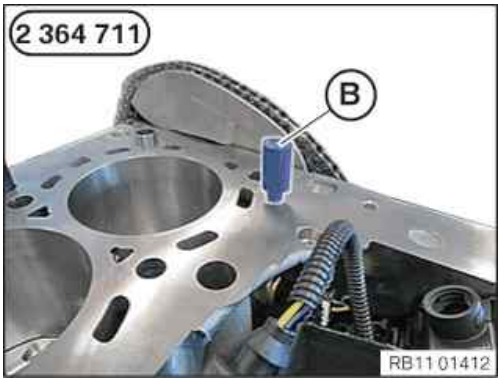
▶ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.

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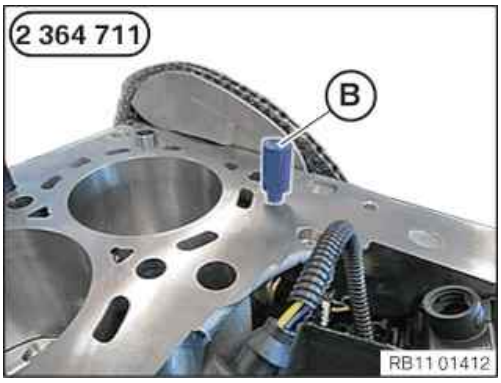
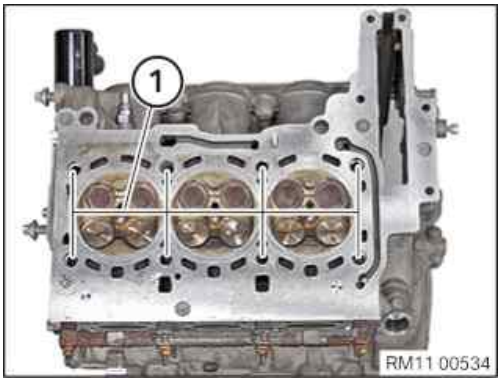


- Remove special tool (B).

▶ **Renewing the cylinder head gasket**



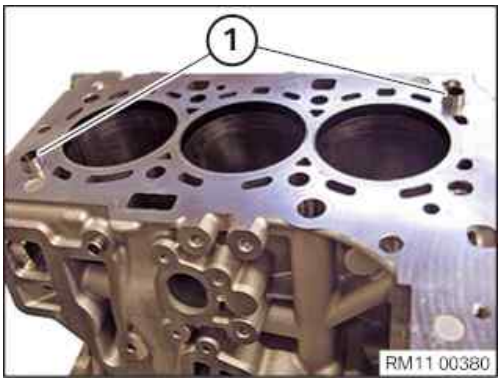
RISK OF DAMAGE

Damage to the surface.

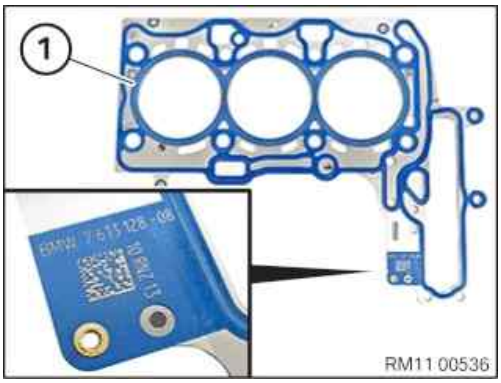
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

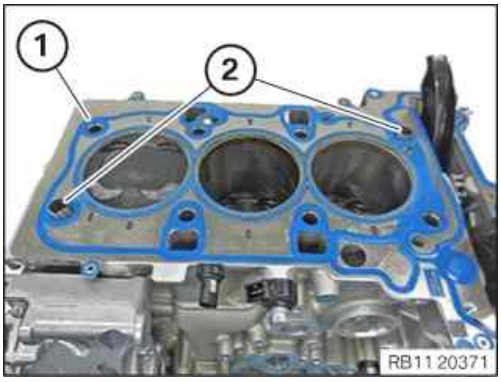
- Remove oil and dirt residue from the blind holes (1).



- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

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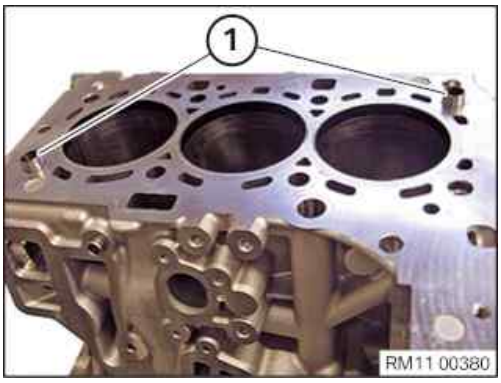
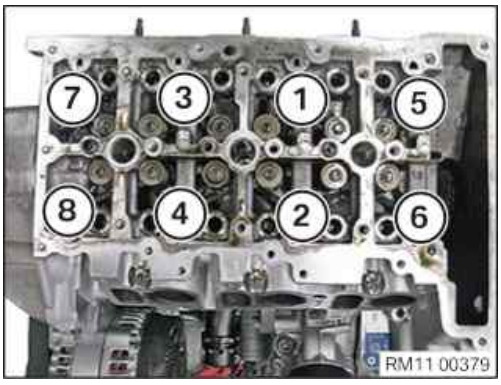


- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.

- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Fit new cylinder head screws.

  Parts: Cylinder head bolts

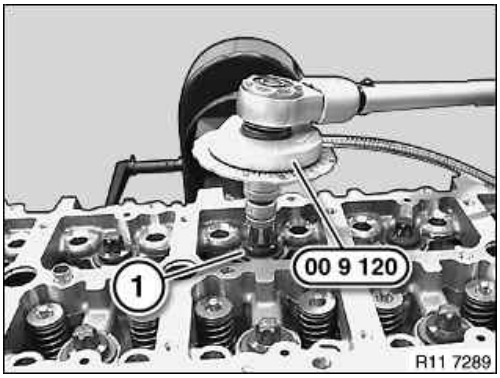
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

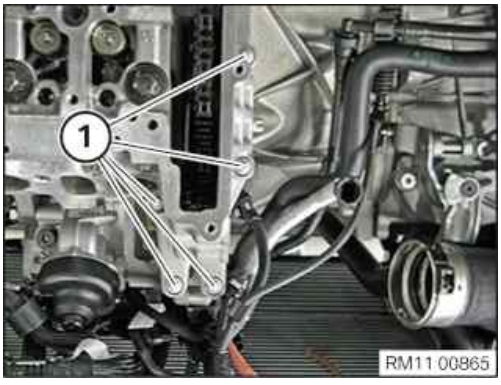
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolts in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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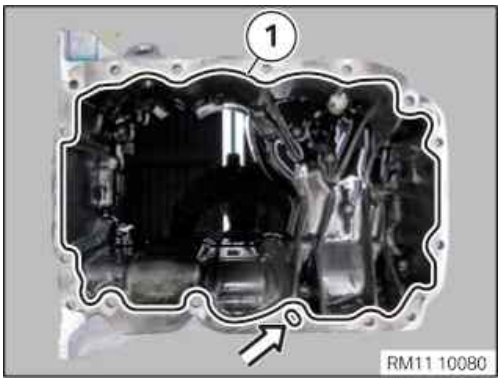


TECHNICAL INFORMATION

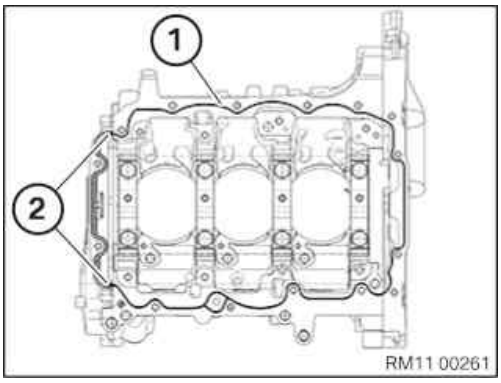
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

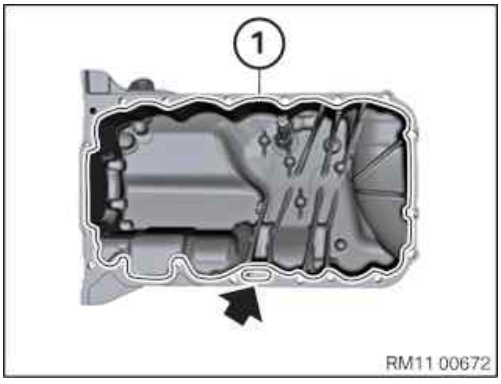
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

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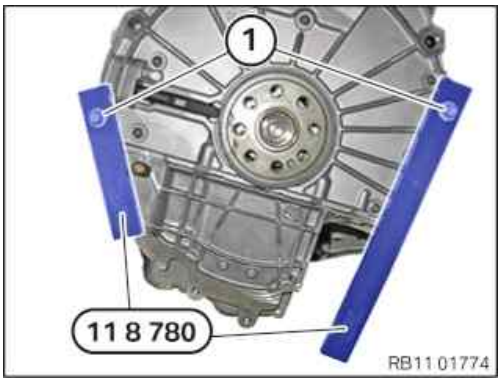
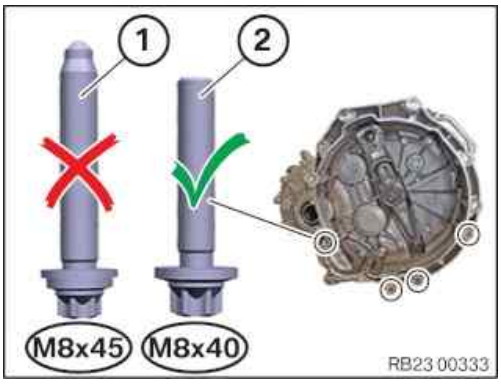


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

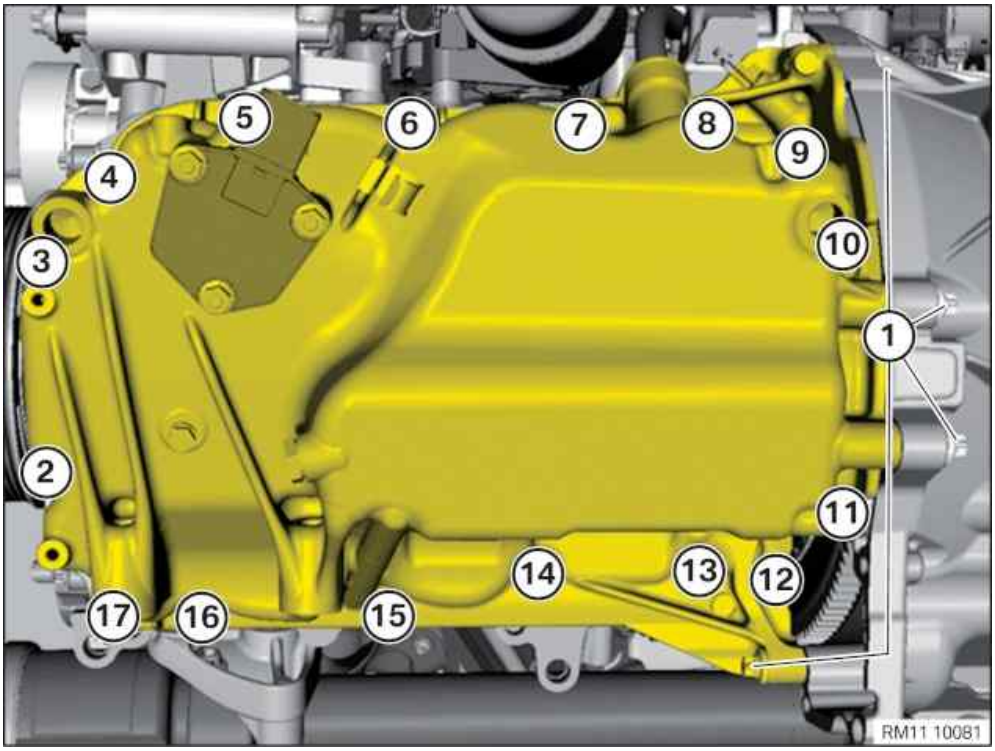
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Hand tighten the screws of oil sump (2) to (17) , but do **not** tighten completely yet.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

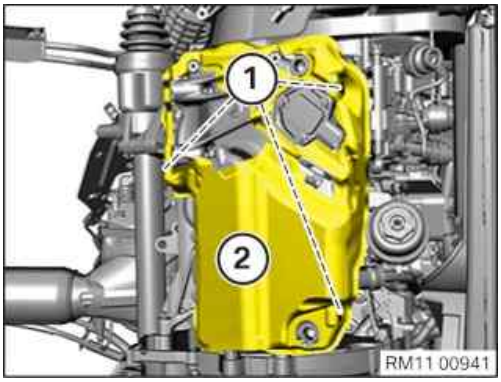
Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

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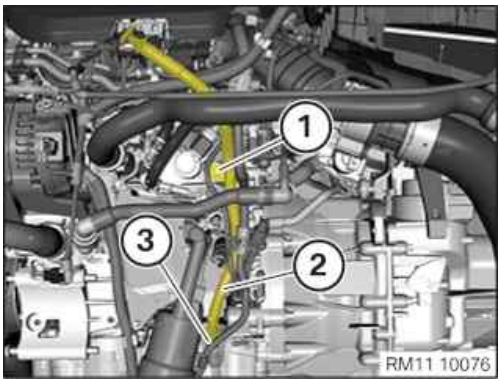
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

31 – Installing the flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all the screw threads (1).

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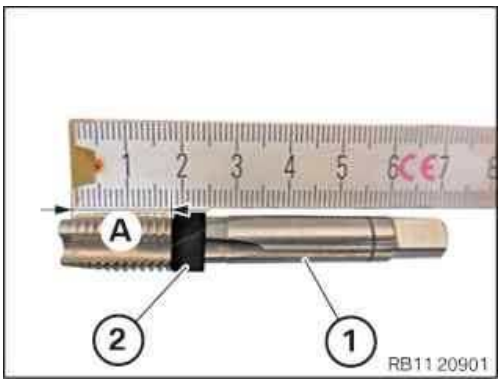
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

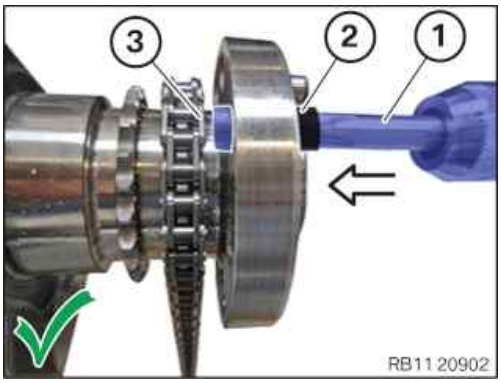
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the depth of insertion (A) on the thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

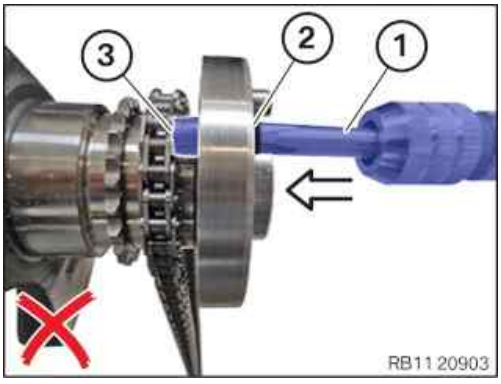
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).



TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the depth of insertion (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).

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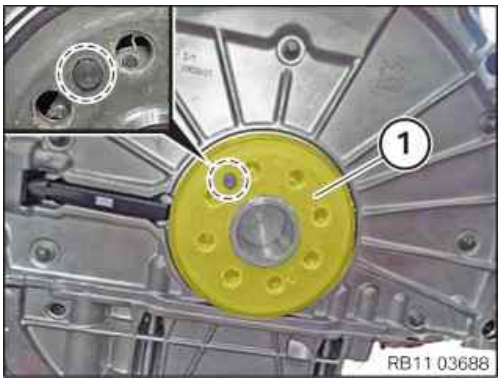
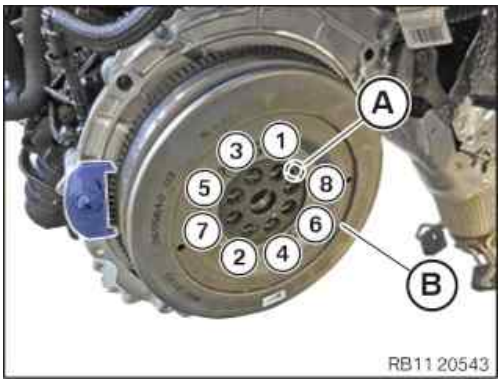


- It is essential to observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

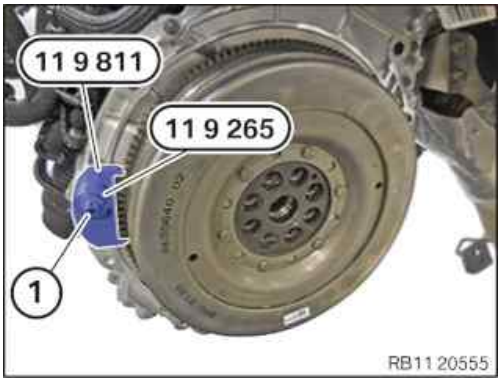


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Thread out special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)** remove.
- Ensure that the washer (5 mm) is removed.

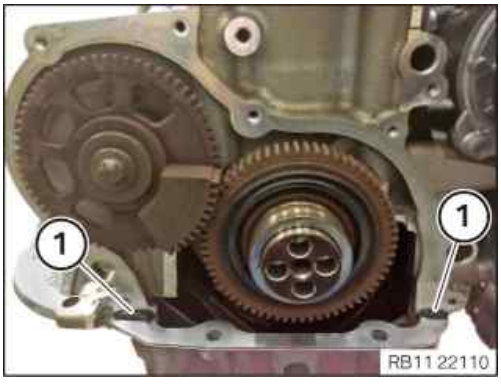
32 – Installing the timing case cover

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply sealing compound (1) approx. **5 mm** as shown.

  The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.

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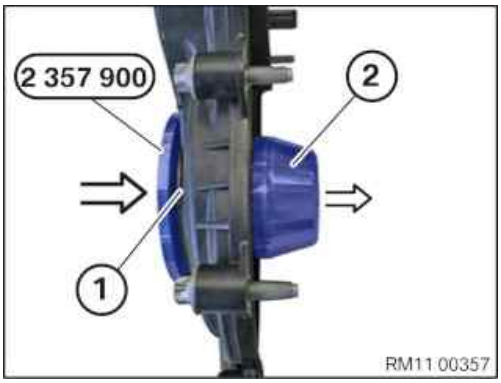
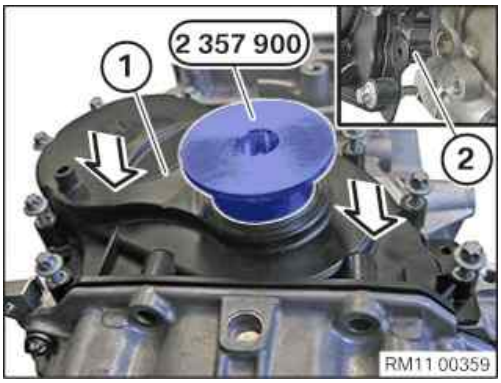
- Assemble special tool **2 357 900** as shown.
- Please note that no greases or lubricants may be used on the special tool **2 357 900**.



- Carefully slide the special tool **2 357 900** in the direction of the arrow through the sealing ring into the timing case cover (1).
- Make sure that the special tool **2 357 900** rests flat against the timing case cover (1).
- Remove the fitting aid (2).

- Connect special tool **2 357 900** to the timing case cover (1) on the hub of the crankshaft (2).



- Feed in and install timing case cover (1) in the direction of the arrow.
- Ensure the guide pins (2) are fitted correctly.
- Tighten screws hand-tight.
- Remove special tool **2 357 900**.

- Make sure that the air guide (1) faces out.

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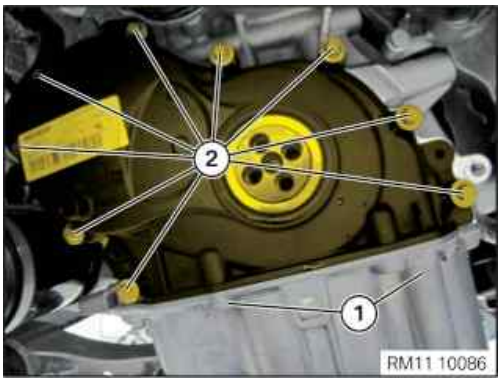


- Hand-tighten the bolts (1).
- Tighten the screws (2) in a crosswise sequence with a tightening torque.

Timing case cover, front, to crankcase

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

- Tighten the screws (1).

Oil sump to crankcase

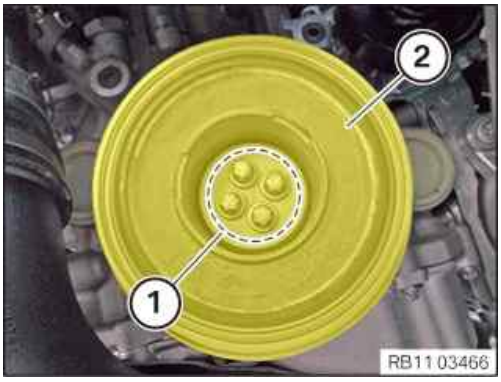
M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

- Tighten the screws (2) in a crosswise sequence with an angle of rotation.

Timing case cover, front, to crankcase

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

33 – Installing the vibration damper

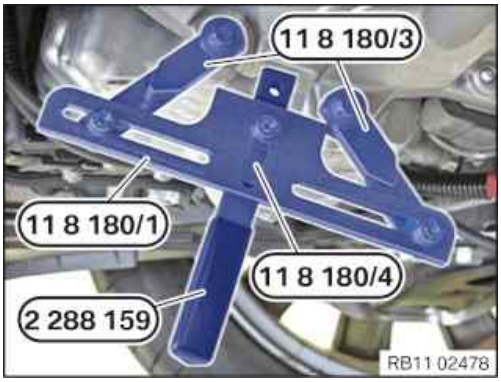


- Position vibration damper (2).
- Renew screws (1).

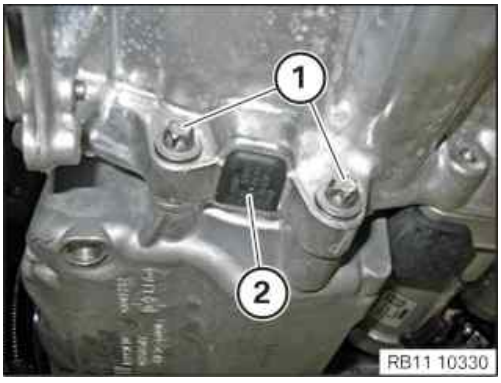
  Parts: Bolts
- Fasten the vibration damper (2) with the bolts (1).
- Tighten the screws (1).

Vibration damper with belt pulley to crankshaft

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °



- Release the transmission bolts and remove the special tool **0 493 587 (11 8 180)**.



- Tighten transmission screws (1).

Transmission to oil sump

M8			19 Nm

- Install protective cap (2).

34 – Installing the hydraulic valve clearance compensating element

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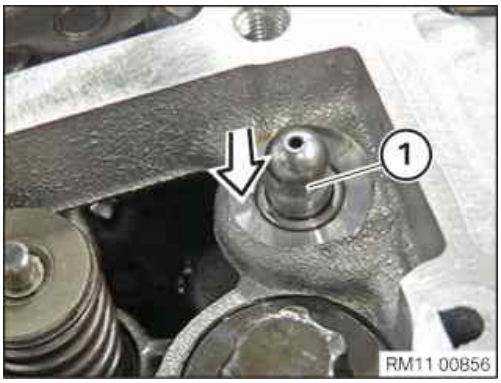
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

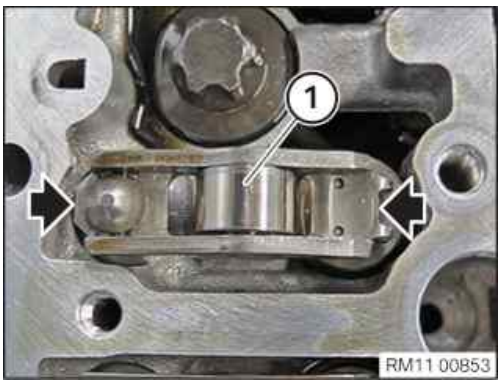


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

35 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

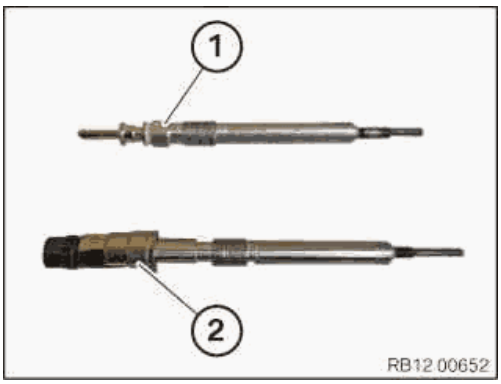


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

36 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

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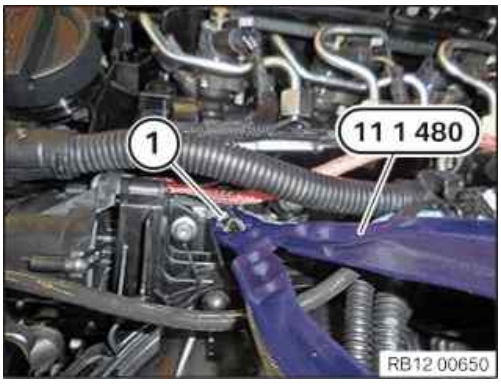
- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

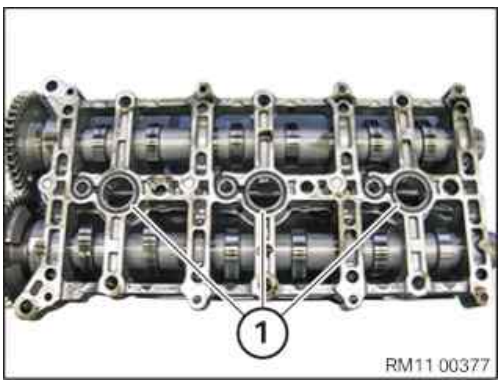
37 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

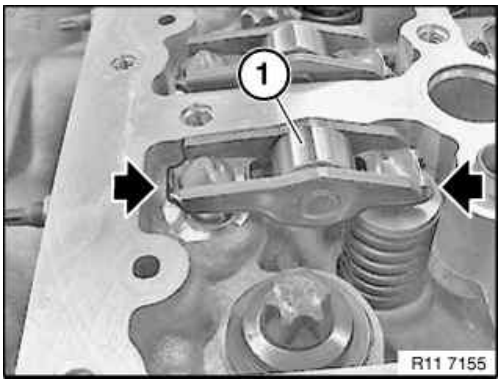
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.

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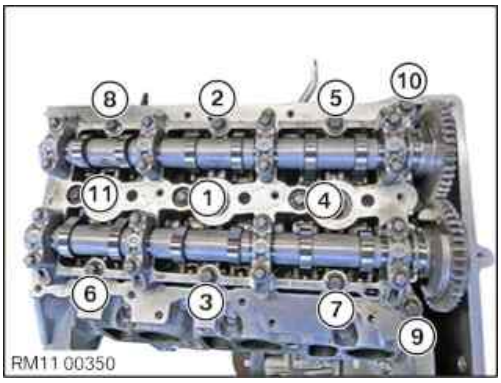


- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

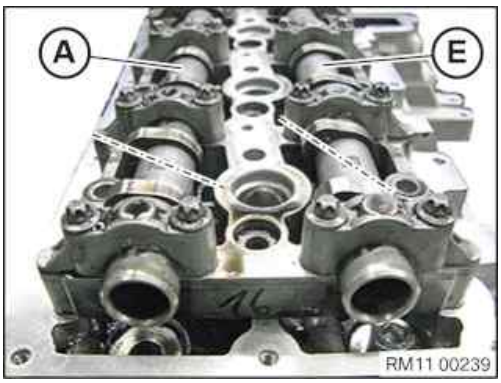
M7x35		Tightening torque	13 Nm

38 – Adjusting the timing of the camshafts

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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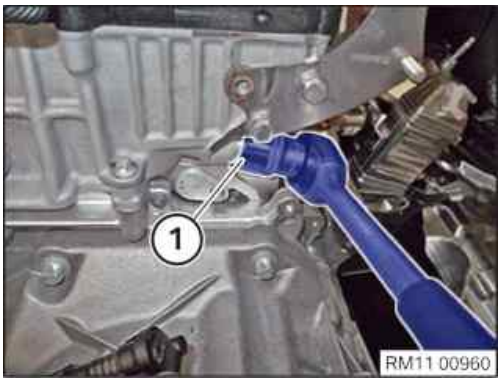


TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

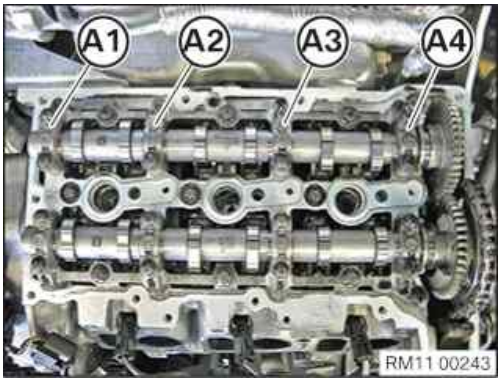
▶ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

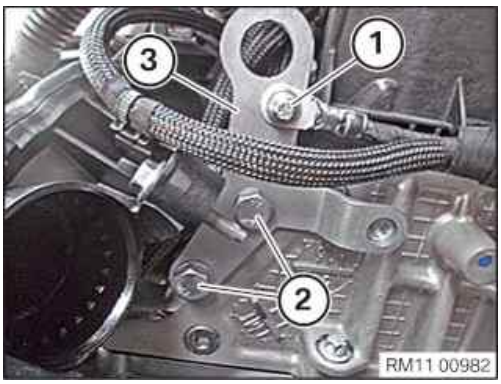


TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▶ **Remove the timing chain guide rail**



- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).

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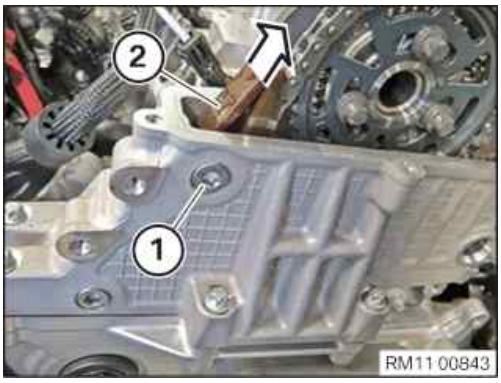
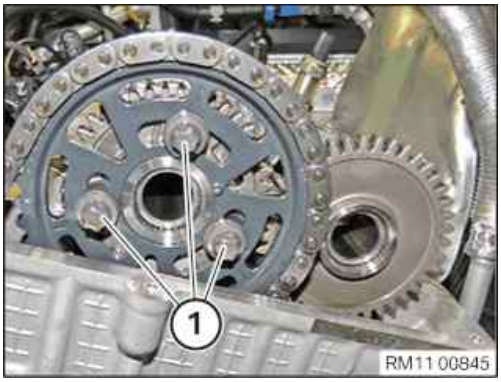


- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

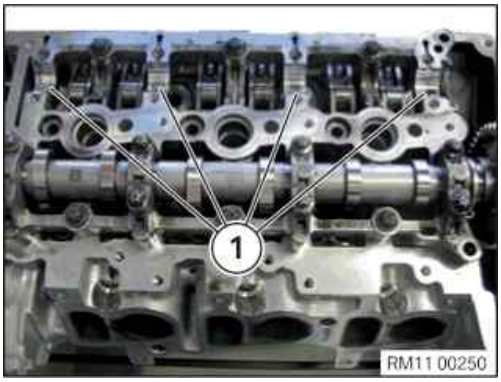
▶ **Installing exhaust camshaft**

RISK OF DAMAGE

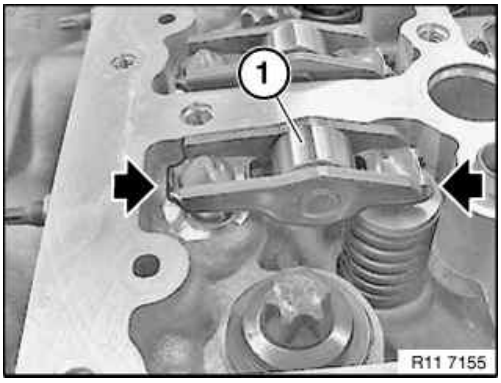
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

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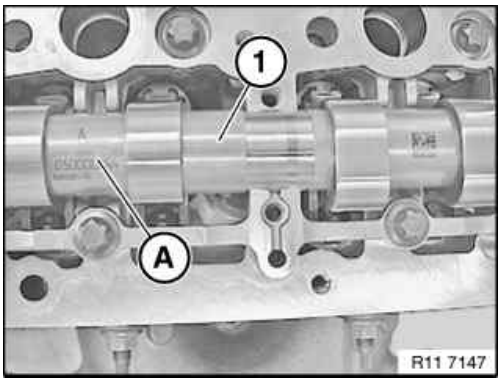
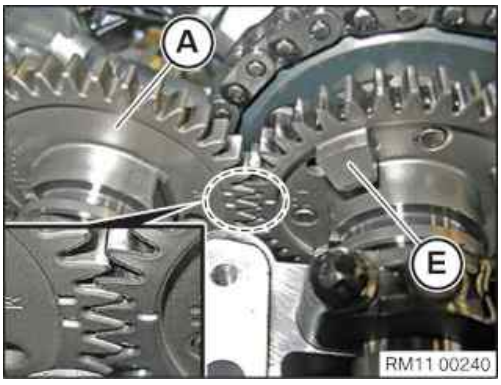
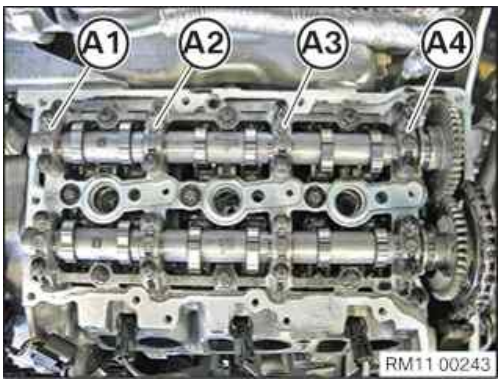


- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

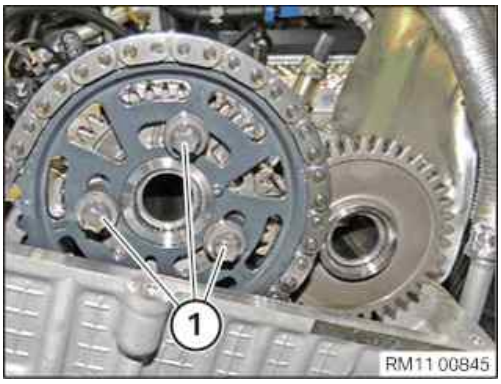
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

► **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

► **Install the timing chain guide rail**

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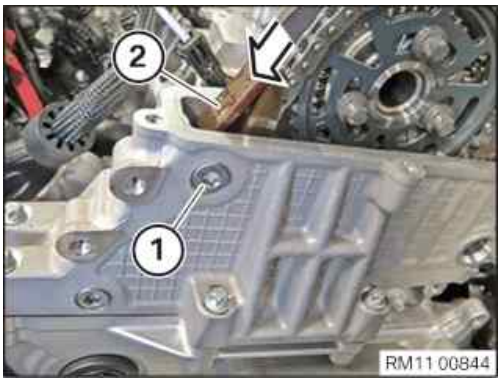


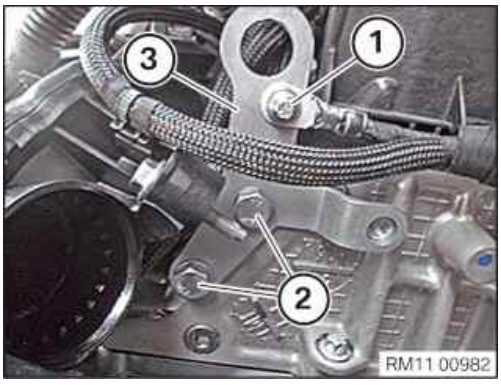
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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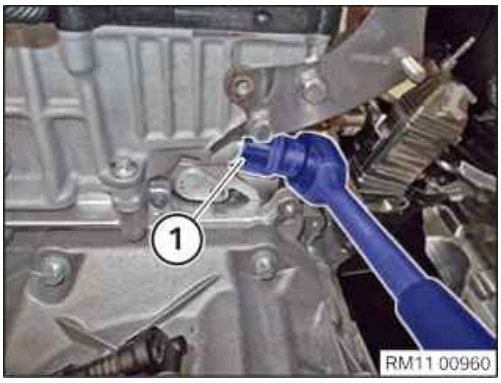
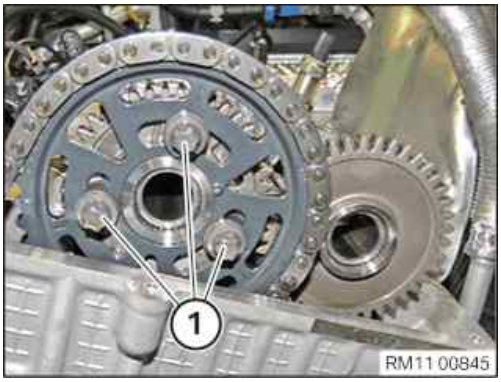


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

39 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

40 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

41 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

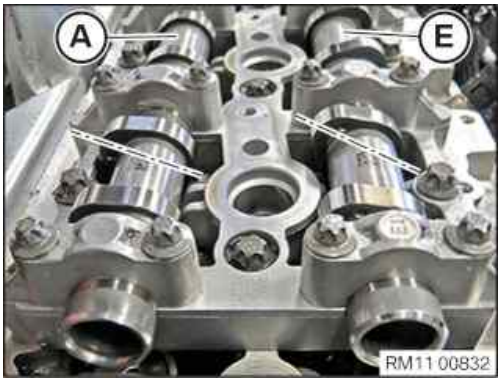
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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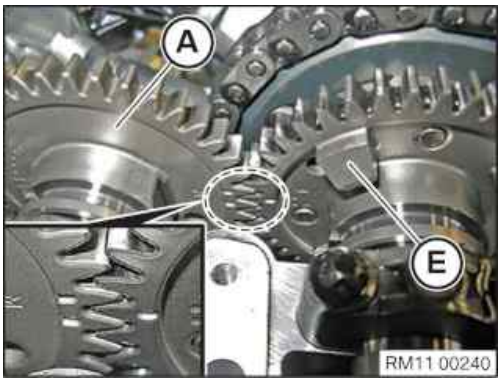


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

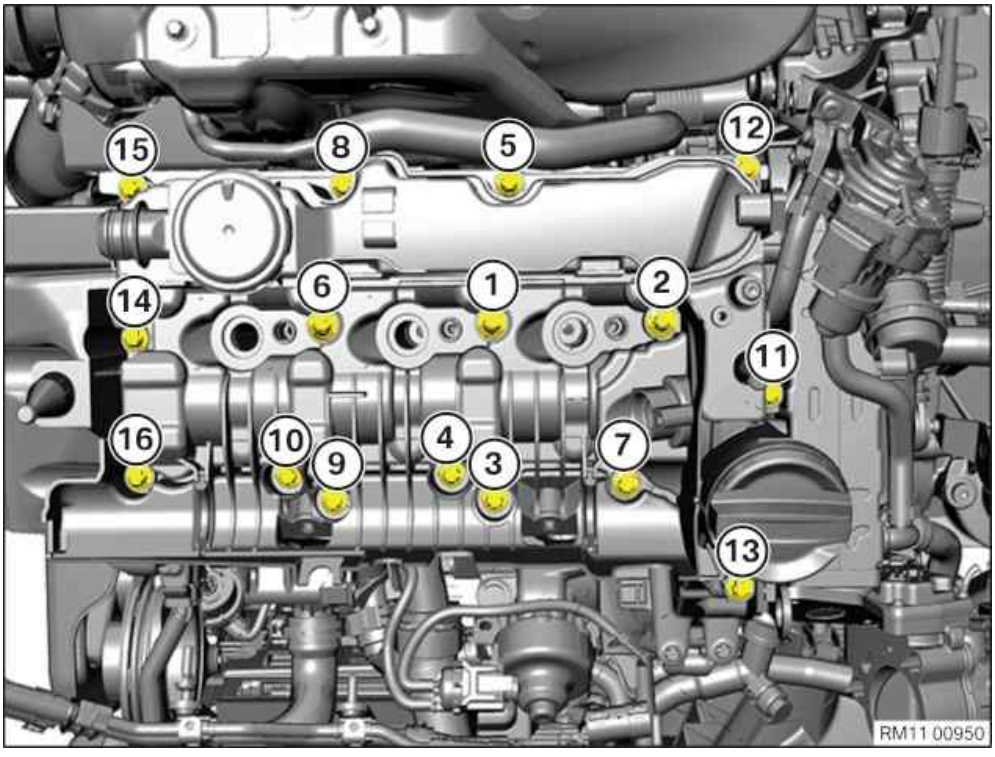
If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

42 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover

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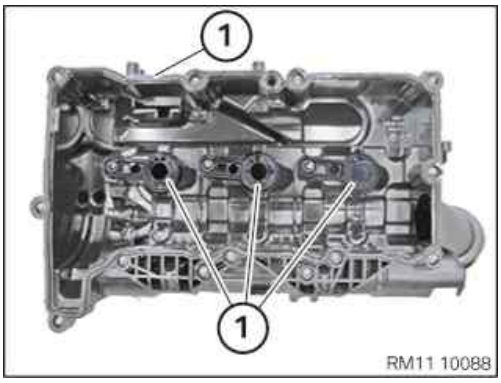
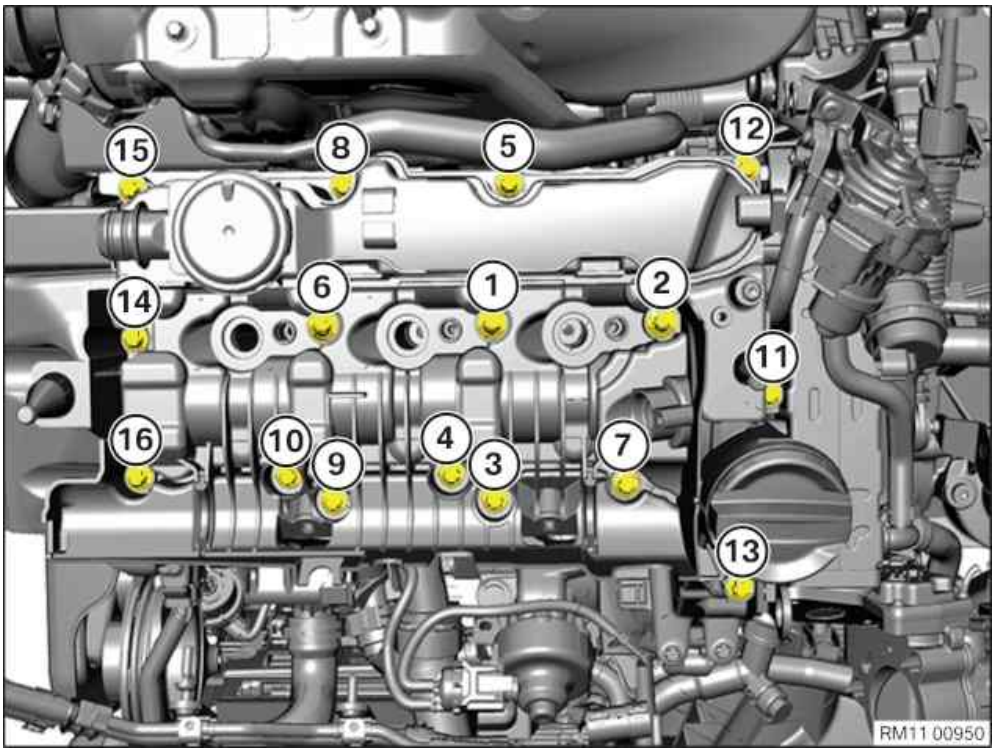


- Renew the gasket (1) of the cylinder head cover.

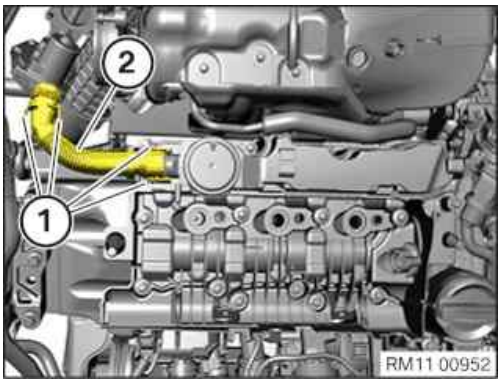
  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nn



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

43 – Installing injectors of injection system

▸ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

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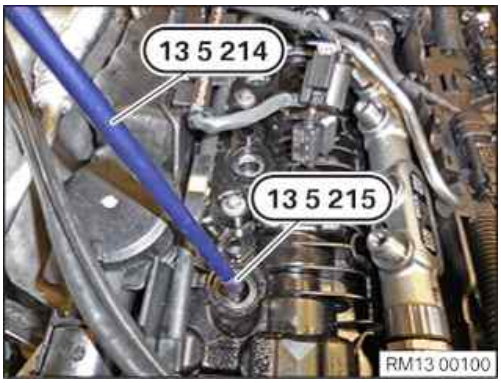
RISK OF DAMAGE

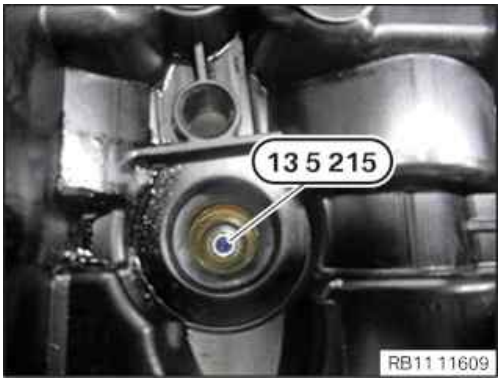
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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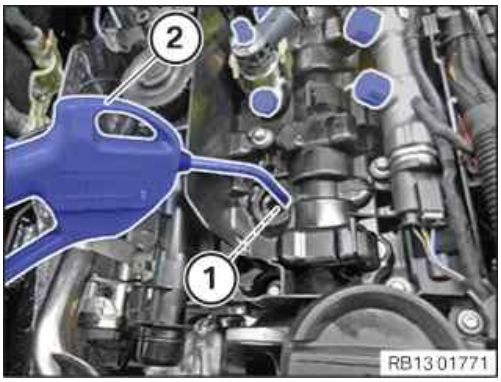
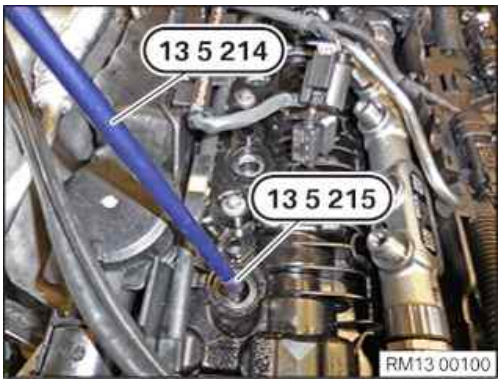


- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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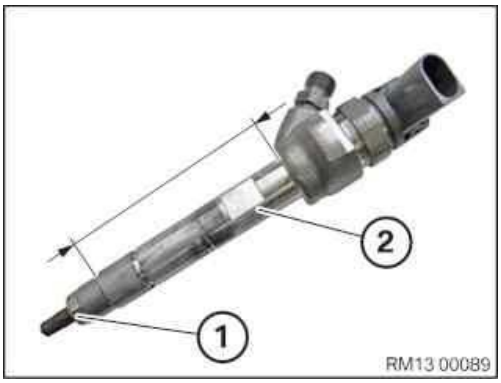
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

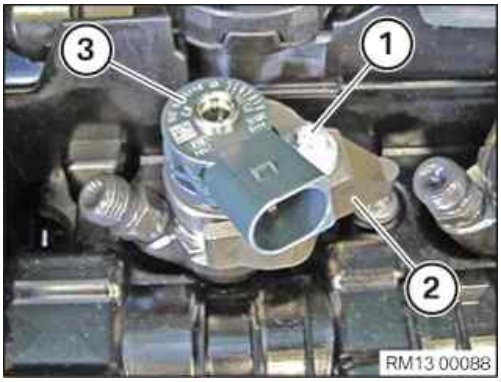


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

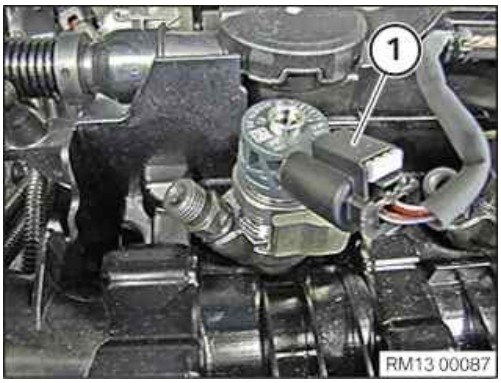
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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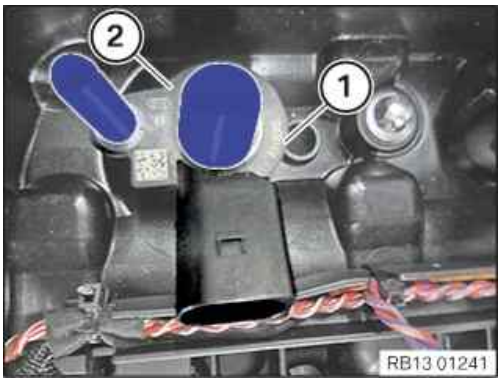
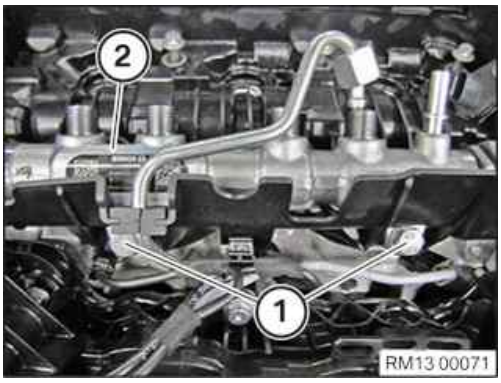


- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

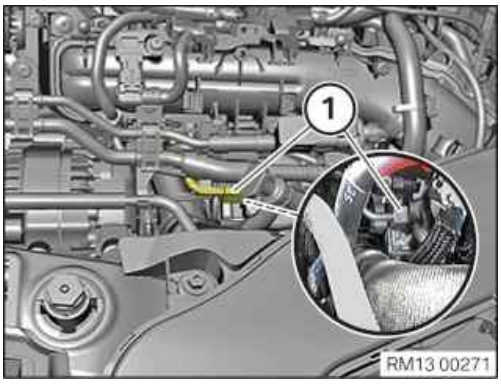
44 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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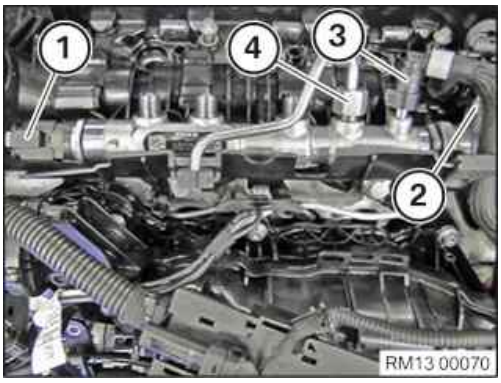

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

45 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

46 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

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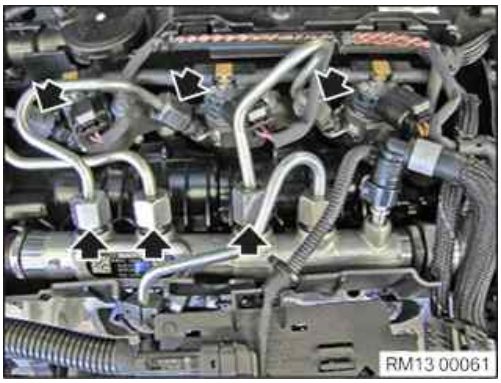
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

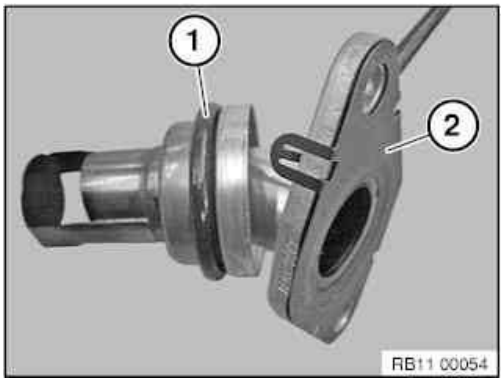
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

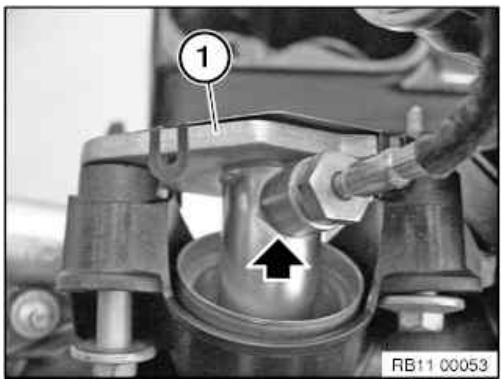
47 – Installing the intake plenum



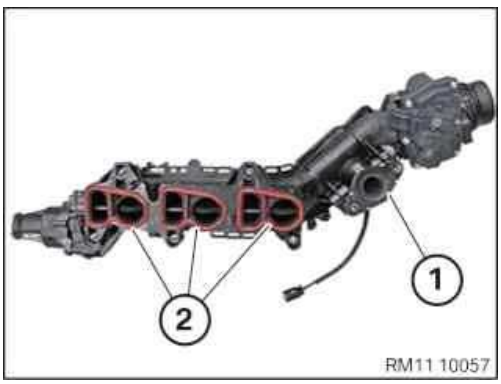
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

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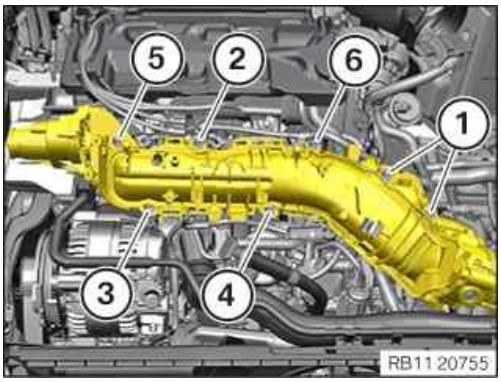
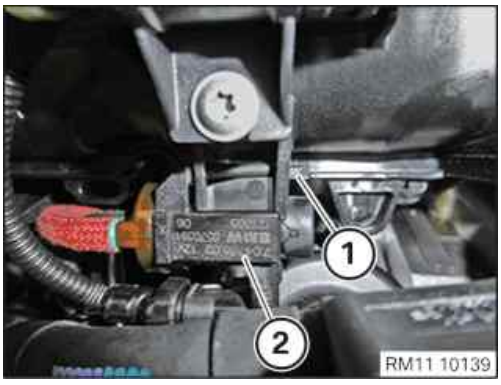


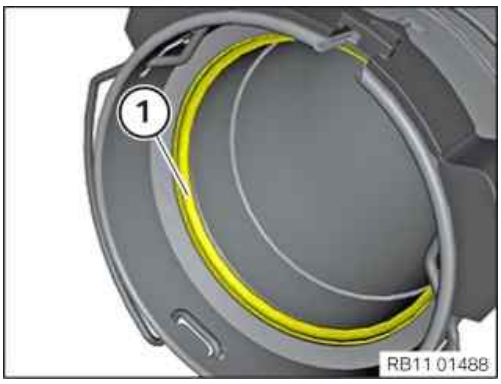
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

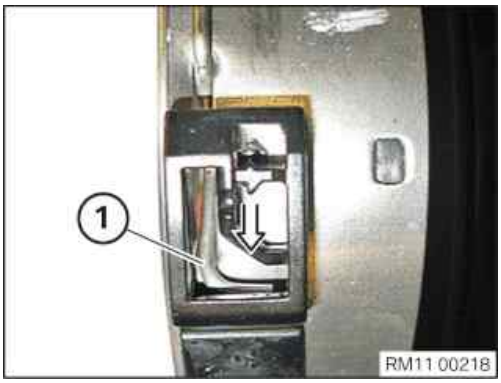


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.

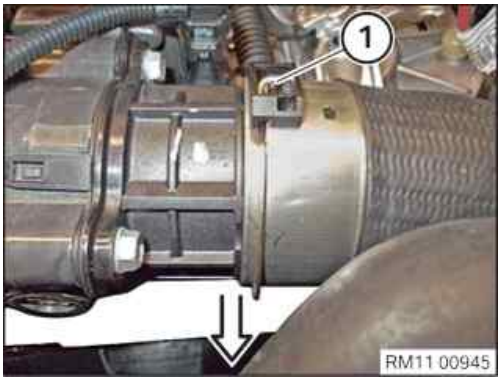


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

48 – Remove the engine from the assembly stand

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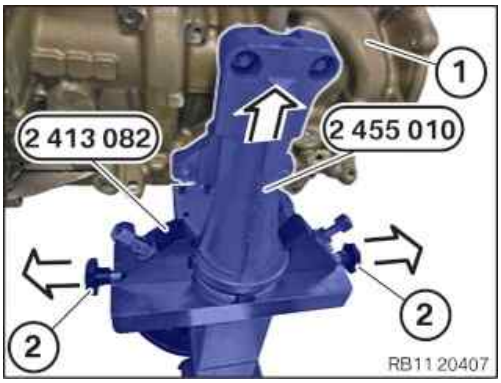
CAUTION

Heavy component.

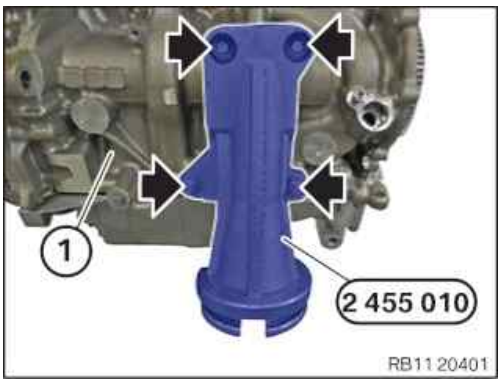
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

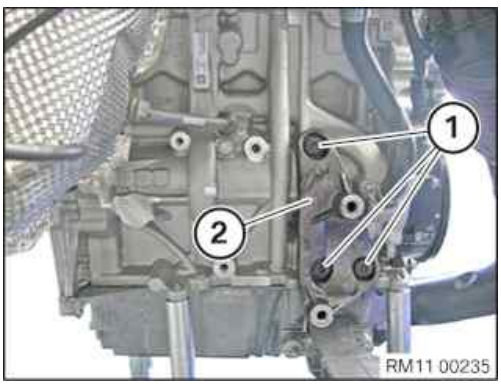
- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.



- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

M10		Tightening torque	38 Nm

49 – Install the engine on the double-clutch transmission (DKG)

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RISK OF DAMAGE

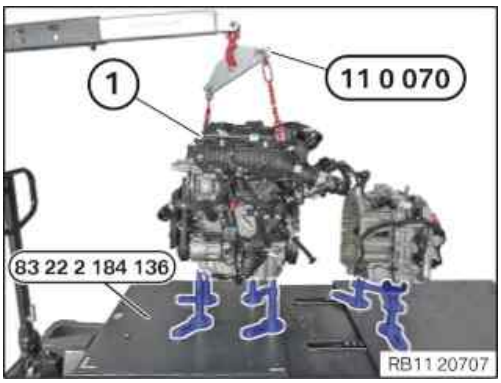
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.

TECHNICAL INFORMATION

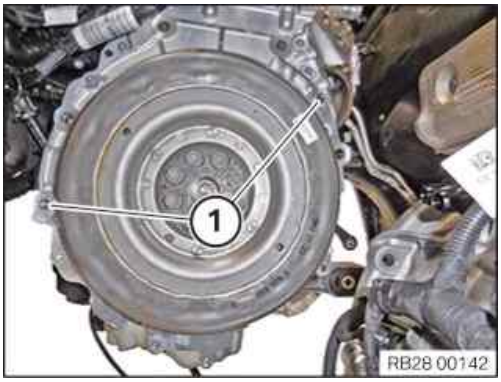
Transmission oil temperature 20 °C up to a maximum 40 °C!
Carry out the "Transmission oil adjustment" service function with the diagnosis system.
The double clutch also needs to be replaced if you exceed the oil change interval by more than 3000 km!
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox (DKG).



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Clean the gearing (1) of the drive shaft.
- Coat the gearing (1) with MI-Setral-43N grease (BMW part number 83 23 2 152 082).

  Tooth gaps must be filled with grease up to tooth height!

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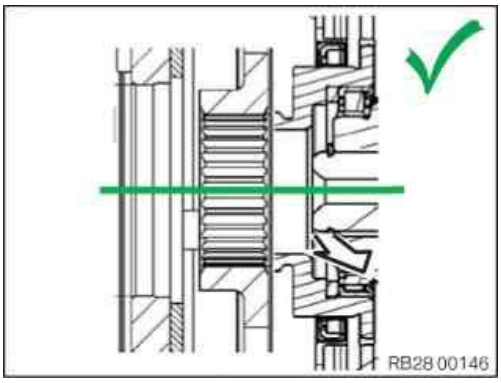
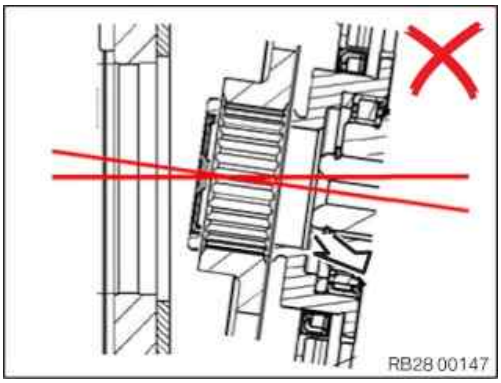
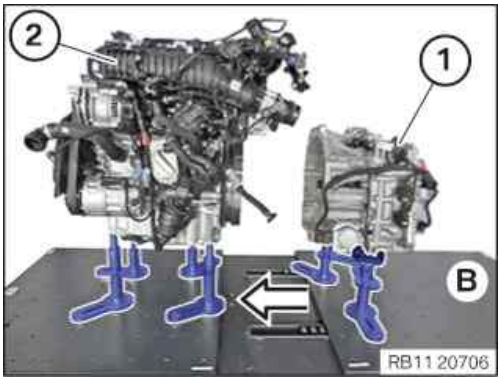


- **Correct:** Insert the double-clutch transmission (DKG) horizontally into the flywheel.



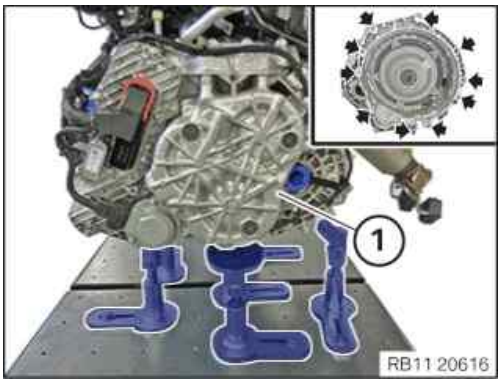
- **Wrong:** Do not tilt the double-clutch transmission (DKG) when inserting it into the flywheel.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table plate (B) in the direction of the arrow and position double-clutch transmission (DKG) (1) **carefully** on the engine (2).



- Flange-mount the double-clutch transmission (DKG) to the engine so that it is **absolutely** horizontal.
- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Connect and lock the coolant lines (1).
- Make sure that you can hear the coolant lines (1) engage.

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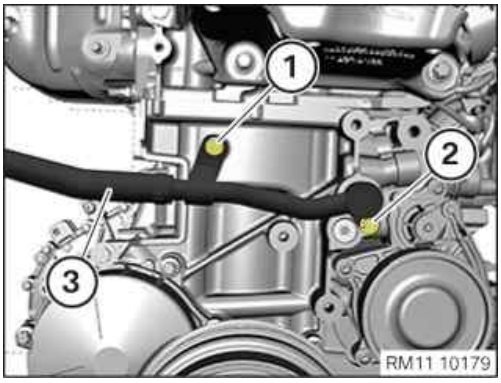
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

50 – Attaching assemblies (on lifting table)

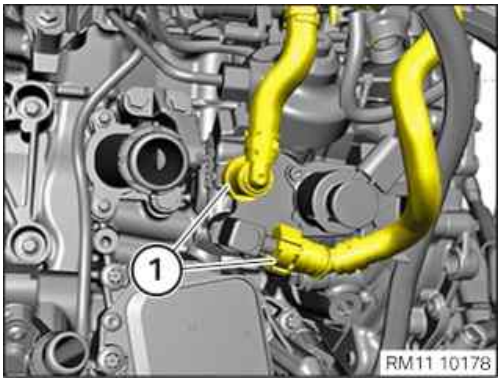


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The locks must engage audibly.

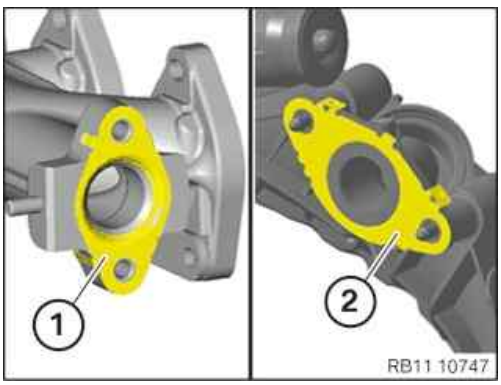
▸ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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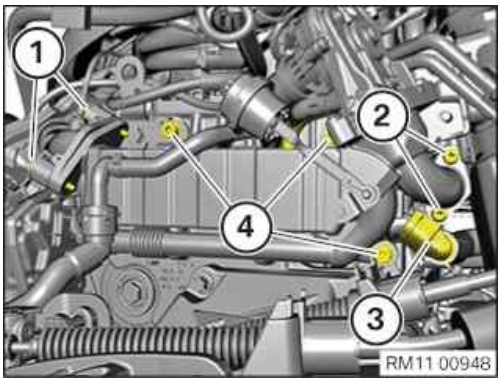


- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

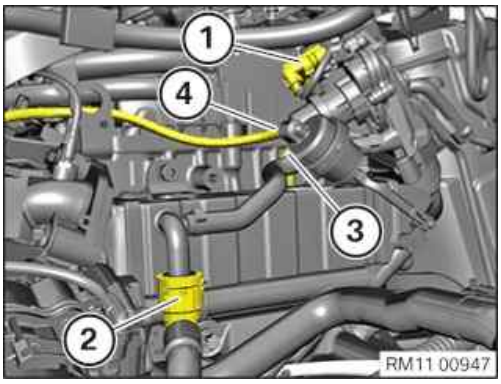
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

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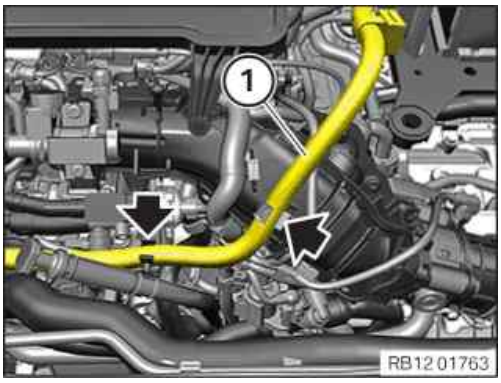


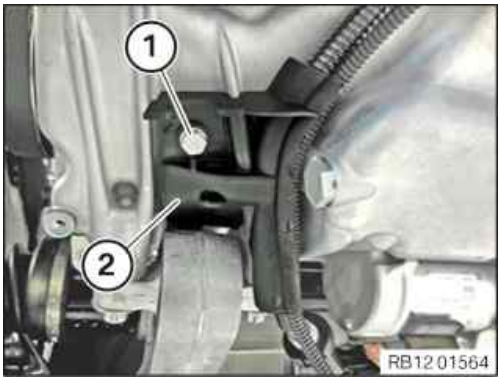
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

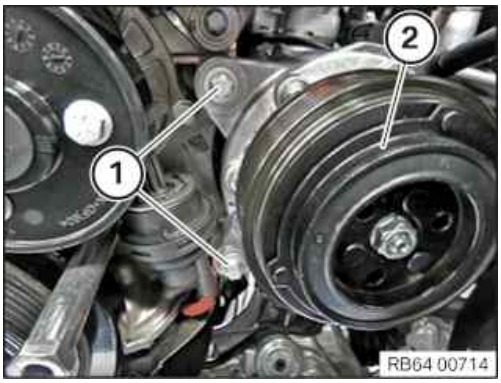
- Insert the positive battery cable (1) into the clamps (arrows).
- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

- Tighten the screws (1).

- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

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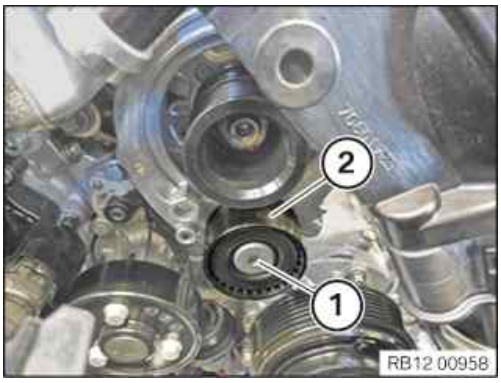
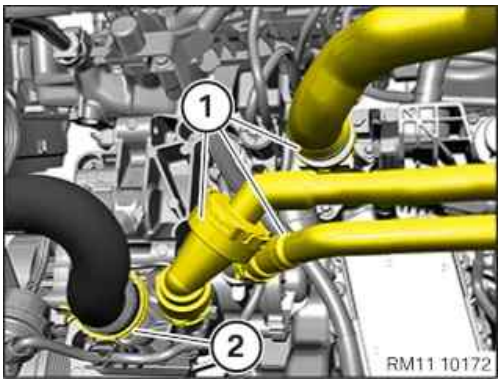


- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

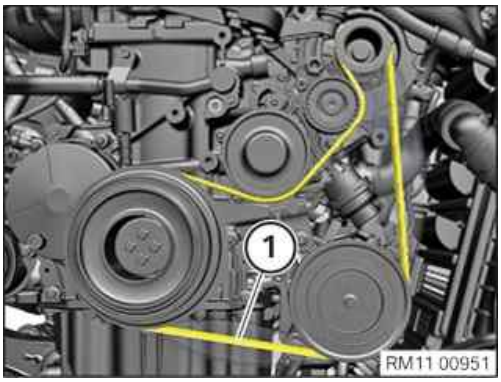
▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ Install the acoustic cover for the engine at the front

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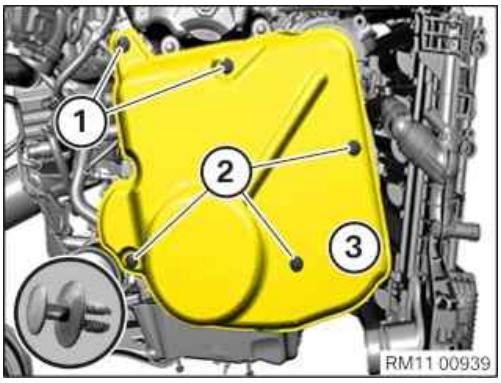
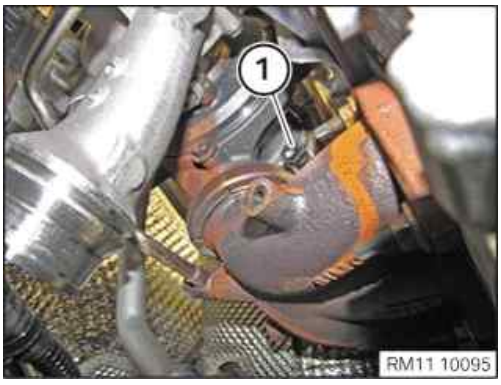


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

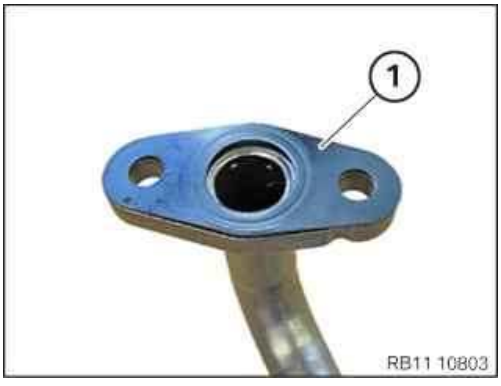
▸ **Installing the oil return line for the exhaust turbocharger**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

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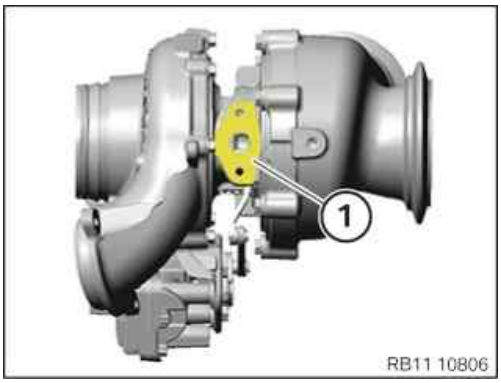
- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

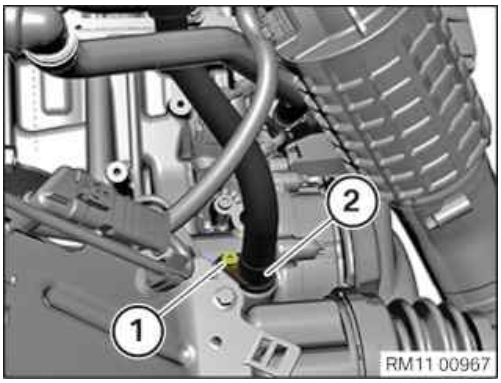
- Do not use any metal-cutting tools.

- Clean sealing surface.

- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm



- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

▸ **Install the oil feed line for the exhaust turbocharger**

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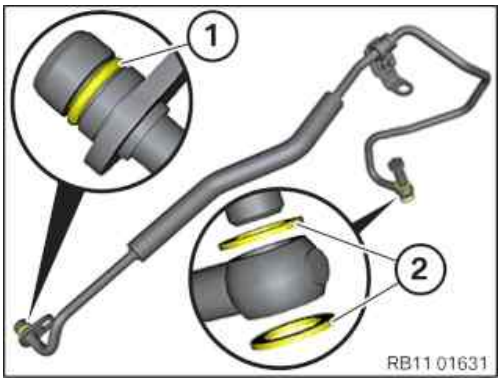
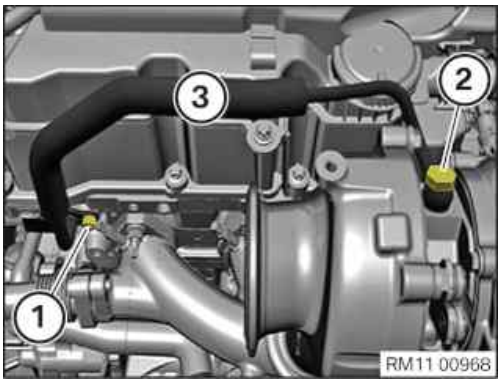


- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

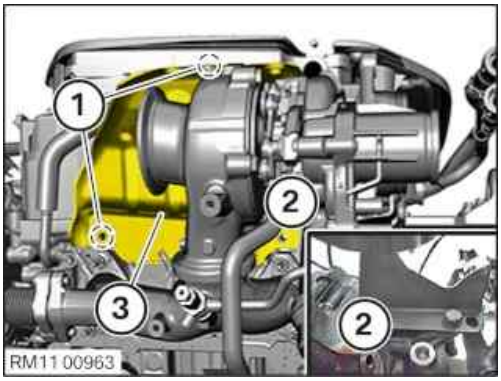
▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

▸ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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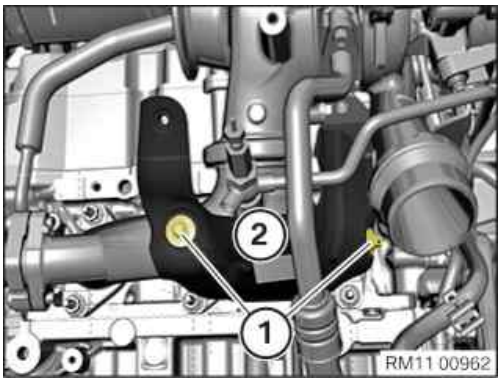


- Feed in and install the heat shield (2).
- Tighten the screws (1).

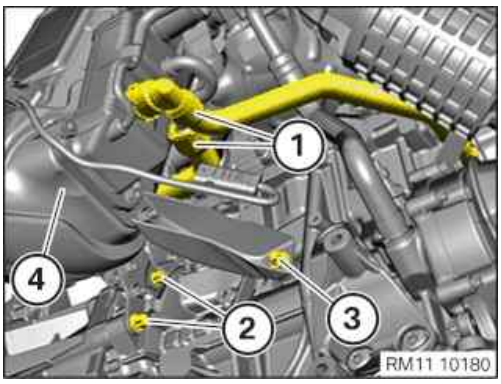
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

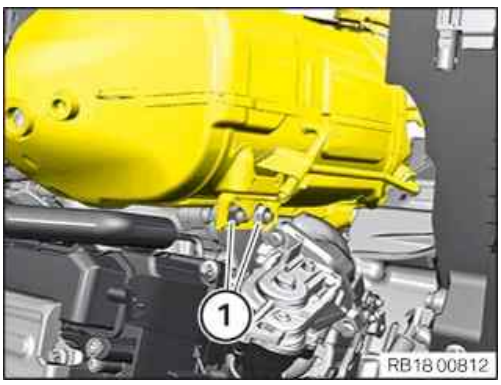
M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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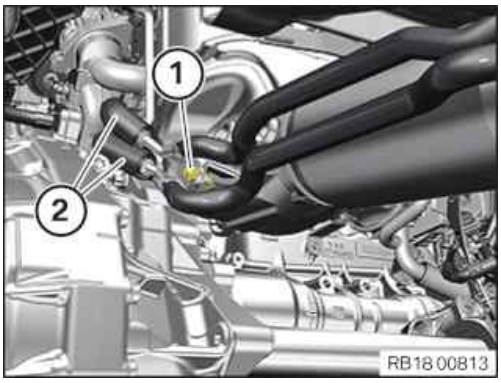


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

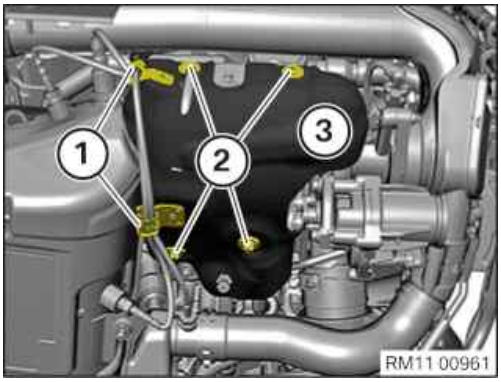
▶ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



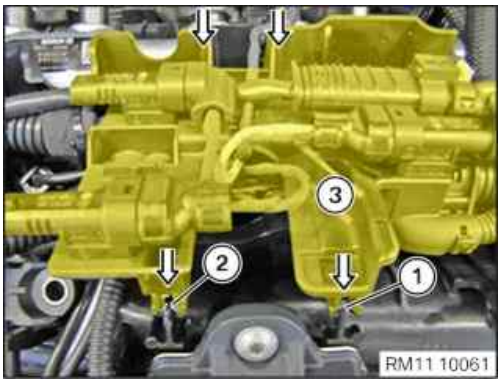
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

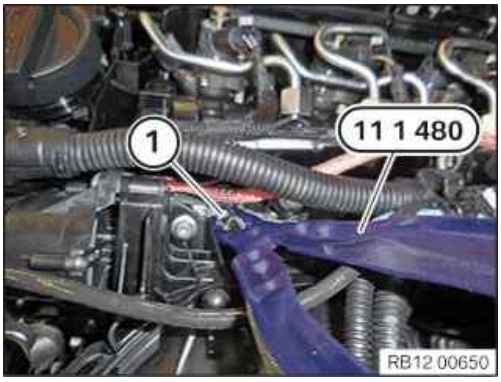
Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▶ **Installing the cable clip for the intake plenum**



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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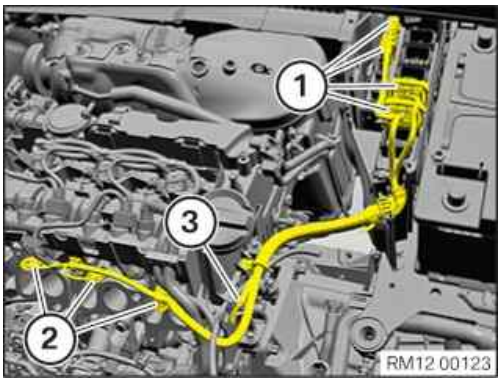
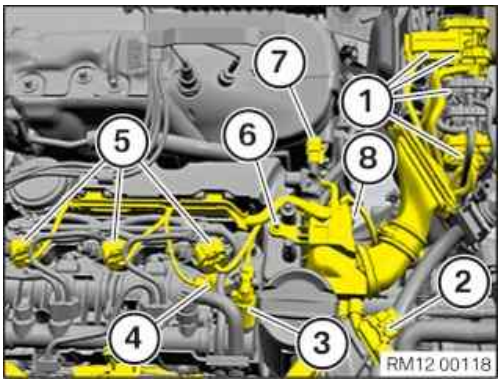


- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

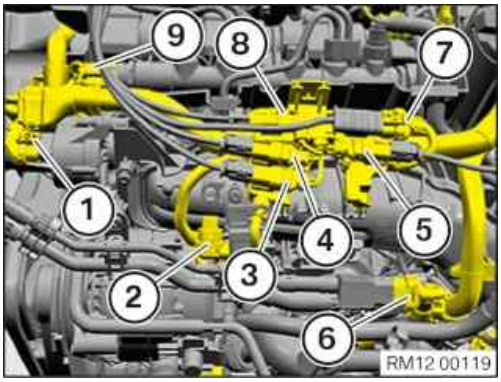


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

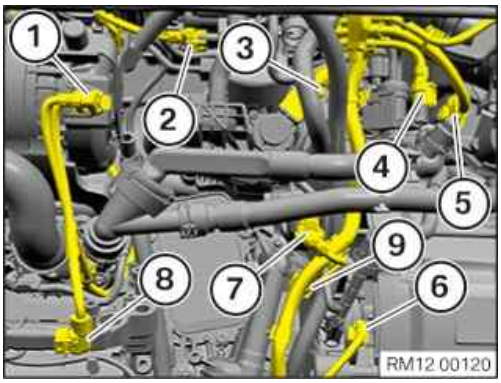
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.

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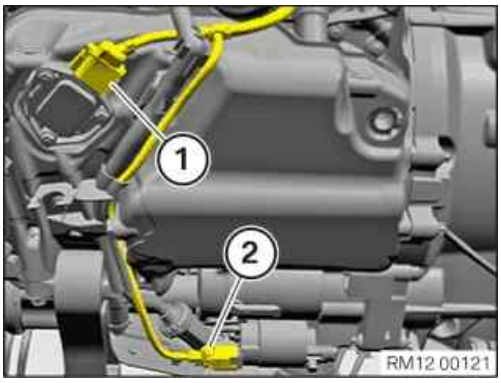
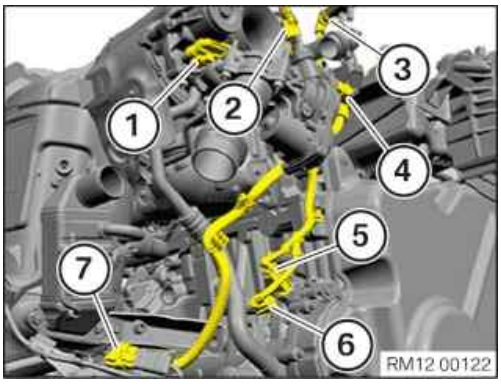
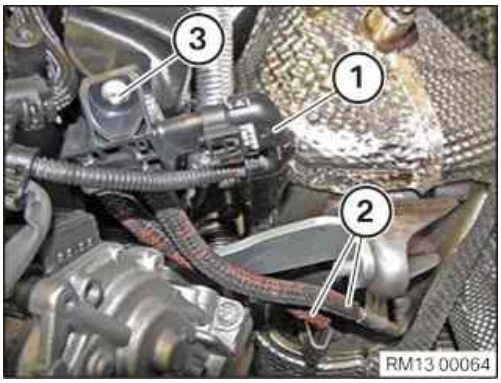


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

51 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

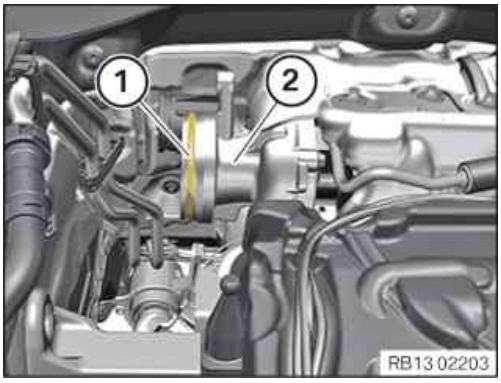
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

52 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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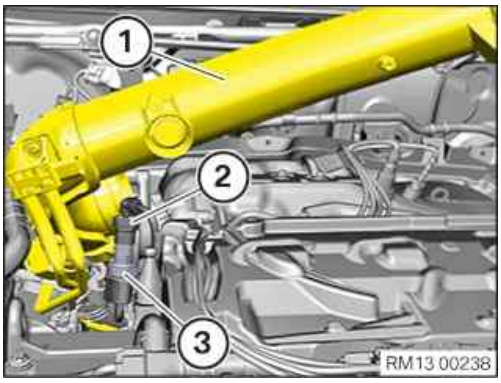


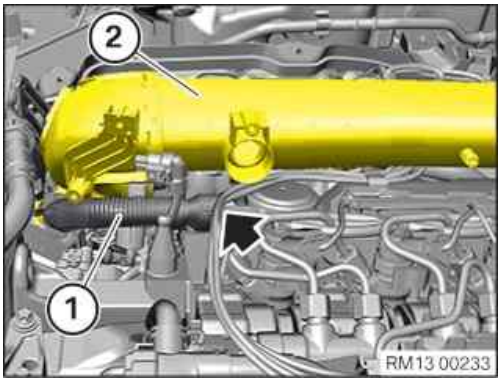
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

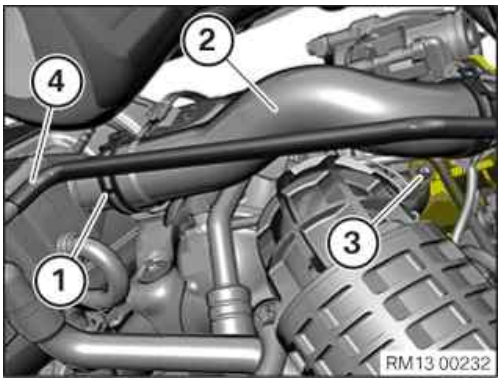
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

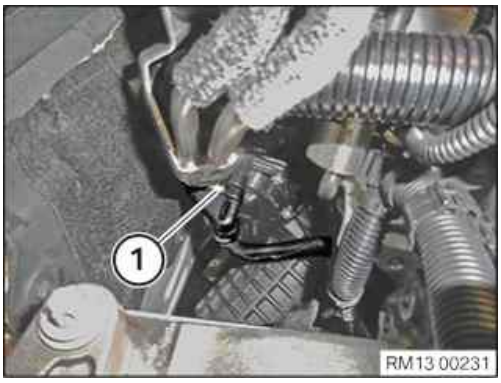
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.

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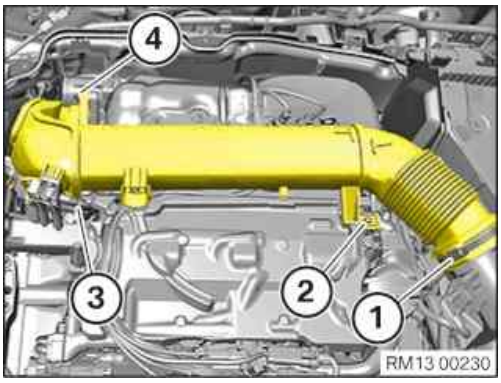


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

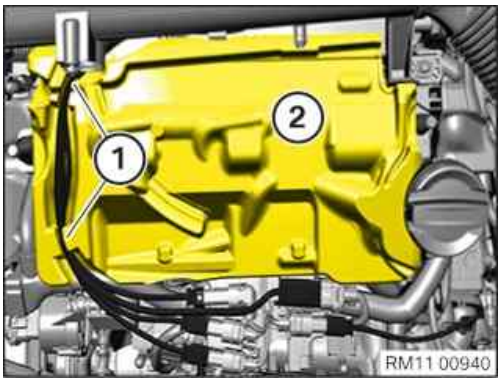
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

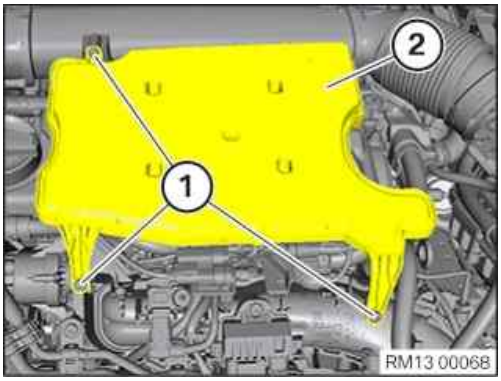
Clamp		Tightening torque	3 Nm

53 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

54 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

55 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

56 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 8

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 9

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320 — Used in step 9

M14x35		Tightening torque	160 Nm

Standard screw connection M6 — Used in step 28 29 38 50

M6			8 Nm

Gear to counterbalance shaft — Used in step 29

	Renew screw.	Tightening torque	20 Nm
		Angle of rotation	60 °

Rear timing case cover to crankcase — Used in step 30

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover — Used in step 30

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase — Used in step 30

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 30

M8x40		Tightening torque	19 Nm

Oil sump to crankcase — Used in step 30 32

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump — Used in step 30

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine — Used in step 30

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft — Used in step 31

M12x1.5	Renew screws.	Tightening torque	120 Nm

Timing case cover, front, to crankcase — Used in step 32

M6	*Observe tightening specification.*	Tightening torque	4 Nm
		Angle of rotation	60 °

Vibration damper with belt pulley to crankshaft — Used in step 33

M10x65	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	120 °

Transmission to oil sump — Used in step 33

M8			19 Nm

Glow elements to cylinder head — Used in step 36

Glow element		Tightening torque	13 Nm

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Camshaft carrier to cylinder head

Used in step 37

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 38

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 38

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 38

M8		Tightening torque	19 Nm

Chain tensioner piston to cylinder head

Used in step 38

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 38

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 42

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 43

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 43

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 44

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 44

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 46

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 47

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 48 50

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 49 50

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 50

M8x20		Tightening torque	5 Nm
		Release angle	90 °

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Intake plenum to exhaust-gas recirculation cooler

Used in step 50

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 50

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 50

M8x20		Tightening torque	19 Nm

Bracket to oil sump

Used in step 50

M6		Tightening torque	8 Nm

Air conditioning compressor in component carrier

Used in step 50

M10		Tightening torque	38 Nm

Alternator to component carrier

Used in step 50

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner

Used in step 50

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold

Used in step 50

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase

Used in step 50

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger

Used in step 50

M6x12		Tightening torque	8 Nm

Oil return line to crankcase

Used in step 50

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head

Used in step 50

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger

Used in step 50

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger

Used in step 50

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head

Used in step 50

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder

Used in step 50

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 50

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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Holder for coolant lines to diesel particulate filter — Used in step 50

Torx bolt BM6x16		Tightening torque	8 Nm

Ground cable to cylinder head — Used in step 50

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 50

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 51

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 51 52

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor — Used in step 52

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 52

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 52

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 52

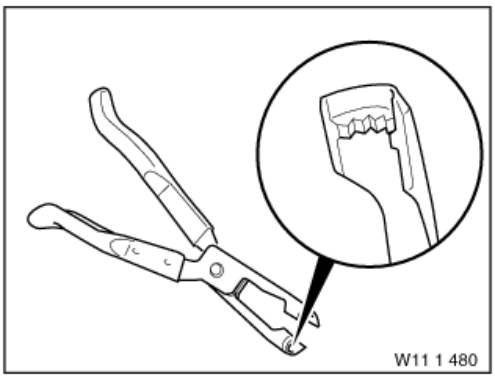
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 54

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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2 459 012 Holder

Common

Used in step 8 49

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 490 579 (11 0 070) Lifting gear

Used in step 8 9 48 49

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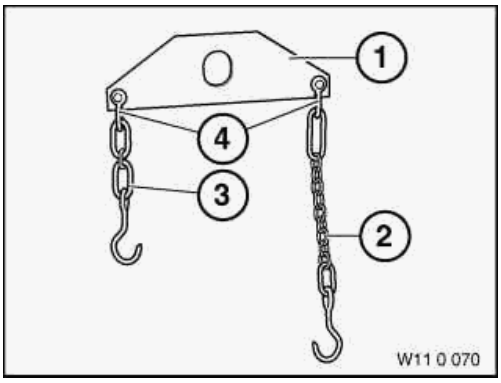


Common

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

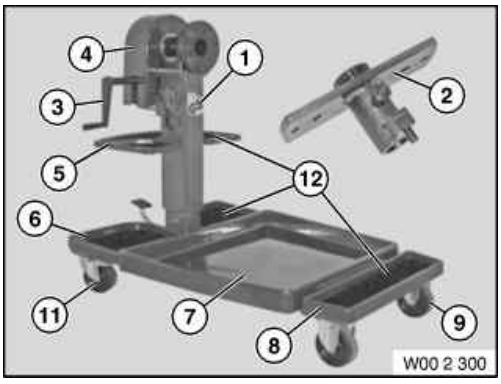
Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

2 455 010 Engine support

Common Used in step 9 48

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand



Common Used in step 9

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

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Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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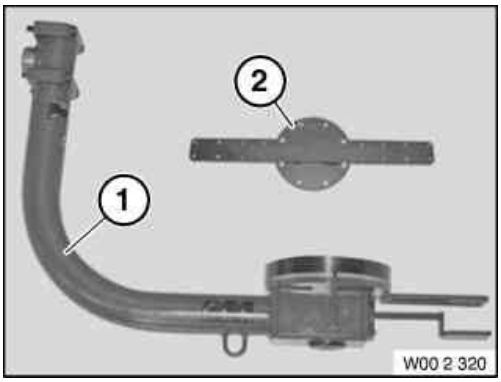
0 495 196 (00 2 320) Support arm



Common

Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common

Used in step 11 14 44 46

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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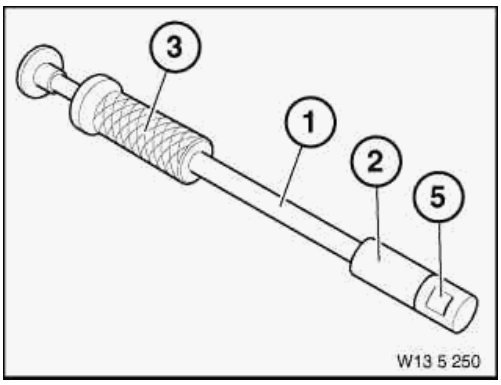
2 413 106 Fastener

Common Used in step 11 46

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush

Common Used in step 13

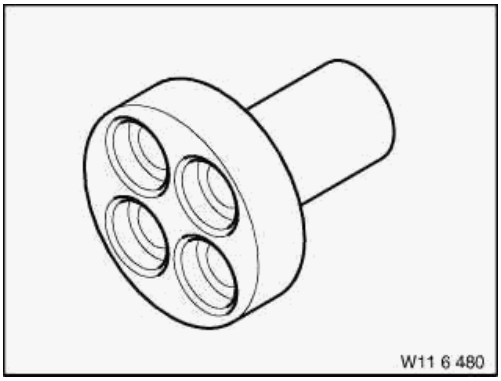
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 13

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 16 38 41

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common Used in step 16 38 39 41

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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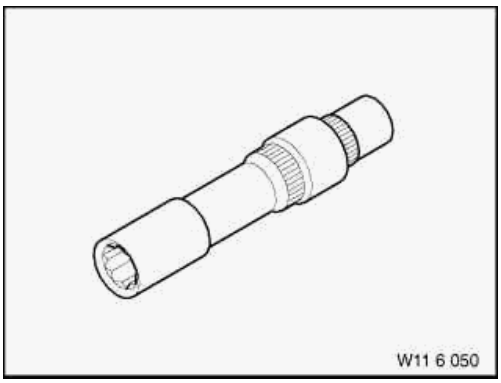
0 496 112 (11 8 760) Gauge

Common	Used in step 16 38 40 41
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common	Used in step 21 36
Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 22 23 38

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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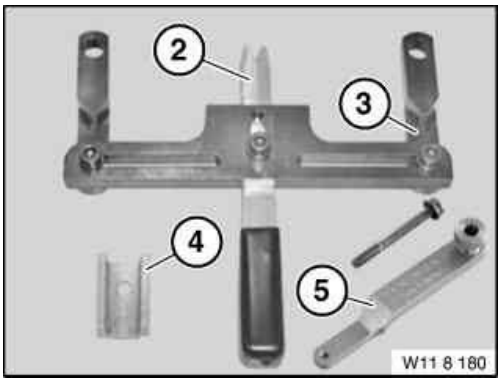
0 493 587 (11 8 180) Holder



Common

Used in step 24 33

Usage	(Counter support) Blocking flywheel when releasing and tightening down central bolts on vibration absorber
Included in the tool or work	
Storage location	B45
Replaced by	
In connection with	
SI-Number	01 12 99 (452)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
2	0 494 433 (11 8 182)		**Shaped part** (shaped part)	
5	0 494 716 (11 8 185)		**Adapter** (Adapter with adjusting sleeve) E46 M47TU	
1	0 494 432 (11 8 181)	**0 494 434**	**Basic body** (Basic body) E65/M67, E38/M67 Discontinuation Replaced by 11 8 183 (0 494 434)	
3	0 494 434 (11 8 183)		**Basic body**	
4	0 494 435 (11 8 184)		**Adapter** E65 / M67	

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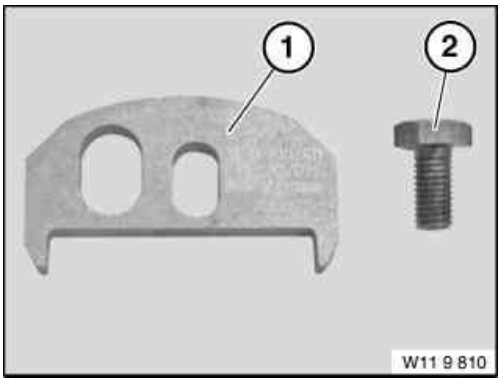
0 496 171 (11 9 811) Holder

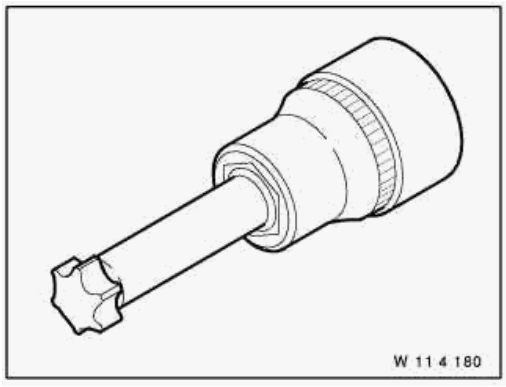


Common	Used in step 26 31
Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush

Common	Used in step 26 31
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 26 31
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

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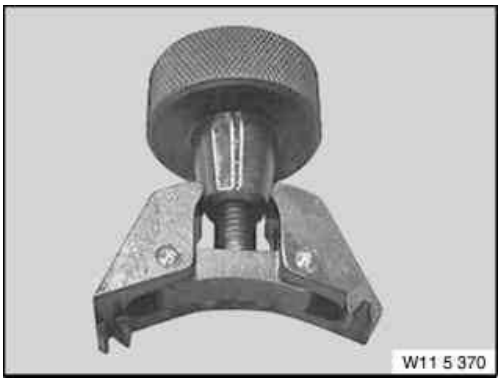
0 495 131 (11 5 370) Tool

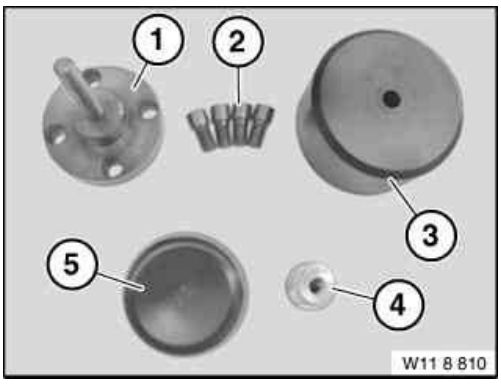


Common	Used in step 28 29
Usage	(Locating tool) For VANOS exhaust camshaft gear setting.
Included in the tool or work	
Storage location	A71
Replaced by	
In connection with	
SI-Number	01 02 05 (173)

2 288 943 Striking tool

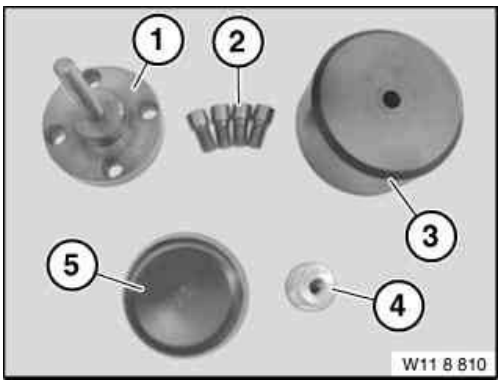
Common	Used in step 28
Usage	For dismantling the ring gear of the counterbalance shaft.. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 137 (11 8 815) Holding sleeve



Common	Used in step 30
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body



Common	Used in step 30
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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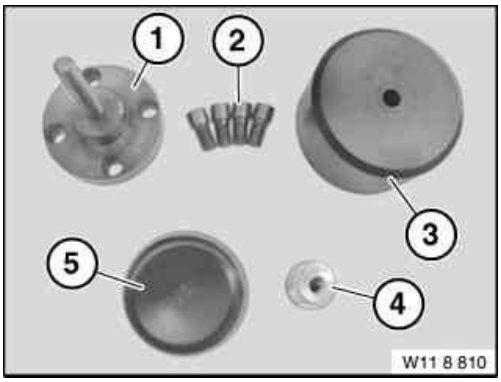
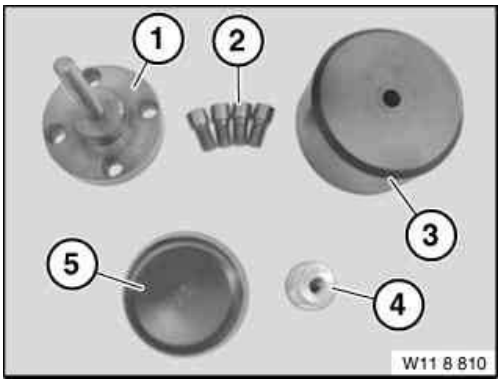
0 496 134 (11 8 812) Screw



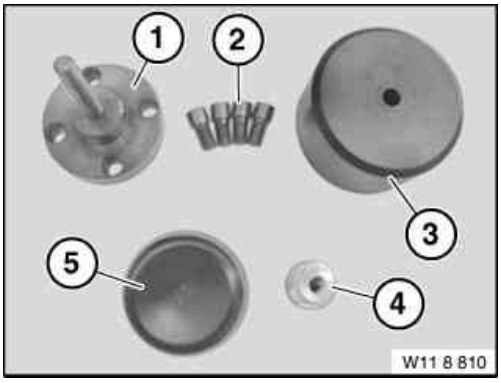
Common	Used in step 30
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve



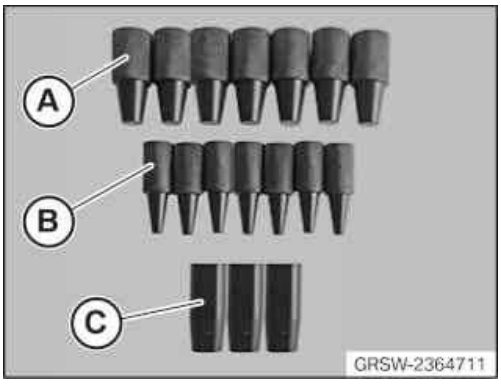
Common	Used in step 30
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut



Common	Used in step 30
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common	Used in step 30
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

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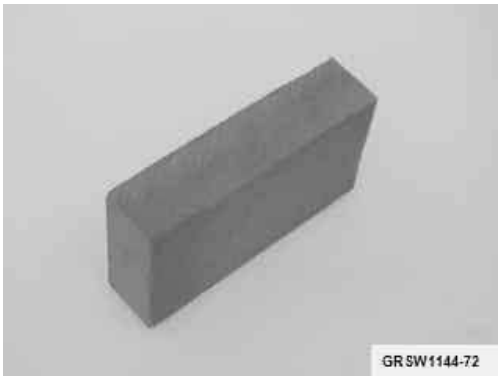
0 495 103 (11 4 471) Scraper

Common	Used in step 30
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 30
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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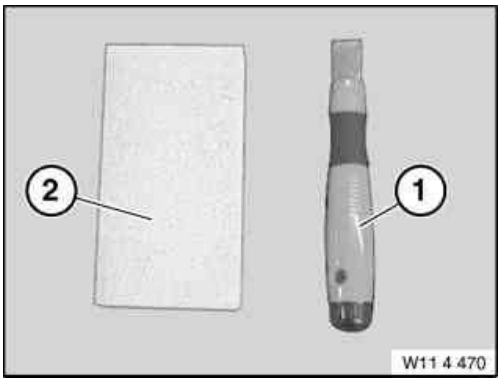
0 495 102 (11 4 470) Tool



Common

Used in step 30

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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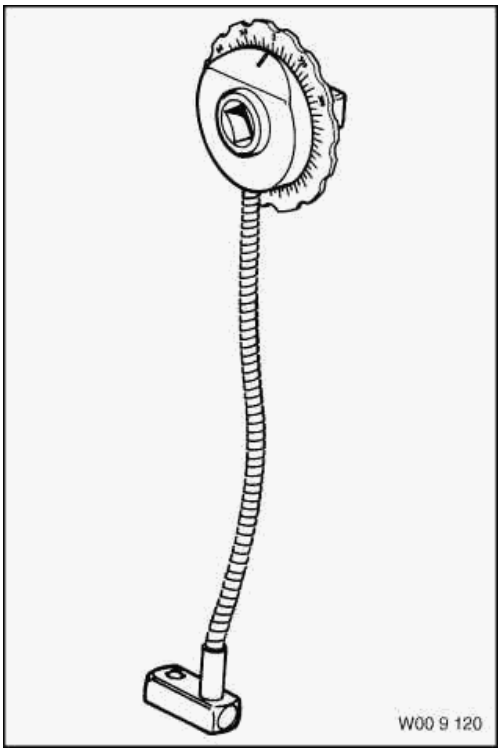
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 30

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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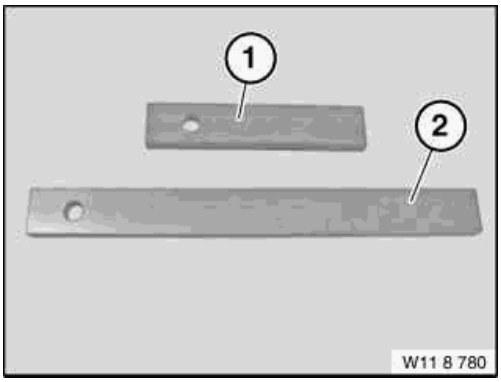
0 496 120 (11 8 780) Plate



Common

Used in step 30

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

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2 285 058 Tool set

Common	Used in step 31
Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

2 357 900 Fitting aid

Common	Used in step 32
Usage	For installation of the front radial shaft seal incl. lid.
Included in the tool or work	
Storage location	C56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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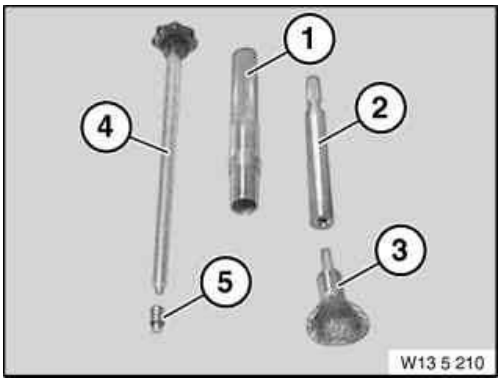
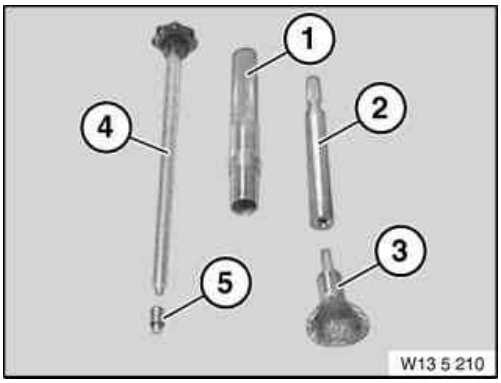
0 493 763 (13 5 215) Plug



Common Used in step 43

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common Used in step 43

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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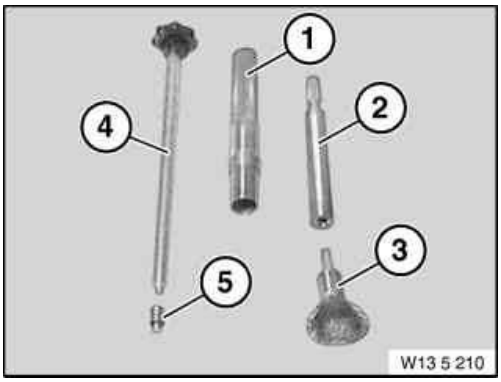
0 493 758 (13 5 210) Tool



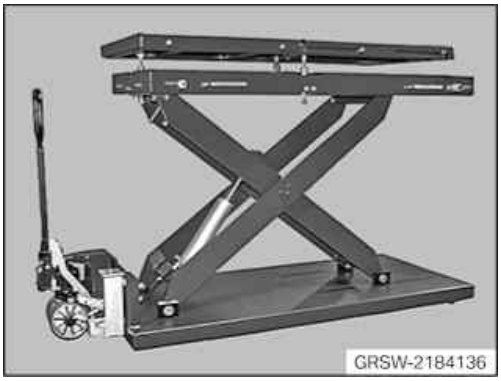
Common Used in step 43

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 49

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

Replacement tools:

2 299 563 Adapter

Common Used in step 9

Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

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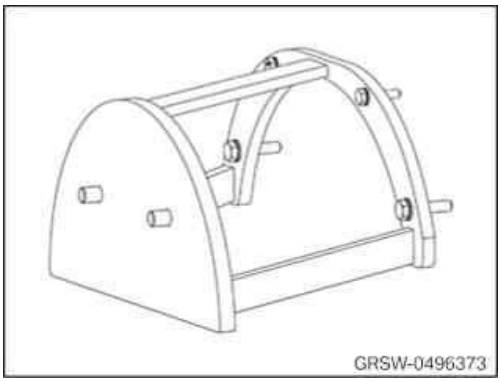
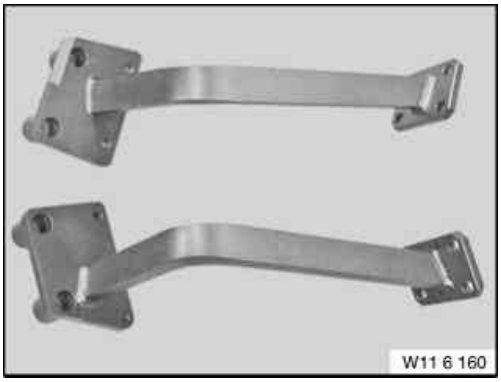
0 496 373 (11 5 420) Plate



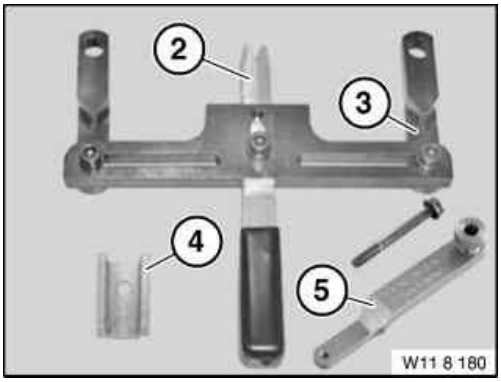
Common	Used in step 9
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 9
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

0 494 434 (11 8 183) Basic body



Common	Used in step 24 33
Usage	
Included in the tool or work	0 493 587
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Screw-in depth of thread cutter	Used in step 31
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 50
EGR controller	7 50

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	30 32

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Repair instructions	Used in step
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
31 10 001 Completely removing and installing front axle with engine and transmission	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
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11 00 050 Removing and installing engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Removing and installing the engine (manual gearbox)	1 56
11 00 050 Remove and install engine (Automatic)	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
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11 00 050 Removing and installing engine	1 56

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11 00 050 Removing and installing engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine \PREMIUM	1 56
11 00 050 Removing and installing/replacing engine (N63)	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Removing and installing engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine (Automatic)	1 56
11 00 050 Remove and install engine (Automatic)	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine (Automatic)	1 56
11 00 050 Remove and install engine (Automatic)	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Remove and install engine	1 56
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 56
11 00 050 Remove and install engine	1 56
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21 30
61 35 ... Notes on ESD protection (Electro Static Discharge)	30

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	38
Exhaust-gas recirculation cooler seal on exhaust manifold	50
Exhaust-gas recirculation cooler seal on intake plenum	50

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11 14 200 Detaching and attaching/replacing timing case cover on front at bottom (B37C)

Special tools required:

- 11 4 471
- 11 4 472
- 2 469 803
- 2 357 900

Caution!

When removing the timing case cover, renewing the timing case cover is **essential**.

Reuse of the timing case cover is **not** permitted.

Caution!

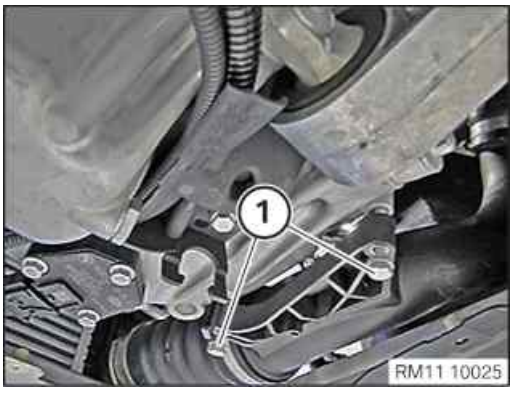
Engines with surface sealant:

Application time of sealing compound maximum 12 min.

Necessary preliminary work:

- Remove underbody protection
- Remove vibration damper.
- Remove belt tensioner for alternator.

Removal:



Loosen screws (1).

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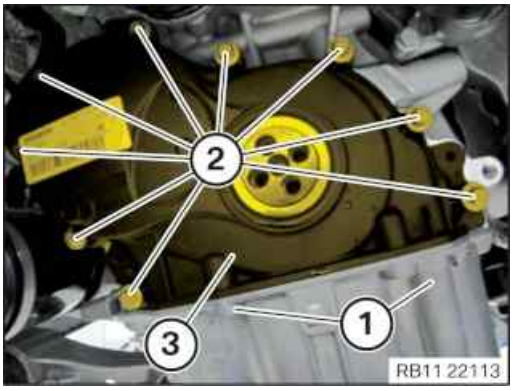


Release screws (1).

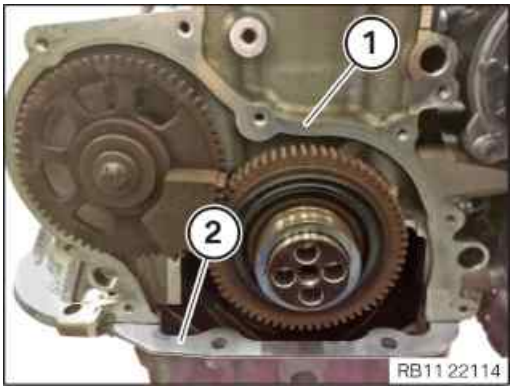
Unfasten screws (2).

Remove gear case cover (3).

Preparation for installation:

Renew timing case cover (1) **without fail**.

Parts: Gear case cover



Caution!

Do not use any metal-cutting tools (e.g. abrasive cloth) for cleaning the sealing surfaces.

Clean sealing surfaces (1) and (2) with special tool 11 4 471 and 11 4 472 of sealing residue.*Installation note:*
Clean sealing surfaces (1) and (2) with brake cleaner 3.3.

Sealing surfaces (1) and (2) **must be free** of oil, grease and cleaning agents.

Keep special tool 2 469 803 ready.

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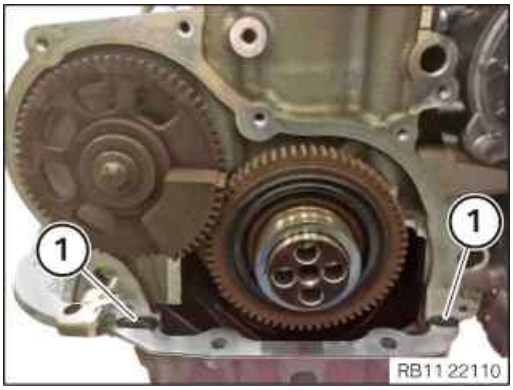
Position sealing compound (1) on special tool 2 469 803 as shown.

Parts: Sealing compound 2.2

Installation:



Caution!

Application time of sealing compound **maximum** 12 min.

Sealing compound height approximately 2 - 2.5 mm.

Apply sealing bead (1) approx. 5 mm as shown.

Assemble special tool 2 357 900 as shown.

Caution!

Do not use engine oil or lubricant.

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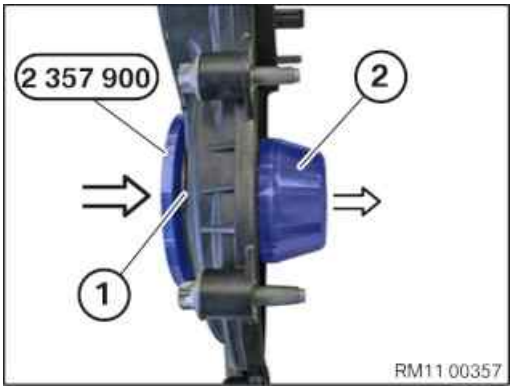
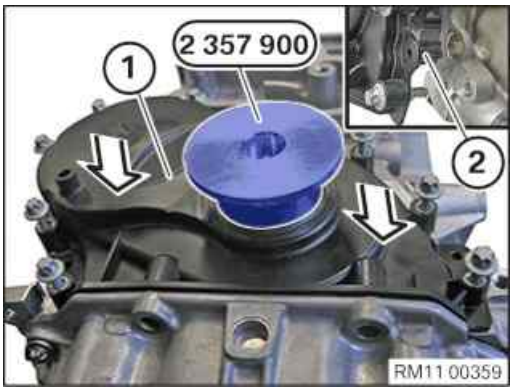


Caution!
Special tool must be resting on timing case cover (1).

Carefully push special tool 2 357 900 through sealing ring into timing case cover and abut.

Remove fitting aid (2).

Fit special tool 2 357 900 with timing case cover (1) on crankshaft hub (2).



Note:
Pay attention to both guide pins (2).

Mount timing case cover (1) on crankcase in direction of arrow.

Abut screws.

Note:
Dust lip (1) must be facing outwards.

Remove special tool 2 357 900 .

Check installation position of dust lip (1).

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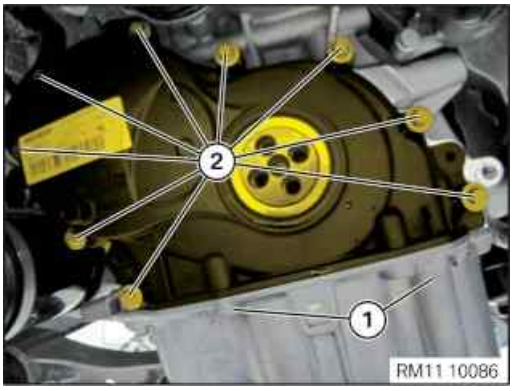
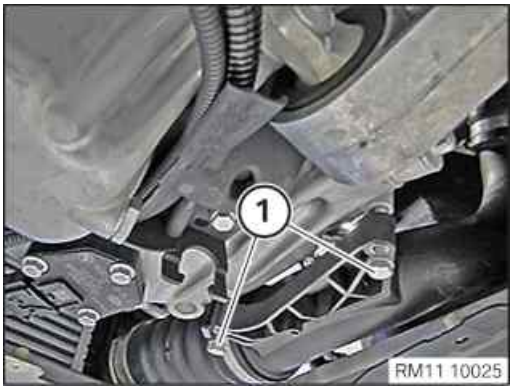


Abut screws (2) crosswise.
Abut screws (1).
Tighten the screws (2) crosswise.
Tightening torque 11 14 3AZ.
Tighten screws (1).
Tightening torque: 11 13 2AZ.



Tighten down screws (1).
Tightening torque: 11 00 2AZ.

Required follow-up work:

- Install belt tensioner for alternator.
- Install vibration damper.
- Install underbody protection.

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11 28 010 Removing and installing/replacing alternator drive belt (B37C)

Caution!

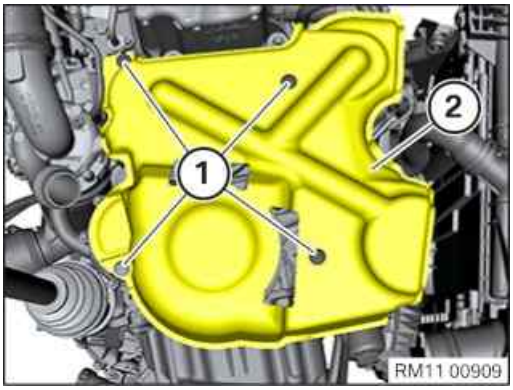
Check drive belt for coolant and oil residues, replace if necessary.

Note:
If the drive belt is to be reused, the direction of rotation must be marked.

Necessary preliminary work:

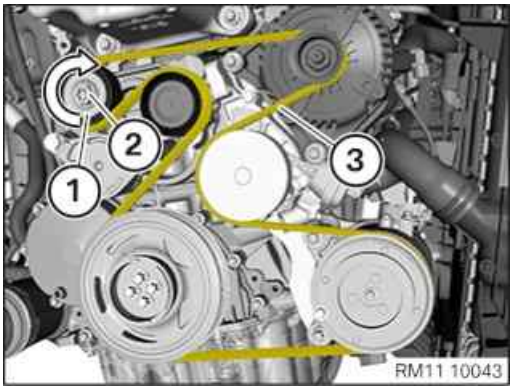
- Remove right charge-air duct
- Remove clean air pipe

Removal:



Release expanding rivet (1).

Remove acoustic cover (2) towards bottom.



Safety information:

- Danger of injury when tensioning or releasing the drive belt.

Turn belt tensioner (1) in direction of arrow at bolt (2) with a suitable tool and hold in position.

Remove drive belt (3).

Slowly relieve tension on belt tensioner.

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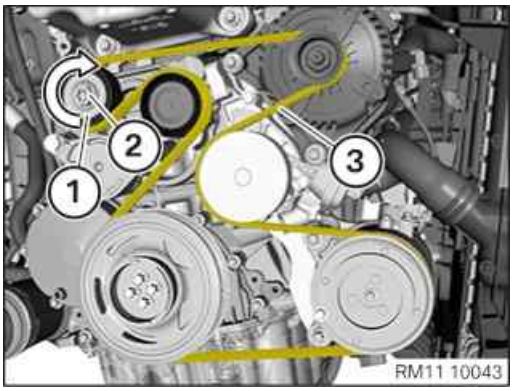
Installation:



Safety information:

- Danger of injury when tensioning or releasing the drive belt.

Note:
Observe direction of rotation of drive belt.

Turn belt tensioner (1) in direction of arrow at bolt (2) with a suitable tool and hold in position.

Position drive belt (3).

Slowly relieve tension on belt tensioner.

Required follow-up work:

- Install acoustic cover, front.

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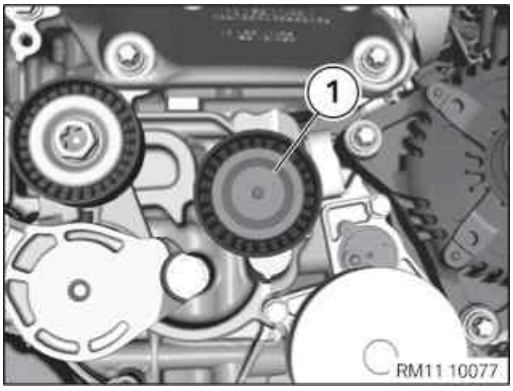
11 28 626 Removing and installing/replacing deflecting element for drive belt (B37C)

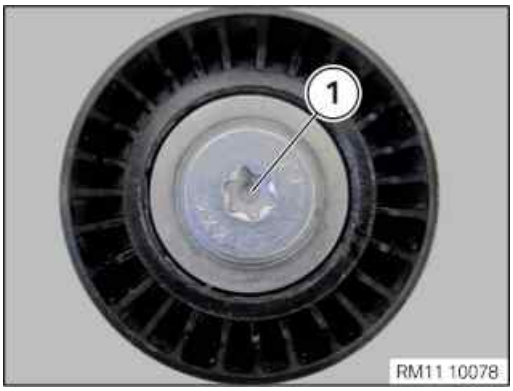
Necessary preliminary tasks:

- Remove drive belt.

Removal:



Unclip end cover (1).



Release screwÂ (1).

Installation:

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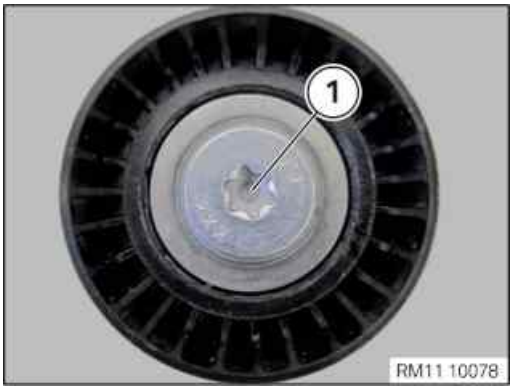
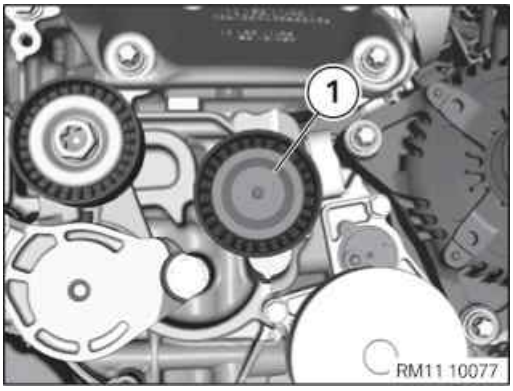


Tighten screw (1).

Tightening torque. 11 28 2AZ.



Mount end cover (1).

Required follow-up work:

- Install drive belt.

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11 28 020 Replace tensioning device for drive belt of the alternator

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

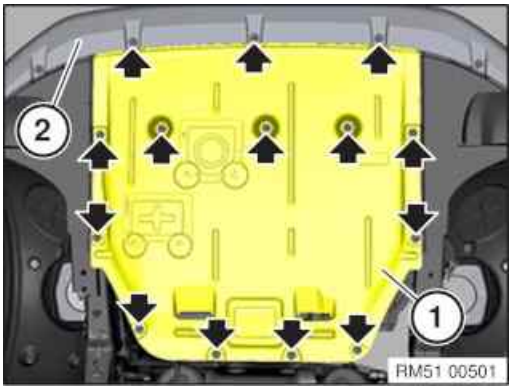
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

3 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

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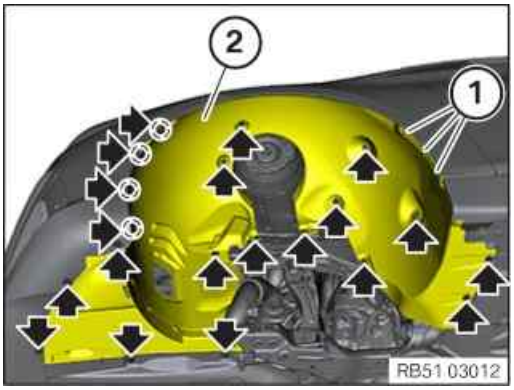
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

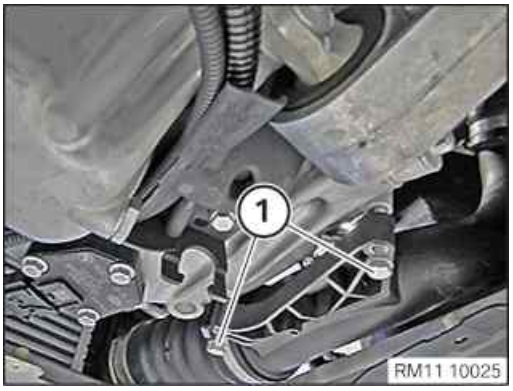
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

4 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

5 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

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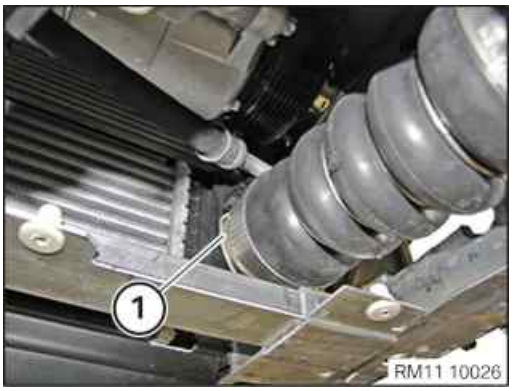
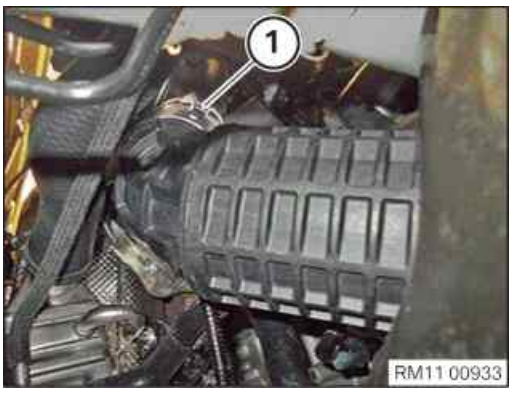
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



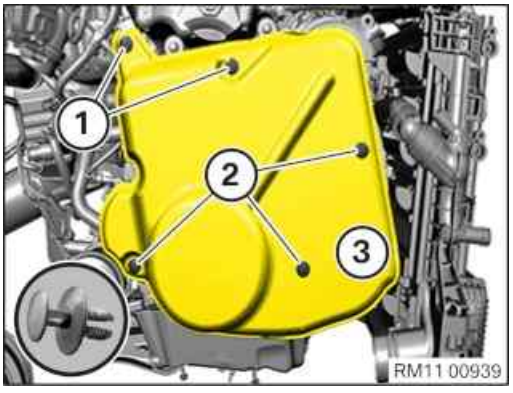
- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

6 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

7 – Removing the drive belt for alternator

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CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

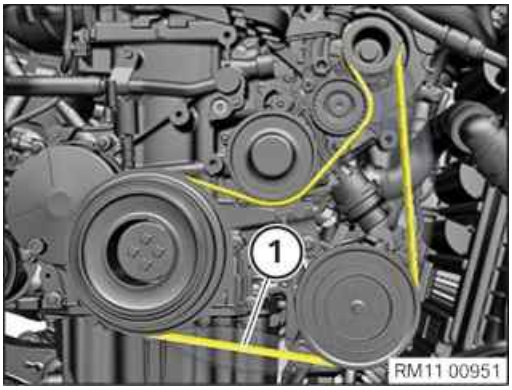
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.

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MAIN WORK

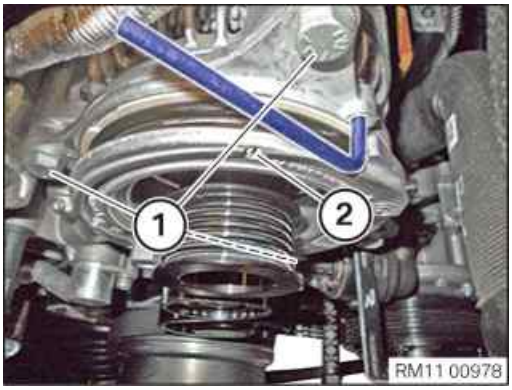
8 – Removing the belt tensioner

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.



TECHNICAL INFORMATION

Remount the belt tensioner for the drive belt on the alternator when replacing the alternator.

- Loosen screws (1).
- Guide out the belt tensioner for the drive belt (2) and remove.

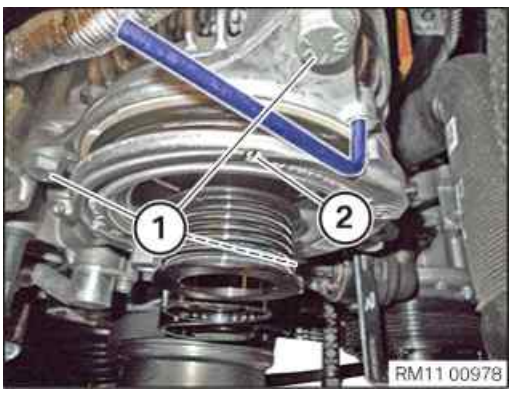
9 – Installing the belt tensioner

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.



- Position the belt tensioner (2) for the drive belt at the alternator and install.
- Tighten screws with holder (1).

Belt tensioner to alternator

M8X30		Tightening torque	28 Nm

POSTPROCESSES

10 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

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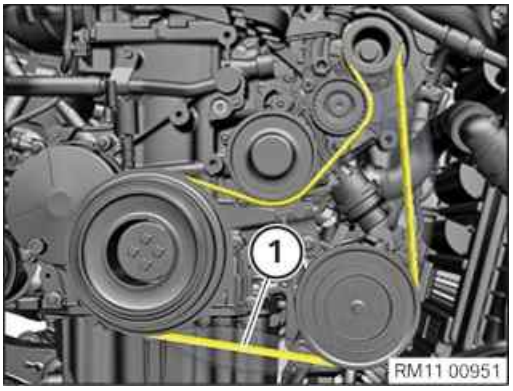
TECHNICAL INFORMATION

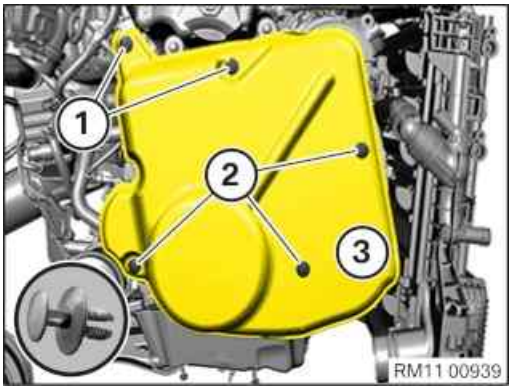
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

11 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

12 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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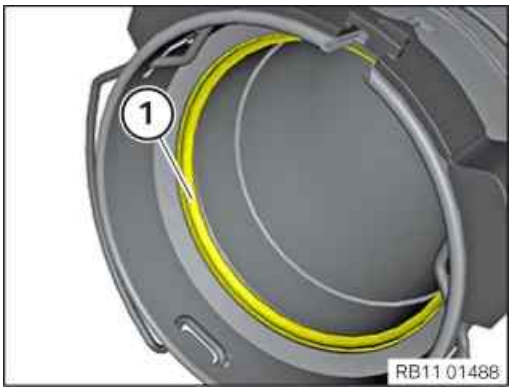
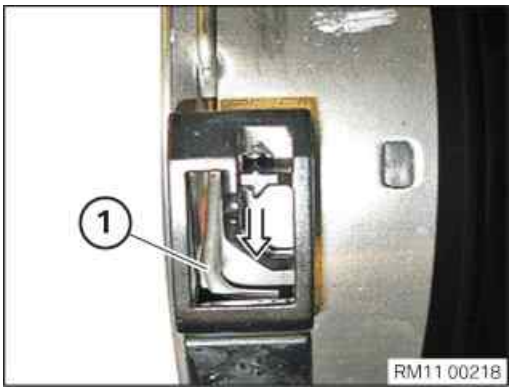
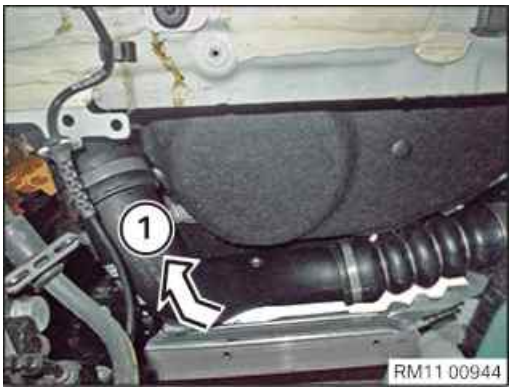


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

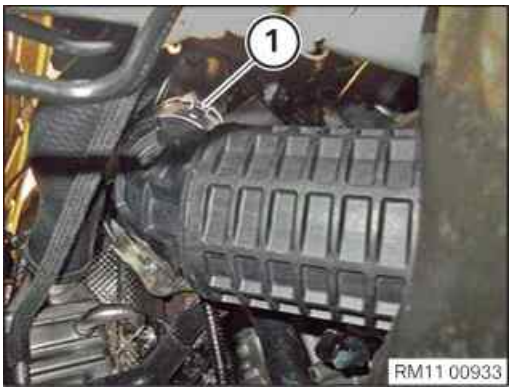
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

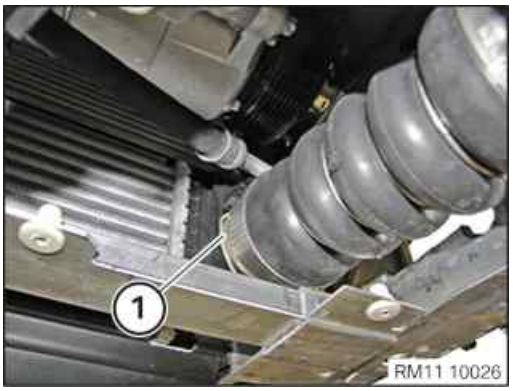


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

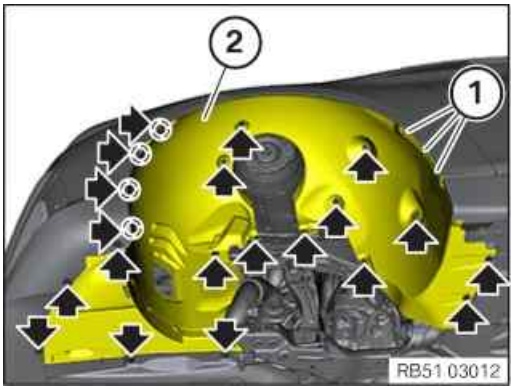
M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

13 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

14 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

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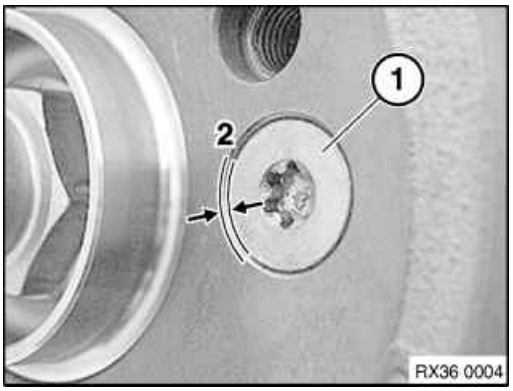
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

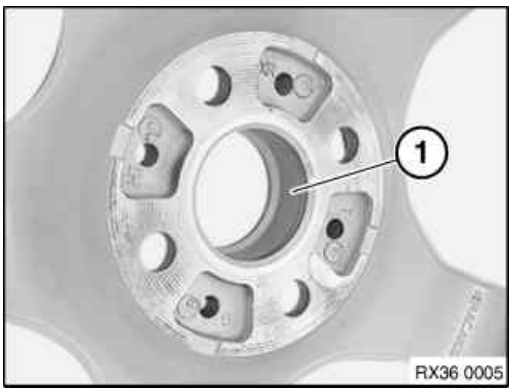


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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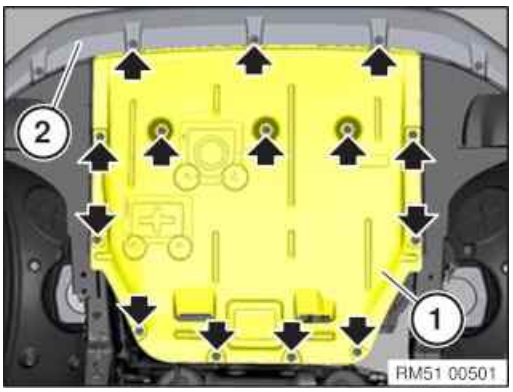
15 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

16 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Belt tensioner to alternator — Used in step 9

M8X30		Tightening torque	28 Nm

Charge air line to crankcase — Used in step 12

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 12

M6		Tightening torque	8 Nm

Wheel arch cover — Used in step 13

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub — Used in step 14

M8	Renew screw.		16 Nm

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Wheel bolts			Used in step 14
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front			Used in step 15
			3 Nm

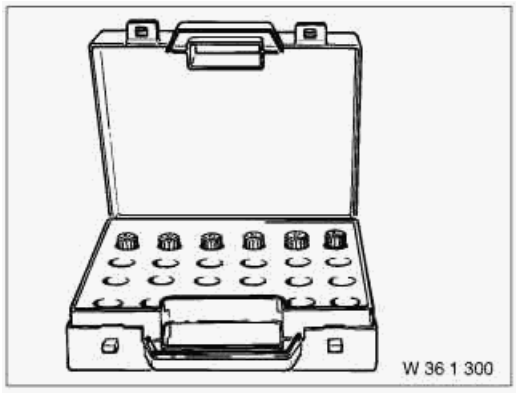
Overview of Special Tools

2 344 011 Tool

Common	Used in step 14
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

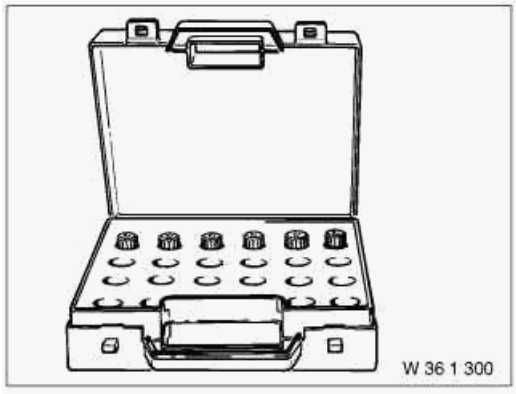
Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 3
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 3
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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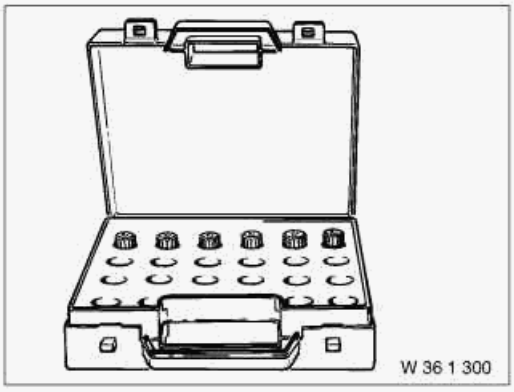
0 495 225 (36 1 327) Wheel stud



Common	Used in step 3
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 3
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 3
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 3
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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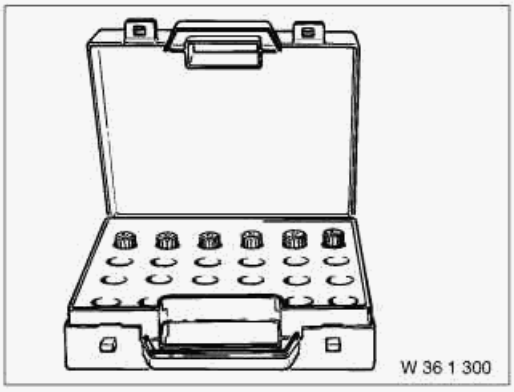
0 495 229 (36 1 332) Wheel stud



Common	Used in step 3
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 3
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	14

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11 28 025 Replacing deflecting element for drive belt of the alternator

PRELIMINARY WORK

1 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

2 – Remove right charge-air line

- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

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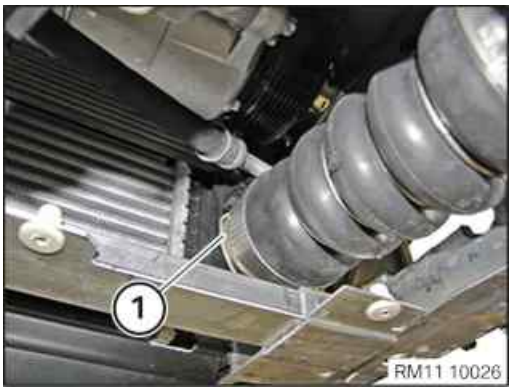
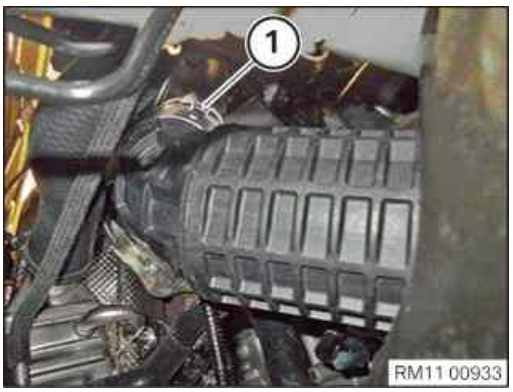
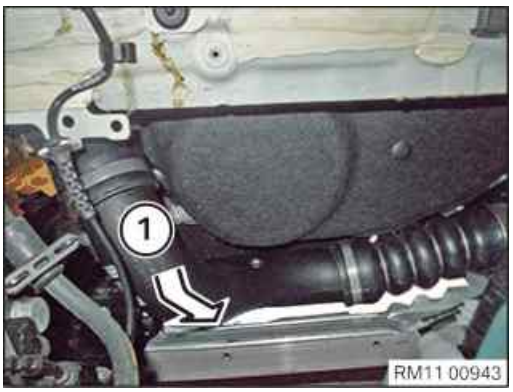
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

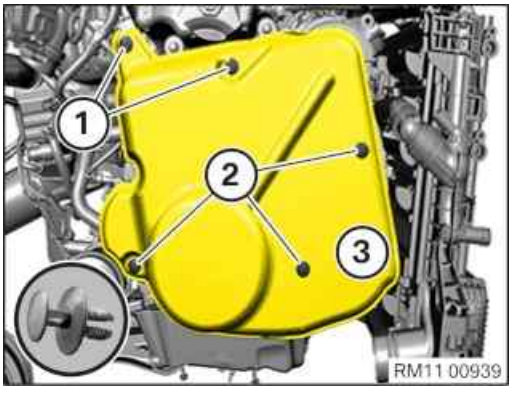


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

3 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

4 – Removing the drive belt for alternator

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CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

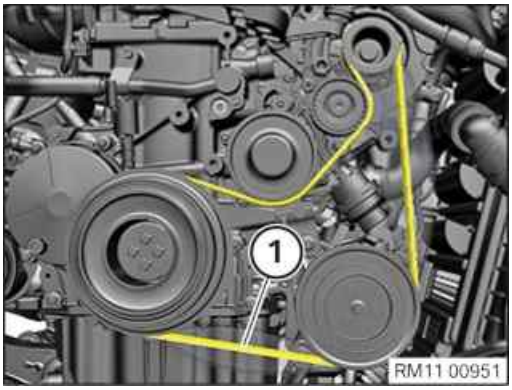
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.

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MAIN WORK

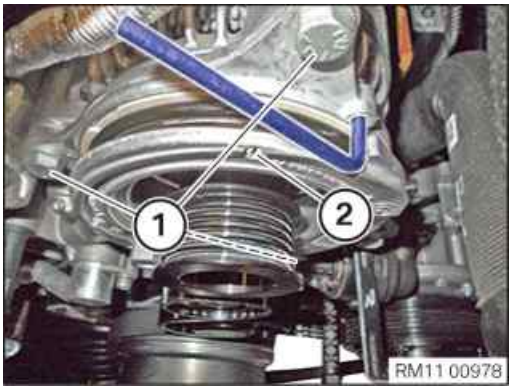
5 – Removing the belt tensioner

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.



TECHNICAL INFORMATION

Remount the belt tensioner for the drive belt on the alternator when replacing the alternator.

- Loosen screws (1).
- Guide out the belt tensioner for the drive belt (2) and remove.

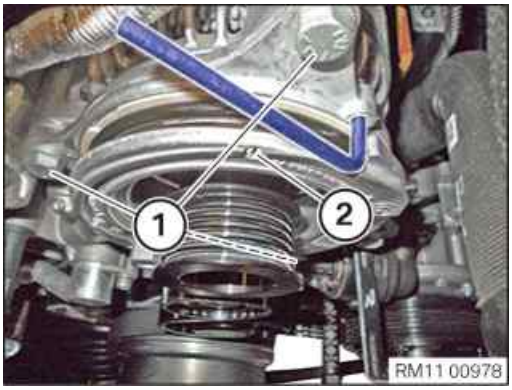
6 – Installing the belt tensioner

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.



- Position the belt tensioner (2) for the drive belt at the alternator and install.
- Tighten screws with holder (1).

Belt tensioner to alternator

M8X30		Tightening torque	28 Nm

POSTPROCESSES

7 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

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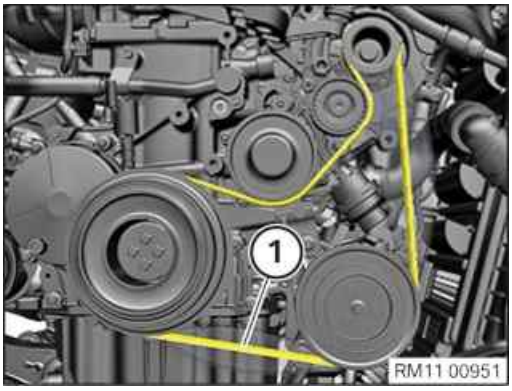
TECHNICAL INFORMATION

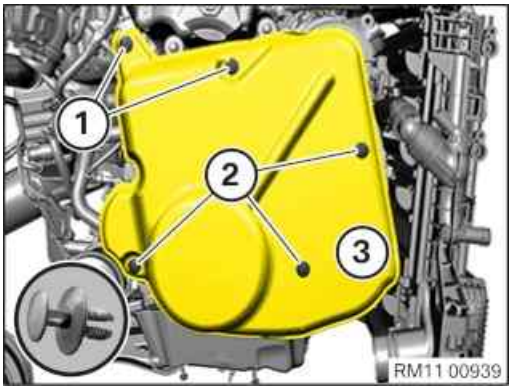
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

8 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

9 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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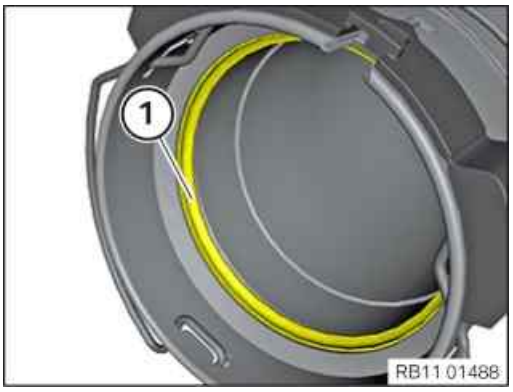
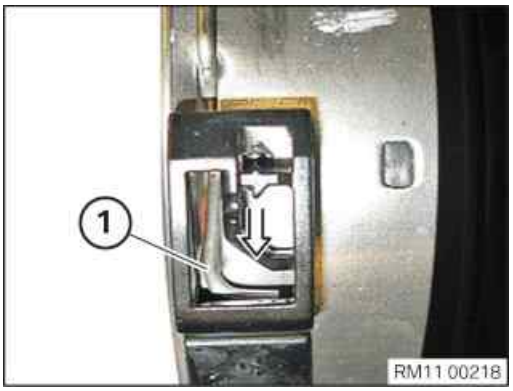
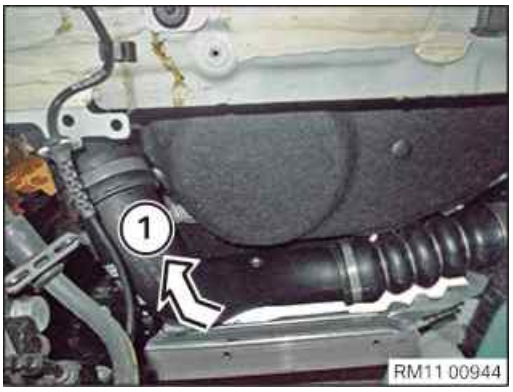


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

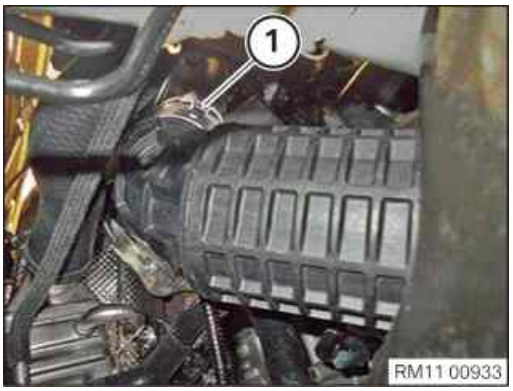
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

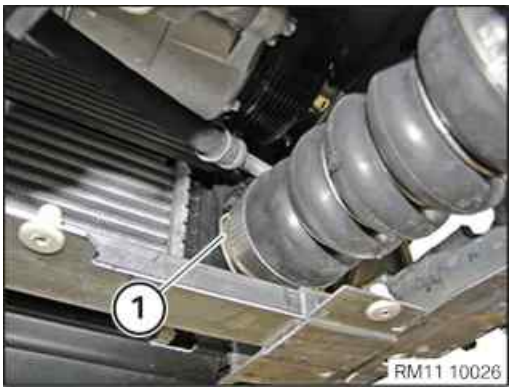


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

10 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

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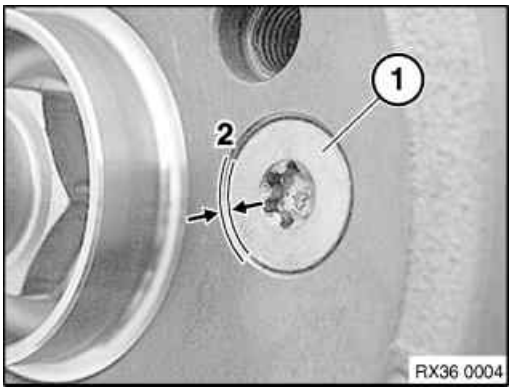
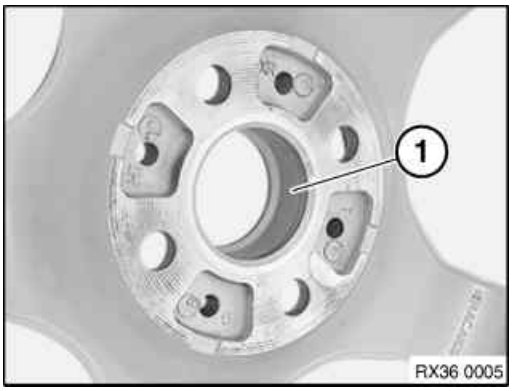


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

Additional Information

Overview of Tightening Torques

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Belt tensioner to alternator — Used in step 6

M8X30		Tightening torque	28 Nm

Charge air line to crankcase — Used in step 9

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 9

M6		Tightening torque	8 Nm

Brake disc to front wheel hub — Used in step 10

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 10

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Overview of Special Tools

2 344 011 Tool

Common — Used in step 10

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common — Used in step 1

Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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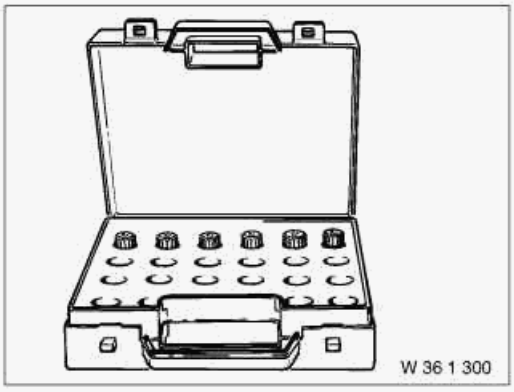
0 495 224 (36 1 326) Wheel stud

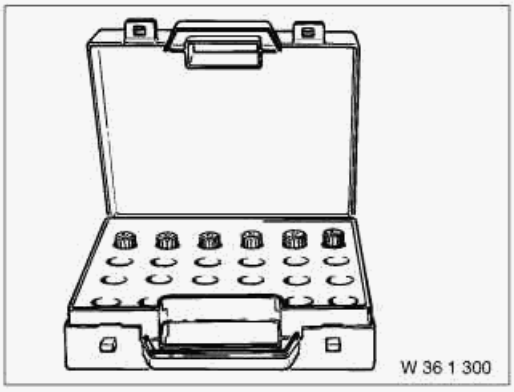


Common	Used in step 1
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 1
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud



Common	Used in step 1
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 1
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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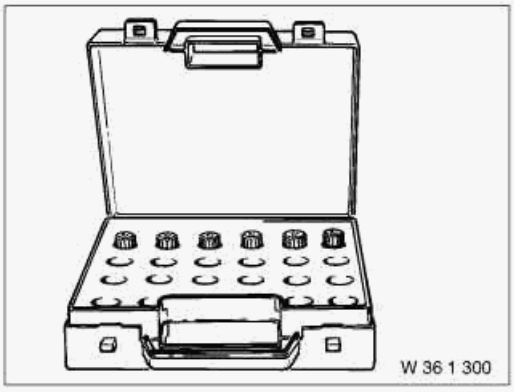
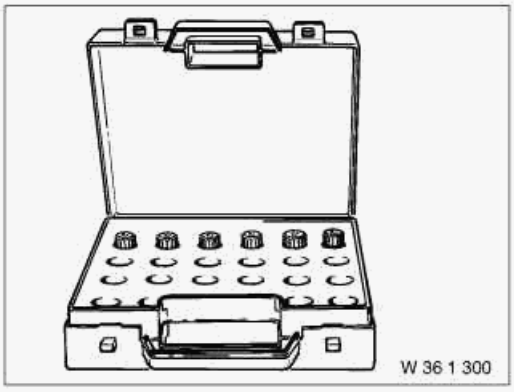
0 495 228 (36 1 331) Wheel stud



Common	Used in step 1
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud



Common	Used in step 1
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 1
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	10

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11 28 050 Replacing drive belt for air conditioning compressor

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

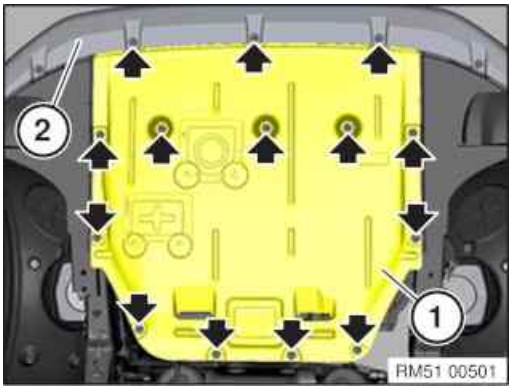
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

3 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

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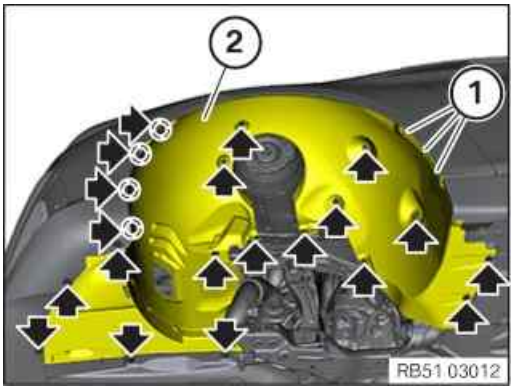
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

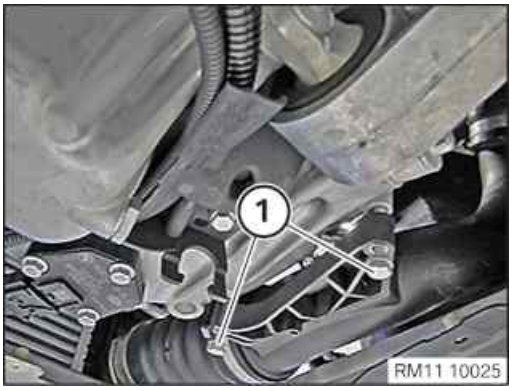
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

4 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

5 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

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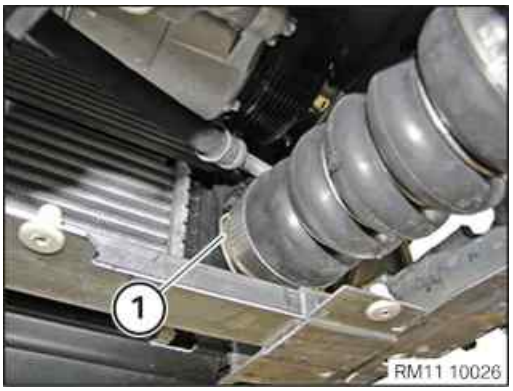
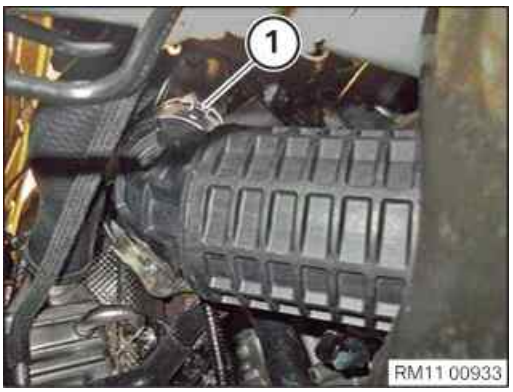
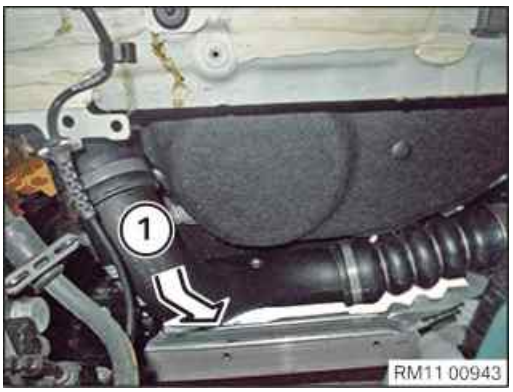
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

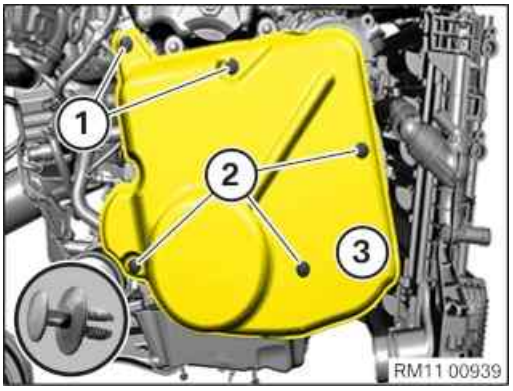


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

6 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

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7 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

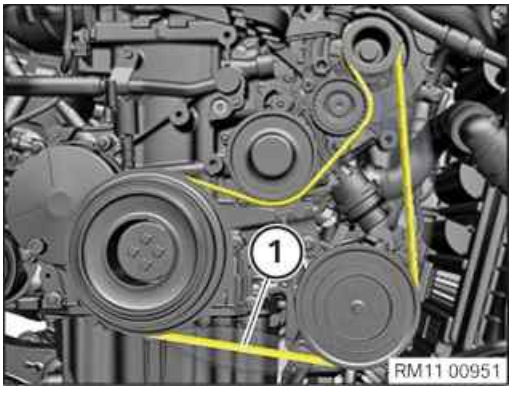
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.

8 – Installing the drive belt for alternator

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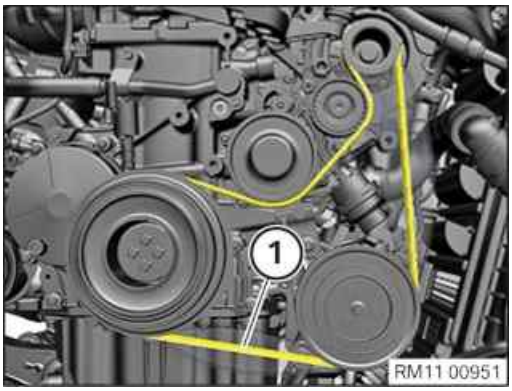
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

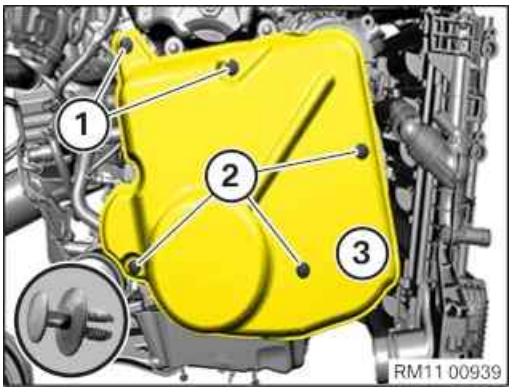


- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

POSTPROCESSES

9 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

10 – Install right charge air duct

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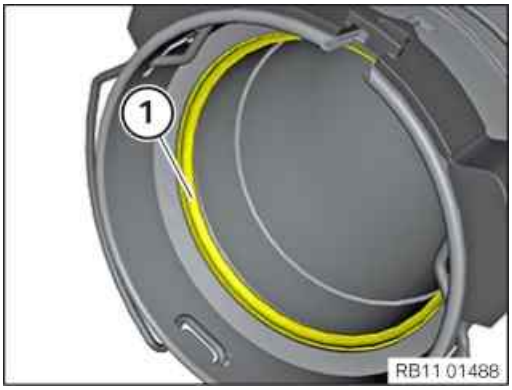
RISK OF DAMAGE

Damage to the exhaust turbocharger.

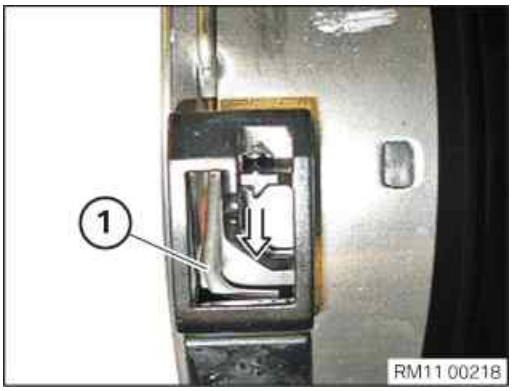
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

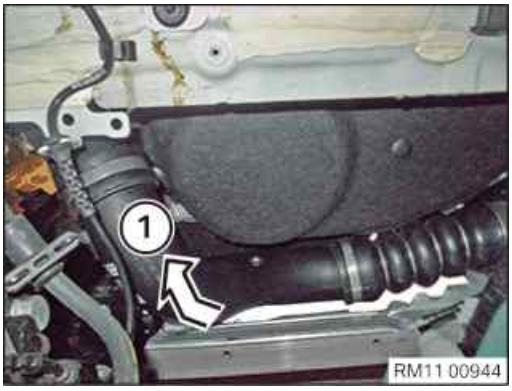


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

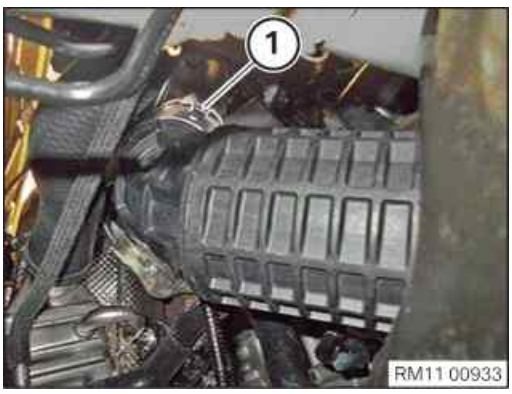
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.

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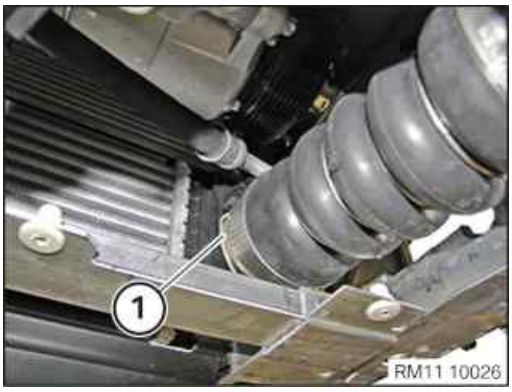


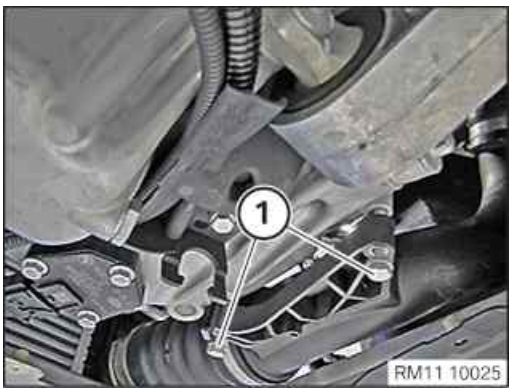
- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

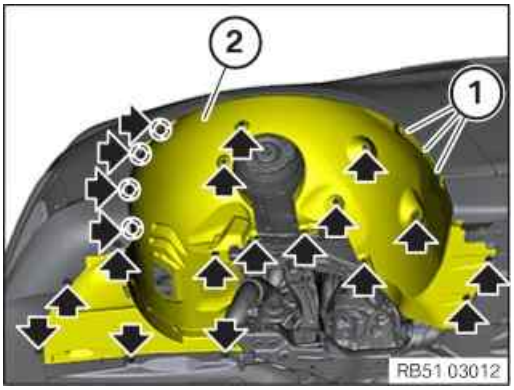


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

11 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

12 – Installing the front right wheel

▶ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

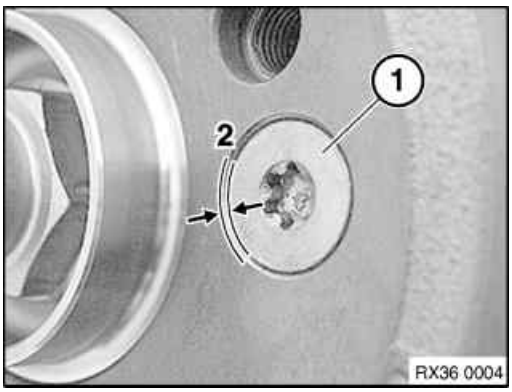
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

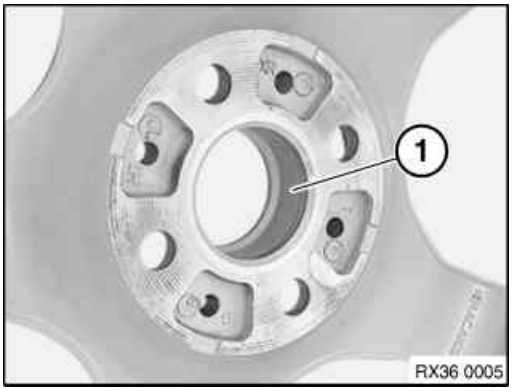


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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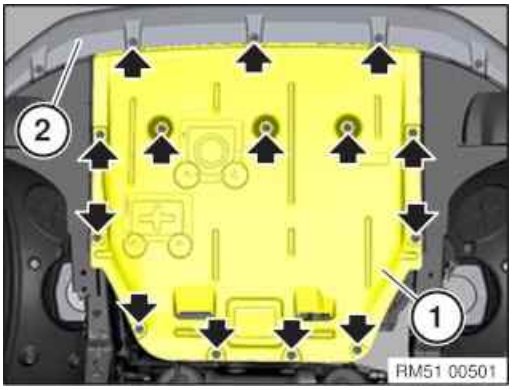
13 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

14 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Charge air line to crankcase — Used in step 10

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 10

M6		Tightening torque	8 Nm

Wheel arch cover — Used in step 11

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub — Used in step 12

M8	Renew screw.		16 Nm

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Wheel bolts Used in step 12

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front Used in step 13

			3 Nm

Overview of Special Tools

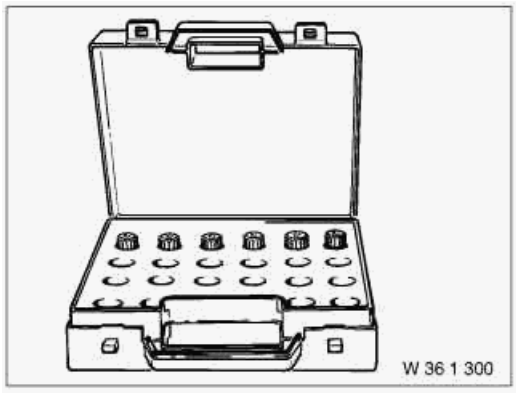
2 344 011 Tool

Common Used in step 12

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common Used in step 3

Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common Used in step 3

Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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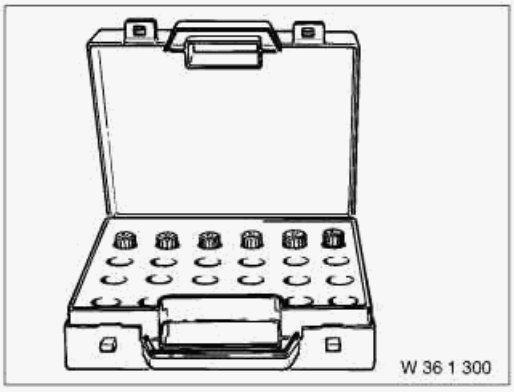
0 495 225 (36 1 327) Wheel stud



Common	Used in step 3
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 3
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 3
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 3
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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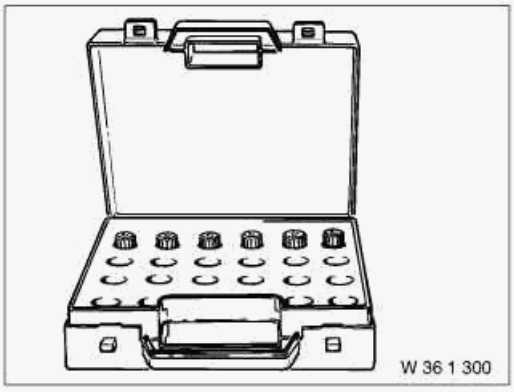
0 495 229 (36 1 332) Wheel stud



Common	Used in step 3
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 3
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	12

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11 28 010 Replacing drive belt for alternator

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

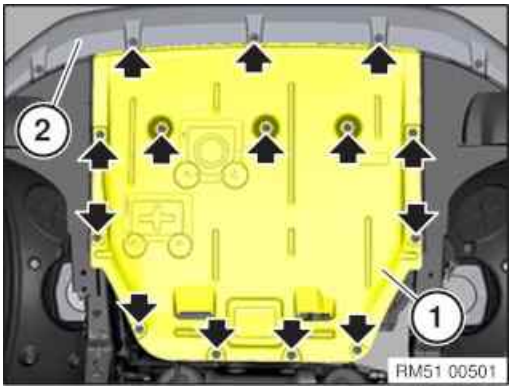
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

3 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

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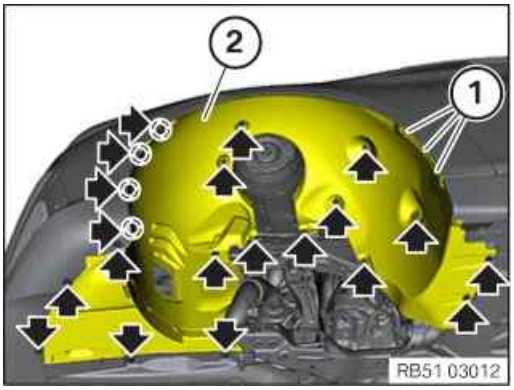
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

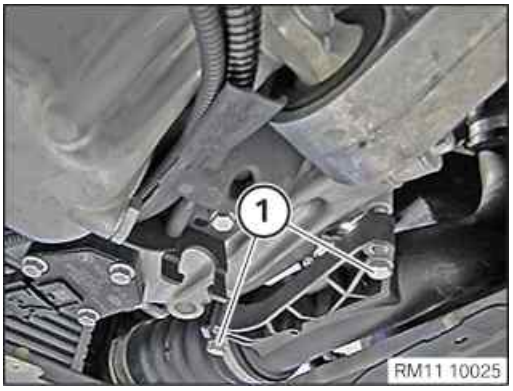
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

4 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

5 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

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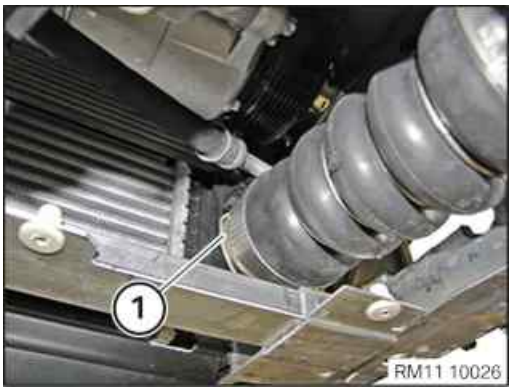
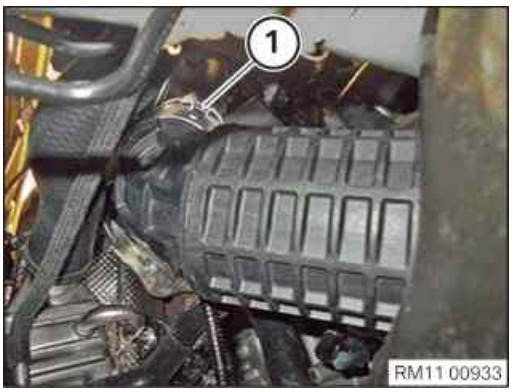
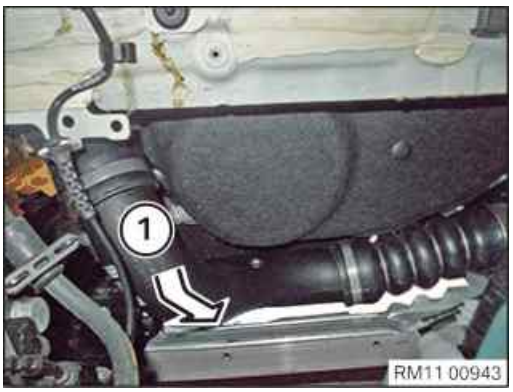
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

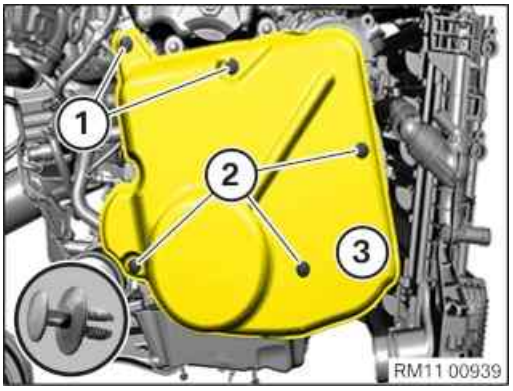


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

6 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

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7 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

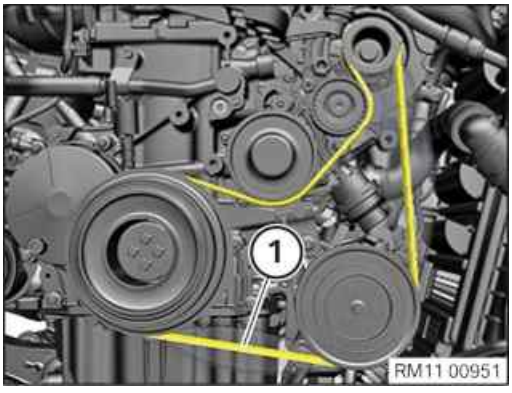
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.

8 – Installing the drive belt for alternator

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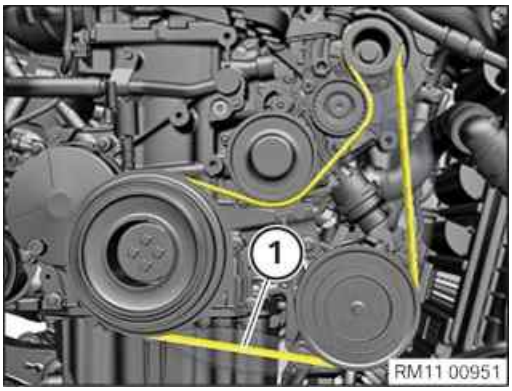
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

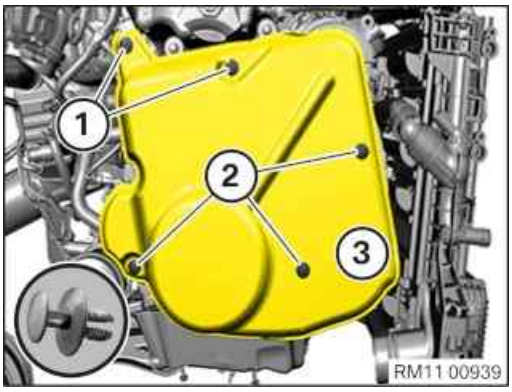


- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

POSTPROCESSES

9 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

10 – Install right charge air duct

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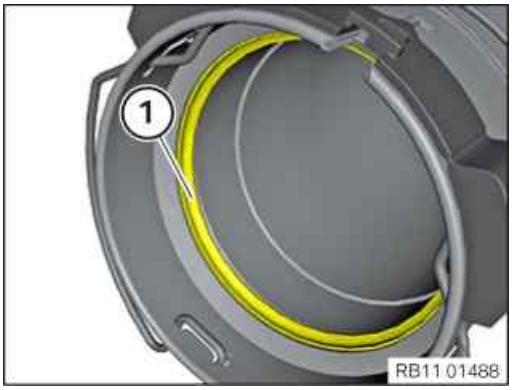
RISK OF DAMAGE

Damage to the exhaust turbocharger.

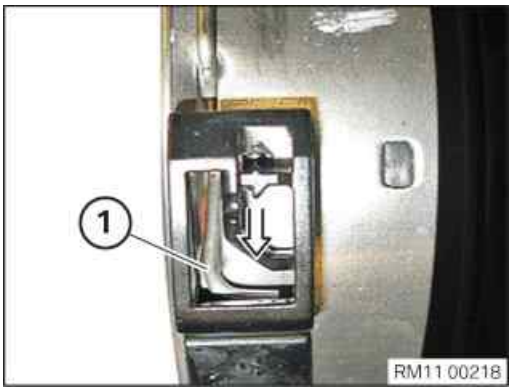
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

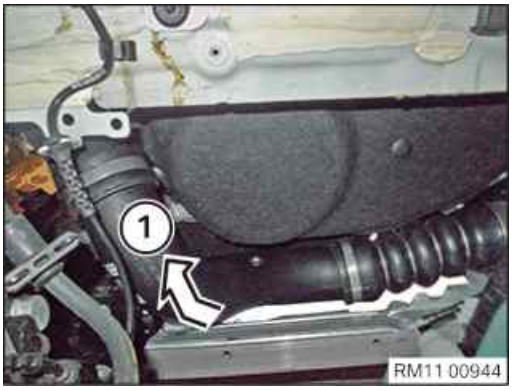


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

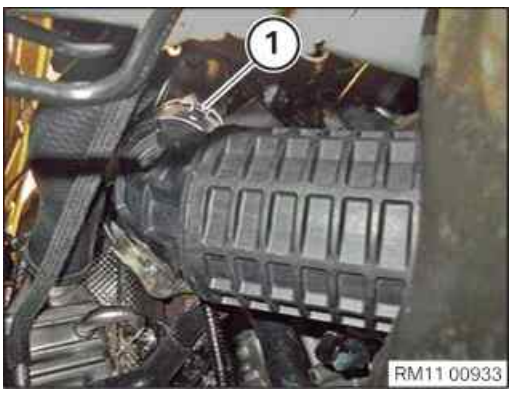
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.

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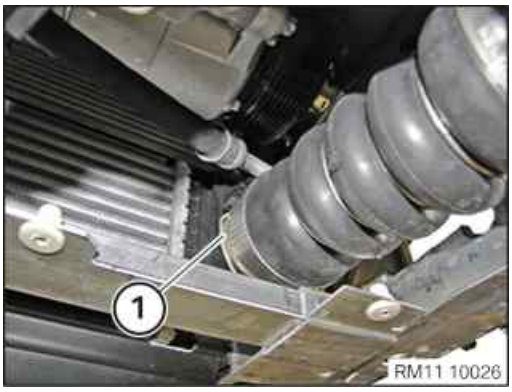


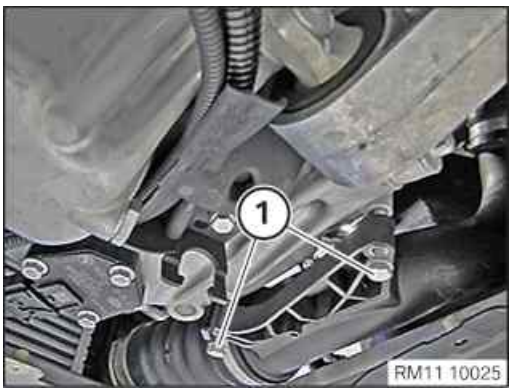
- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

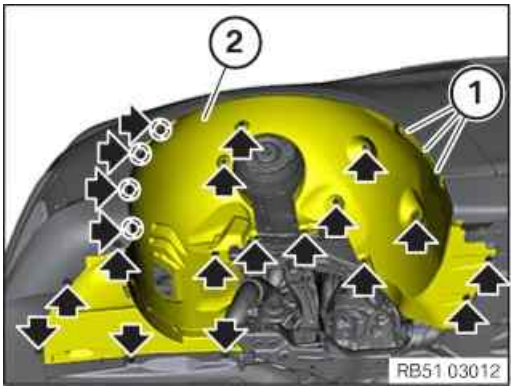


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

11 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

12 – Installing the front right wheel

▶ **Clean the contact surfaces between the brake disc and the wheel rim**

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TECHNICAL INFORMATION

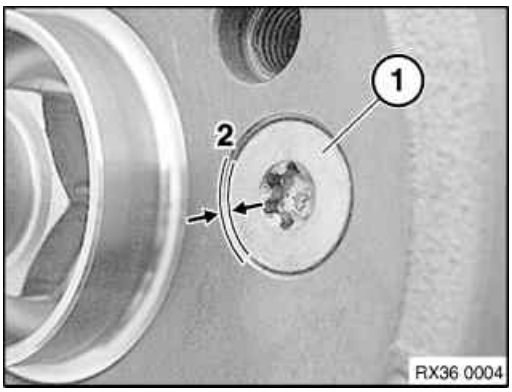
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

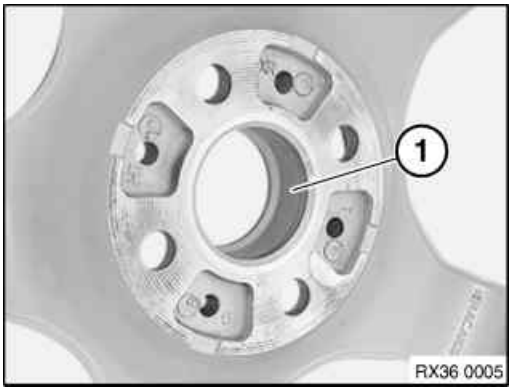


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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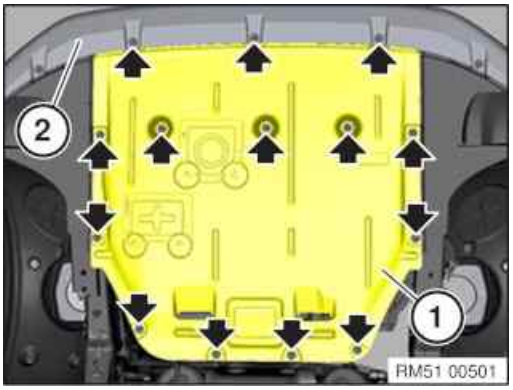
13 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

14 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Charge air line to crankcase — Used in step 10

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 10

M6		Tightening torque	8 Nm

Wheel arch cover — Used in step 11

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub — Used in step 12

M8	Renew screw.		16 Nm

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Wheel bolts Used in step 12

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front Used in step 13

			3 Nm

Overview of Special Tools

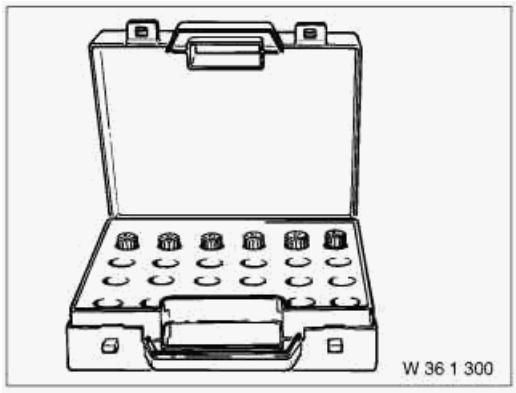
2 344 011 Tool

Common Used in step 12

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common Used in step 3

Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common Used in step 3

Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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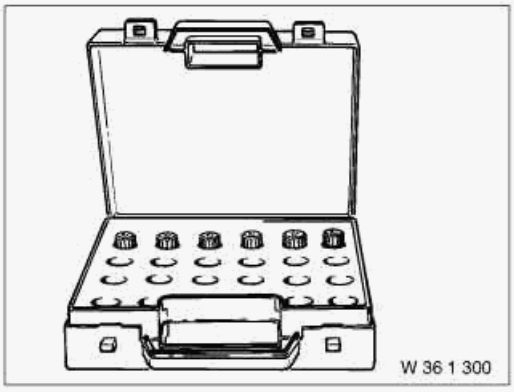
0 495 225 (36 1 327) Wheel stud



Common	Used in step 3
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 3
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 3
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 3
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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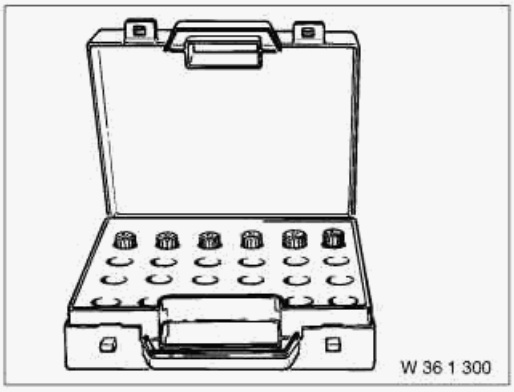
0 495 229 (36 1 332) Wheel stud



Common	Used in step 3
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 3
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	12

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11 28 060 Replacing tensioning device drive belt for air conditioning compressor

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

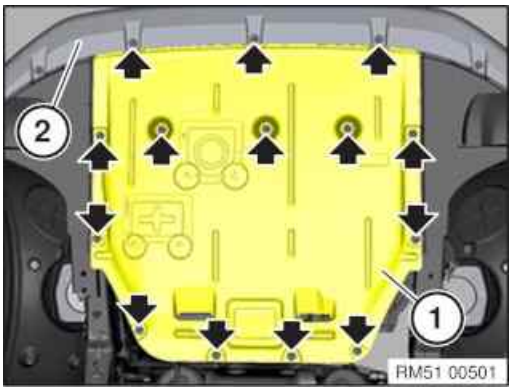
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

3 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

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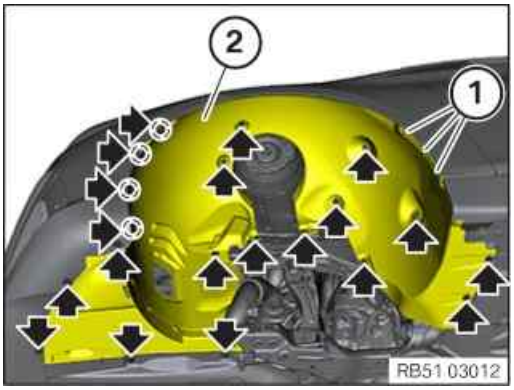
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

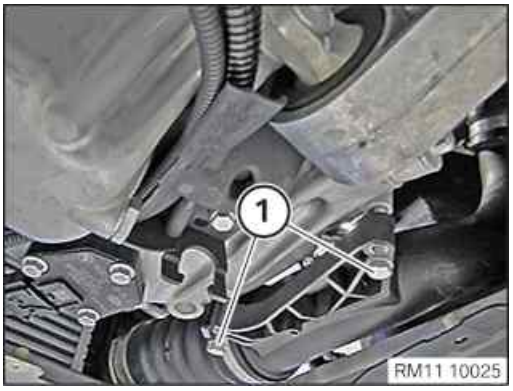
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

4 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

5 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

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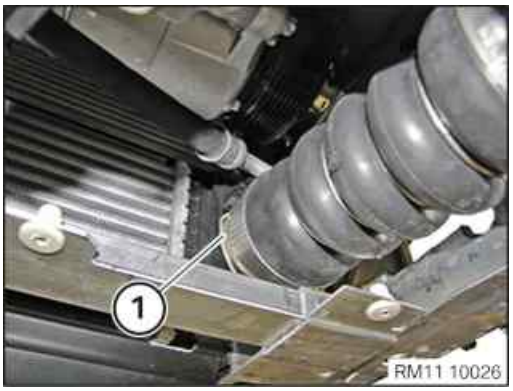
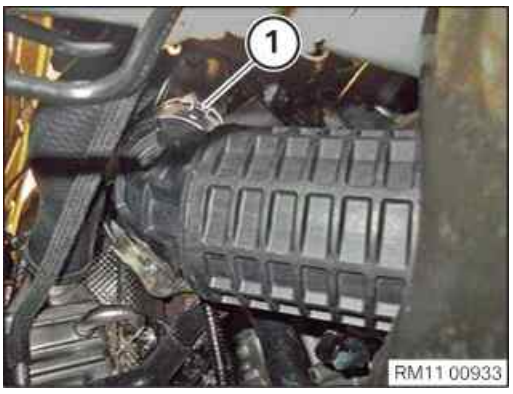
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



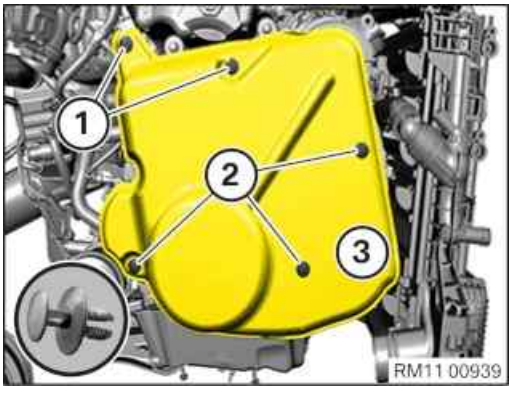
- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

6 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

7 – Removing the drive belt for alternator

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CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

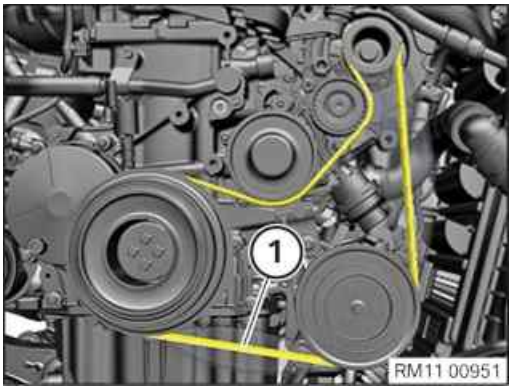
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.

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MAIN WORK

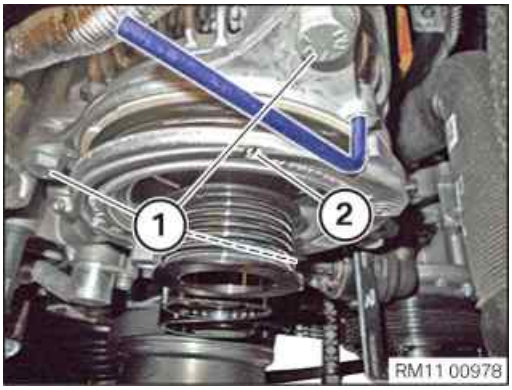
8 – Removing the belt tensioner

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.



TECHNICAL INFORMATION

Remount the belt tensioner for the drive belt on the alternator when replacing the alternator.

- Loosen screws (1).
- Guide out the belt tensioner for the drive belt (2) and remove.

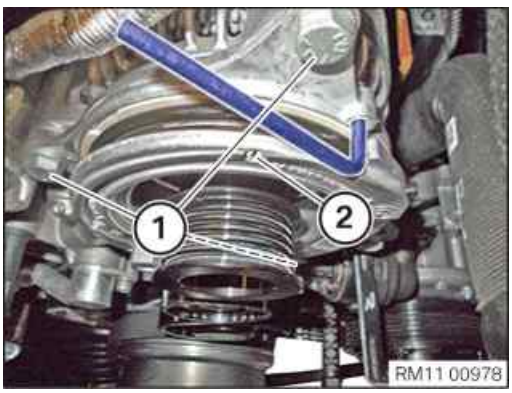
9 – Installing the belt tensioner

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.



- Position the belt tensioner (2) for the drive belt at the alternator and install.
- Tighten screws with holder (1).

Belt tensioner to alternator

M8X30		Tightening torque	28 Nm

POSTPROCESSES

10 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

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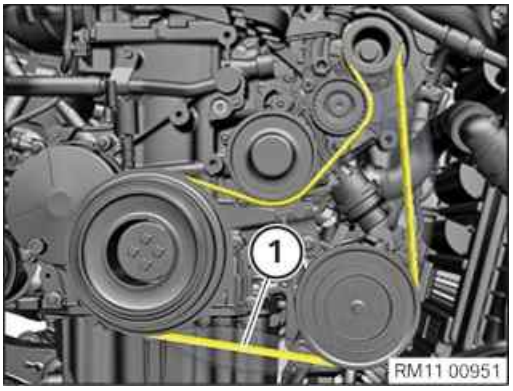
TECHNICAL INFORMATION

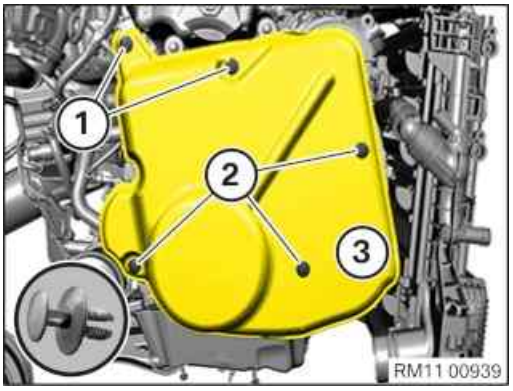
The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

11 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

12 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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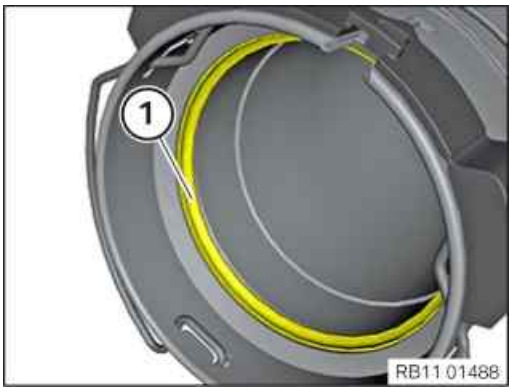
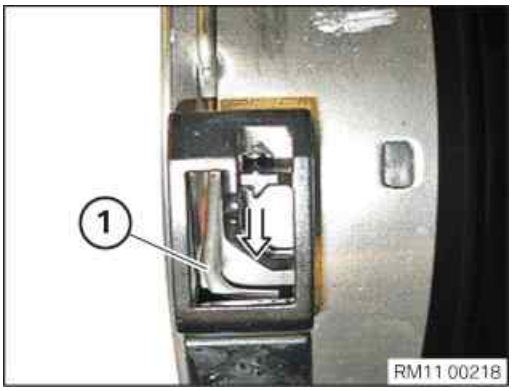
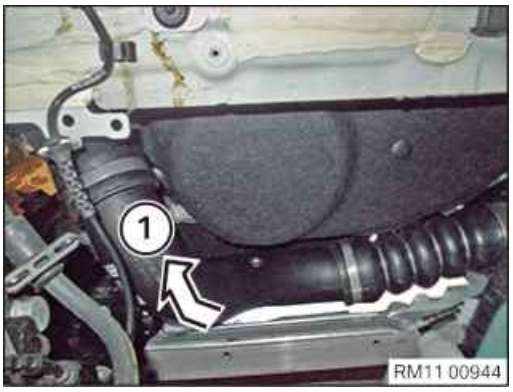


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

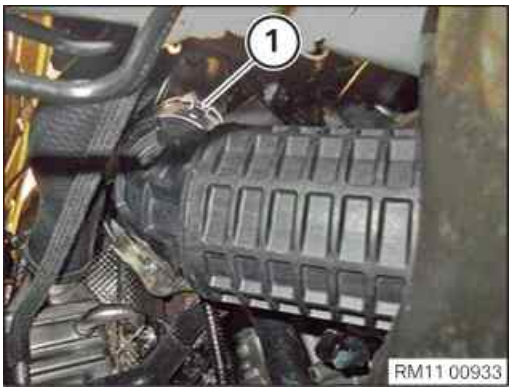
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

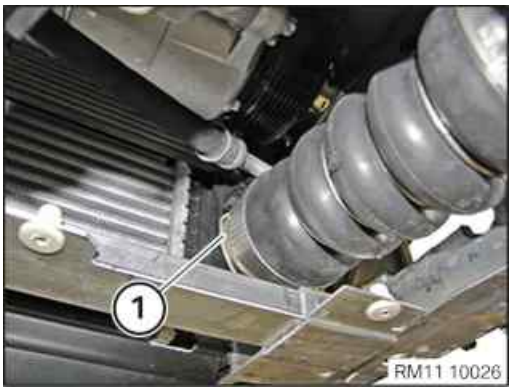


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

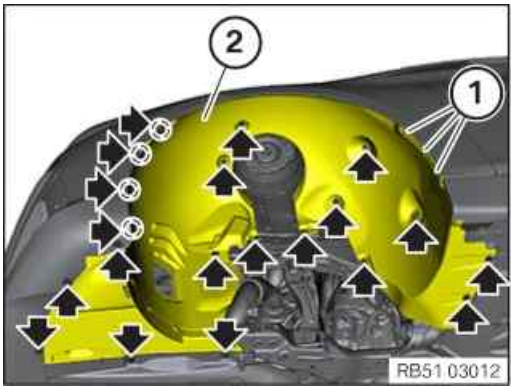
M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

13 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

14 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

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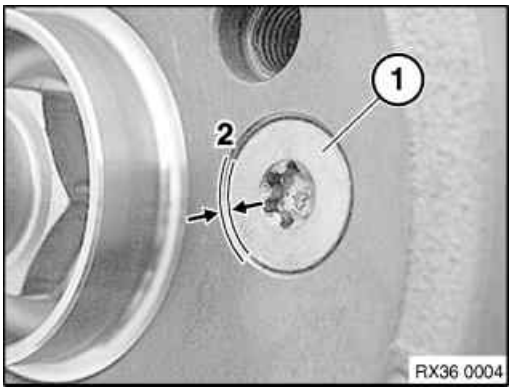
- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

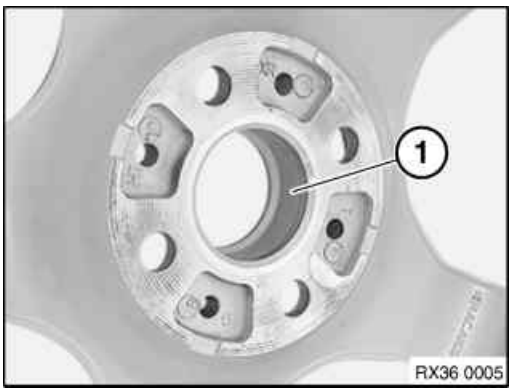


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

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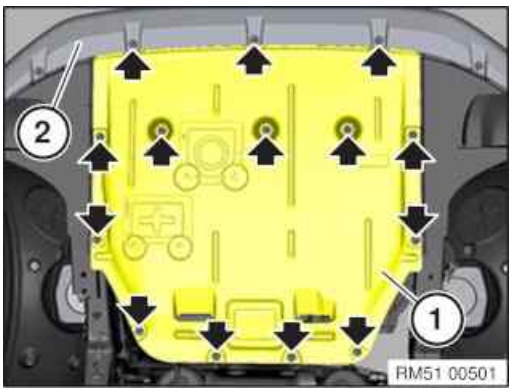
15 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

16 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Belt tensioner to alternator — Used in step 9

M8X30		Tightening torque	28 Nm

Charge air line to crankcase — Used in step 12

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 12

M6		Tightening torque	8 Nm

Wheel arch cover — Used in step 13

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub — Used in step 14

M8	Renew screw.		16 Nm

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Wheel bolts			Used in step 14
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front			Used in step 15
			3 Nm

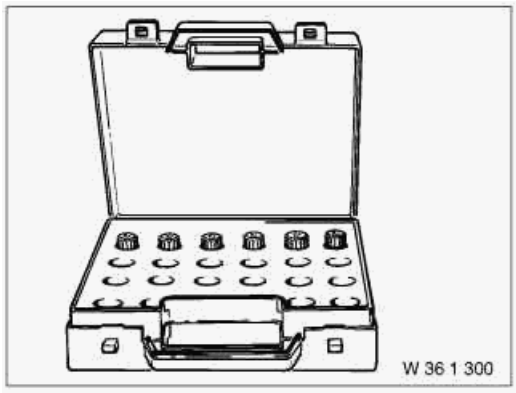
Overview of Special Tools

2 344 011 Tool

Common	Used in step 14
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

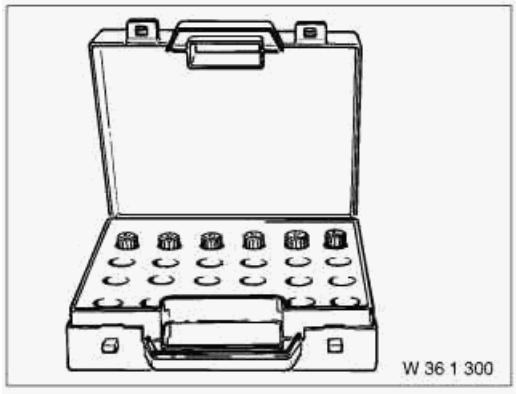
Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 3
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud



Common	Used in step 3
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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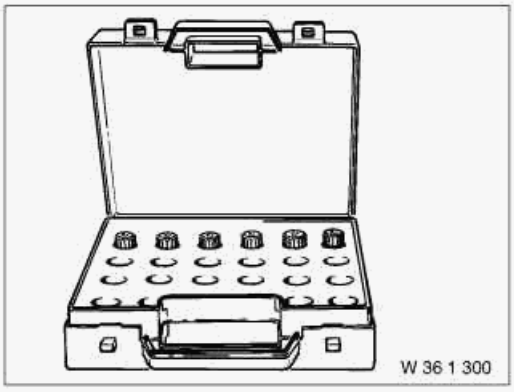
0 495 225 (36 1 327) Wheel stud



Common	Used in step 3
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 3
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 3
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 3
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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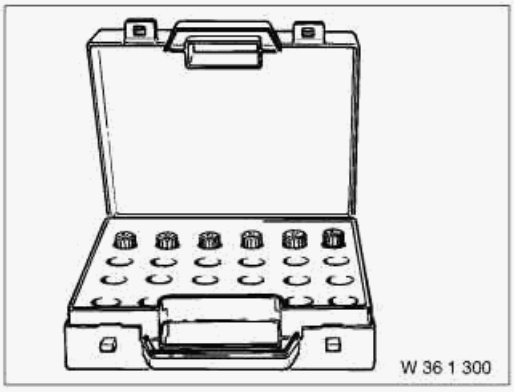
0 495 229 (36 1 332) Wheel stud



Common	Used in step 3
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 3
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	14

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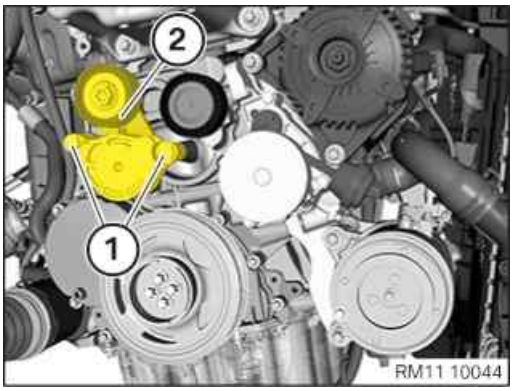
11 28 020 Replacing tensioning device for alternator drive belt (B37C)

Necessary preliminary tasks:

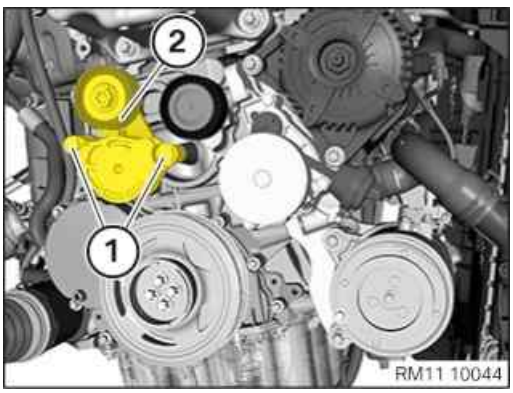
- Remove drive belt.

Removal:



Release screwsÂ (1) from belt tensioner (2).
Remove belt tensioner (2).

Installation:



Install belt tensioner (2).
Tighten down screws (1).
Tightening torque: 11 28 1AZ.

Required follow-up work:

- Install drive belt

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11 31 505 Adjusting camshaft timing (B37C)

Special tools required:

- 11 6 480
- 2 288 380
- 11 4 480
- 11 8 760

Important!

Risk of damage to engine.

Notes for checking and setting the timing must be observed without fail.

Necessary preliminary tasks:

- Remove front right wheel arch panel
- Remove cylinder head cover
- Remove exhaust-gas recirculation cooler

Crank engine at central bolt with special tool 11 6 480 **Important!**

Do not turn the engine back.

Remove protective cap on oil sump.

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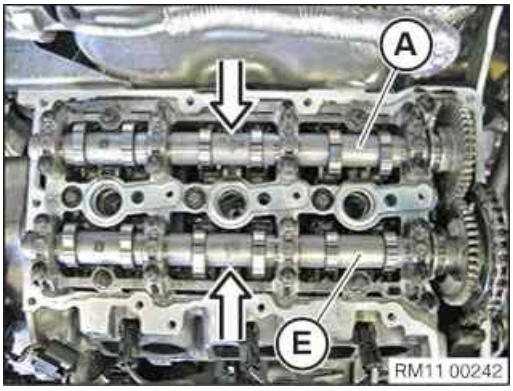
Important!

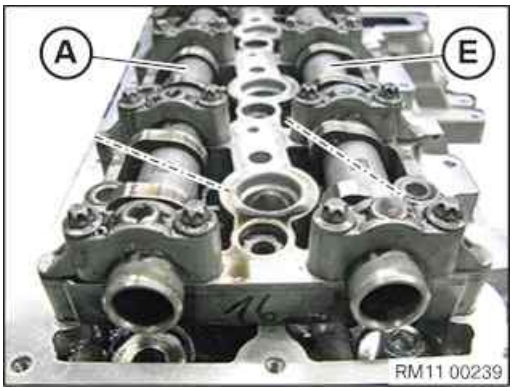
On vehicles with manual gearbox, an additional bore hole that can be confused with dowel hole is located in front of dowel hole.

It must be possible to slide special tool 2 288 380 up to the crank in the oil sump.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool2 288 380 .

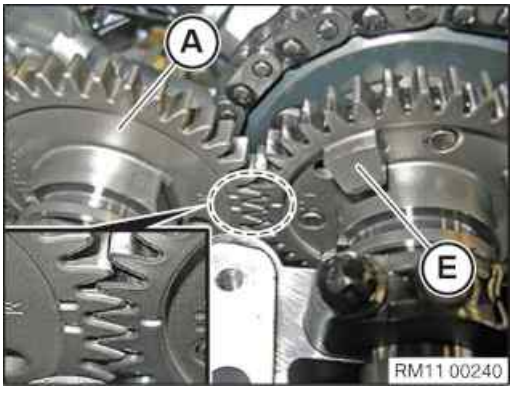


It must be possible to read the part number on the exhaust and intake camshafts (A and E) from above.*Note:*
See illustration.



The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



Marks on both camshafts (A and E) must match up (see graphic).*Note:*
The exhaust camshaft must be removed if the marks do not match up (are not aligned).

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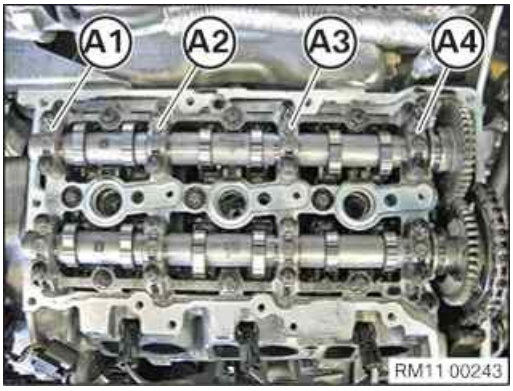
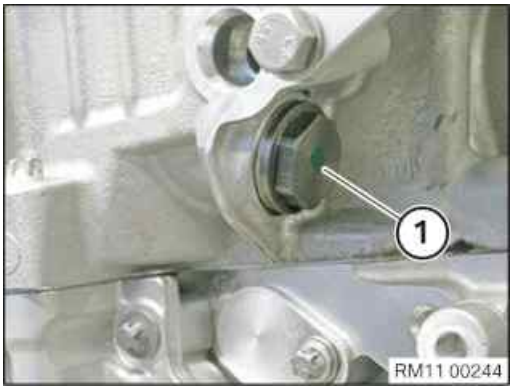


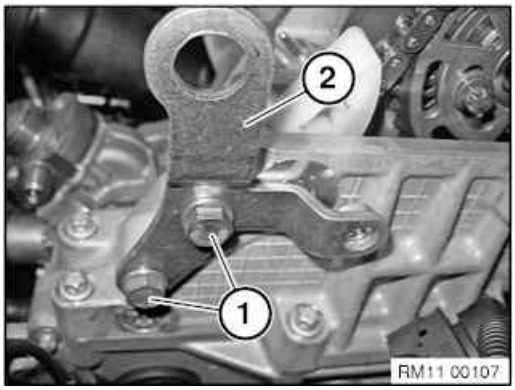
If necessary, release all bolts of camshaft bearing caps **A1** to **A4** by 1/2 a turn at a time, working from the outside inwards.

Remove exhaust camshaft in upward direction.

Place all components on special tool 11 4 480 in a tidy and orderly fashion.



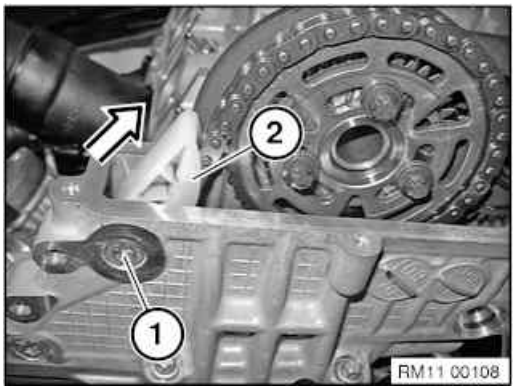
Release chain tensioner (1).



Release screws (1).

Remove suspension element (2).

Note:
Figure N47.



Remove bearing journal (1).

Remove guide rail (2) in direction of arrow.

Note:
Figure N47.

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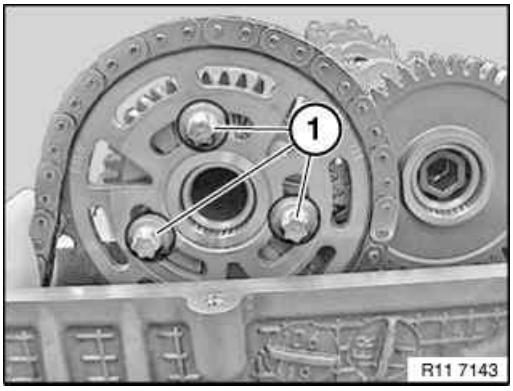
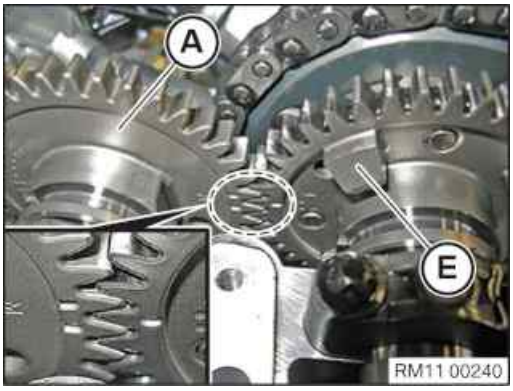


Important!

Protect timing chain to prevent it from falling.

Risk of damage to oil spray nozzle.

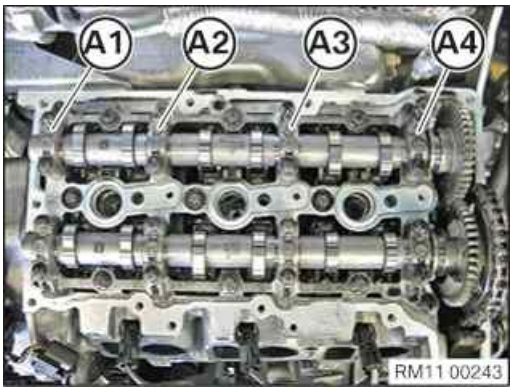
Remove camshaft bolts (1) and detach camshaft sprocket.



Position camshafts (A and E) accordingly (see graphic).

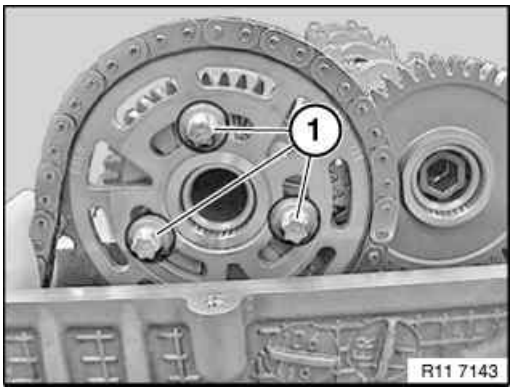
If necessary, insert exhaust camshaft (A) so that both marks match up (see graphic).

Installation note:
Check installation position of roller cam followers.



Tighten down all camshaft bearing caps **A1** to **A4** by 1/2 a turn at a time, working from the inside outwards.

Tightening torque: 11 31 2AZ.



Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the elongated holes.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

Release bolts (1) again by a 90° turn.

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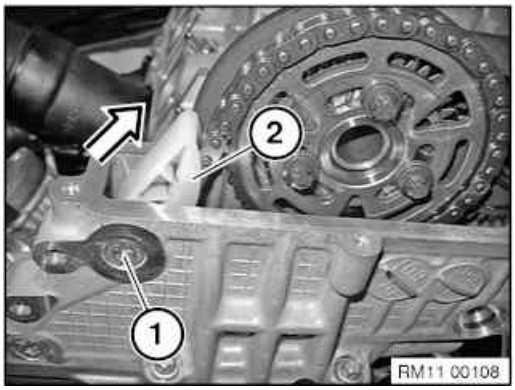
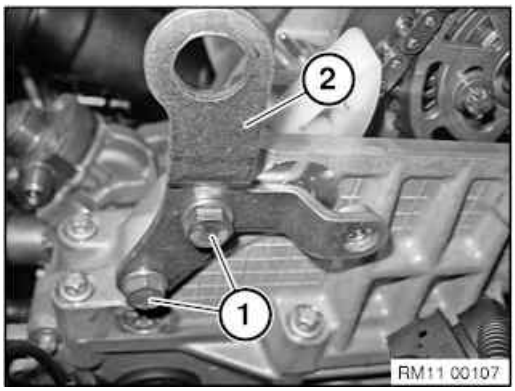
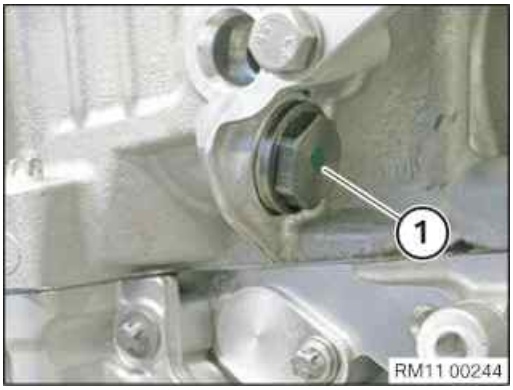


Note:
Parts: Replace bearing journal.

Install guide rail (2) against direction of arrow.
Screw in bearing journals (1).
Tightening torque: 11 12 6AZ.



Install suspension element (2).
Tighten down screws (1).
Tightening torque: 11 00 4AZ.



Install chain tensioner (1) and tighten down.
Parts:
Replace sealing ring.
Tightening torque: 11 12 5AZ.

Place special tool 11 8 760 on exhaust camshaft.**Note:**
Special tool 11 8 760 must lie flush on cylinder head.

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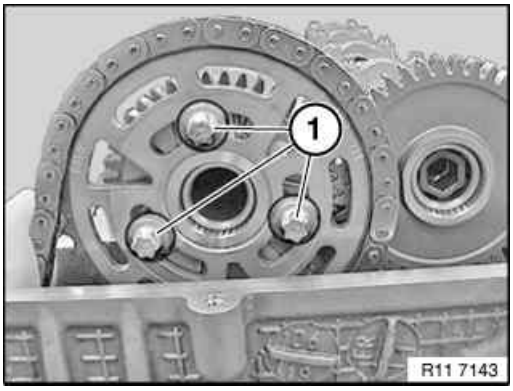

Tighten down screws (1).

Tightening torque: 11 31 1AZ.

Crank engine with special tool 11 6 480 twice in direction of rotation.

Check timing of camshafts.

Important!

Do not turn the engine back.

Important!

Special tool 2 288 380 must be removed before starting engine.

Required follow-up work:

- Install exhaust-gas recirculation cooler
- Install cylinder head cover
- Install front right wheel arch panel

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11 31 505 Adjusting the timing of the camshaft (s) (for work no. 11 31 005/508)

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

PRELIMINARY WORK

1 – Checking camshaft timing

- See additional information.

2 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

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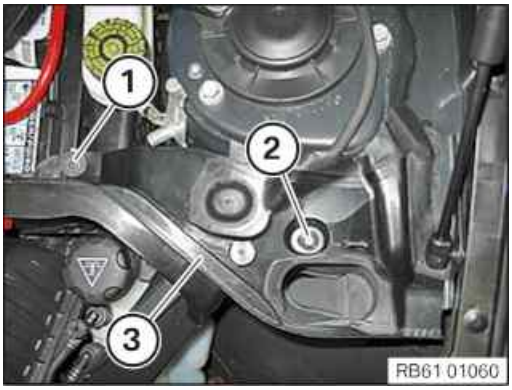
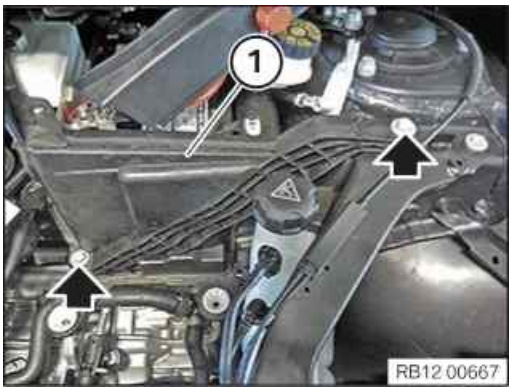
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

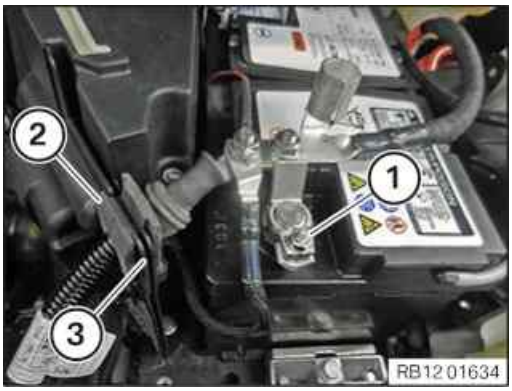


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

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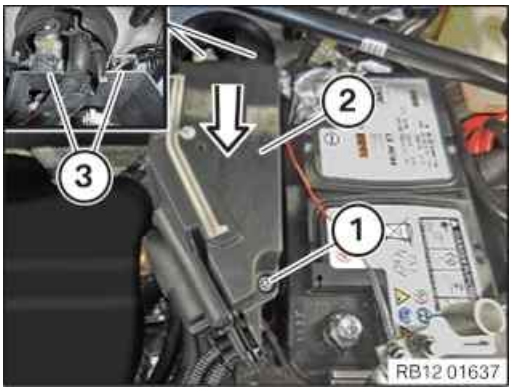
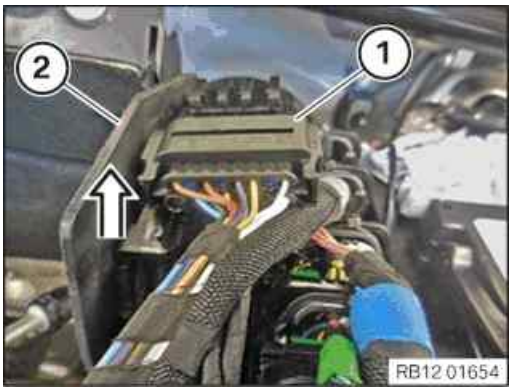
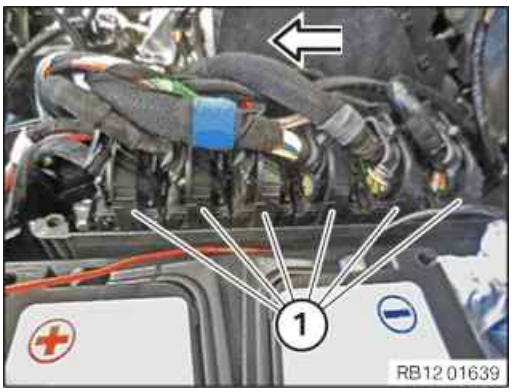


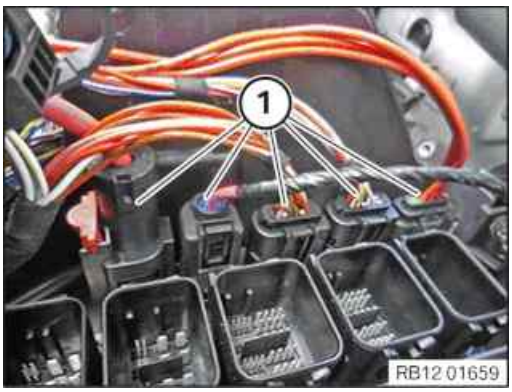
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



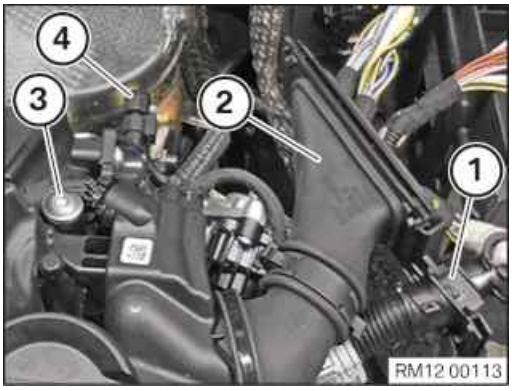
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

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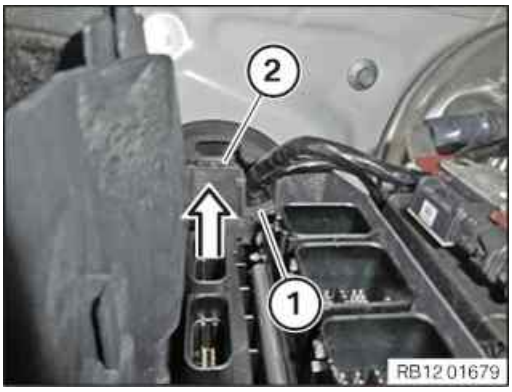
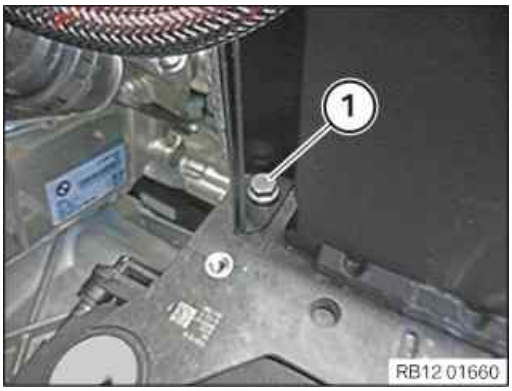
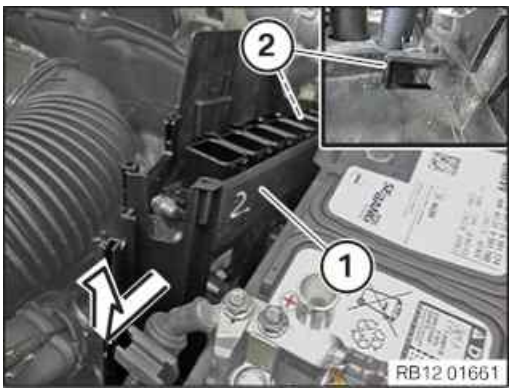


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

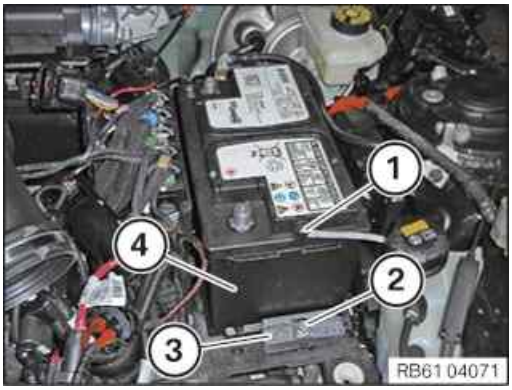


- Loosen screw (1).



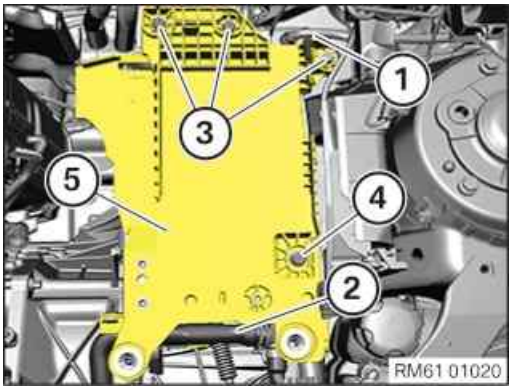
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

3 – Partially remove vehicle battery



- Pull off the vent hose (1).
- Unscrew the screw (2) and remove the holder (3).
- Remove vehicle battery (4).

4 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

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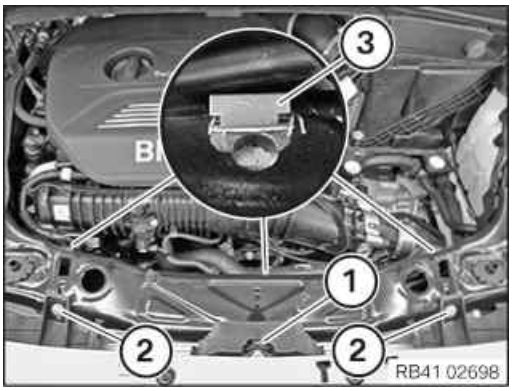
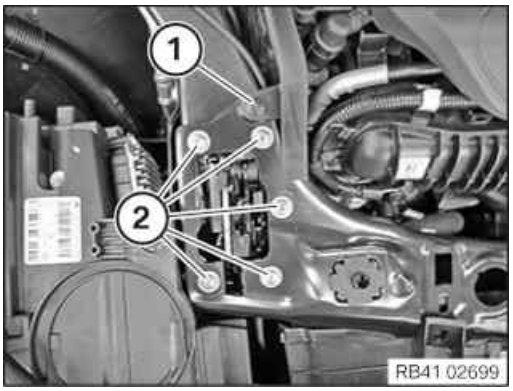
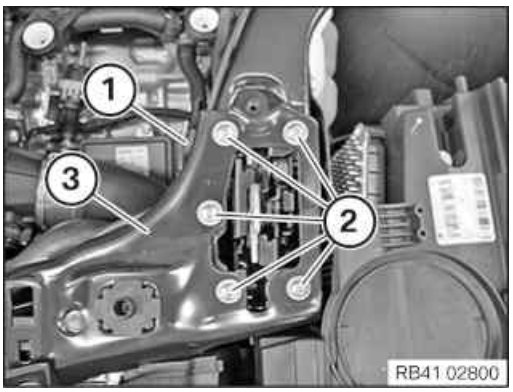
5 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

6 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

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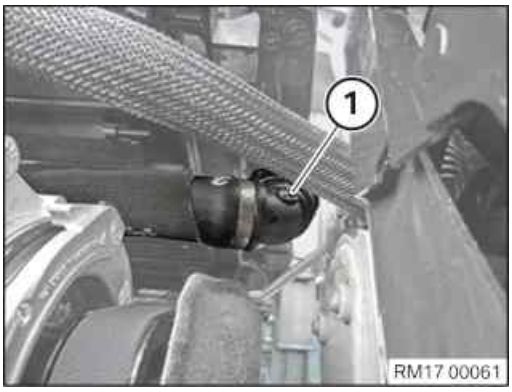
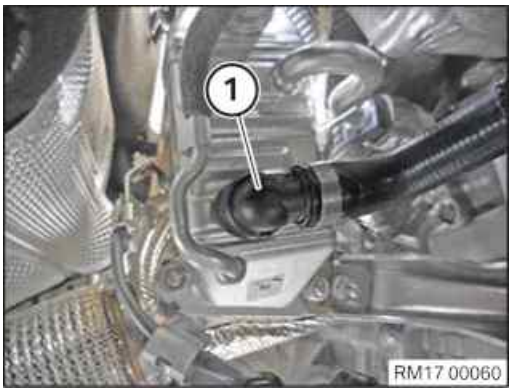
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

7 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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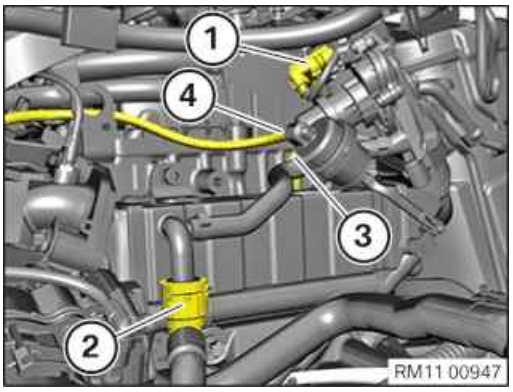
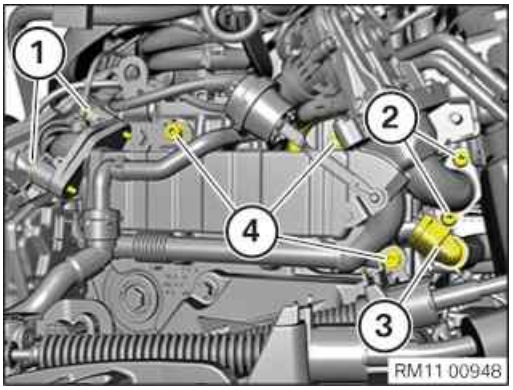


TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

8 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

9 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

MAIN WORK

10 – Adjusting the timing of the camshafts

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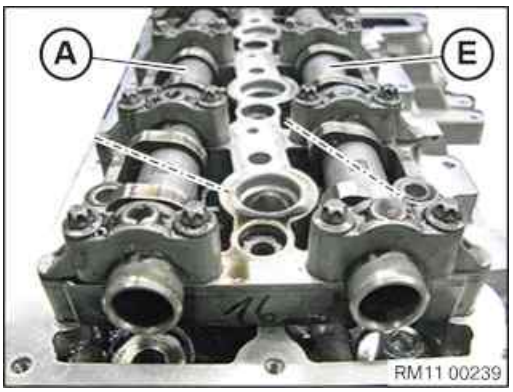
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

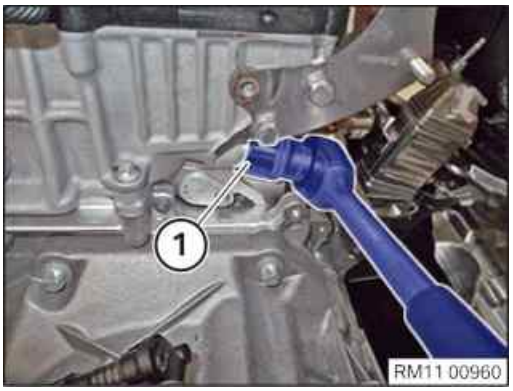
▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove exhaust camshaft.**

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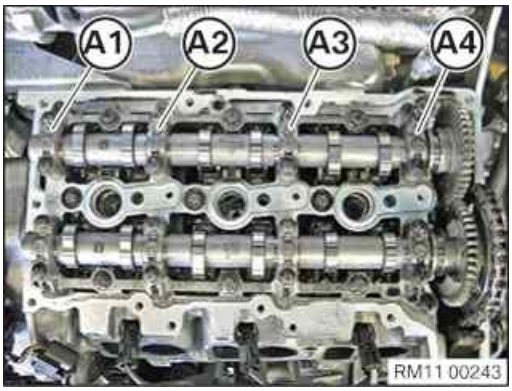
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

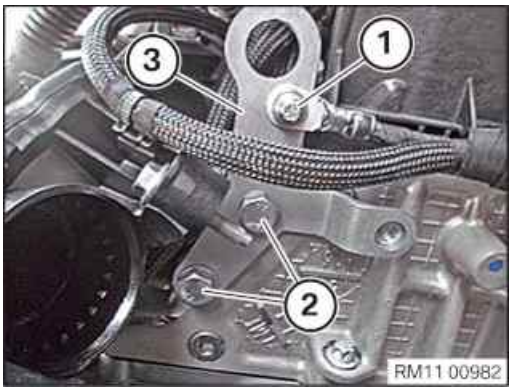


TECHNICAL INFORMATION

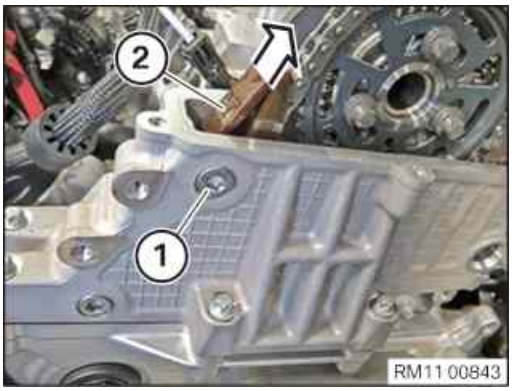
The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▸ **Remove the timing chain guide rail**



- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▸ **Removing the camshaft sprocket on the intake camshaft**

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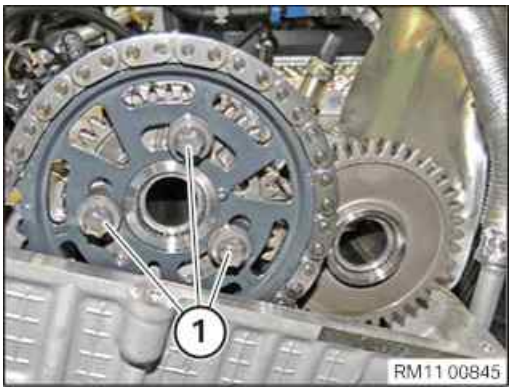


- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

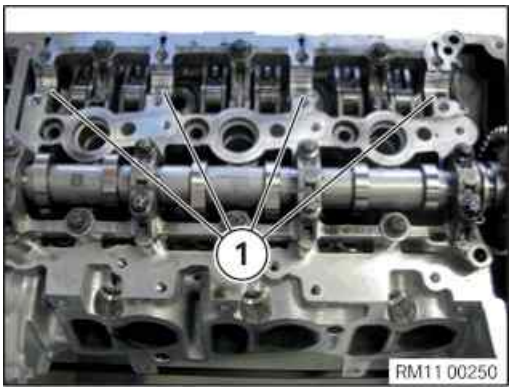
▶ **Installing exhaust camshaft**

RISK OF DAMAGE

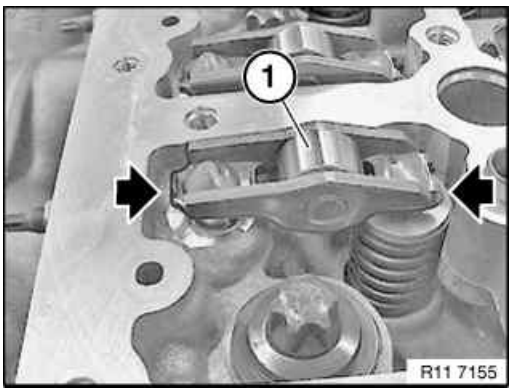
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

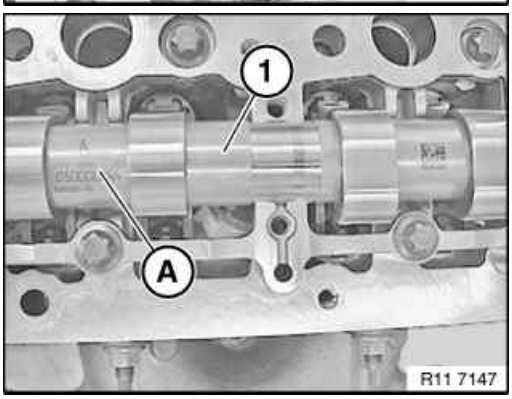
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.

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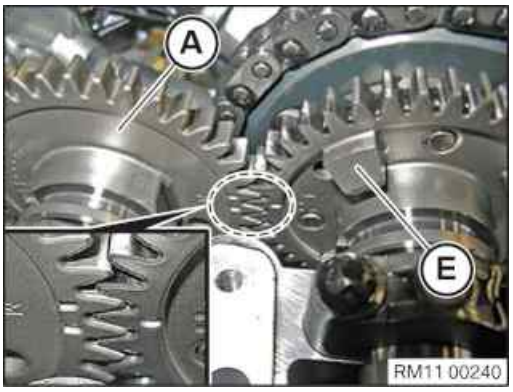
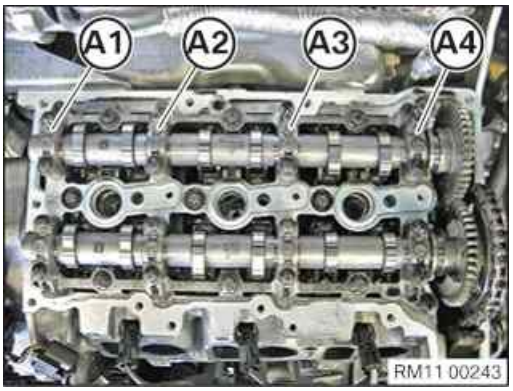


- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

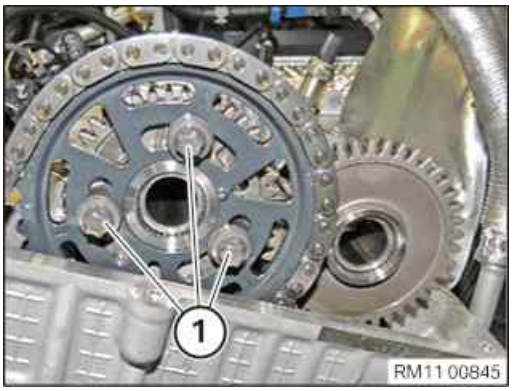
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▸ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▸ **Install the timing chain guide rail**

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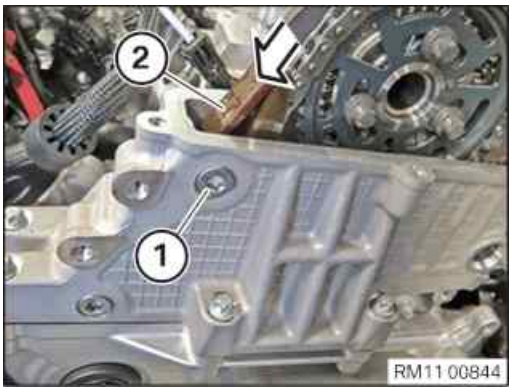


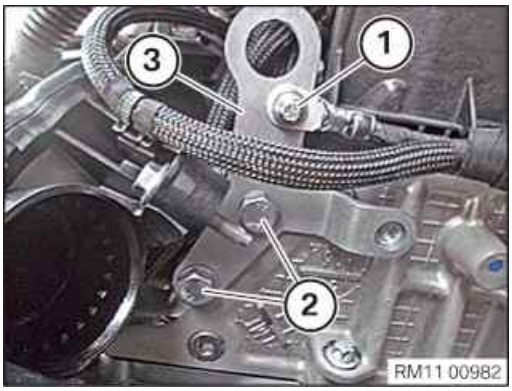
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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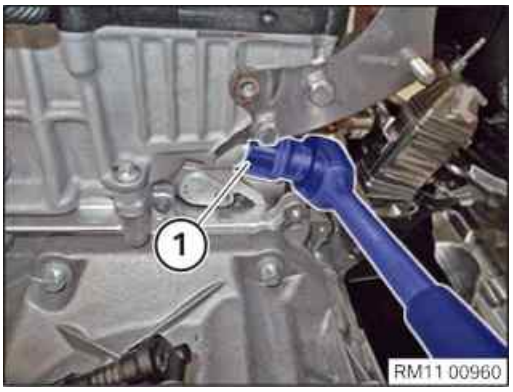
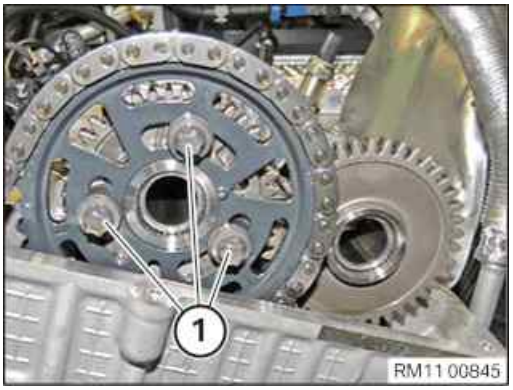


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▸ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

POSTPROCESSES

11 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

12 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

13 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

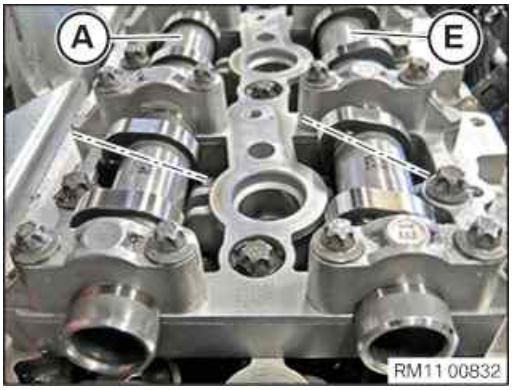
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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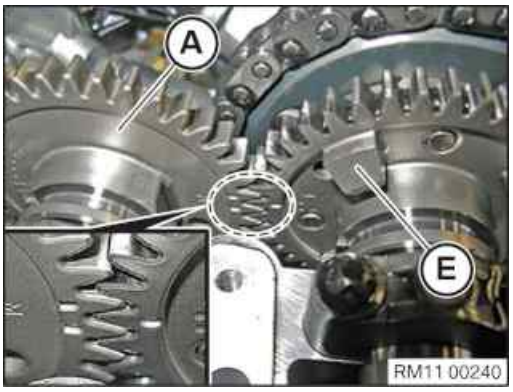


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

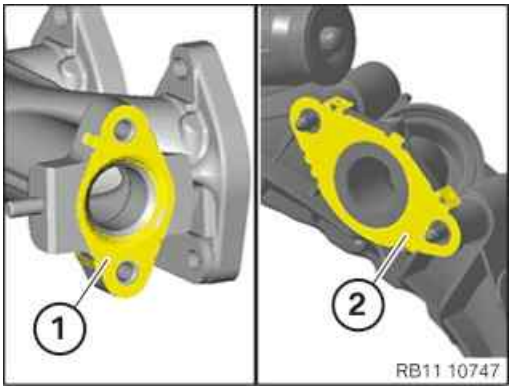
14 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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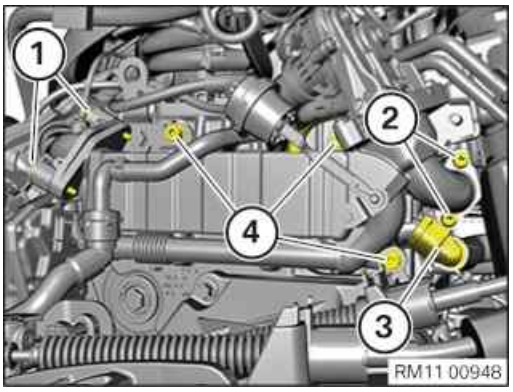


- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

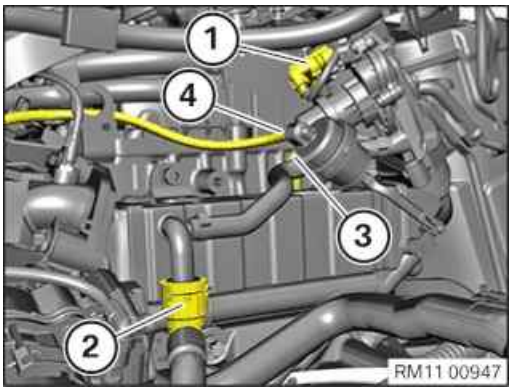
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

15 Connect the coolant line

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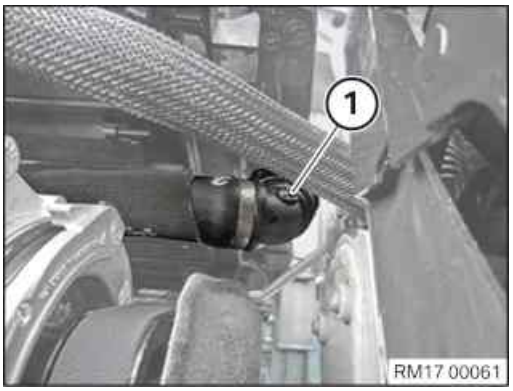
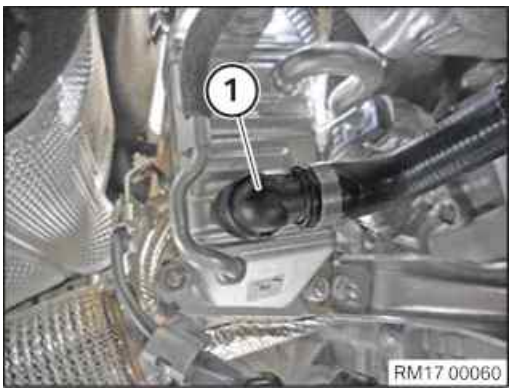
15 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

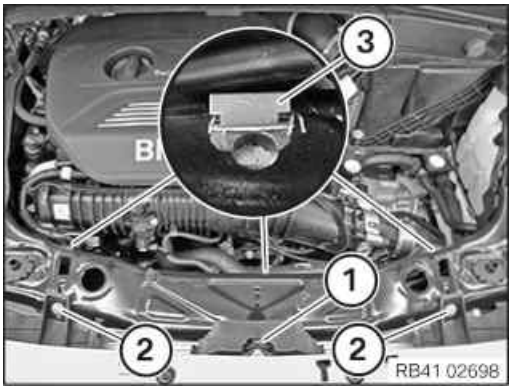


- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

16 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

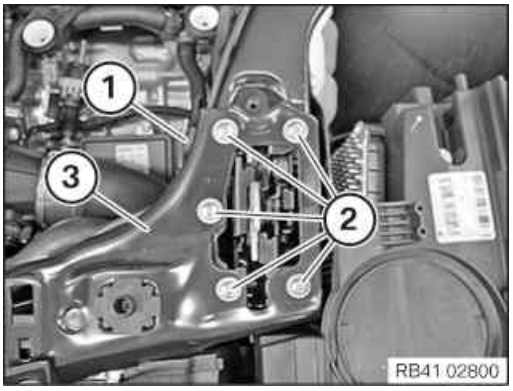
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.



- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

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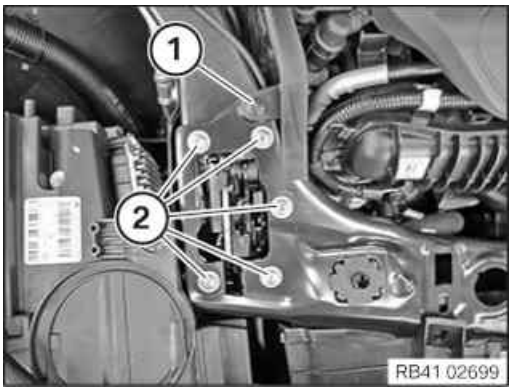


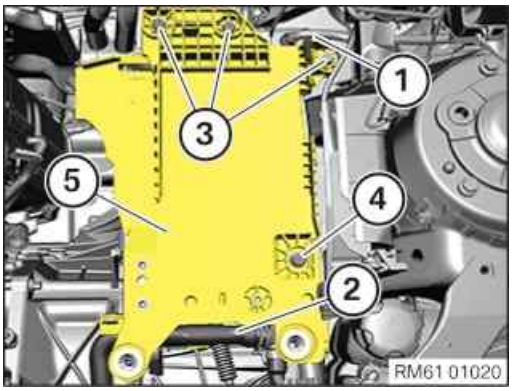
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

17 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

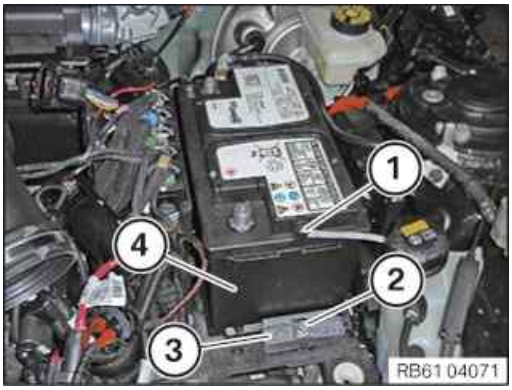
- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

18 – Partially install vehicle battery



- Install vehicle battery (4).
- Correctly position the holder (3).
- Tighten down screw (2).

Battery terminal rail to battery tray

M8		19 Nm

- Fit and clip the vent hose (1) in.

▸ **Check the vent holes of the battery**

WARNING

Gas emission.

Danger of injury! Danger of explosion!

- Assign the vent holes correctly.
- Route the vent hose correctly.

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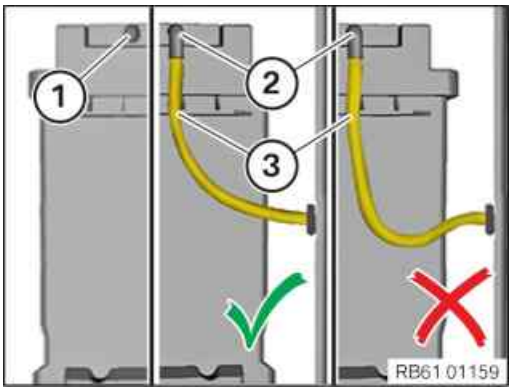
TECHNICAL INFORMATION

The battery has two vent holes, opposite:
One vent hole (1) must be closed correctly with a dummy plug.
The vent hose (3) must be correctly connected and routed at the other vent hole (2).



Check
- Check if the vent hole (1) is correctly closed with a dummy plug.

Result
» No dummy plug.

Measure
- Close the vent hole (1) correctly with a dummy plug.

Check
- Check if the vent hole (2) has a correctly connected vent hose (3).

Result
» The vent hose (3) is not correctly connected.

Measure
- At the vent hole (2), connect the vent hose (3) correctly.

Check
- Check if the vent hose (3) is routed to the outside with a downhill gradient (**no siphon formation!**).

Result
» The vent hose (3) is not correctly routed as shown in the image on the right.

Measure
- Route the vent hose (3) correctly as shown in the centre image.

19 – Install electronics box

Prerequisite
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.
- Route all cables without abrasions, do not trap and crush.

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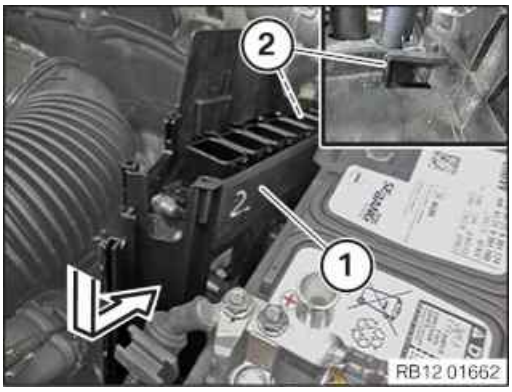
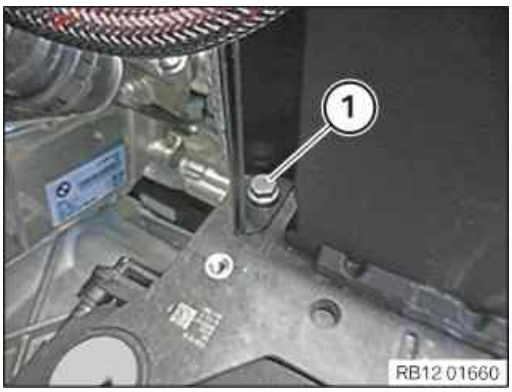


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

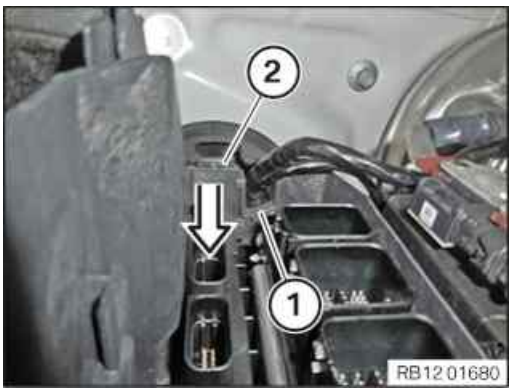
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



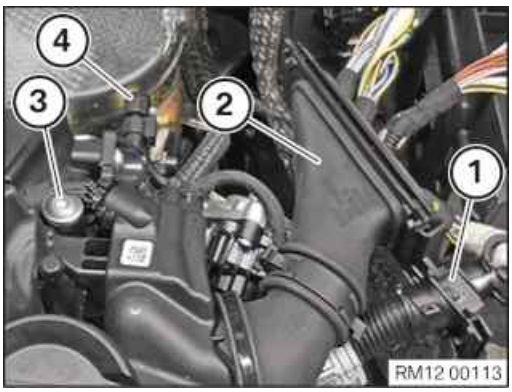
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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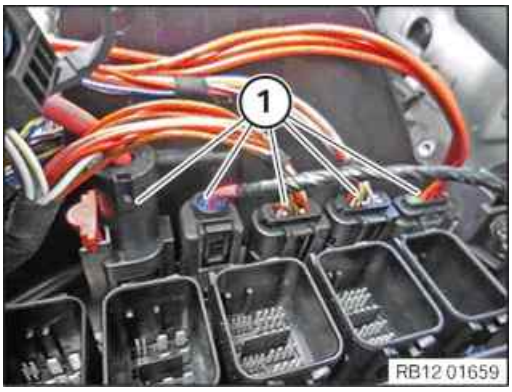
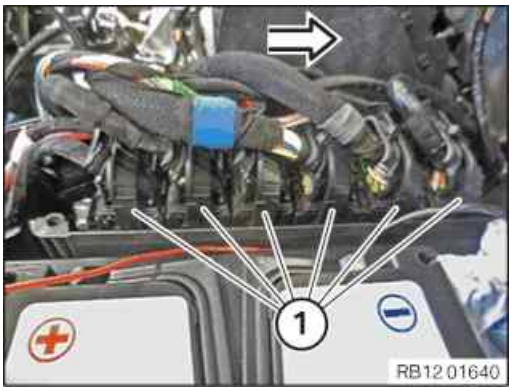
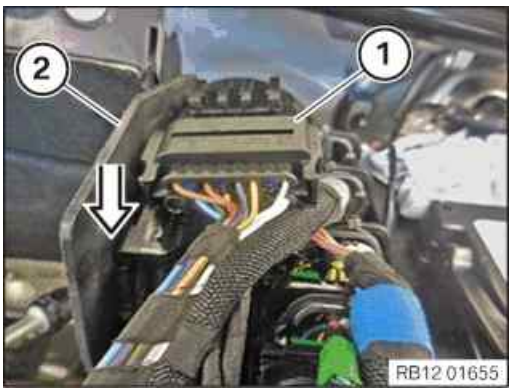


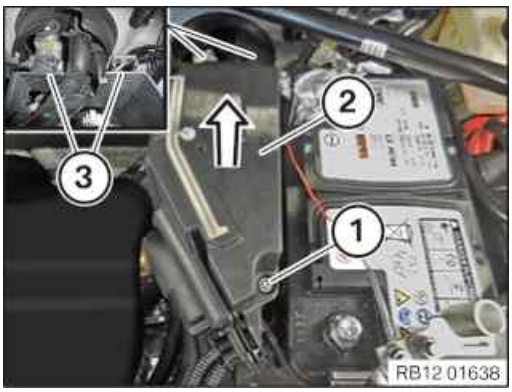
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



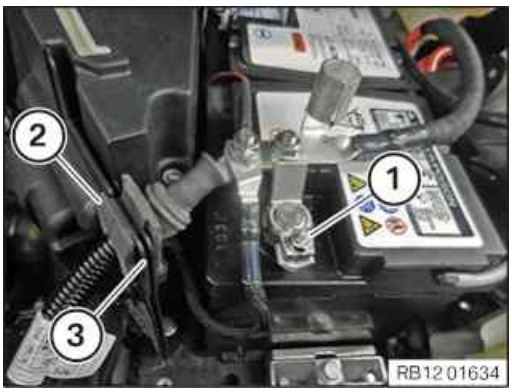
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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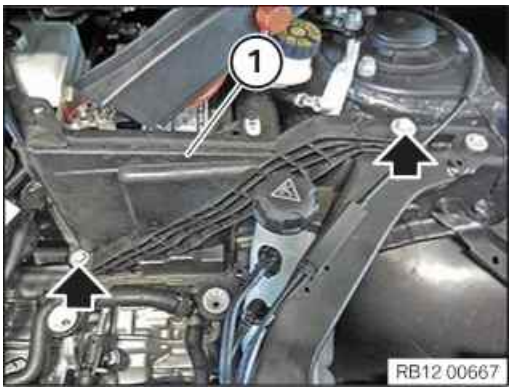


- Feed in and install tension strut (1).
- Tighten screws (arrows).

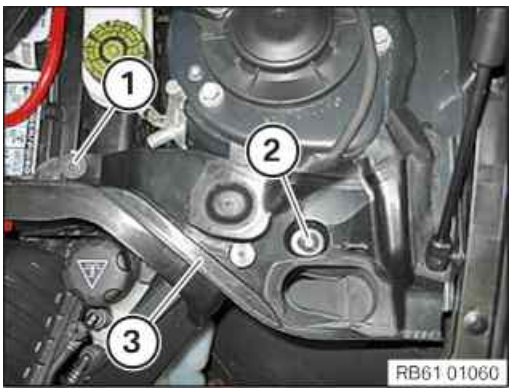
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

20 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

- See additional information.

Additional Information

Overview of Tightening Torques

Intake and exhaust camshaft in camshaft support Used in step 10

M6x31		Tightening torque	10 Nm

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Bearing journal to cylinder head

Used in step 10

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 10

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 10

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 10

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 10

M7x17.			17 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 14

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 14

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 14

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 14

M8x20		Tightening torque	19 Nm

Bracing strut to top cross connection

Used in step 16

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection

Used in step 16

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection

Used in step 16

M6x20		Tightening torque	12 Nm

Battery holder to engine support

Used in step 17

Hexagon screw M8x30		Tightening torque	19 Nm

Battery terminal rail to battery tray

Used in step 18

M8			19 Nm

Electronics box to battery tray

Used in step 19

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 19

TS5x20		Tightening torque	3,5 Nm

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Cover to electronics box — Used in step 19

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 19

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 19

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 19

		Tightening torque	3 Nm

Battery cover — Used in step 19

Screw		2,8 Nm

Overview of Special Tools

2 288 380 Locating stud

Common — Used in step 8 10 12 13

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common — Used in step 9 10 11 13

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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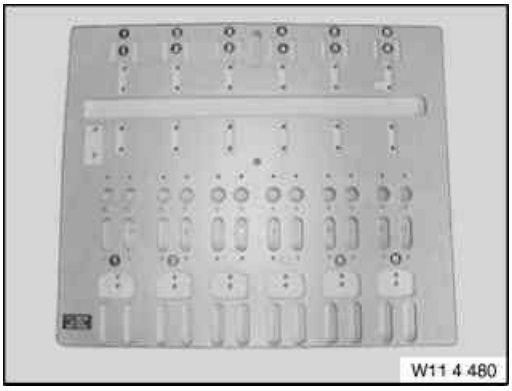
0 495 105 (11 4 480) oddments tray

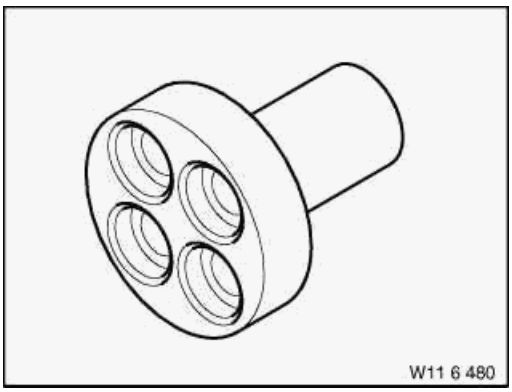


Common	Used in step 10
Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 493 380 (11 6 480) Connector



Common	Used in step 10 13
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 14

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Repair instructions	Used in step
11 31 005 Check the timing of the camshaft(s)	1
11 31 005 Check the timing of the camshaft(s)	1
11 31 005 Check the timing of the camshaft(s)	1
11 31 005 Check the timing of the camshaft(s)	1
11 31 005 Check the timing of the camshaft(s)	1
11 31 005 Check the timing of the camshaft(s)	1
11 31 005 Check the timing of the camshaft(s)	1
11 31 005 Check the timing of the camshaft(s)	1
11 31 005 Checking camshaft timing	1
11 31 005 Check the timing of the camshaft(s)	1
11 31 005 Check the timing of the camshaft(s)	1
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11 31 005 Check the timing of the camshaft(s)	1
11 31 005 Check the timing of the camshaft(s)	1
61 35 ... Notes on ESD protection (Electro Static Discharge)	2
17 00 008 Draining and topping up coolant for high-temperature circuit	20
17 00 008 Draining and topping up coolant for high-temperature circuit	20
17 00 008 Draining and topping up coolant for high-temperature circuit	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	20
17 00 039 Bleeding cooling system (B37, B47)	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	20
17 00 008 Draining and topping up the high-temperature coolant circuit	20
17 00 008 Draining and topping up the high-temperature coolant circuit	20
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	20
17 00 008 Draining and topping up the high-temperature coolant circuit	20
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	20
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	20
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	20
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	20
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	20

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	10
Exhaust-gas recirculation cooler seal on exhaust manifold	14
Exhaust-gas recirculation cooler seal on intake plenum	14

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11 31 005 Check the timing of the camshaft (s)

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

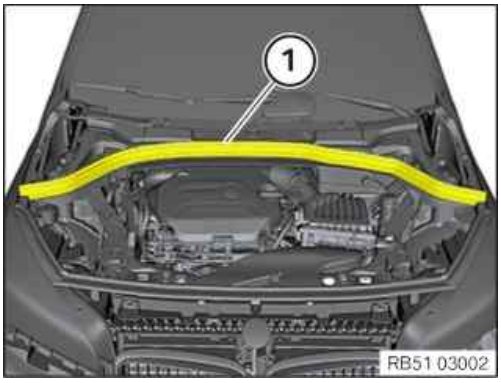
1 – Disconnecting all battery earth leads

- See additional information.

2 – Remove the seal for the rear bonnet

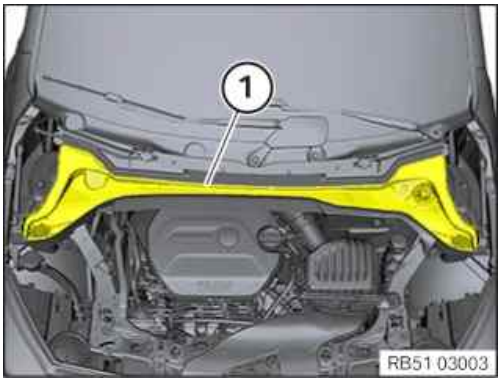
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

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4 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

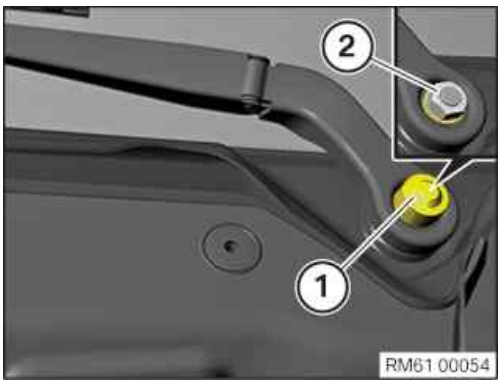
▶ **Remove the wiper arm**

RISK OF DAMAGE

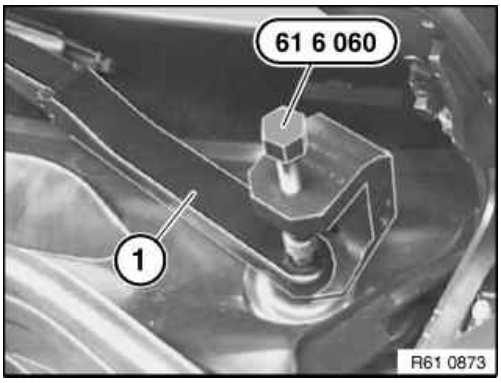
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

5 – Remove the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**

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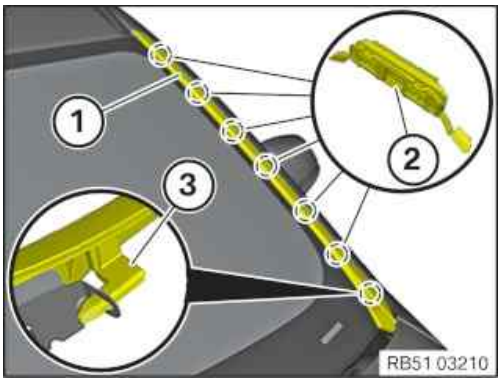
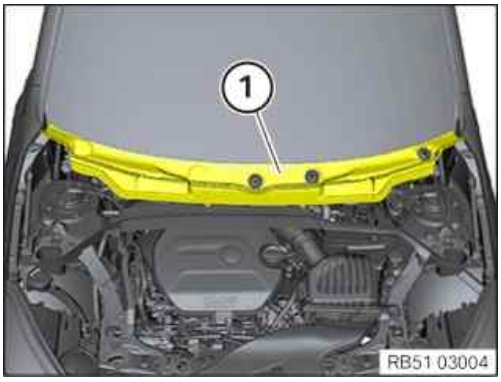


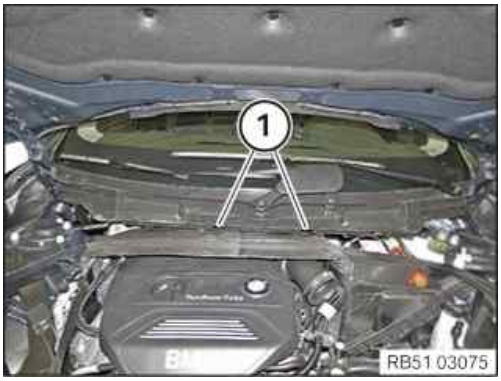
- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

6 – Remove the rear cowl panel cover

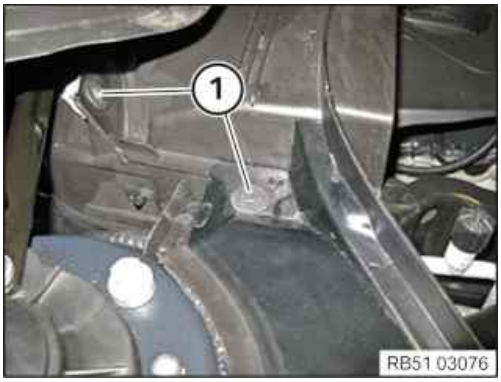


- Disengage and guide out the rear cowl panel cover (1) towards the top.

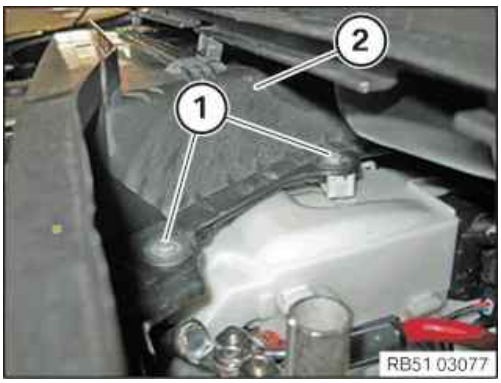
7 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

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8 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

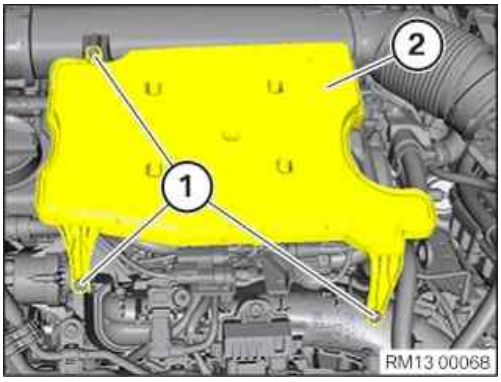
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

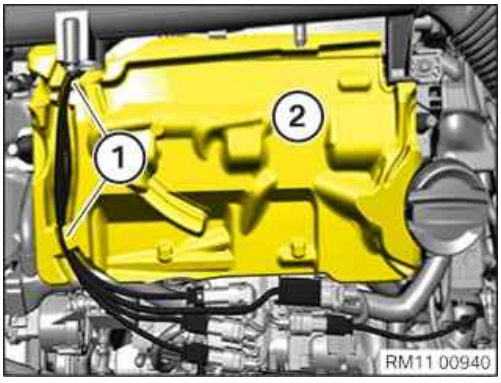
- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

10 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

11 – Remove the intake neck for intake silencer housing

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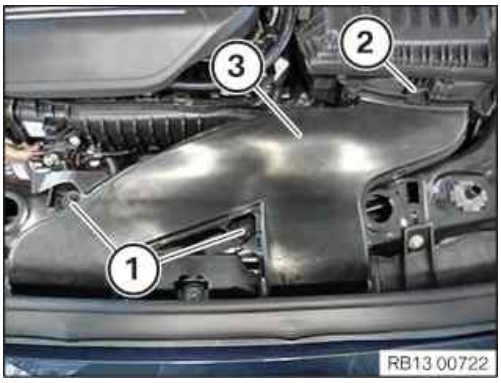
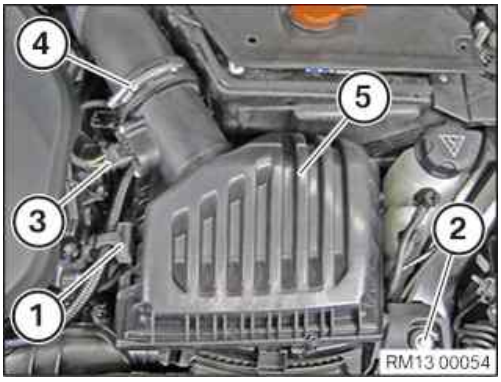


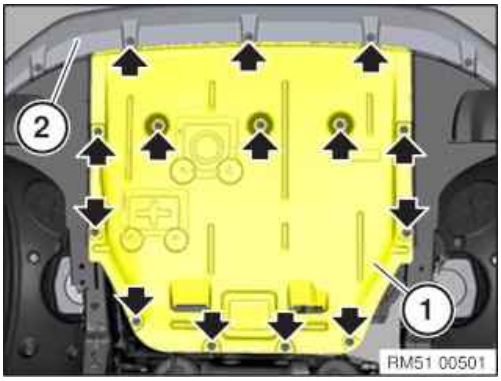
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

12 – Removing intake silencer housing



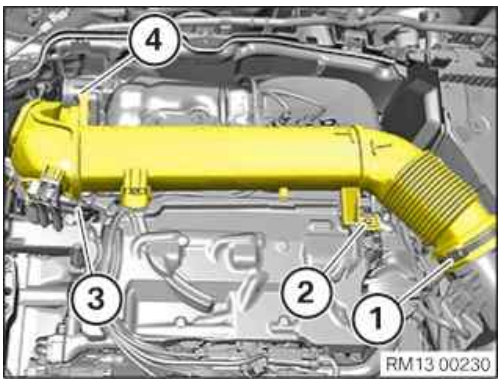
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

13 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

14 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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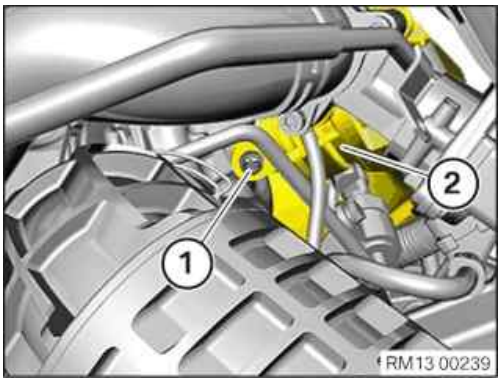
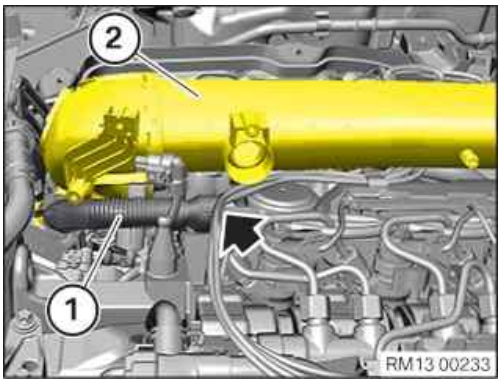


- Unscrew the screw (1) from the clean air pipe (2).

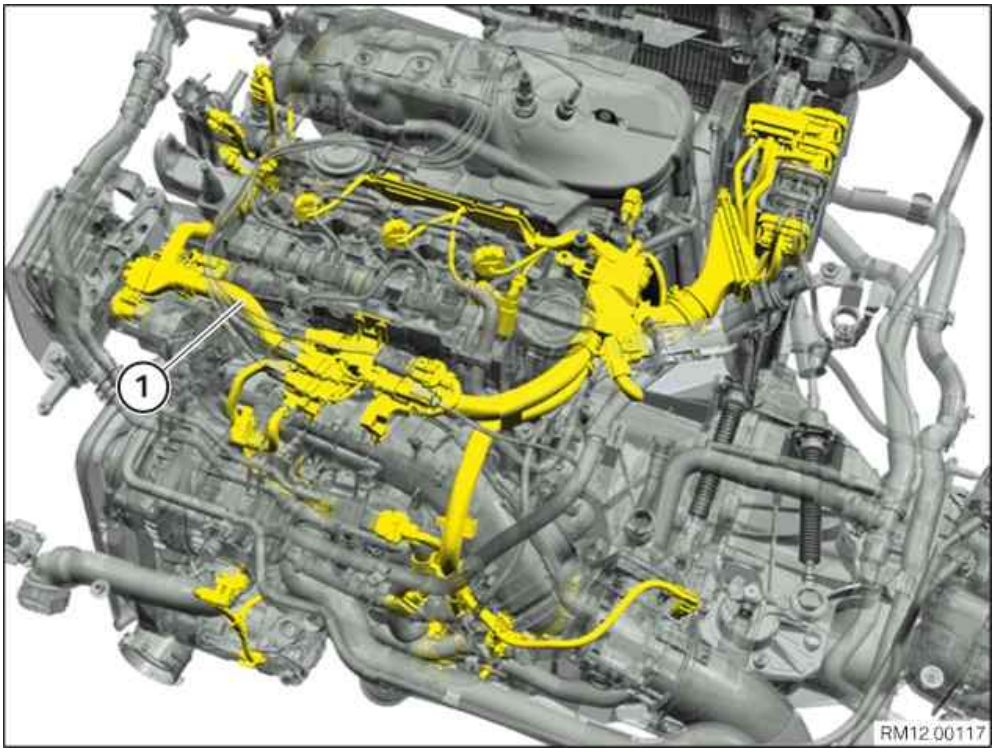


- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

15 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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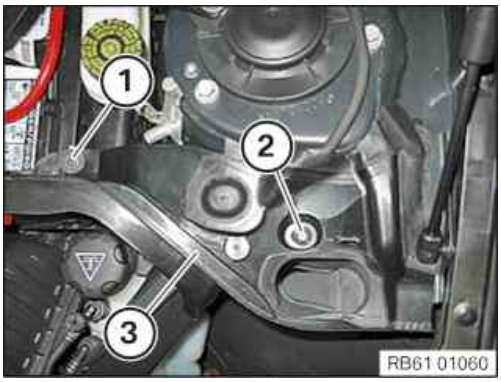
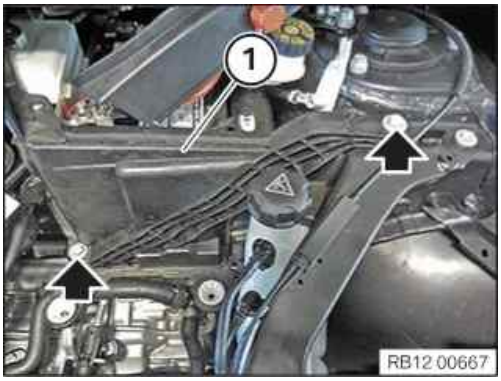
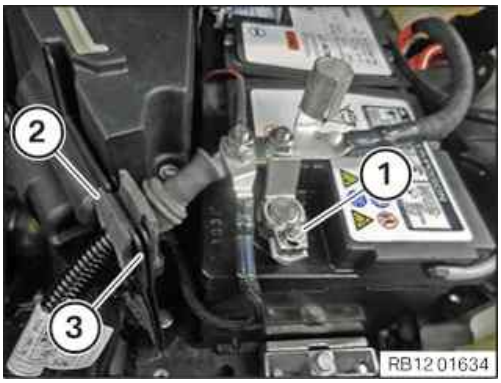


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

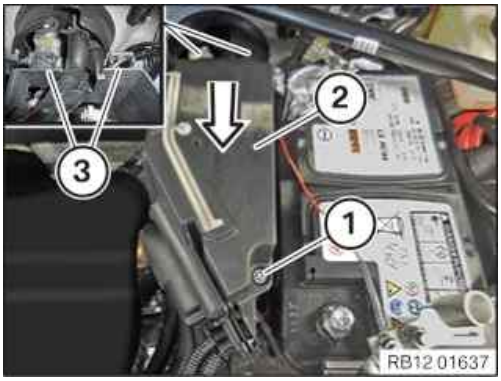
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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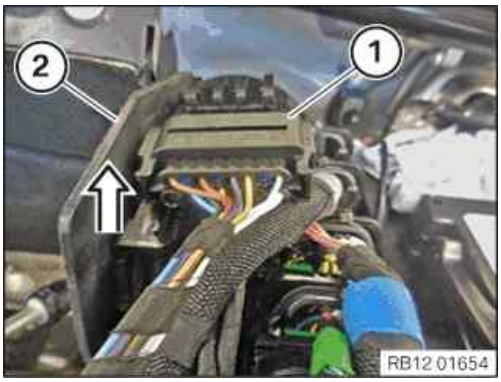
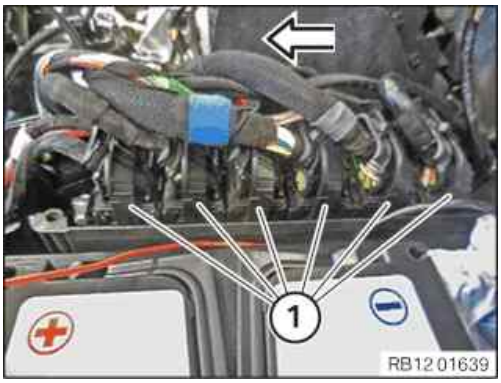
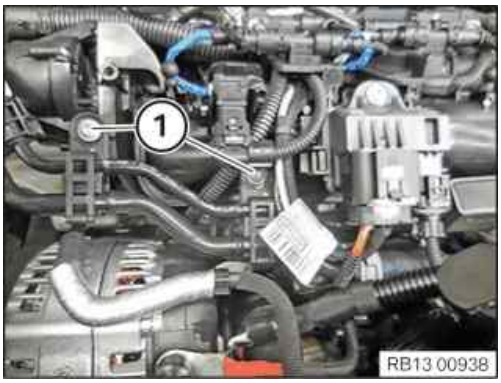


- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).

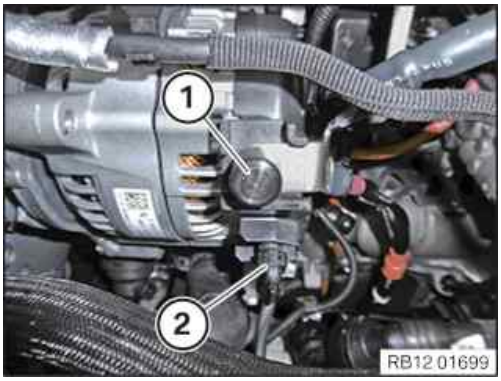


- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).



- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

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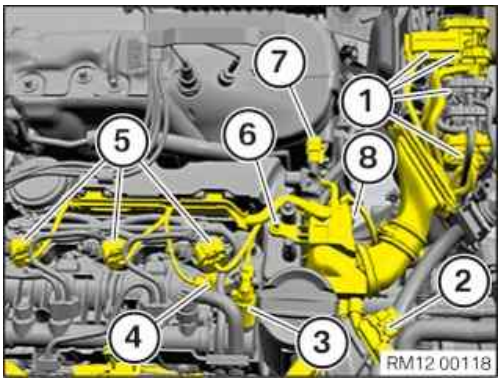
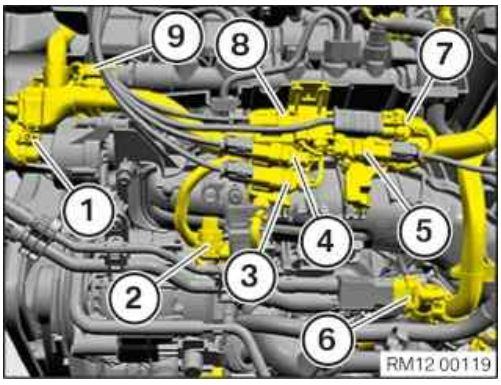
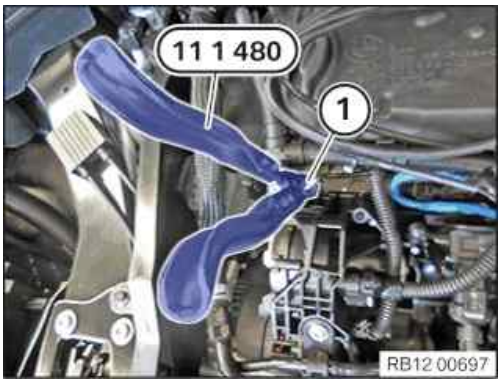


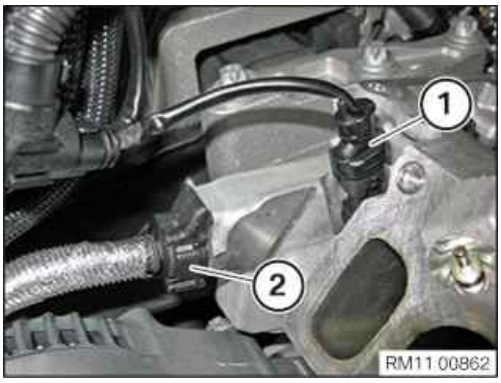
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.

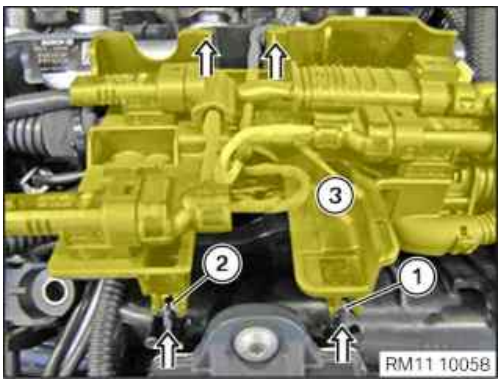


- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

16 – Removing the cable clips from the intake plenum



- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

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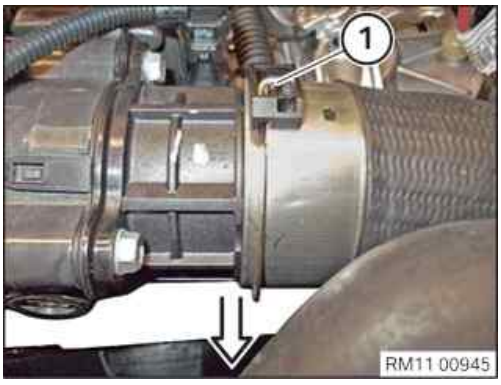
17 – Removing the intake plenum

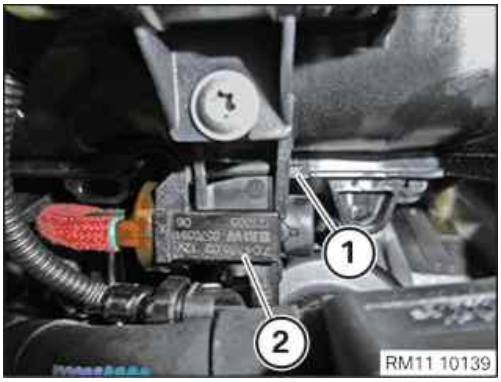
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

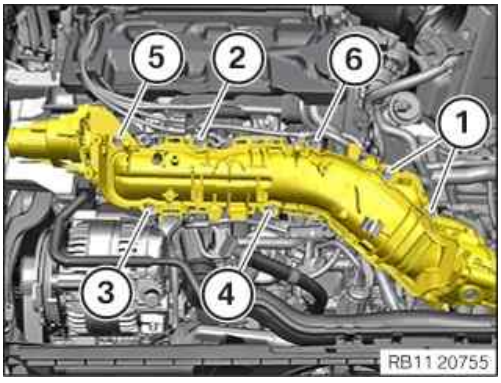
- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.

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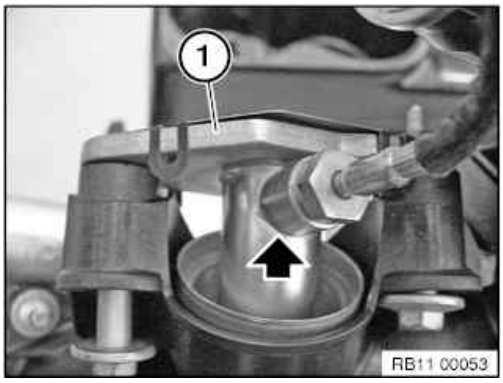

- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

18 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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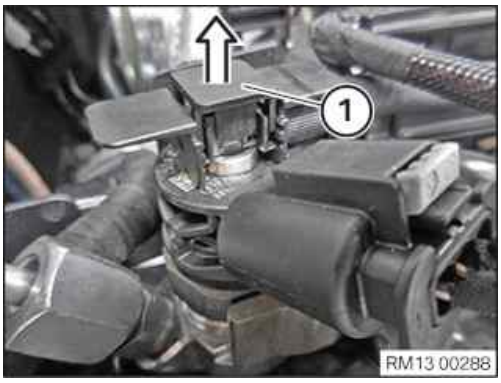

- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

19 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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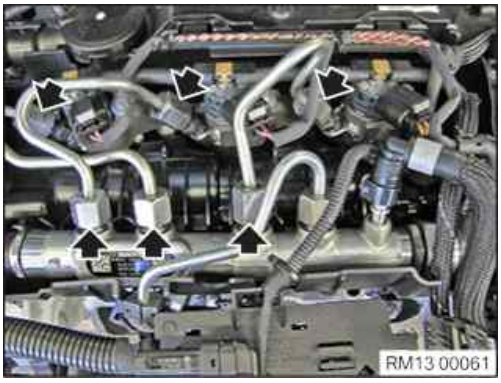
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

20 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

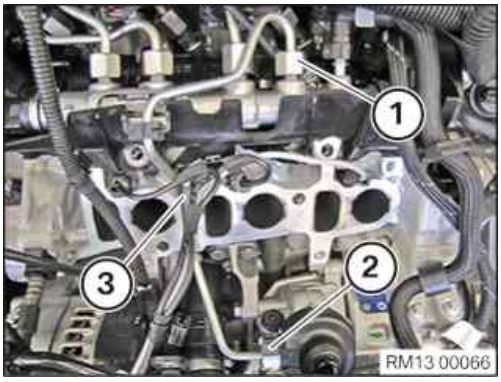
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

21 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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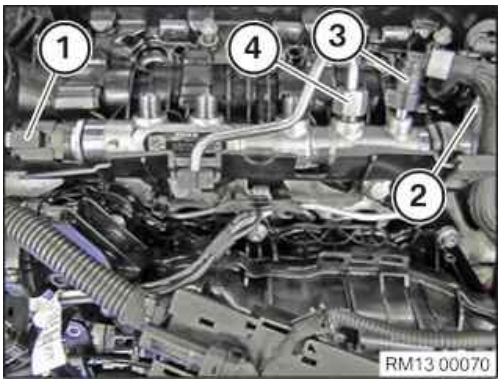
TECHNICAL INFORMATION

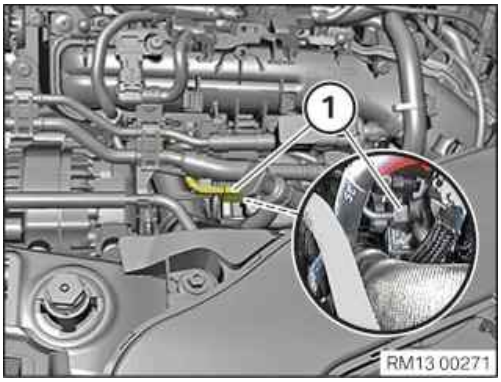
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

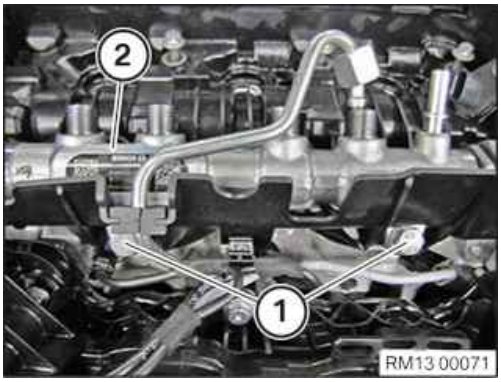
Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.



- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

22 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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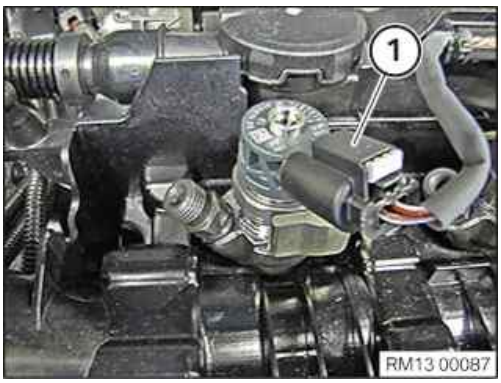
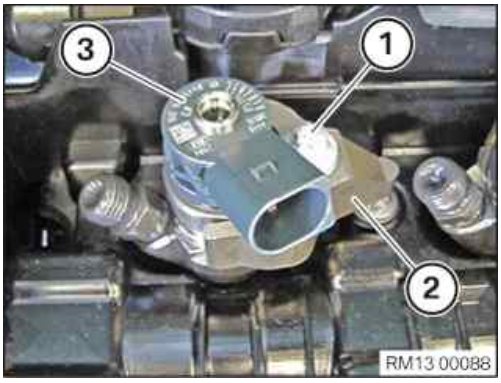
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

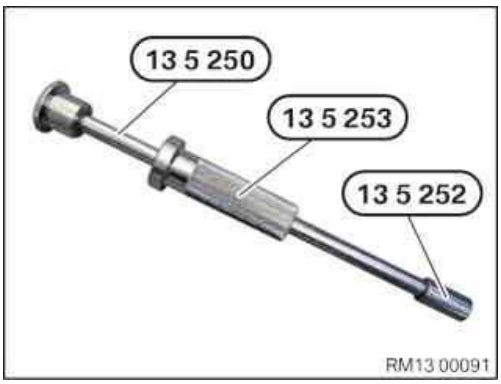
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

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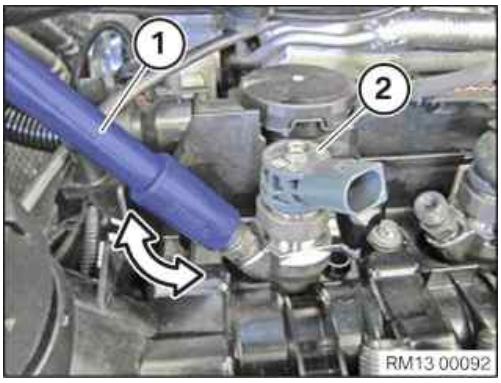


- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

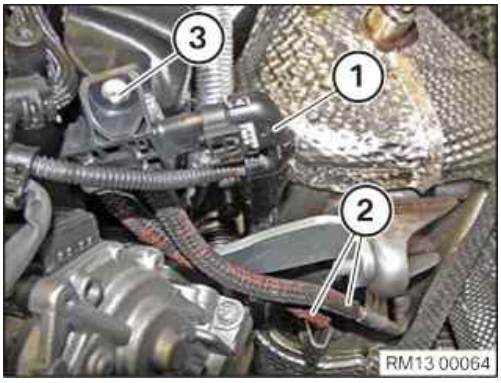
23 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

24 – Removing the cylinder head cover

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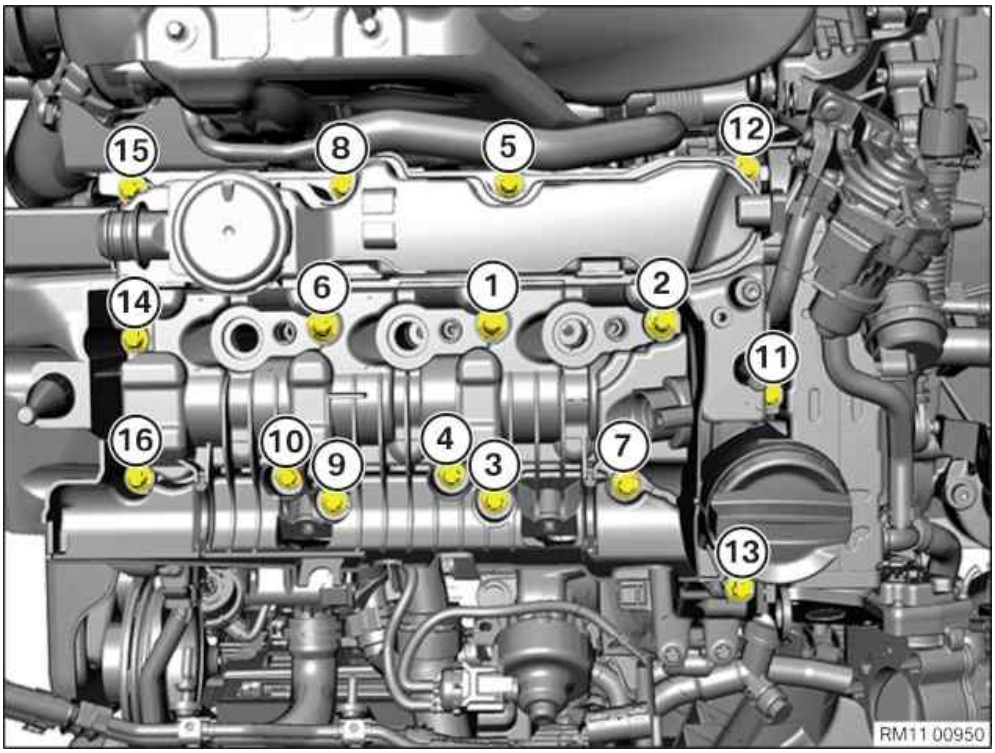
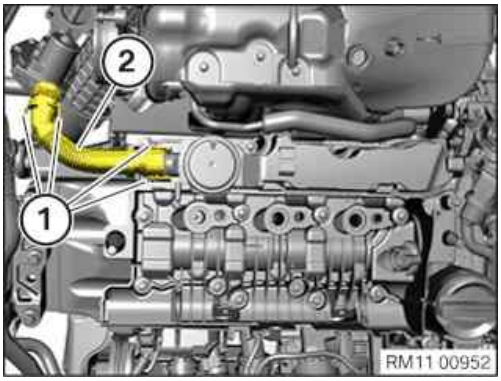
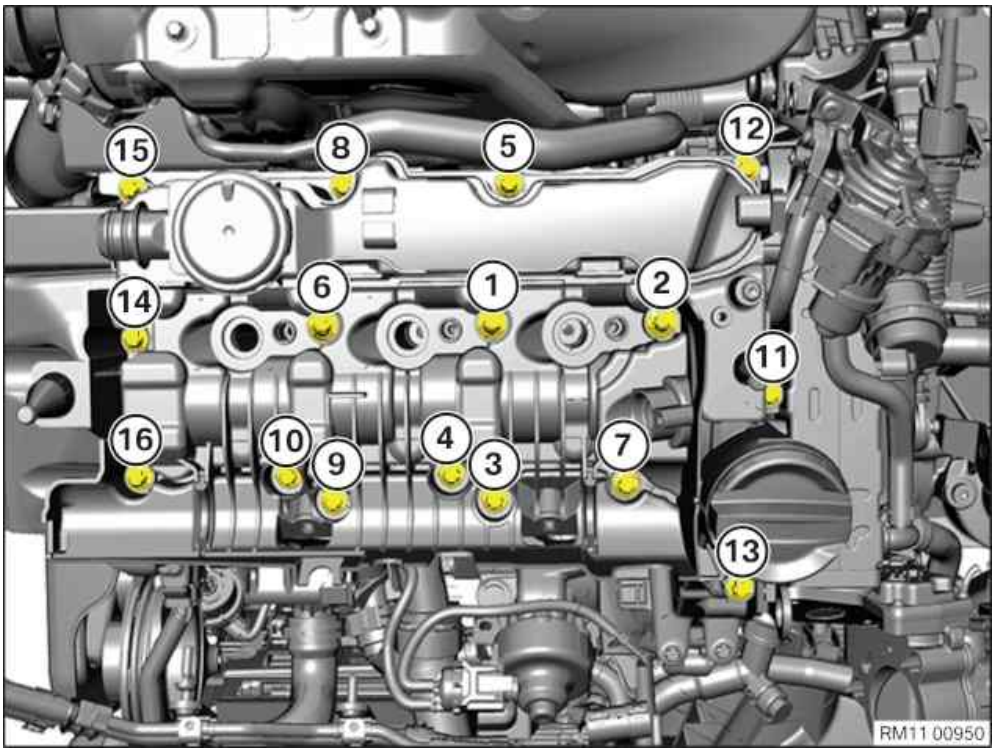
Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

25 – Remove front right wheel

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TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

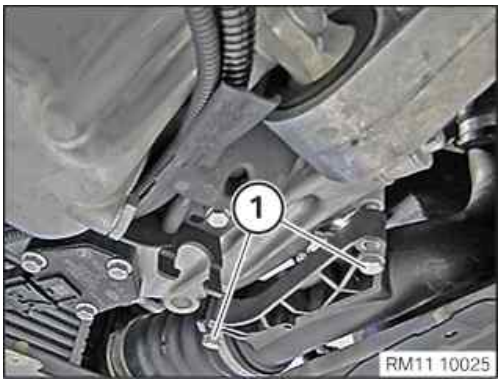
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

26 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).

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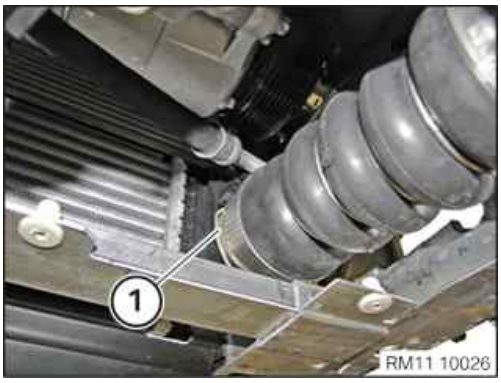
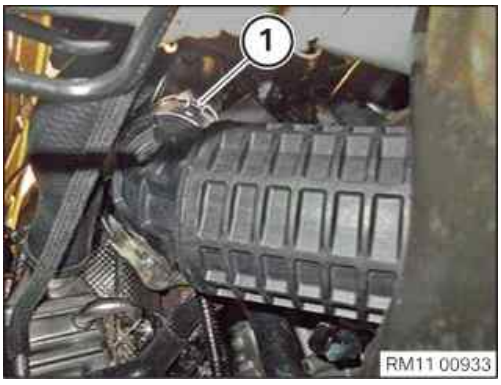
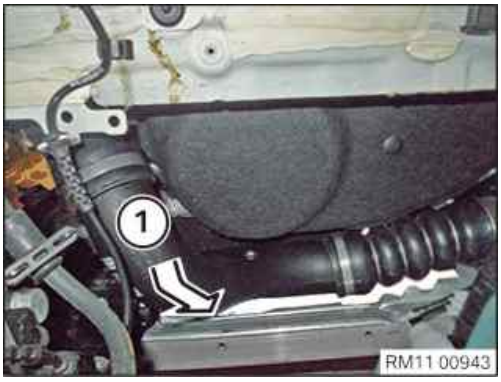


- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

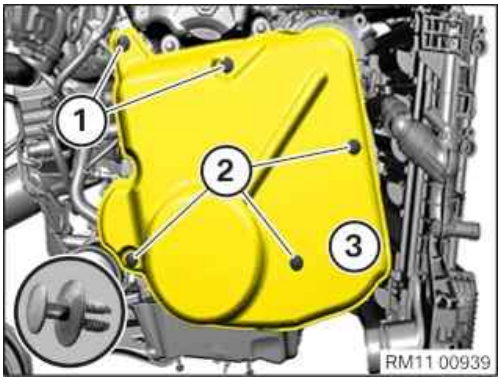


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

27 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

MAIN WORK

28 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

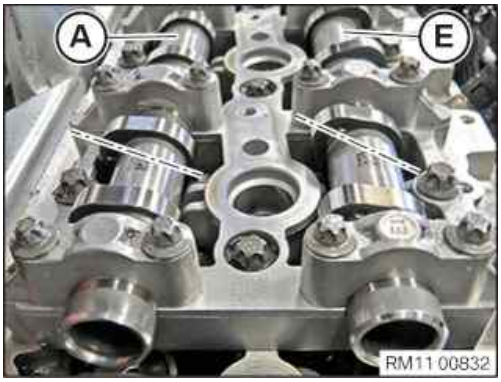
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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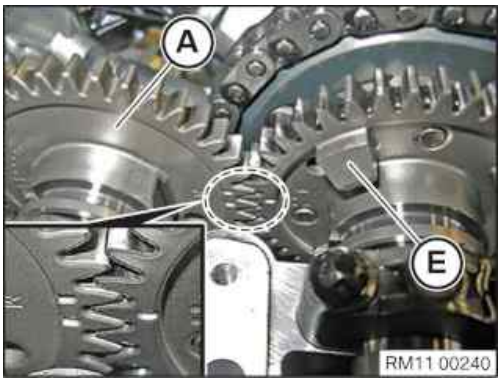


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

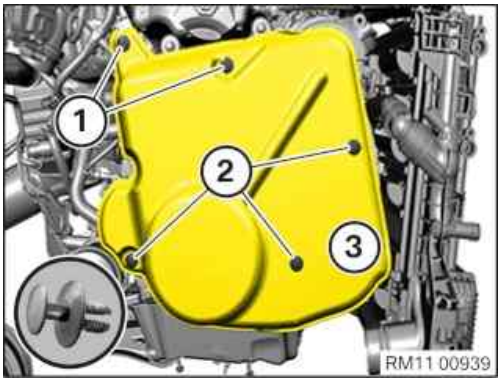
If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

POSTPROCESSES

29 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

30 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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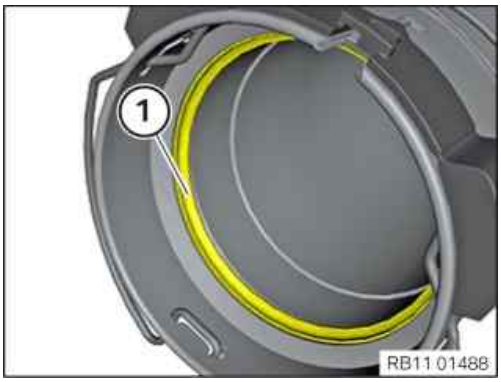
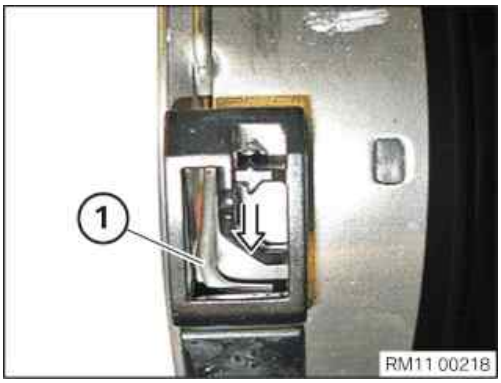
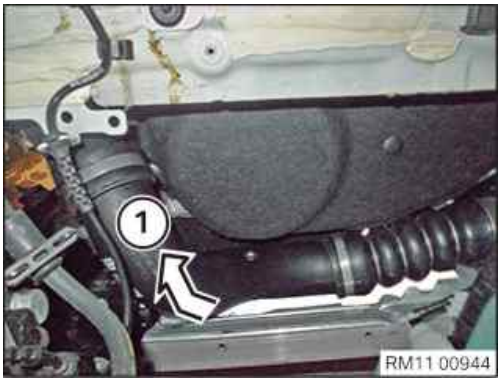


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

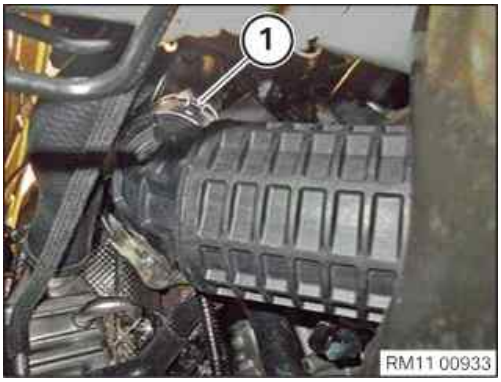
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

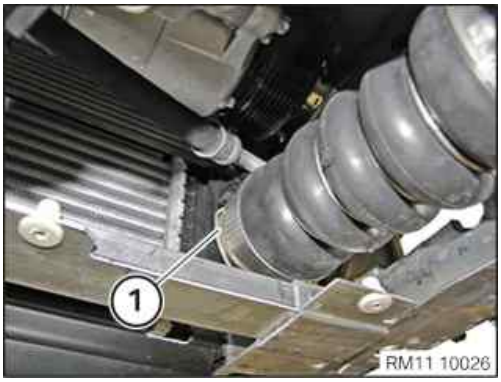


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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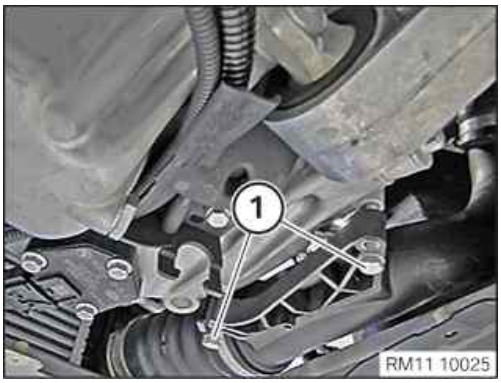
- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

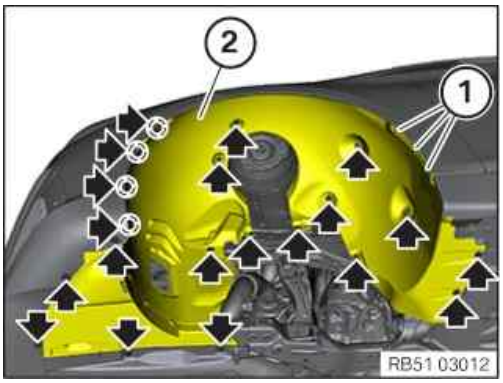


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

31 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

32 – Installing cylinder head cover

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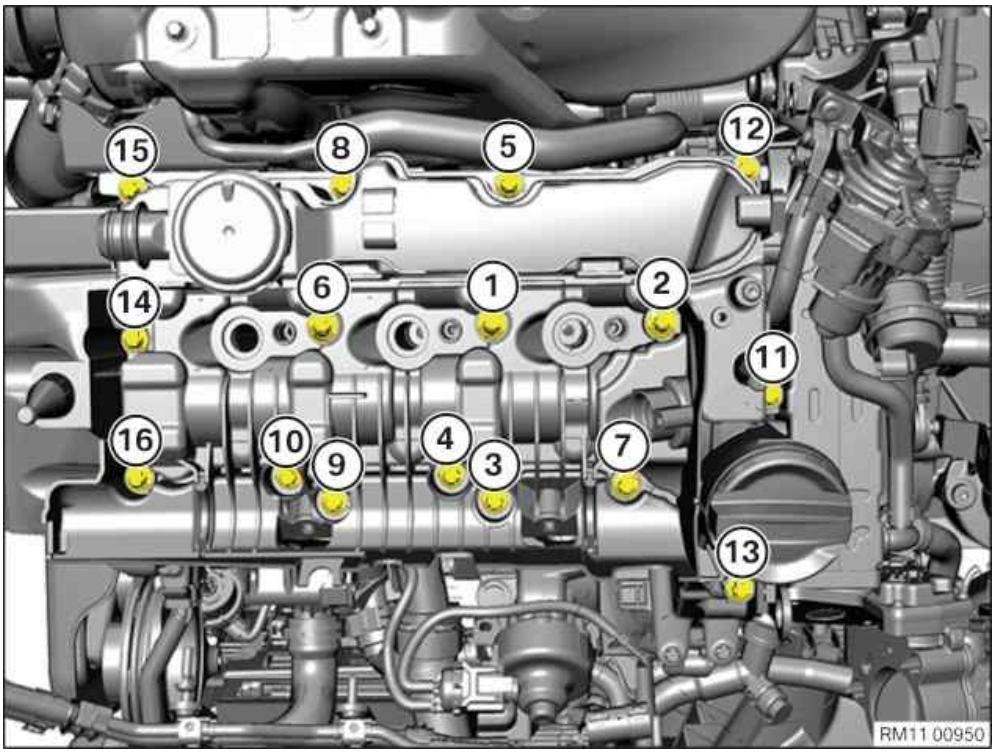
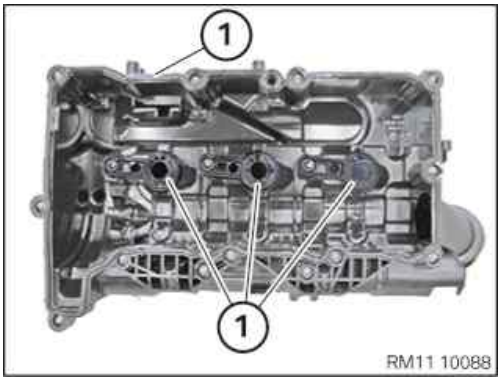
Overview: Screw connection of the cylinder head cover

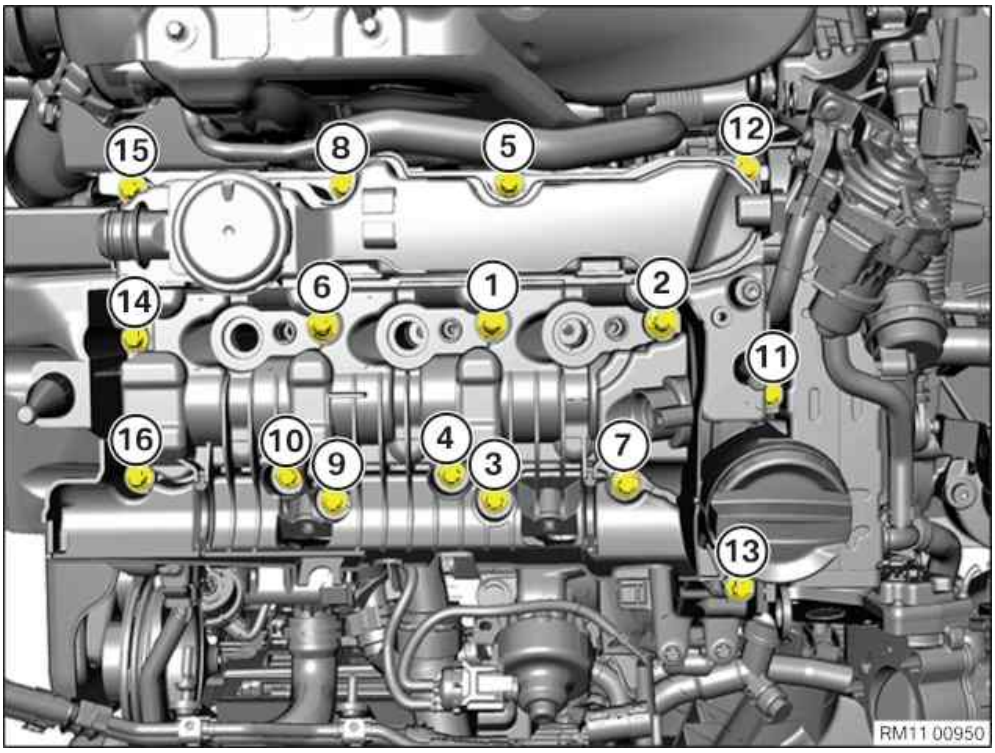


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nm

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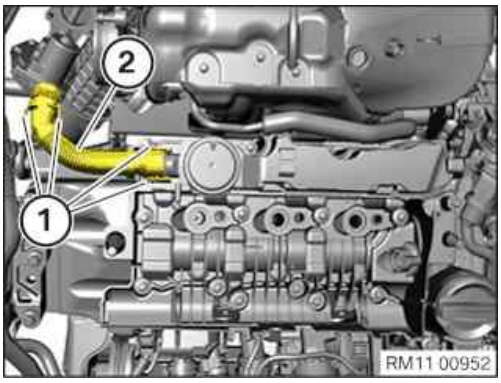
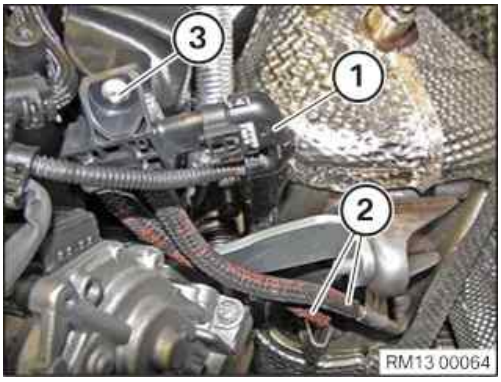


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

33 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

34 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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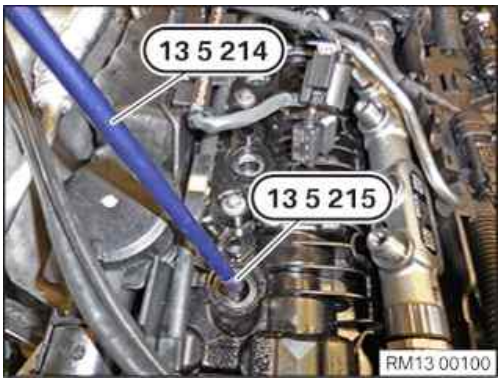
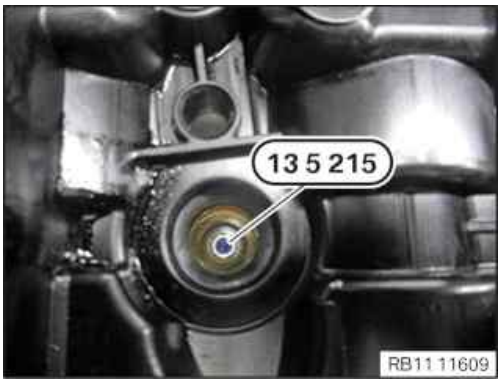


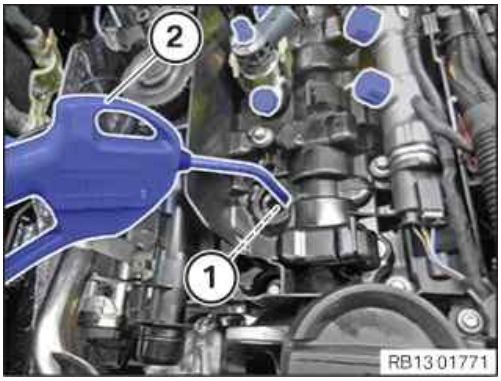
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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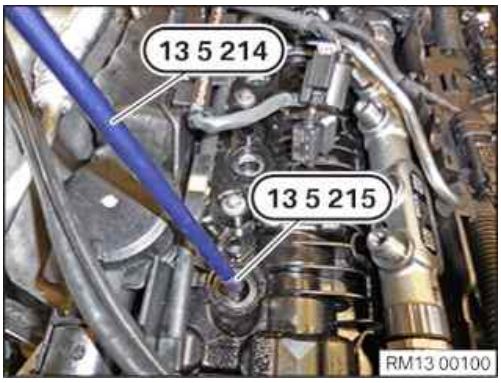


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

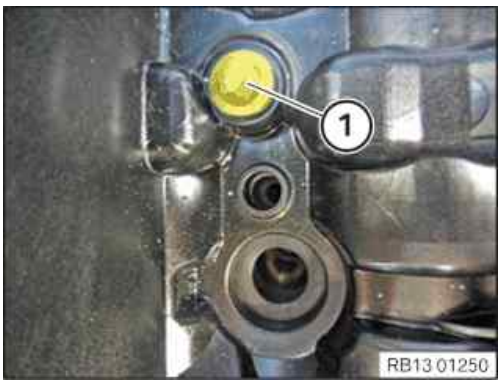
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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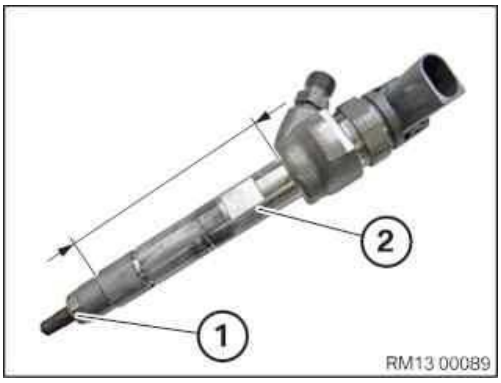


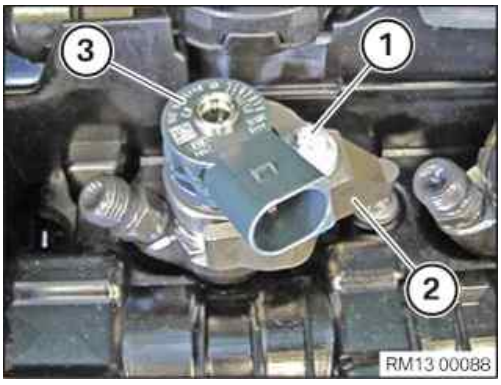
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

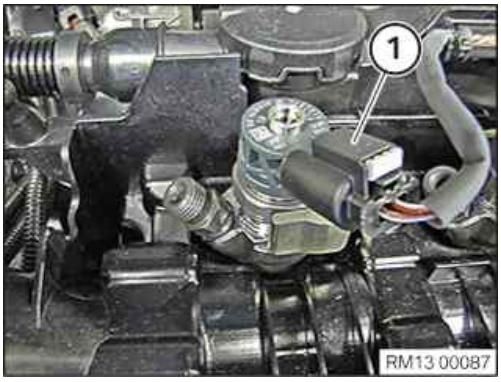
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

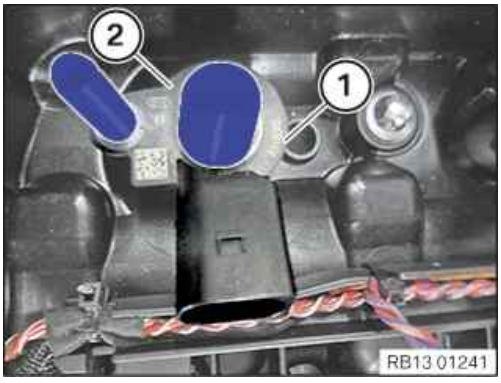
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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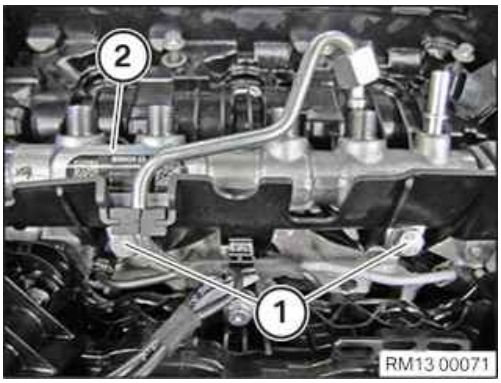
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

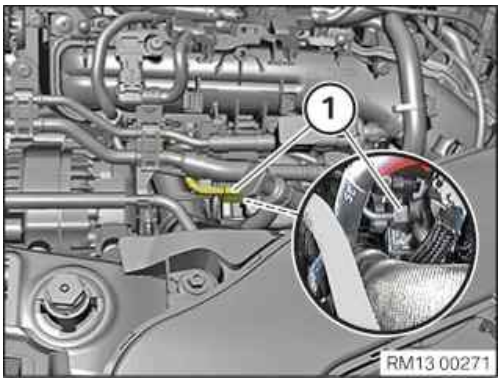
35 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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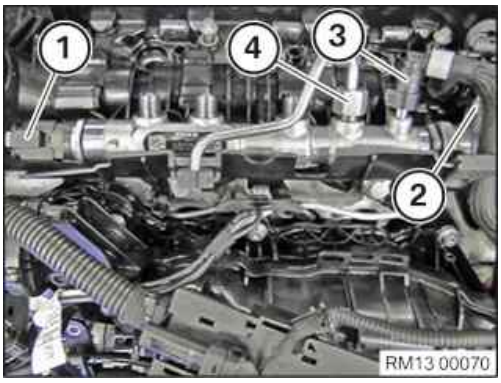

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

36 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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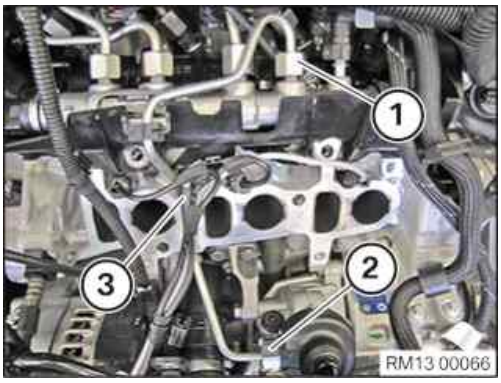

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

37 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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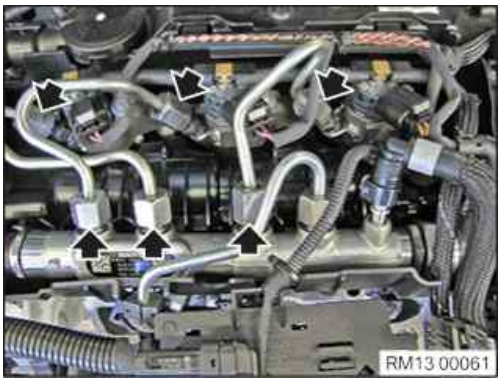


- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

38 – Connect the leakage oil line on the injector

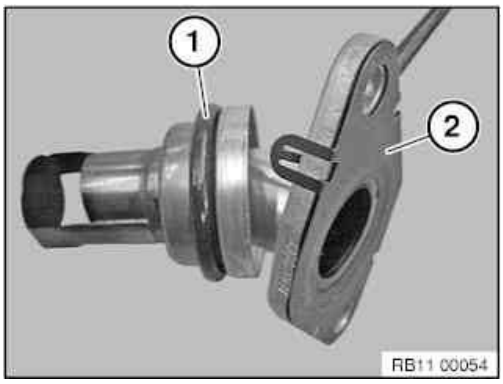
- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

39 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

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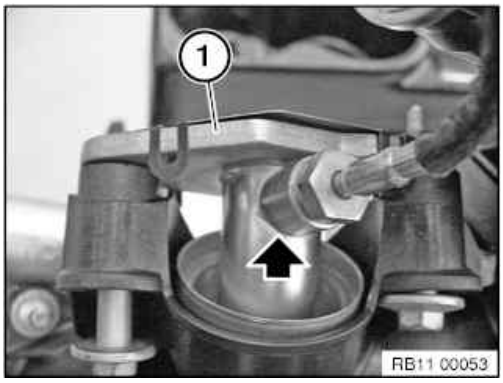
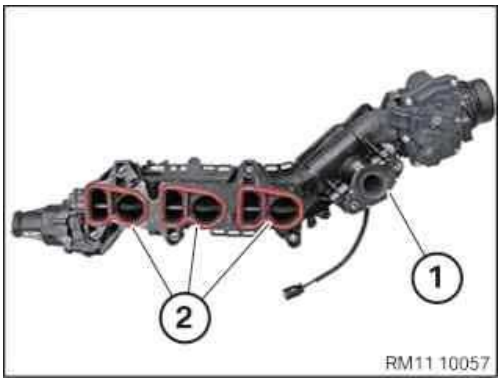
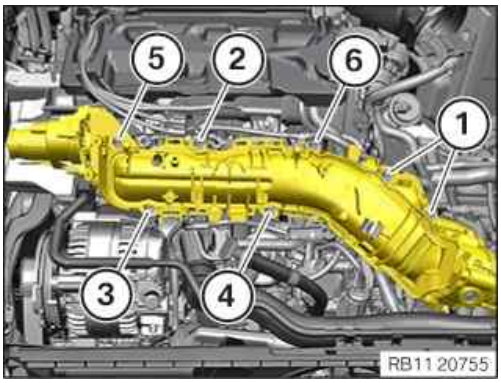


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

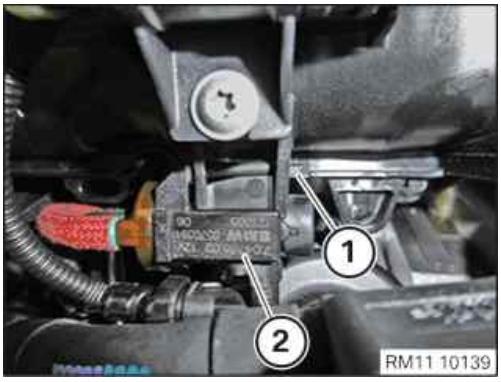
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



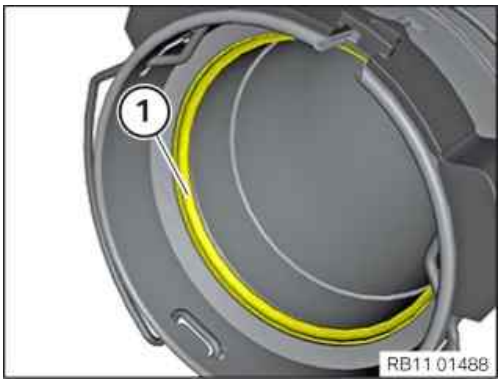
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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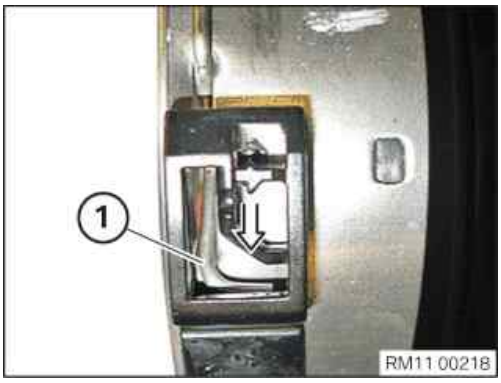
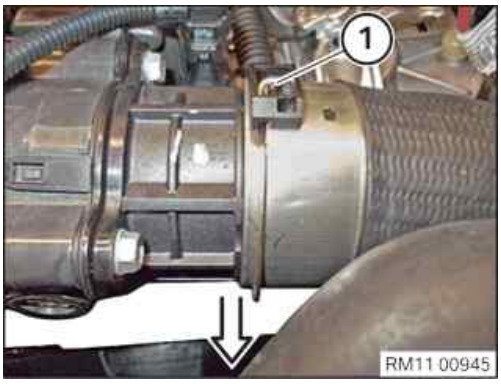
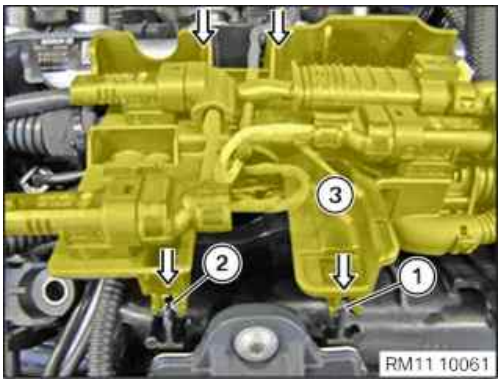


- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

40 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

41 – Fastening the wiring harness section for the intake plenum

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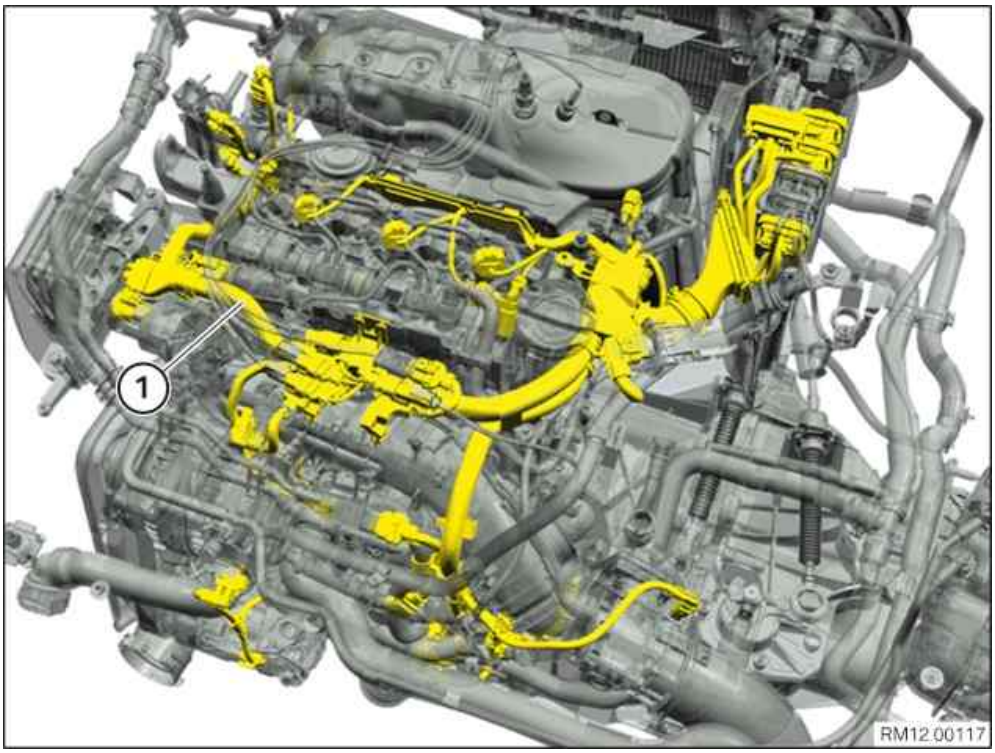
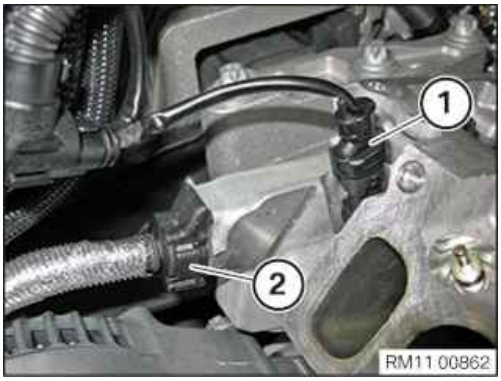
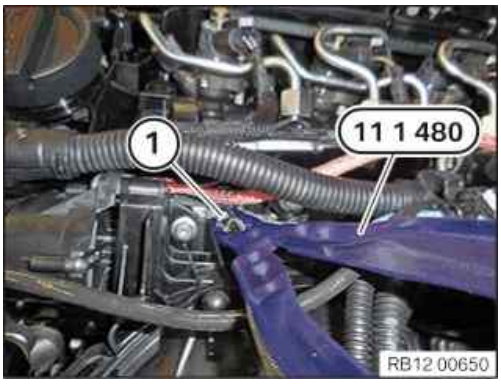
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

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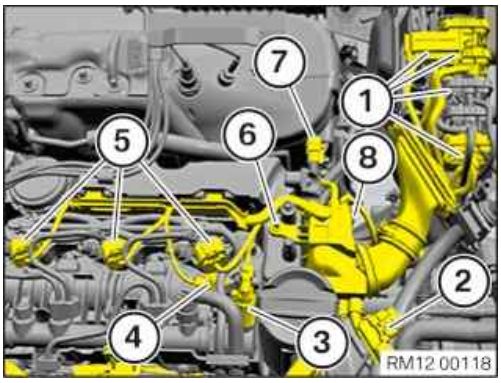
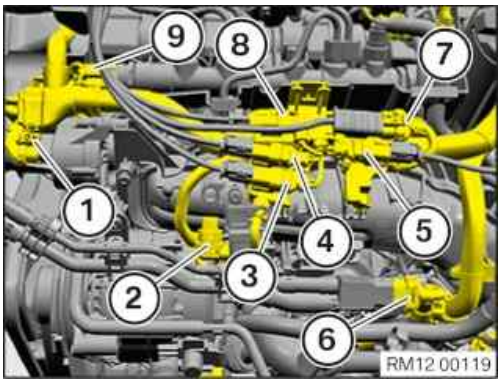


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

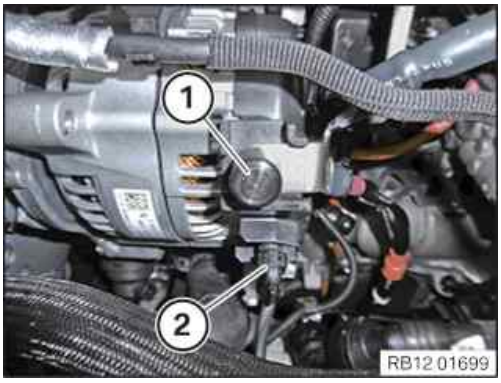
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

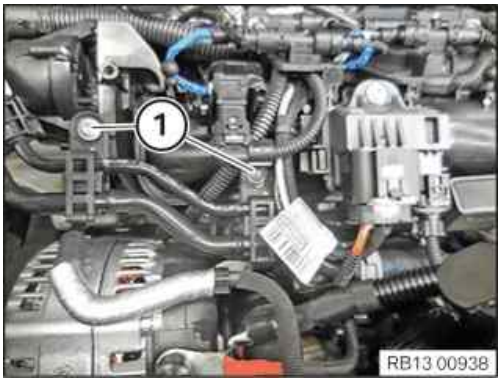


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm



- Position fuel lines.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

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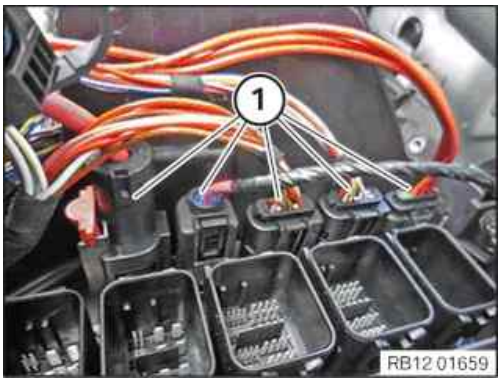
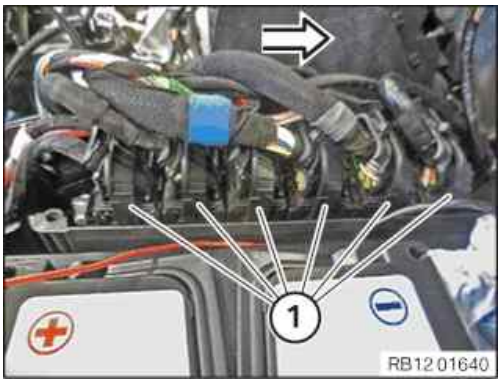
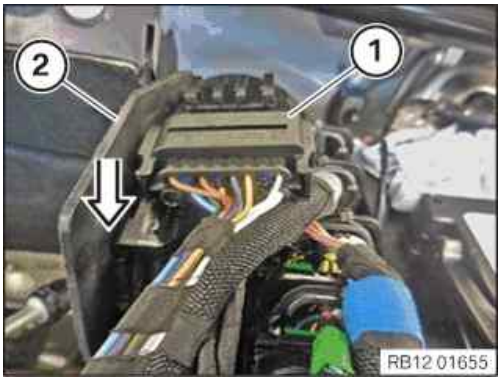


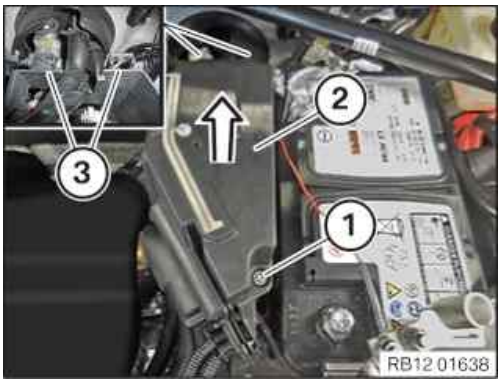
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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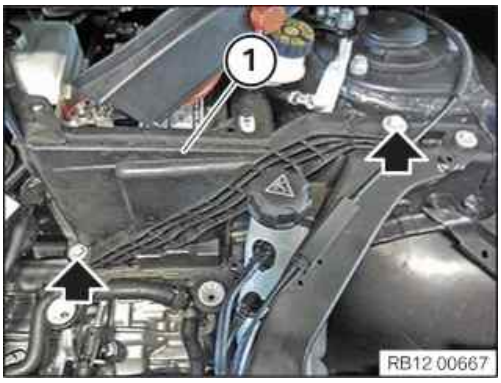


- Feed in and install tension strut (1).
- Tighten screws (arrows).

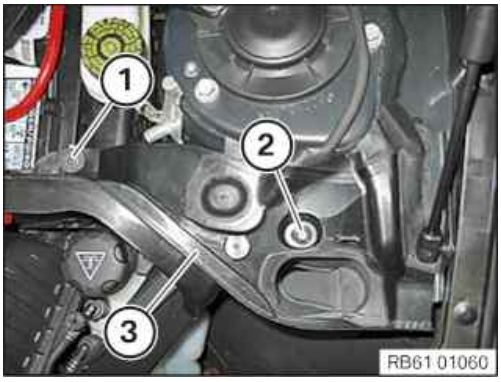
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

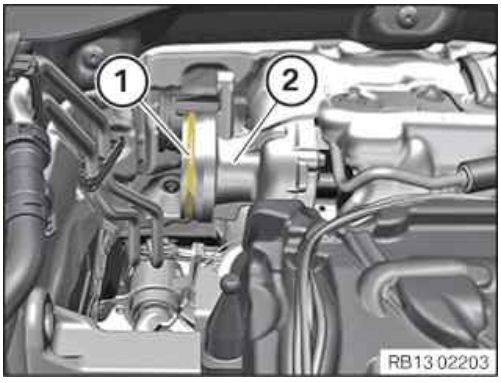


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

42 – Partially securing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.

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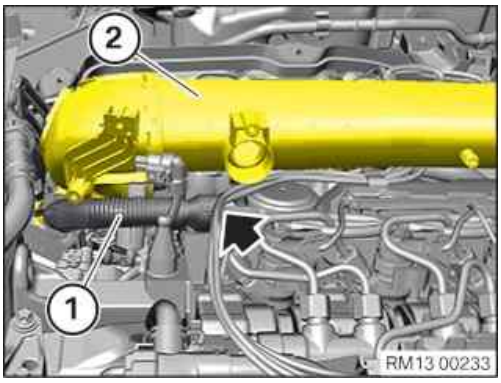
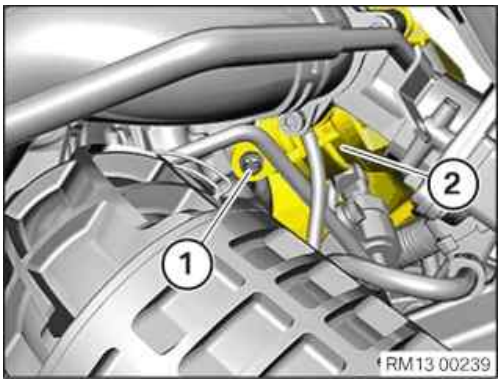


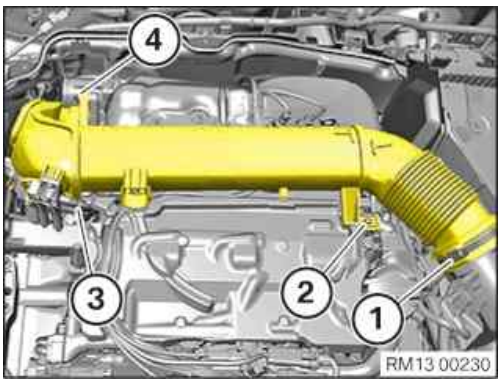
- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

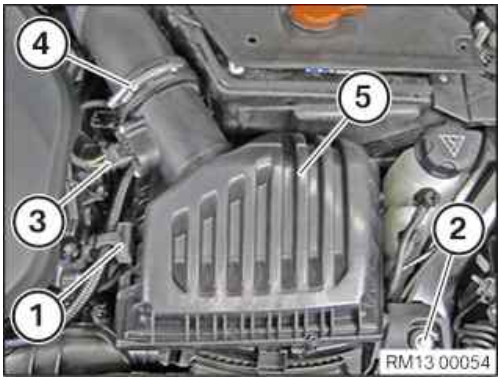
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

43 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

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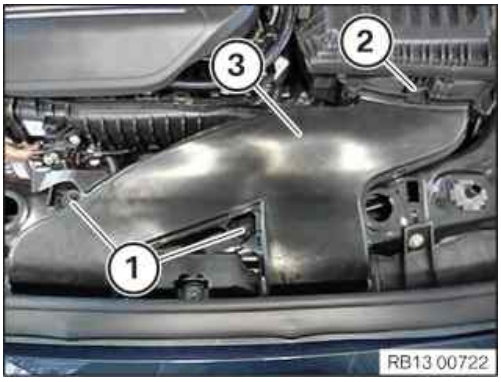
44 – Install the intake neck for the intake filter housing



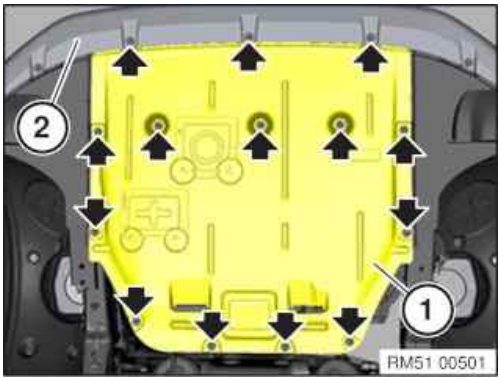
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

45 – Installing the front underbody protection

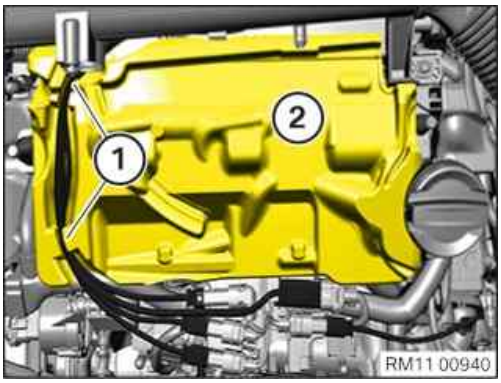


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

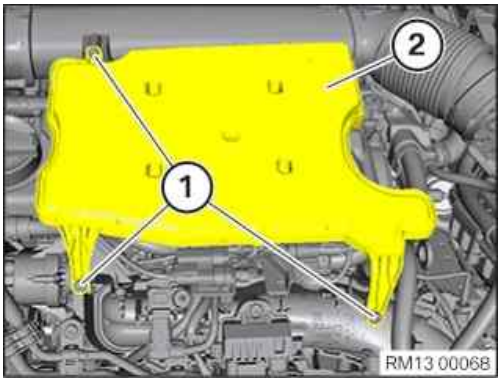
			3 Nm

46 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

47 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

48 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

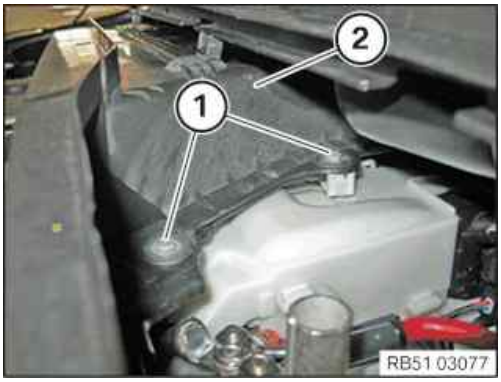
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

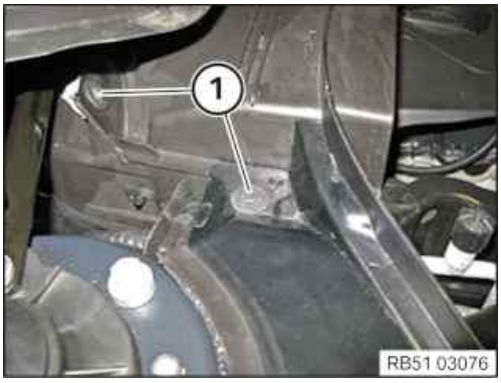
49 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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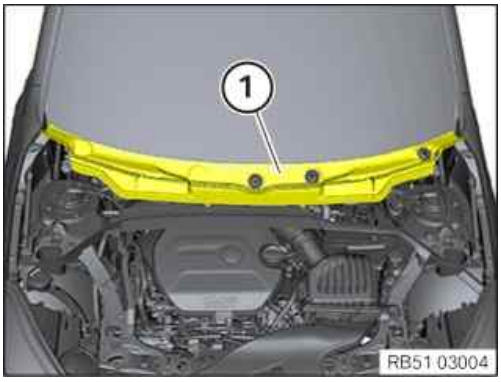
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

50 – Install the rear cowl panel cover



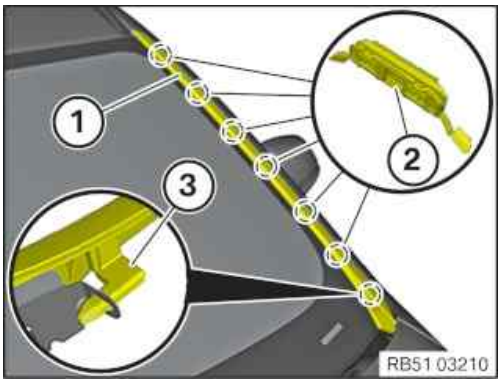
- Feed in and engage the rear cowl panel cover (1).

51 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

52 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

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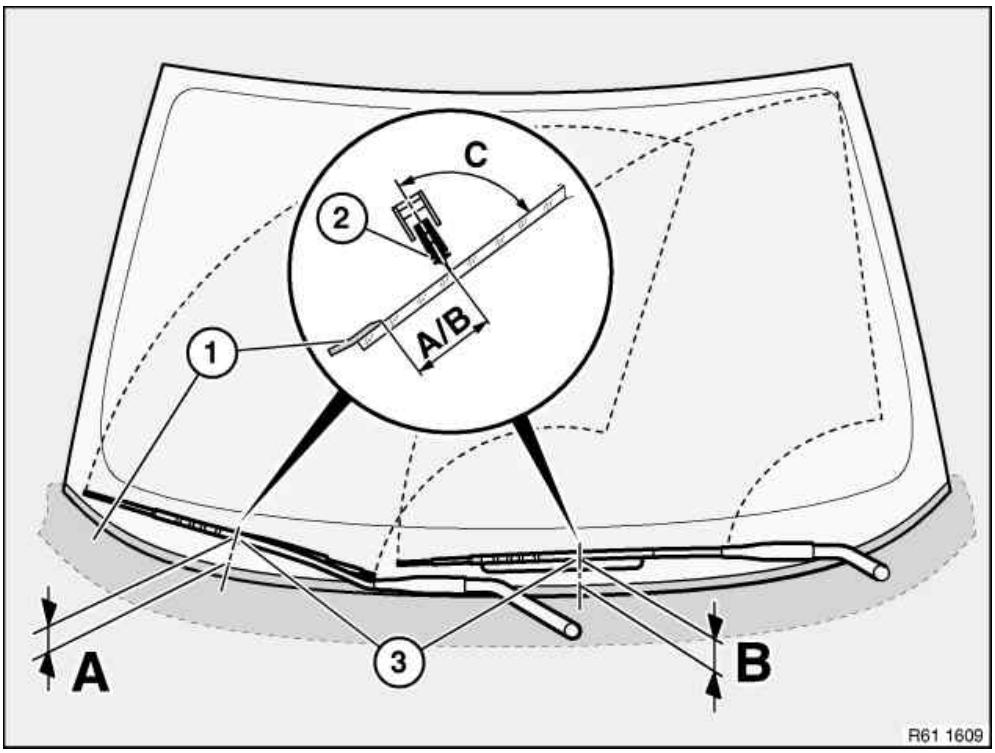
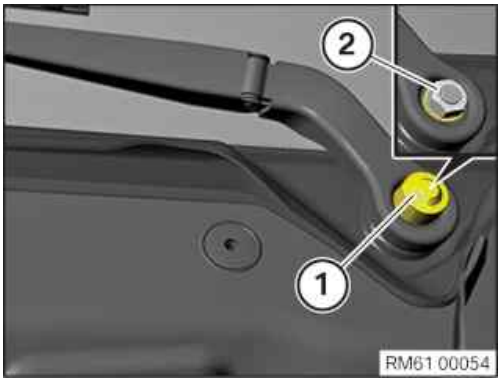
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

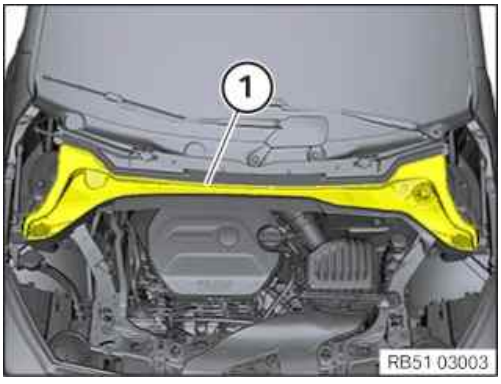
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

53 – Installing front cowl panel cover



- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

54 – Install the seal for the bonnet

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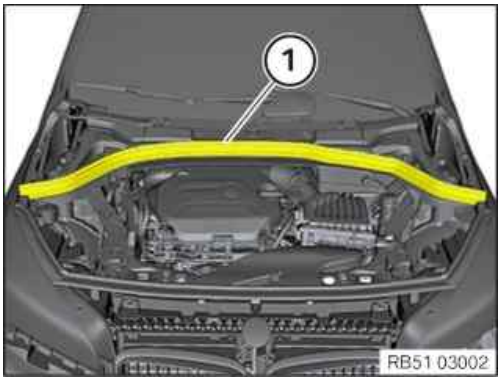
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

55 – Disconnecting all battery earth leads

- See additional information.

Additional Information

Overview of Tightening Torques

Charge air line to crankcase — Used in step 30

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 30

M6		Tightening torque	8 Nm

Wheel arch cover — Used in step 31

Screw			3 Nm
Plastic nut			2,6 Nm

Cylinder head cover to cylinder head — Used in step 32

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder — Used in step 33

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 33

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover — Used in step 34

Screw M6		Tightening torque	8 Nm

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Injector to cylinder head cover

Used in step 34

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 35

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 35 36

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 37

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 39

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover

Used in step 41

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 41

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 41

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 41

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 41

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 41

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 41

		Tightening torque	3 Nm

Battery cover

Used in step 41

Screw			2,8 Nm

Clean air pipe to exhaust turbocharger

Used in step 42

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover

Used in step 42

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 42 43

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge

Used in step 43

M6X30		Tightening torque	8 Nm

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Intake neck to cross connection			Used in step 44
M6		Tightening torque	8 Nm

Underbody protection front			Used in step 45
			3 Nm

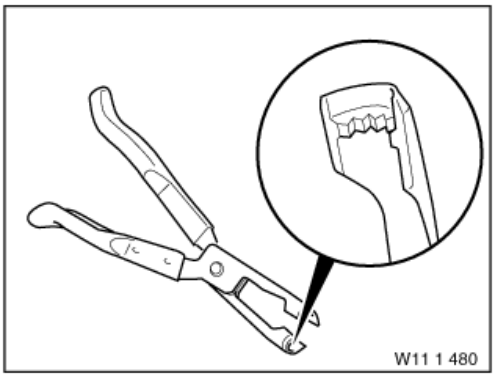
Resonator to manifold and clean air pipe			Used in step 47
Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top			Used in step 49
Screw		Tightening torque	3 Nm

Windscreen wiper arm			Used in step 52
Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common	Used in step 15
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common	Used in step 19 20 21 35 36 37
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

2 413 106 Fastener

Common	Used in step 19 20 36 37
Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

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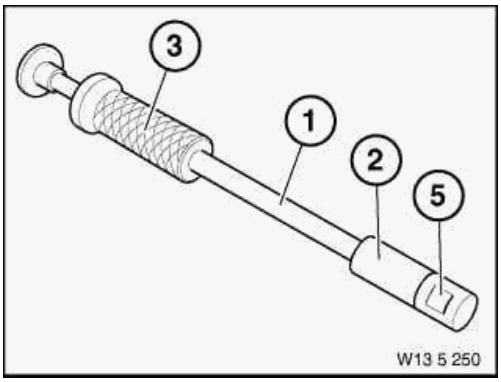
0 493 321 (13 5 250) Puller



Common

Used in step 22

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common

Used in step 22

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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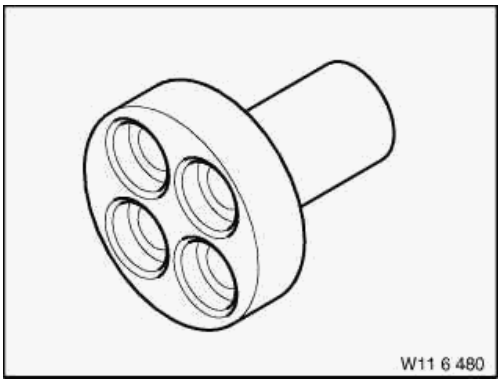
0 493 340 (13 5 253) Weight

Common	Used in step 22
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 28
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 28
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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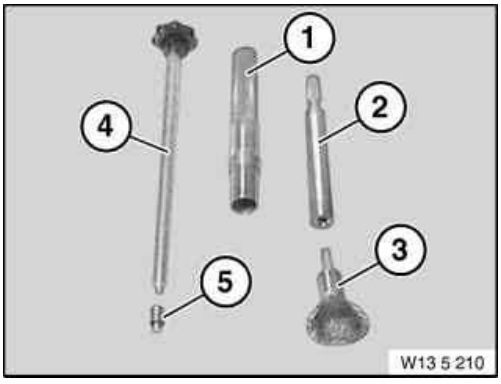
0 496 112 (11 8 760) Gauge

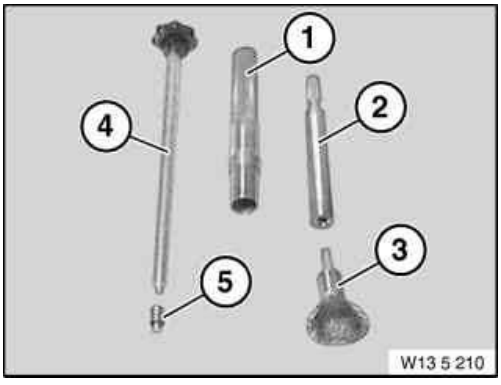
Common	Used in step 28
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 493 763 (13 5 215) Plug



Common	Used in step 34
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 34
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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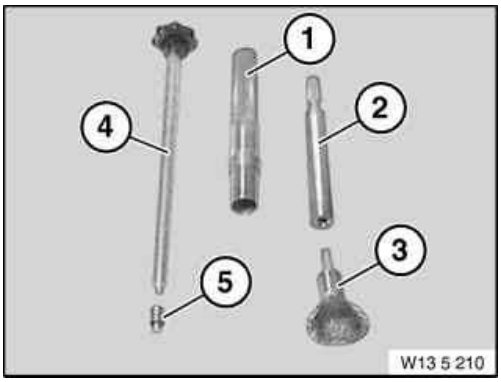
0 493 758 (13 5 210) Tool



Common Used in step 34

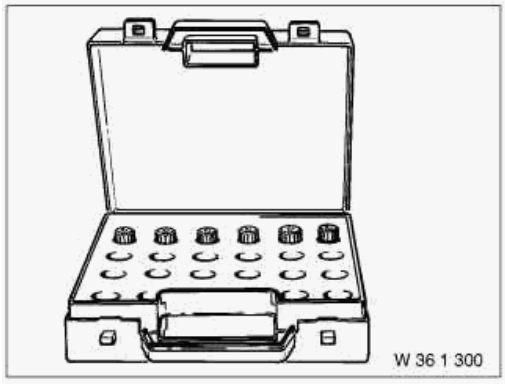
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common Used in step 25

Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common Used in step 25

Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 225 (36 1 327) Wheel stud

Common	Used in step 25
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 25
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 25
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 25
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud

Common	Used in step 25
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 25
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 55
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 55
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55
61 20 900 Disconnecting and connecting battery earth lead	1 55

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61 20 900 Disconnecting and connecting battery earth lead	1	55
61 20 900 Disconnecting and connecting battery earth lead	1	55
61 20 900 Disconnecting and connecting battery earth lead	1	55
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	55
61 20 900 Disconnecting and connecting battery earth lead	1	55
61 20 900 Disconnecting and connecting battery earth lead	1	55
61 20 900 Disconnecting and connecting battery earth lead	1	55
61 20 900 Disconnecting and connecting battery earth lead	1	55
61 20 900 Disconnecting and connecting battery earth lead	1	55
61 20 900 Disconnecting and connecting battery earth lead	1	55
61 20 900 Disconnecting and connecting battery earth lead	1	55
61 35 ... Notes on ESD protection (Electro Static Discharge)	22	23

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11 31 005 Checking camshaft timing (B37C)

Special tools required:

- 11 6 480
- 2 288 380
- 11 8 760

Important!

Risk of damage to engine.

Notes for checking and setting the timing must be observed without fail.

Necessary preliminary tasks:

- Remove cylinder head cover
- Remove front right wheel arch panel

Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**

Do not crank engine back.

Remove protective cap (1) on oil sump.

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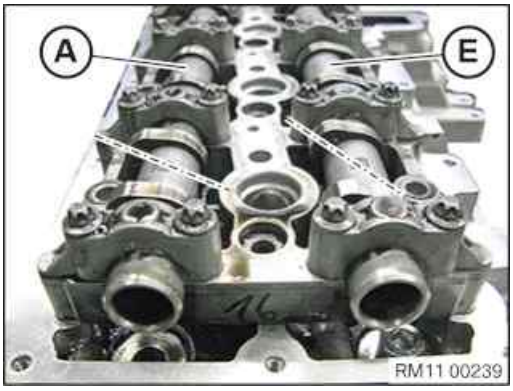
Crank engine at central bolt with special tool 11 6 480

Important!

On vehicles with manual gearbox, an additional bore hole that can be confused with dowel hole is located in front of dowel hole.

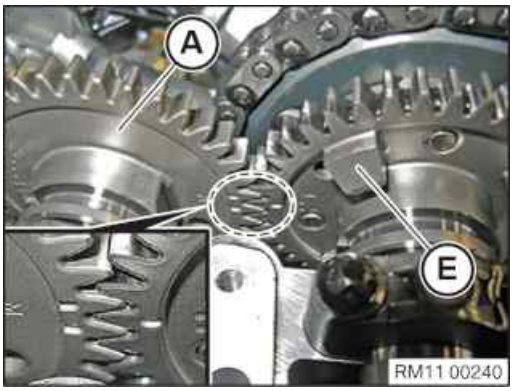
It must be possible to slide special tool 2 288 380 up to the crank in the oil sump.

Use special tool 2 288 380 to block the crankshaft in the TDC firing position Cylinder 1



The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



Marks on both camshafts (A and E) must match up (see graphic).

Place special tool 11 8 760 on exhaust camshaft.

Note:

Special tool 11 8 760 must lie flush on cylinder head.

If necessary, adjust camshaft timing.

Important!

2 288 380 Remove special tool before starting engine.

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Install protective cap (1).

Required follow-up work:

- Install cylinder head cover
- Install front right wheel arch panel
- Add final details to vehicle

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11 31 090 Installing and removing or replacing chain tensioner piston (B37C)

Necessary preliminary tasks:

- Remove exhaust-gas recirculation cooler

Removal:

Release chain tensioner (1).**Important!**

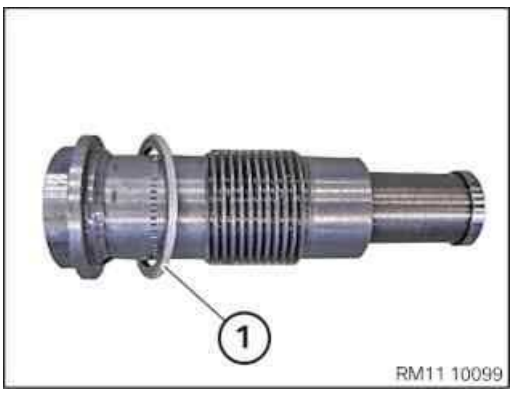
Have a cleaning cloth ready. A small quantity of engine oil will emerge after the screw connection has been released.

Make sure no oil runs into the clutch housing.

Installation:

If the chain tensioner is reused, its oil chamber must be drained. Place chain tensioner on a level support and slowly compress.

Repeat process twice.



Replace sealing ring.

Part: Replace sealing ring (1).

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Tighten chain tensioner (1).

Tightening torque: 11 12 5AZ.

Required follow-up work:

- Install exhaust-gas recirculation cooler.

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11 31 ... Notes for checking and adjusting the timings (B37, B38, B47, B48)

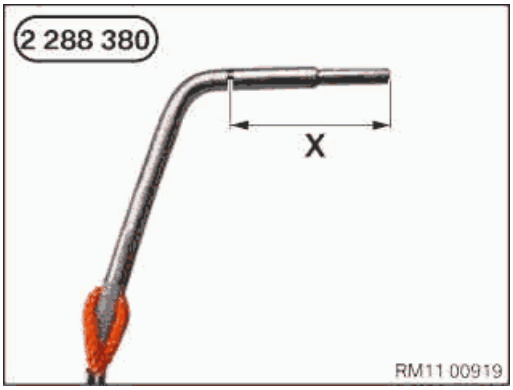
Special tools required:

- 2 288 380

Important!

Risk of damage to engine.

The notes for checking and adjusting the timing must be strictly observed!



Vehicles with manual transmission:

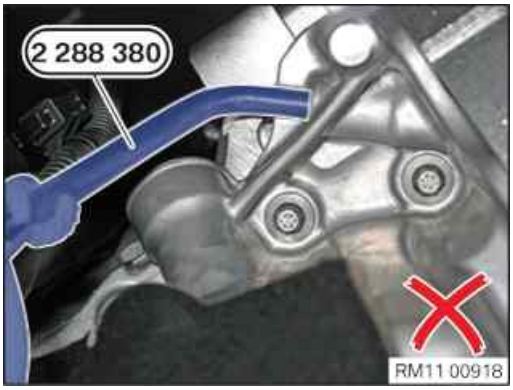
Dimension (x) = 56 mm.

Insert the special tool 2 288 380 up to dimension (X) into the dowel hole.

Vehicles with manual transmission:

Special tool 2 288 380 correctly positioned.

The engine is located at the first cylinder at top dead centre.



Vehicles with manual transmission:

Special tool 2 288 380 incorrectly positioned.

The TDC setting of the first cylinder has not been acheived.

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Vehicles with automatic transmission:

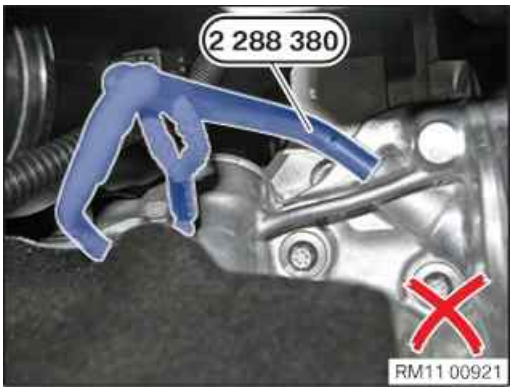
Dimension (Y) = 66 mm.

Insert the special tool 2 288 380 up to dimension (Y) into the dowel hole.

Vehicles with automatic transmission:

Special tool 2 288 380 correctly positioned.

The engine is located at the first cylinder at top dead centre.



Vehicles with automatic transmission:

Special tool 2 288 380 incorrectly positioned.

The TDC setting of the first cylinder has not been acheived.

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11 31 ... Notes on checking and adjusting the timing (B36, B37, B38, B46, B47, B48)

Special tools required:

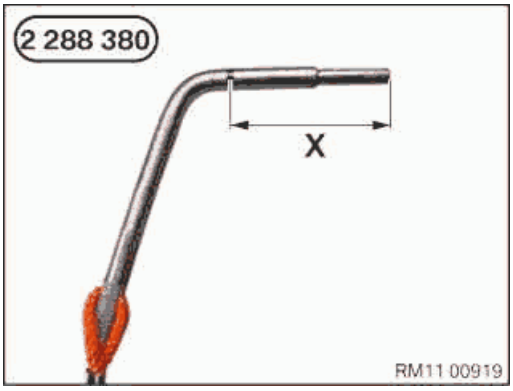
- 2 288 380

Attention!

Risk of damage to engine.

The notes for checking and adjusting the timing must be strictly observed!

If the crankshaft is fixed properly, it is not possible to turn the engine forwards or backwards on the vibration damper.



Vehicles with manual transmission:

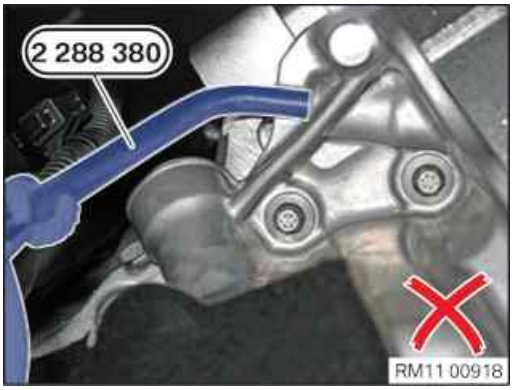
Dimension (x) = 56 mm.

Insert the special tool 2 288 380 up to dimension (X) into the dowel hole.

Vehicles with manual transmission:

Special tool 2 288 380 correctly positioned.

The engine is located at the first cylinder at top dead centre.



Vehicles with manual transmission:

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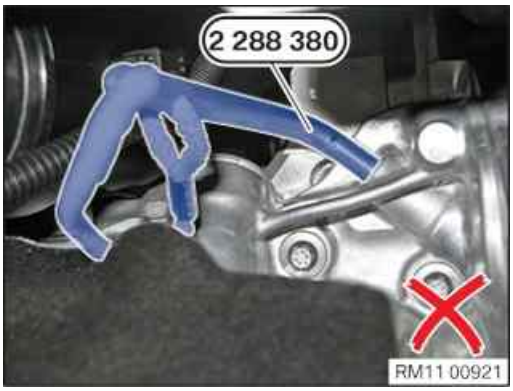
Dimension (Y) = 66 mm.

Insert the special tool 2 288 380 up to dimension (Y) into the dowel hole.

Vehicles with automatic transmission:

Special tool 2 288 380 correctly positioned.

The engine is located at the first cylinder at top dead centre.



Vehicles with automatic transmission:

Special tool 2 288 380 incorrectly positioned.

The TDC setting of the first cylinder has not been acheived.

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11 31 090 Remove and install/replace chain tensioner piston

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

PRELIMINARY WORK

1 – Remove vehicle battery

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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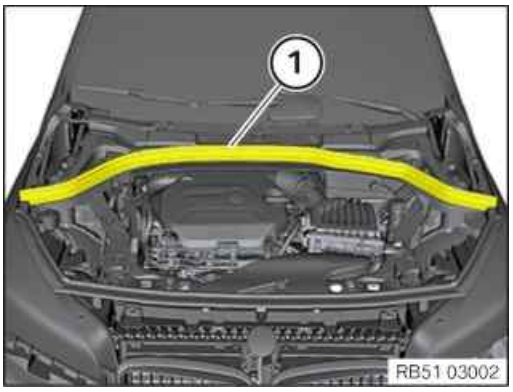
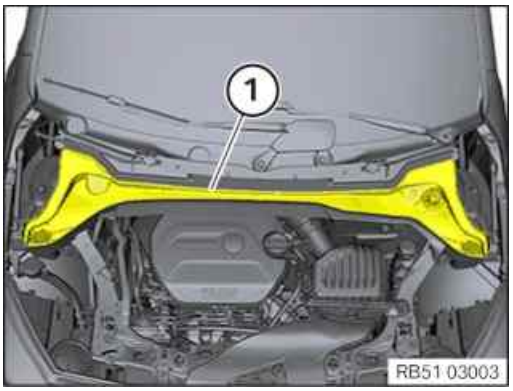
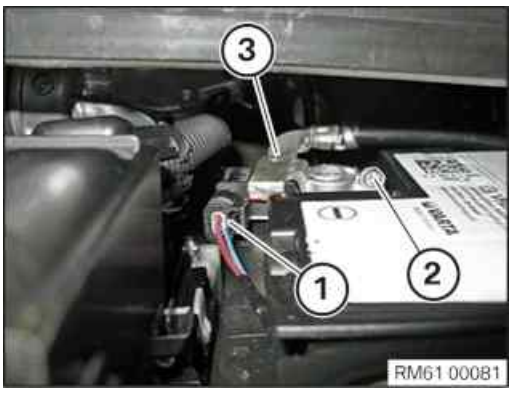


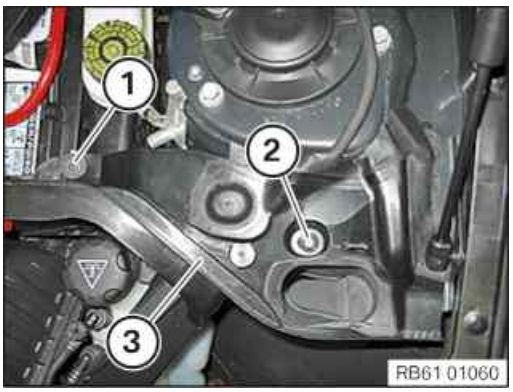
- pull off gasket (1) upwards.



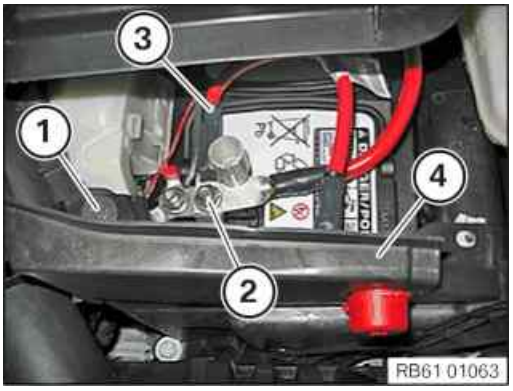
- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.

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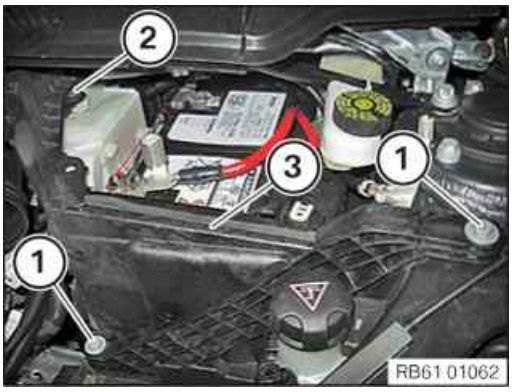
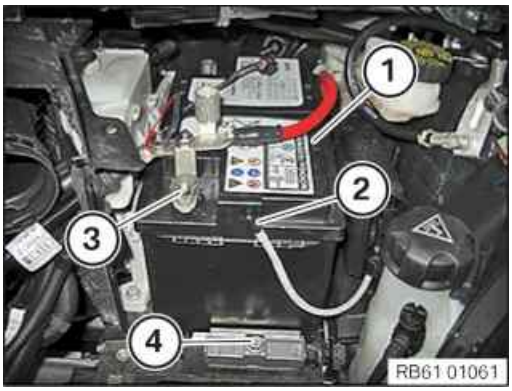


- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

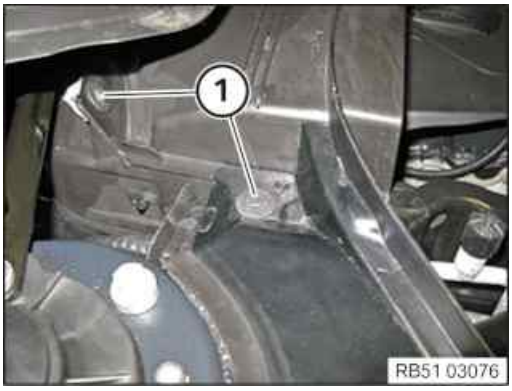
Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).

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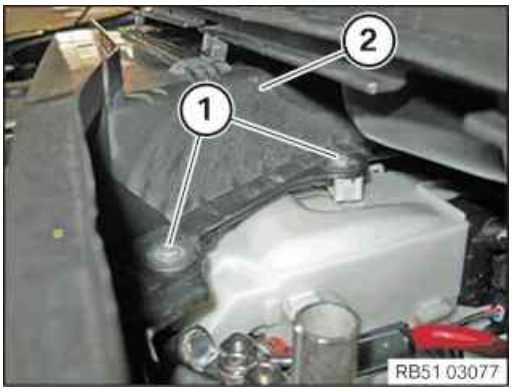
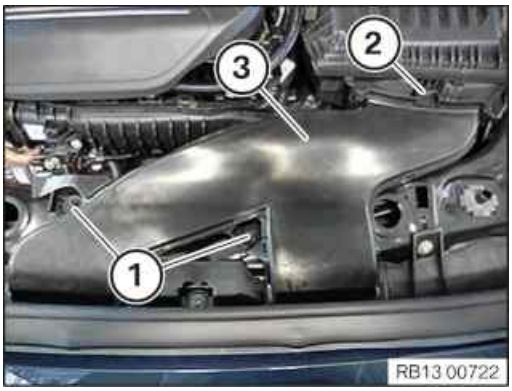


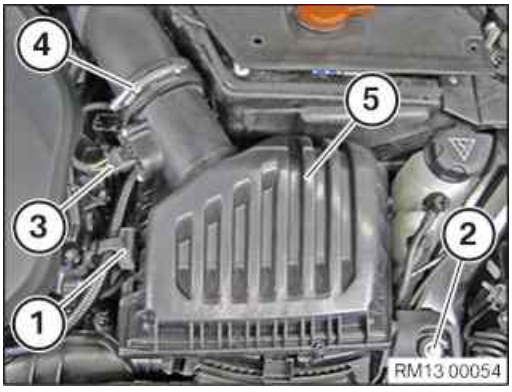
- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

5 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

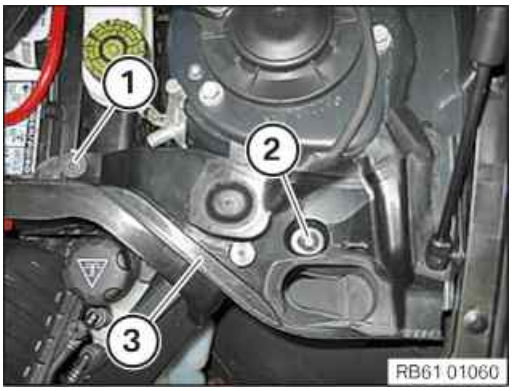
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

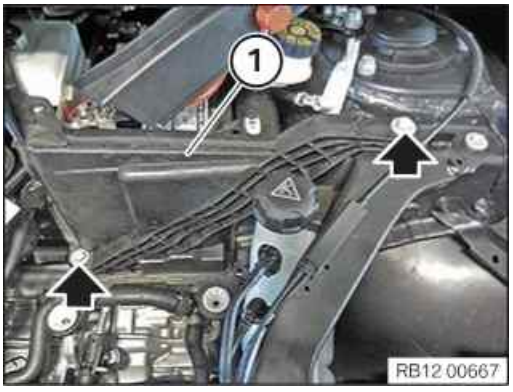
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.

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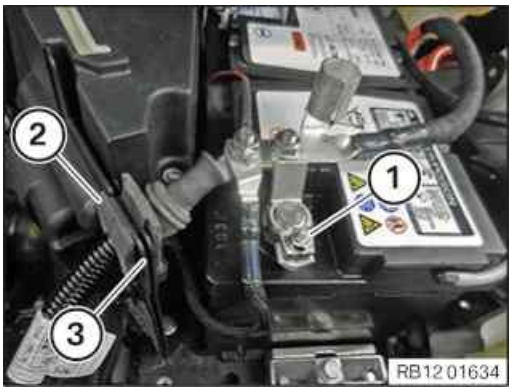
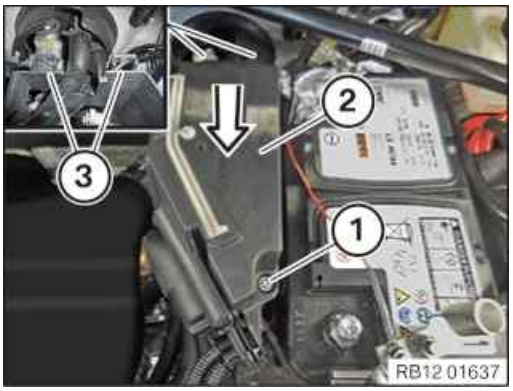
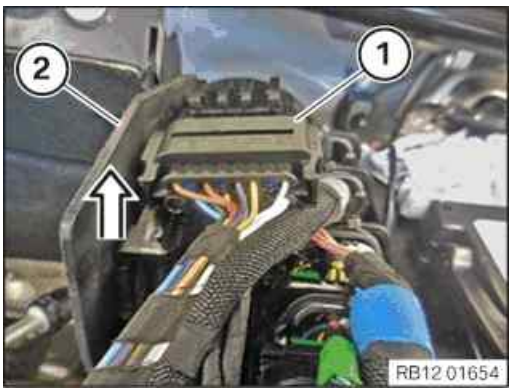


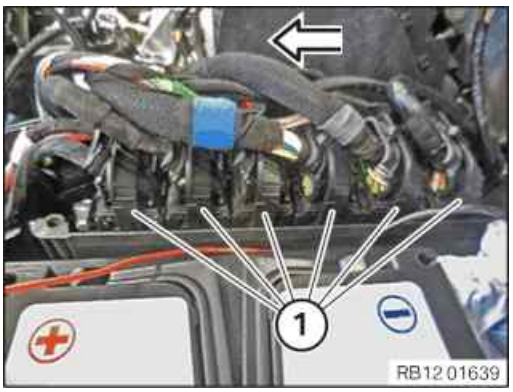
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



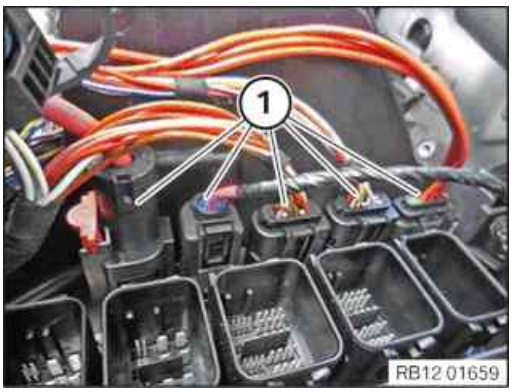
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

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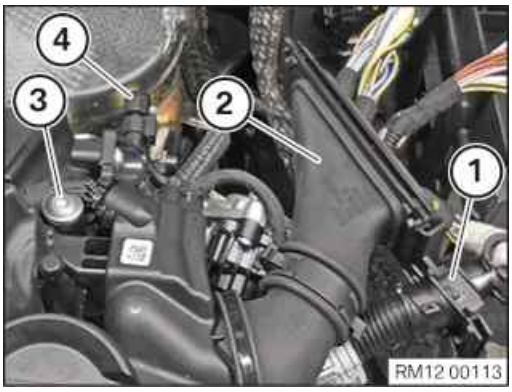
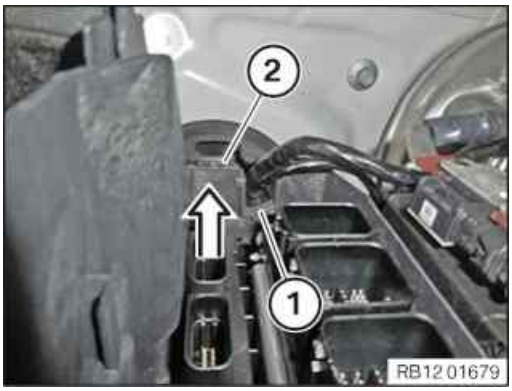
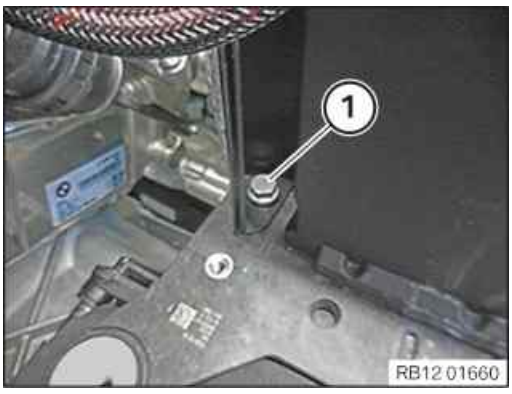


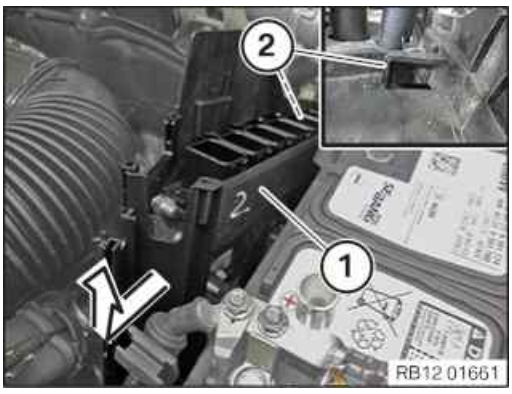
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

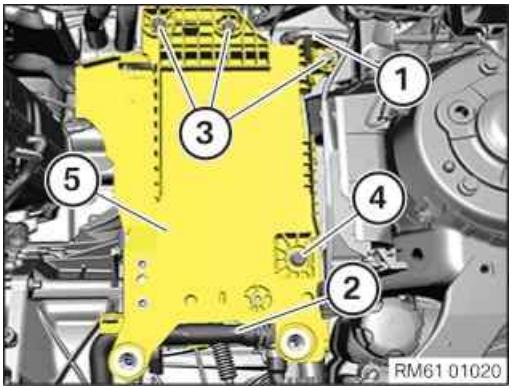


- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

6 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

7 – Remove cross connection

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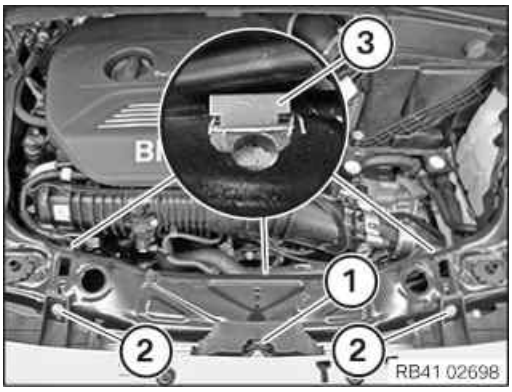
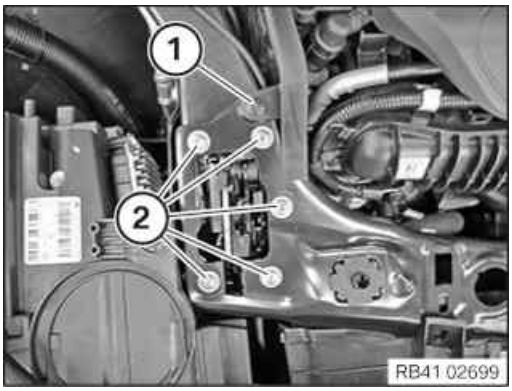
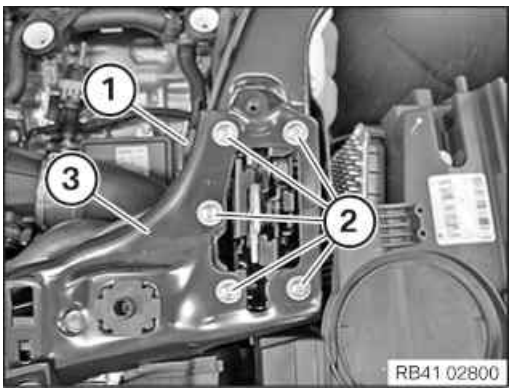


- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.

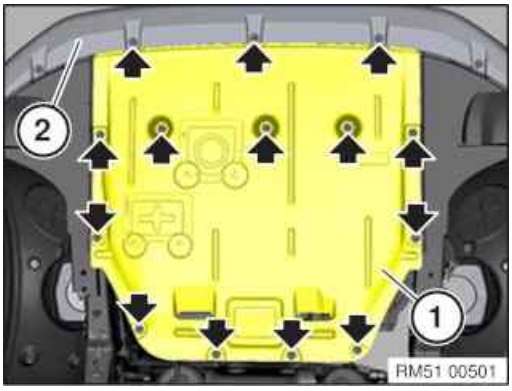


- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

8 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

9 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

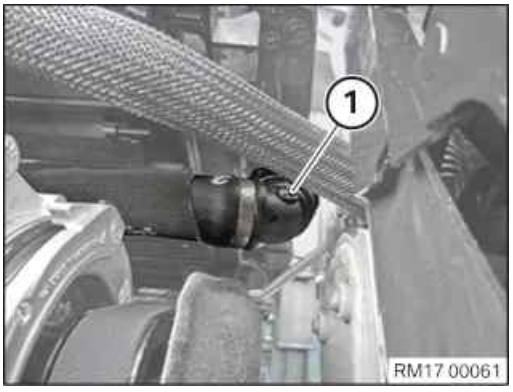
When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

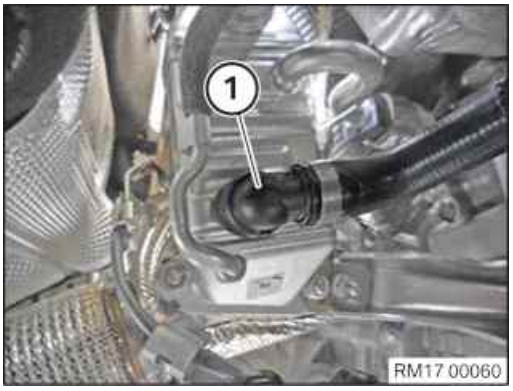
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

10 – Removing the exhaust-gas recirculation cooler

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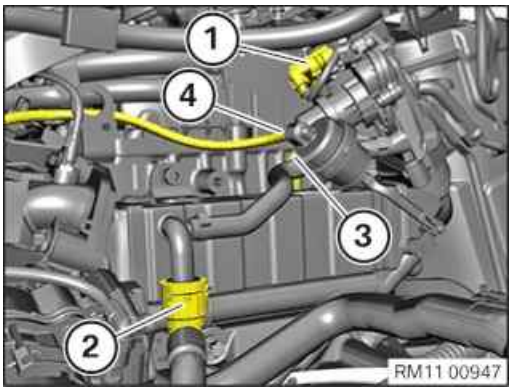
WARNING

Hot surfaces.

Risk of burning!

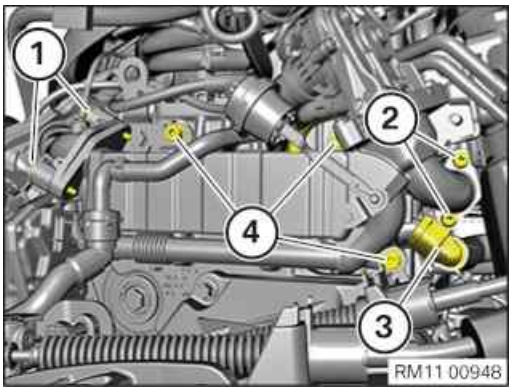
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

MAIN WORK

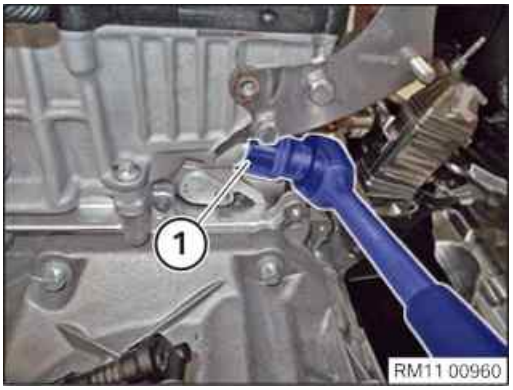
11 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

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12 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

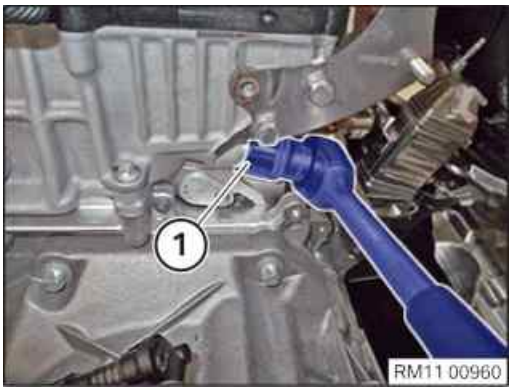
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

POSTPROCESSES

13 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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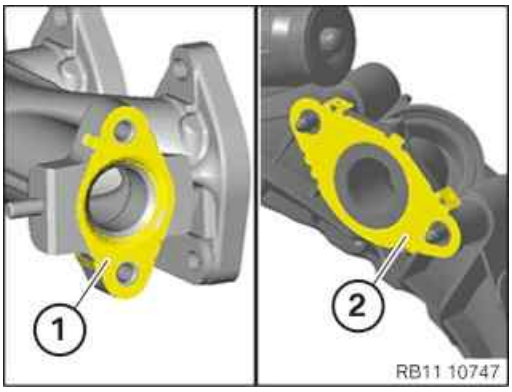
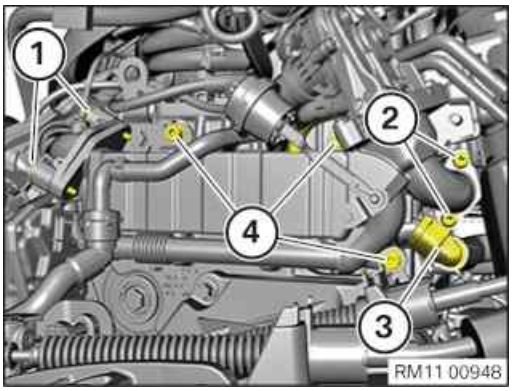


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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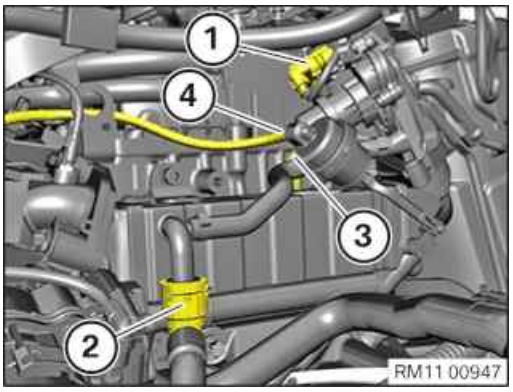


TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

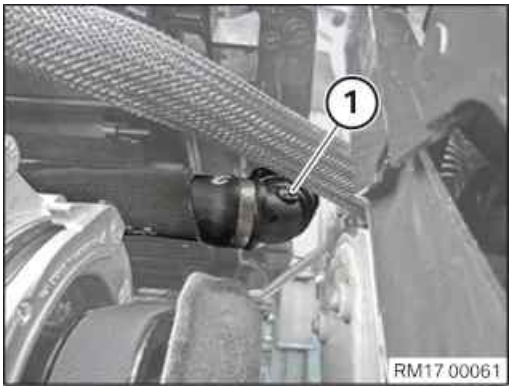
- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

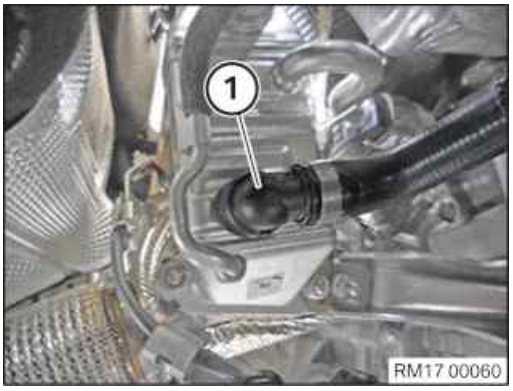
14 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

15 – Installing the front underbody protection

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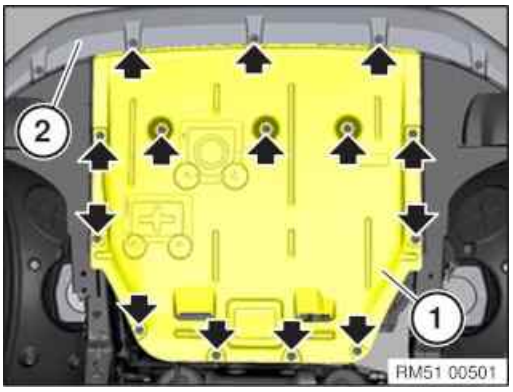
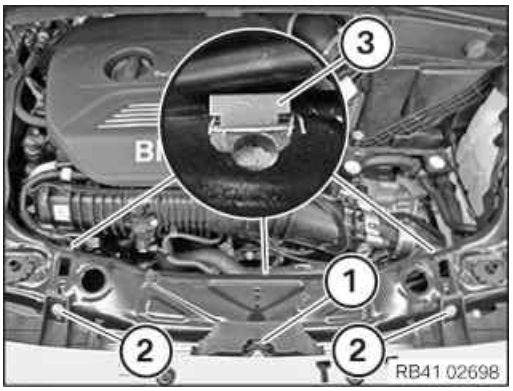


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

16 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

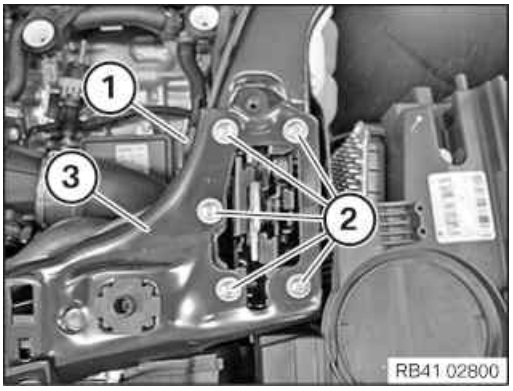
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

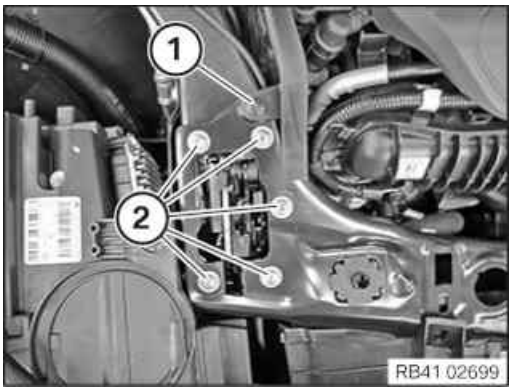
- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.
- Tighten screws (2) of cross connection (3).



Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

17 – Install the battery holder

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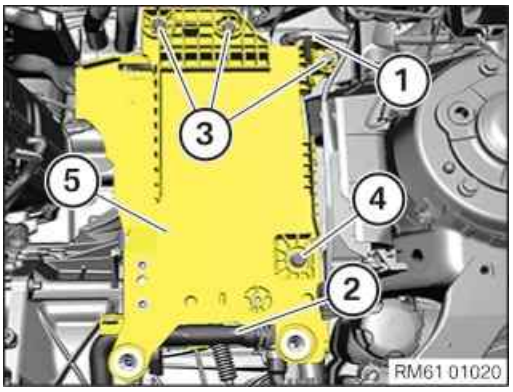


- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

18 – Install electronics box

Prerequisite

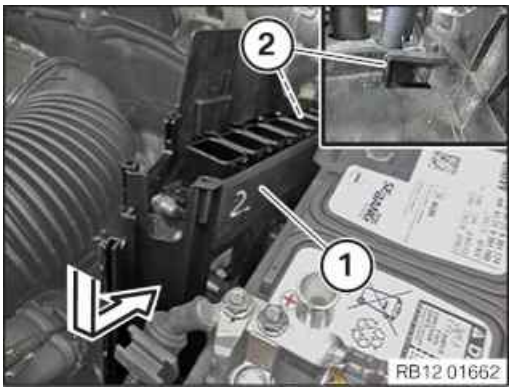
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).

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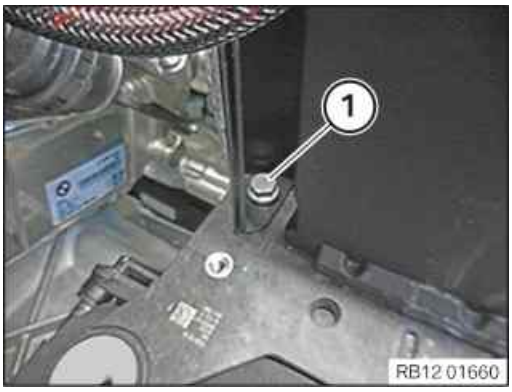
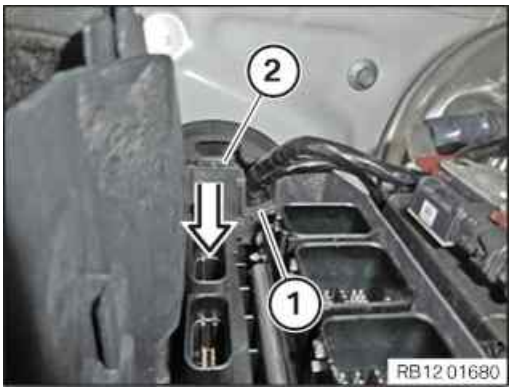


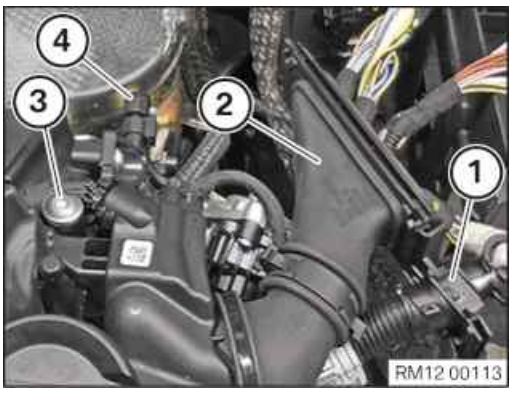
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

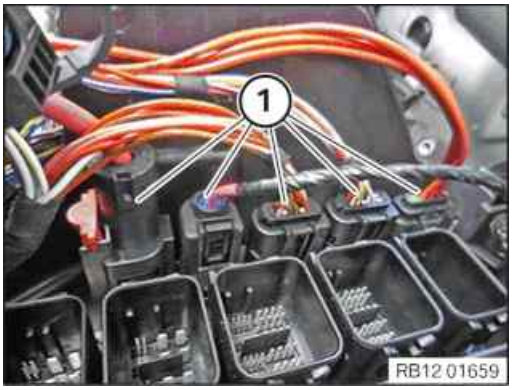


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

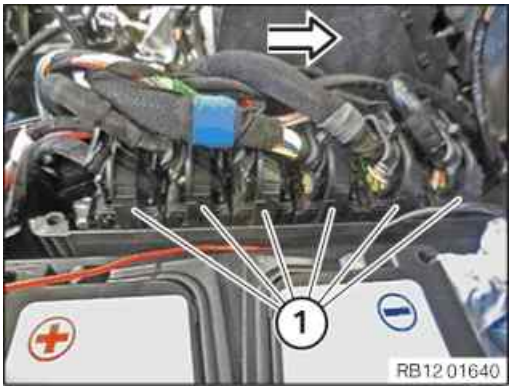
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

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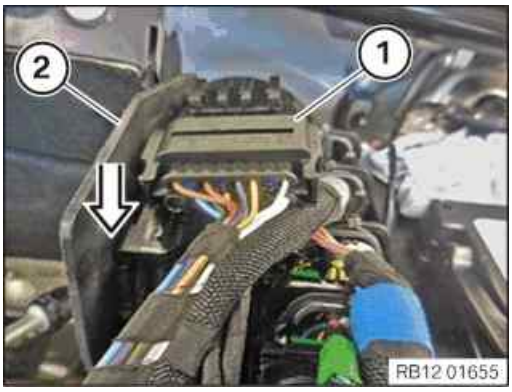
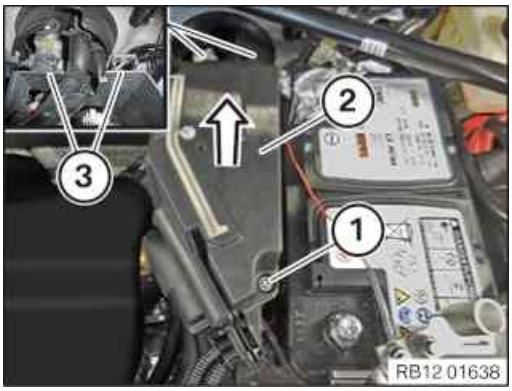


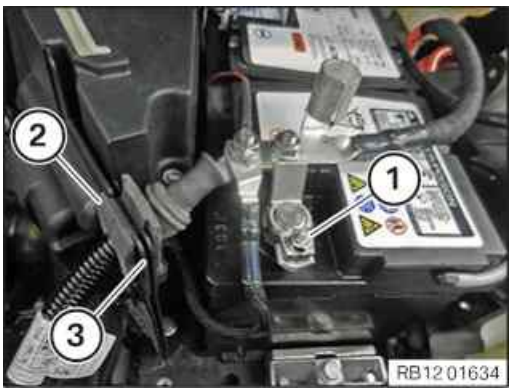
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

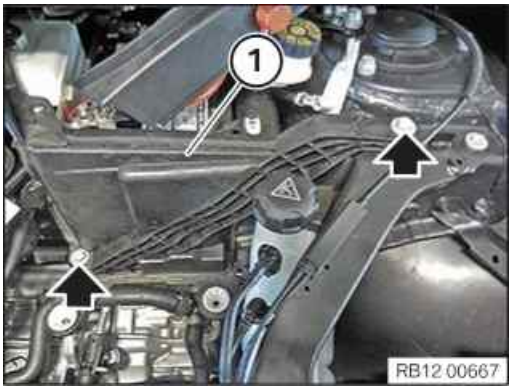
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

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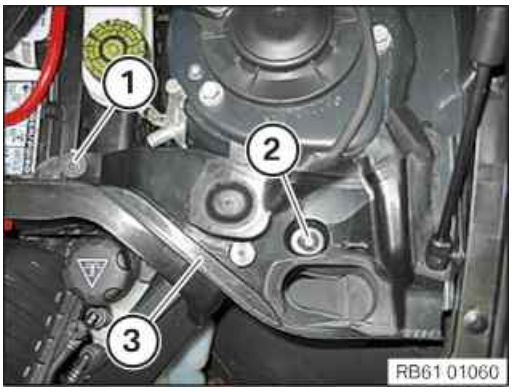
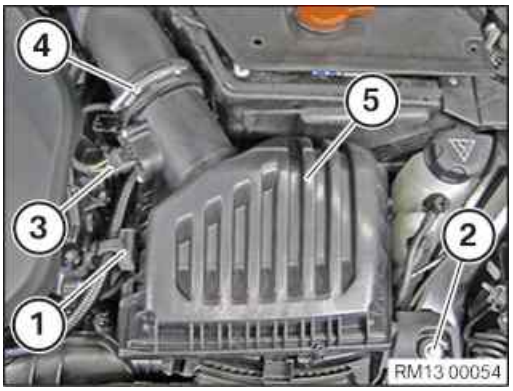


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

19 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

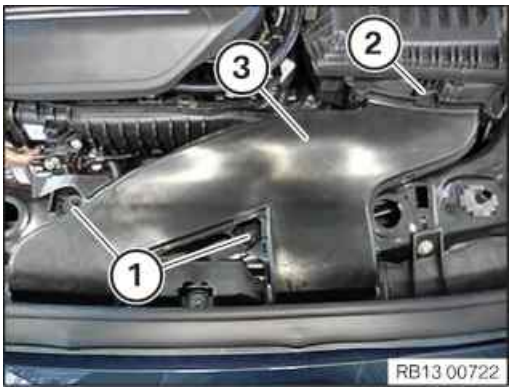
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

20 – Install the intake neck for the intake filter housing

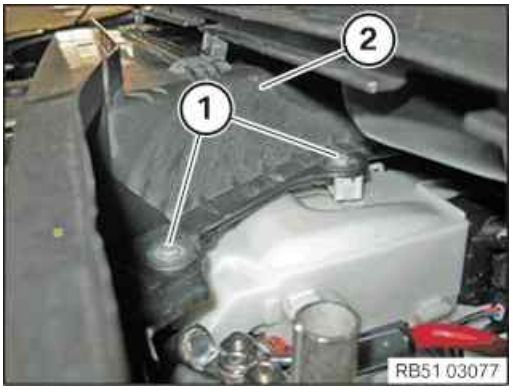


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

21 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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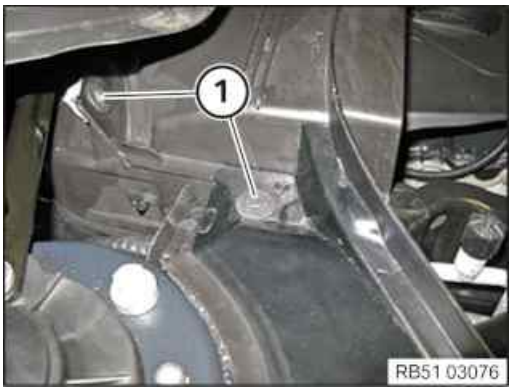


- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

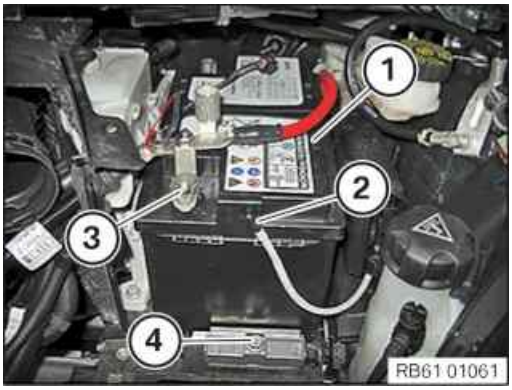
Bulkhead cover, top

Screw		Tightening torque	3 Nm

22 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

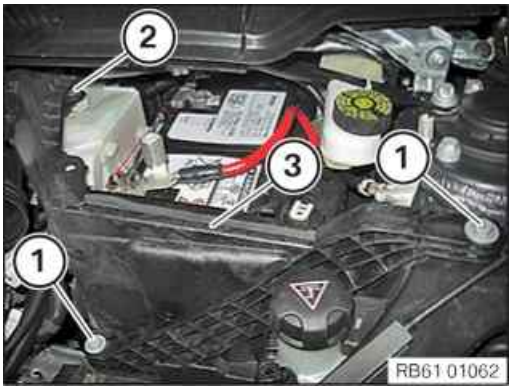
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm

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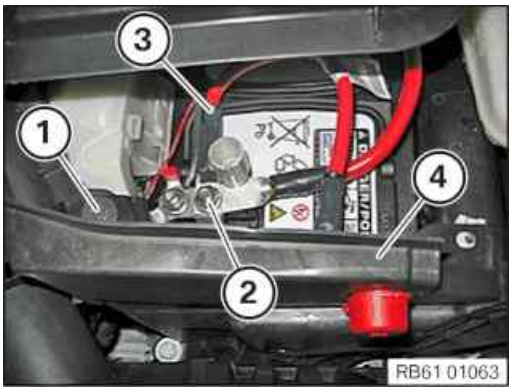


- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

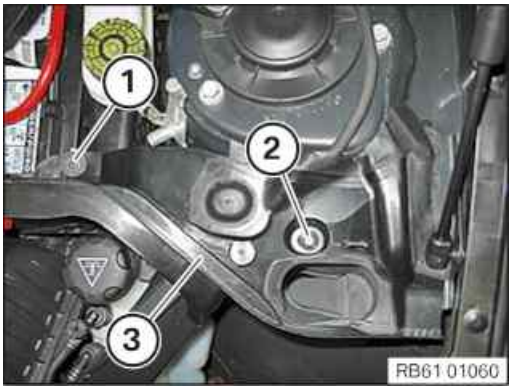
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

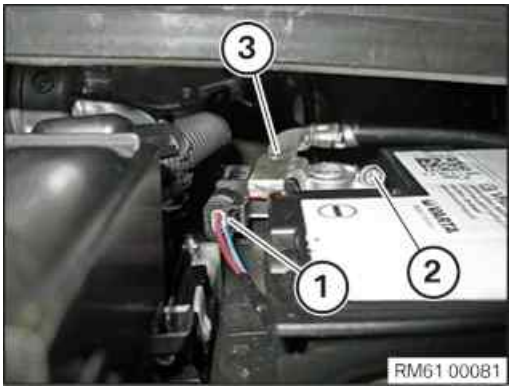
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

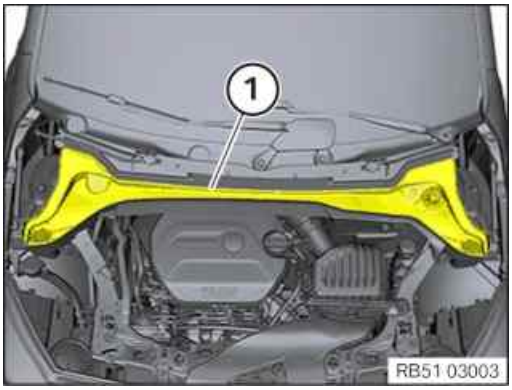


- Position the negative battery terminal (3).
- Tighten nut (2).

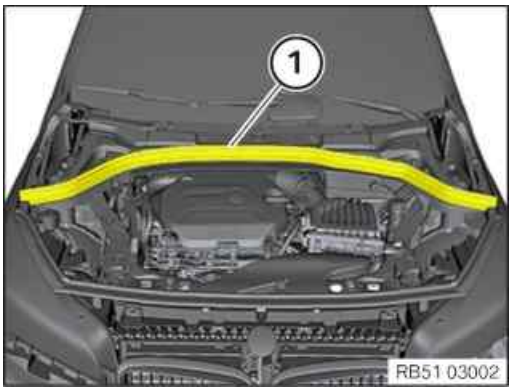
Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.



- Feed in the cowl panel cover (1).



- Press the gasket (1) in a downwards direction.

23 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Chain tensioner piston to cylinder head — Used in step 12

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Exhaust-gas recirculation cooler to cylinder head — Used in step 13

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler — Used in step 13

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold — Used in step 13

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 13

M8x20		Tightening torque	19 Nm

Underbody protection front — Used in step 15

			3 Nm

Bracing strut to top cross connection — Used in step 16

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 16

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 16

M6x20		Tightening torque	12 Nm

Battery holder to engine support — Used in step 17

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray — Used in step 18

M8X16		Tightening torque	15 Nm

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Wiring harness to cylinder head cover			Used in step 18
TS5x20		Tightening torque	3,5 Nm

Cover to electronics box			Used in step 18
RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery			Used in step 18
NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray			Used in step 18
M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall			Used in step 18
		Tightening torque	3 Nm

Battery cover			Used in step 18 22
Screw			2,8 Nm

Intake silencer housing to lock bridge			Used in step 19
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 19
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 20
M6		Tightening torque	8 Nm

Bulkhead cover, top			Used in step 21
Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray			Used in step 22
M8 screw			19 Nm

Positive battery terminal			Used in step 22
NutM6			5 Nm

Trailing link			Used in step 22
M8 screw			19 Nm

Positive battery cable to battery terminal			Used in step 22
Nut M8			15,2 Nm

Negative battery terminal (with IBS)			Used in step 22
NutM6			5 Nm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	10 13
EGR controller	10 13

General repair instructions	Used in step

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61 20 ... Notes on AGM battery	1 22
61 12 ... Notes on intelligent battery sensor (IBS)	1 22
61 00 ... Notes for disconnecting and connecting battery	1 22
12 00 ... Instructions for removal and replacement of control units	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	5
17 00 008 Draining and topping up coolant for high-temperature circuit	23
17 00 008 Draining and topping up coolant for high-temperature circuit	23
17 00 008 Draining and topping up coolant for high-temperature circuit	23
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 008 Draining and topping up the high-temperature coolant circuit	23
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	23
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	23
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	23
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	23
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	23

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	12
Exhaust-gas recirculation cooler seal on exhaust manifold	13
Exhaust-gas recirculation cooler seal on intake plenum	13

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11 31 028 Removing and installing / replacing exhaust camshaft

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

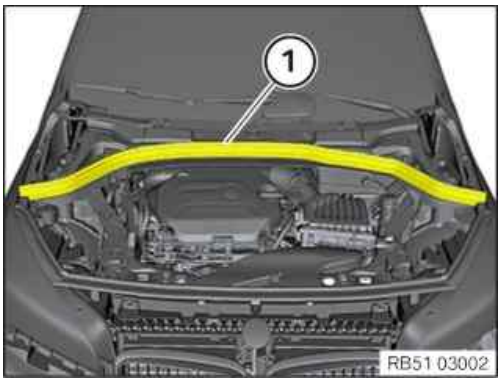
1 – Disconnecting all battery earth leads

- See additional information.

2 – Remove the seal for the rear bonnet

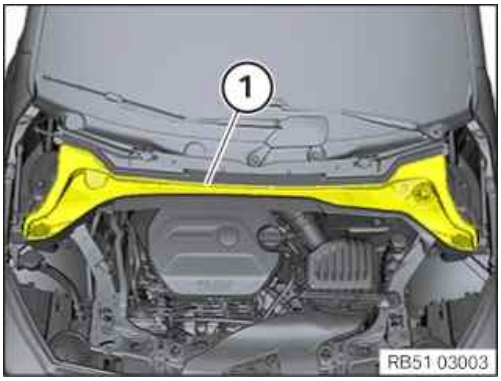
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

4 – Remove left and right wiper arm

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NOTICE

Description is for left component only. Procedure on the right side is identical.

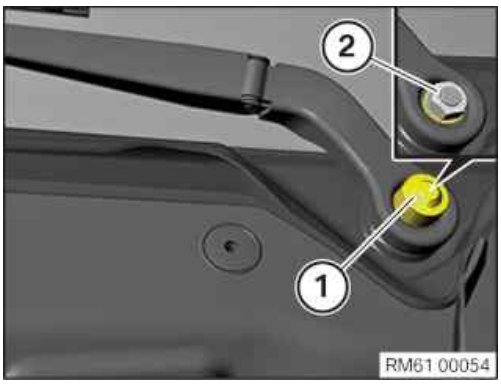
▶ **Remove the wiper arm**

RISK OF DAMAGE

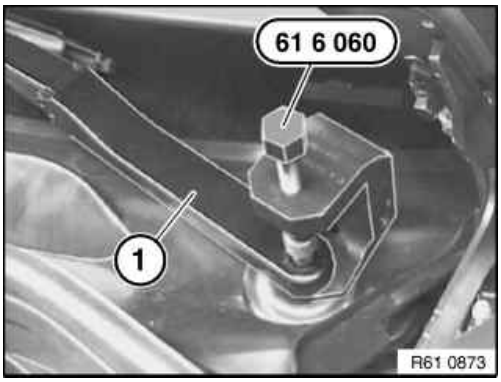
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

5 – Remove the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**

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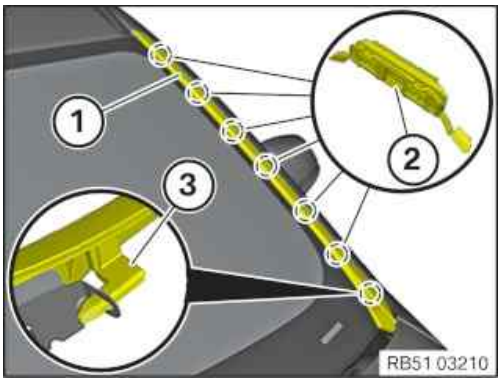
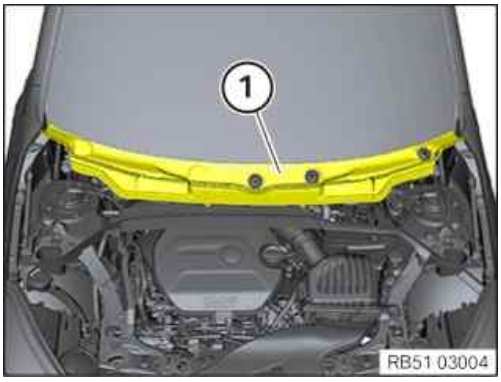


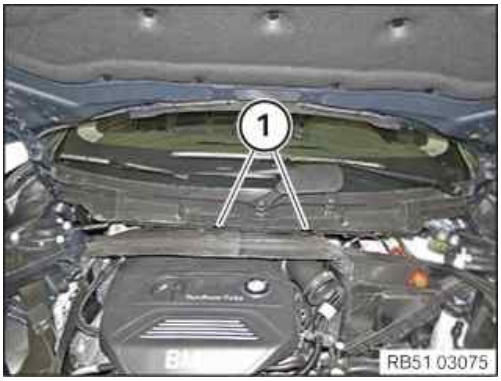
- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

6 – Remove the rear cowl panel cover

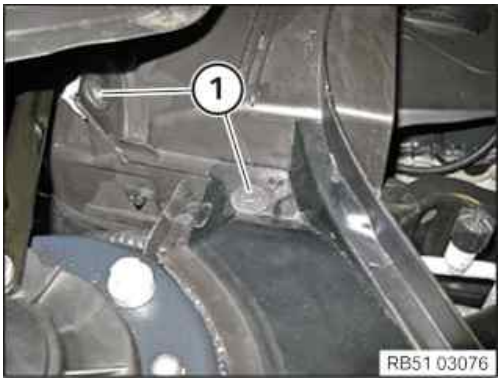


- Disengage and guide out the rear cowl panel cover (1) towards the top.

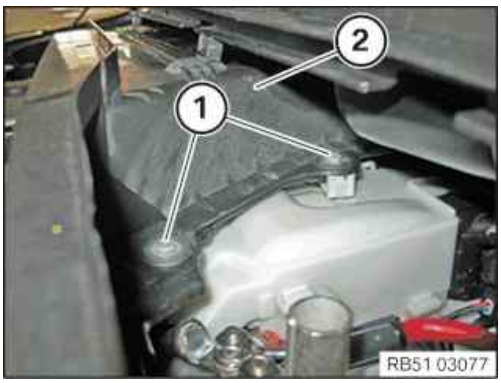
7 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

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8 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

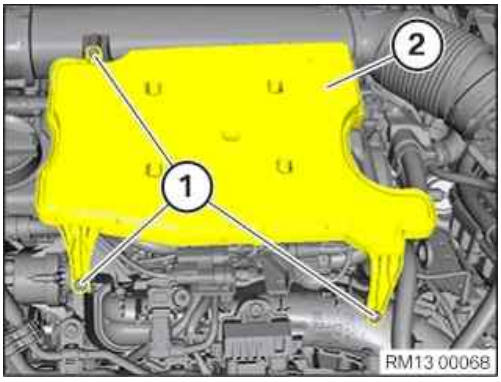
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

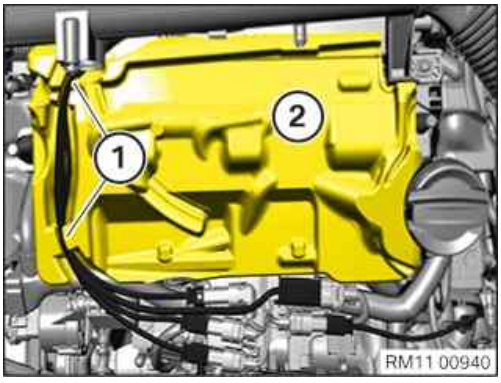
- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

10 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

11 – Remove the intake neck for intake silencer housing

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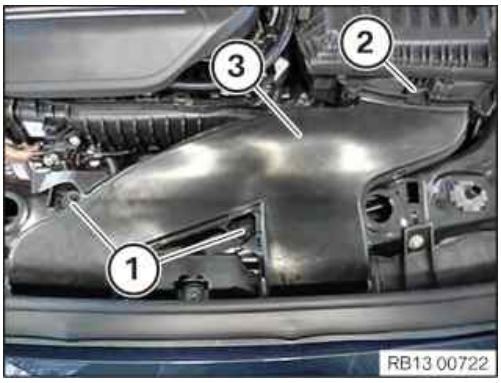
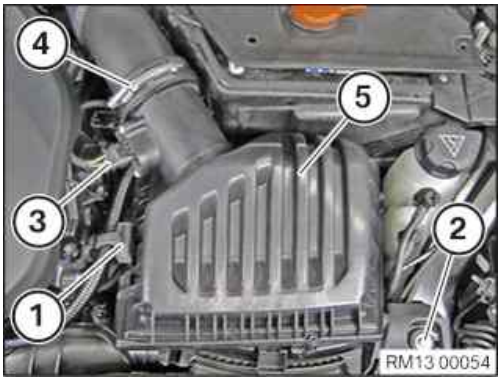


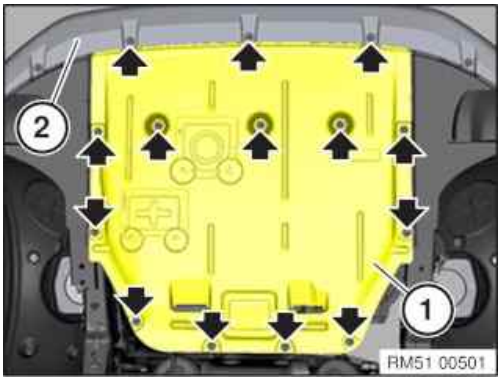
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

12 – Removing intake silencer housing



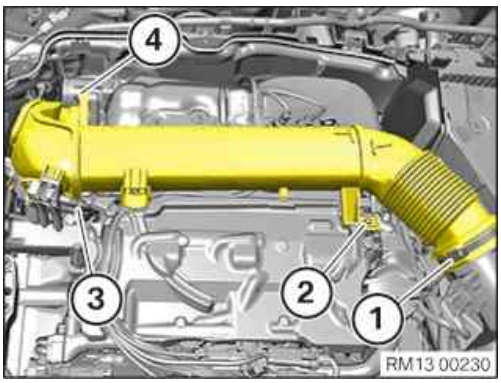
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

13 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

14 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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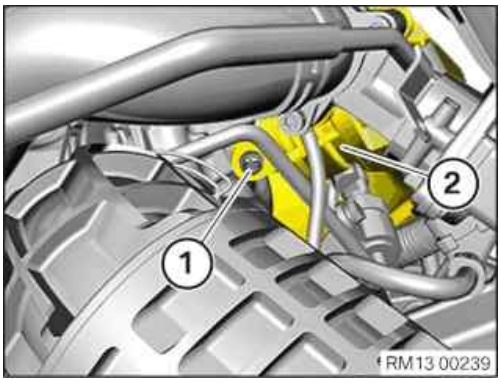
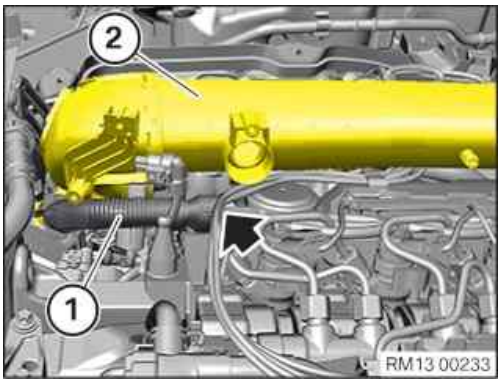


- Unscrew the screw (1) from the clean air pipe (2).

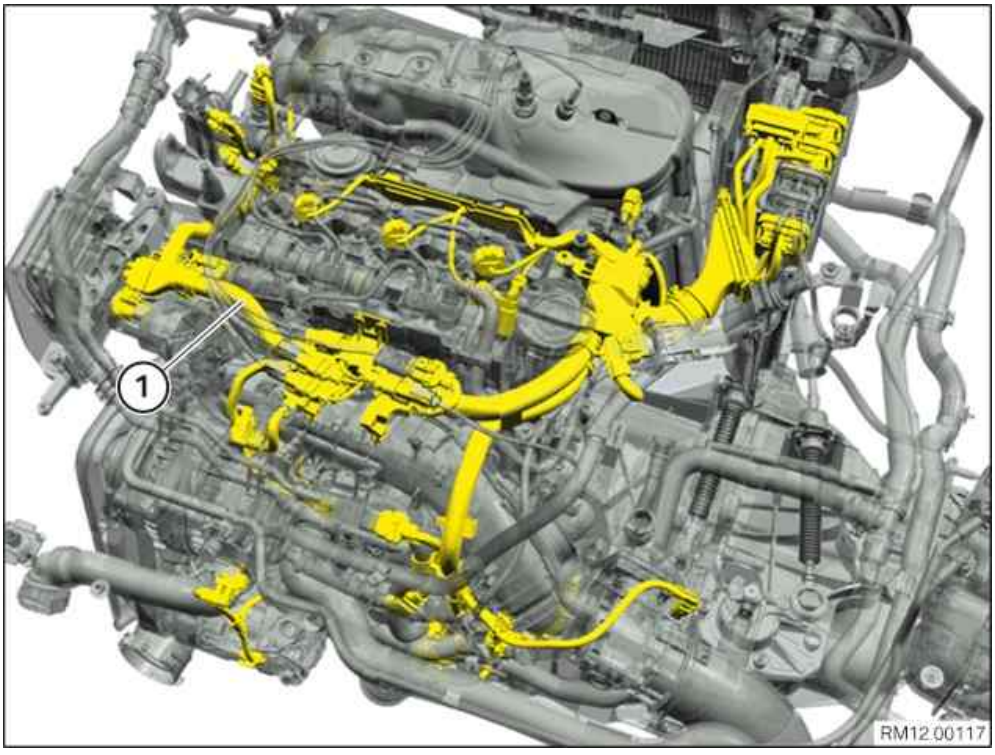


- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

15 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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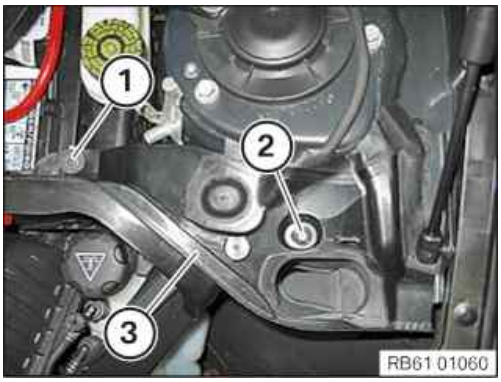
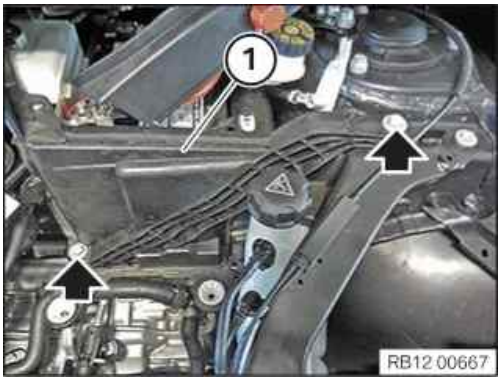
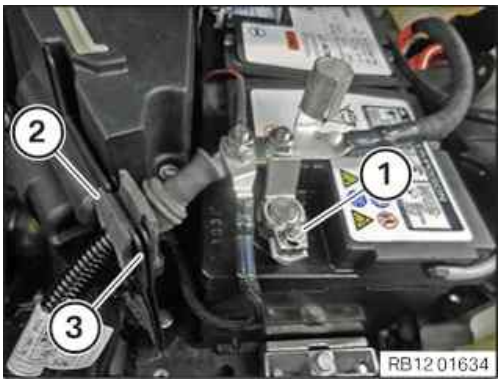


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

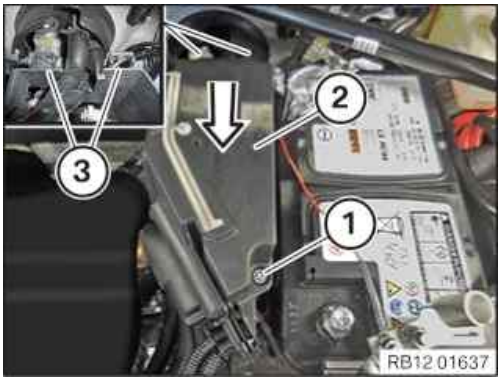
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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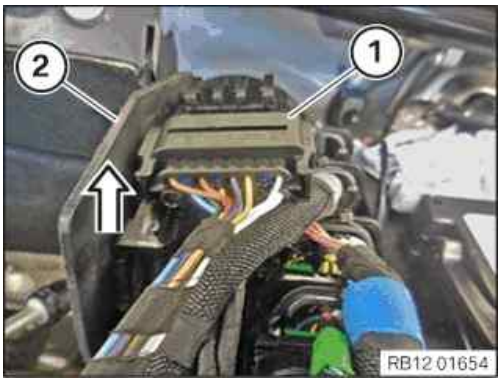
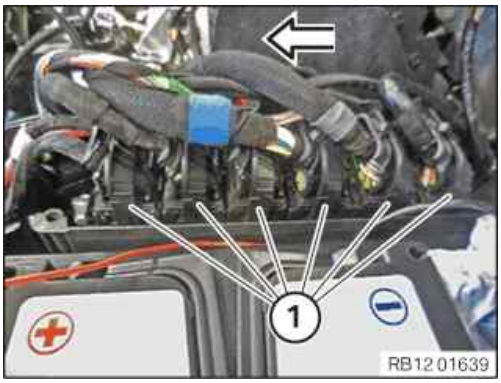
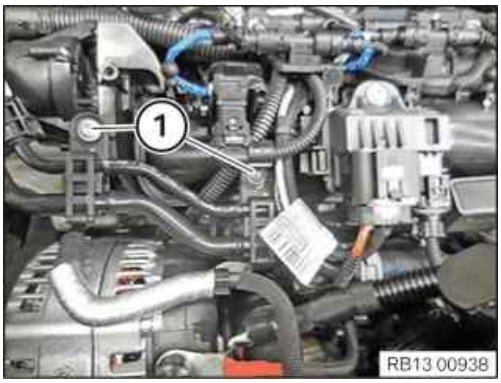


- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).

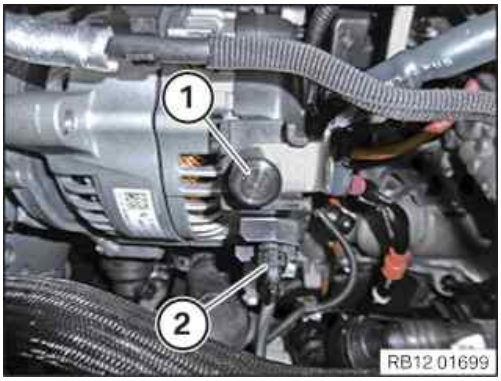


- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).



- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

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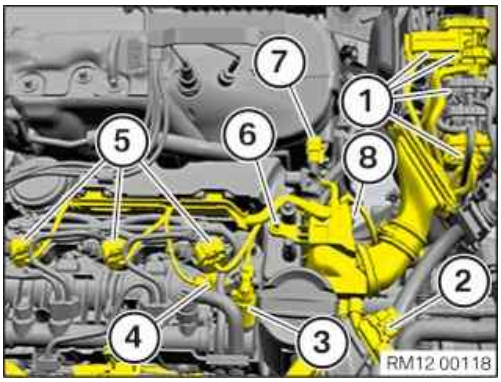
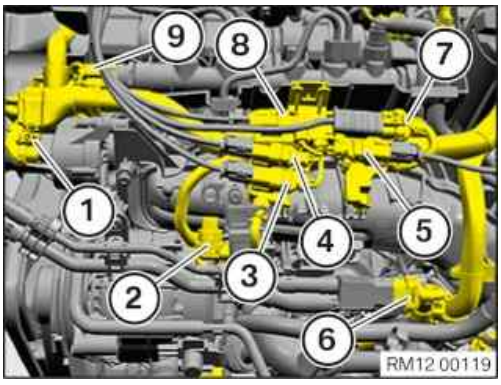
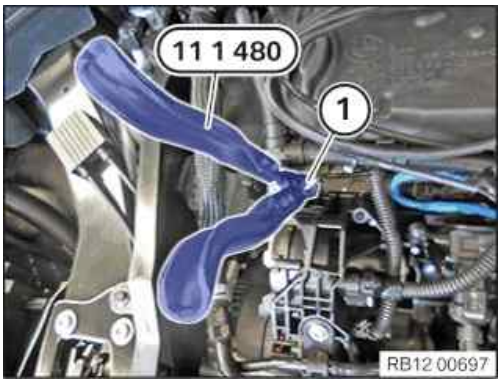


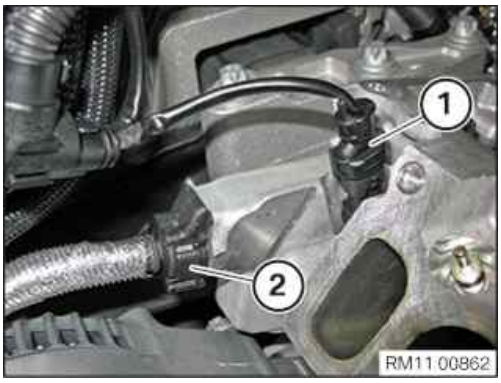
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.

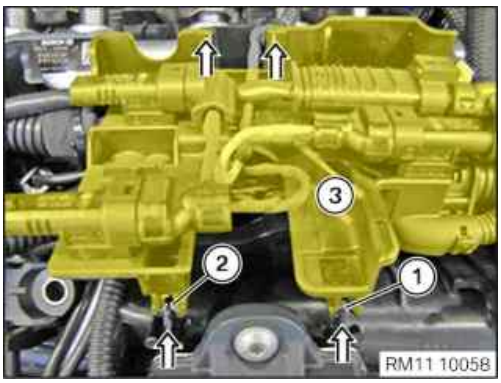


- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

16 – Removing the cable clips from the intake plenum



- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

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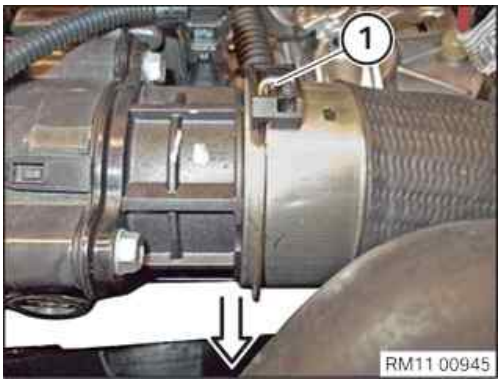
17 – Removing the intake plenum

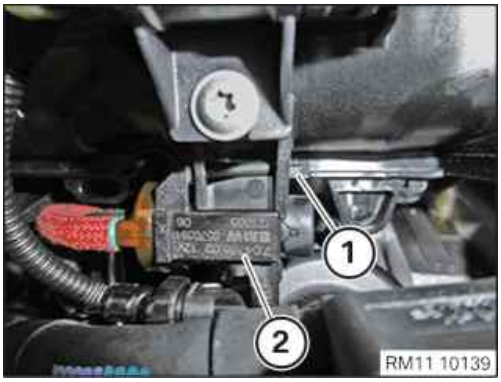
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

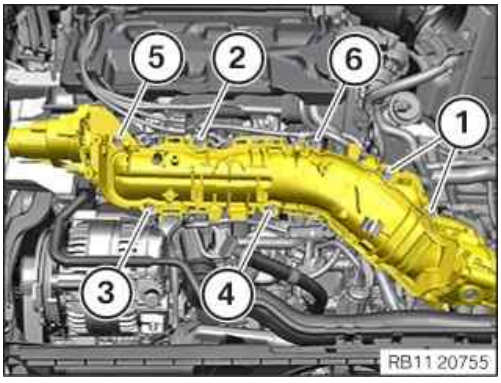
- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.

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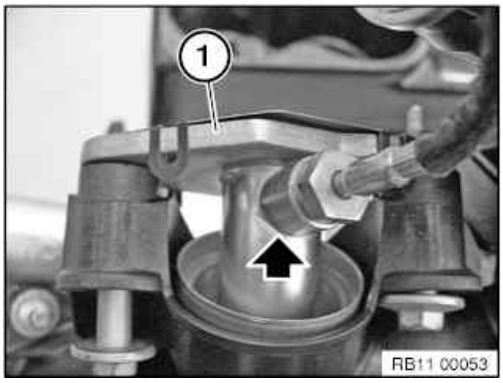

- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

18 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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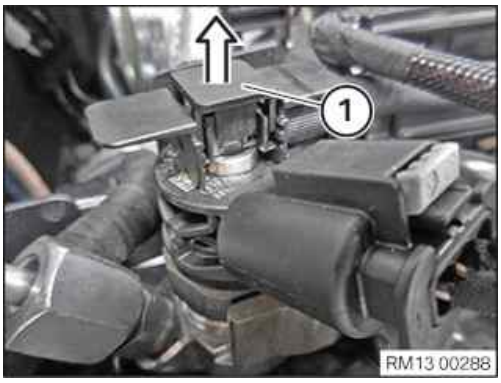

- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

19 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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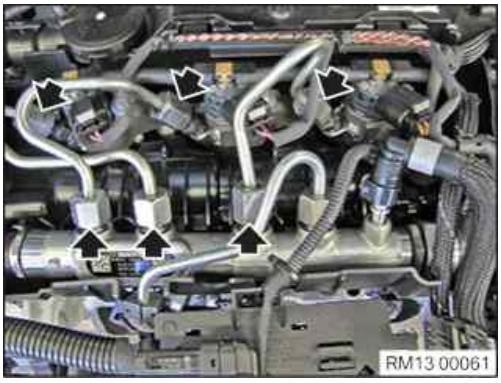
TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

20 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

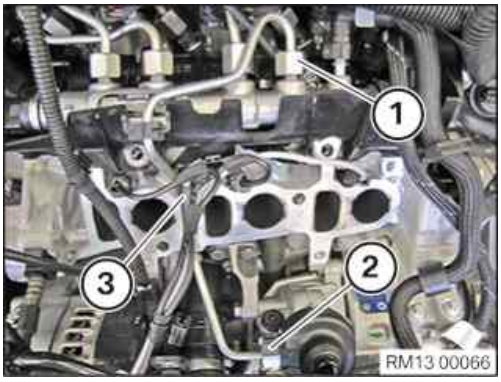
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

21 – Remove high-pressure rail

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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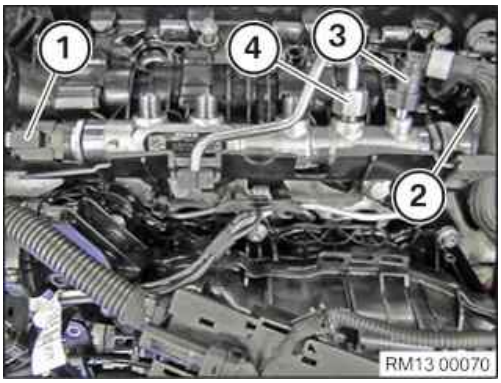
TECHNICAL INFORMATION

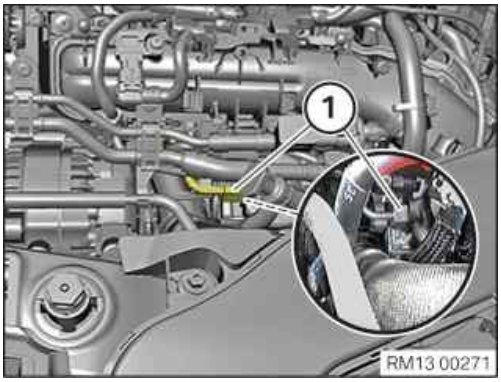
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

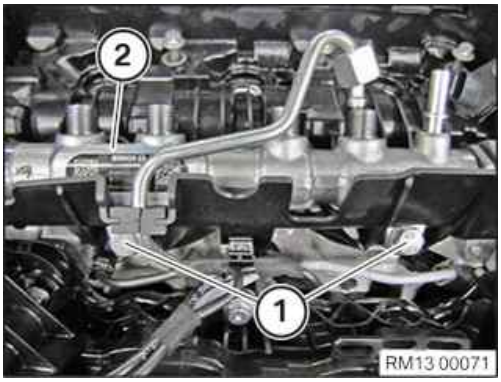
Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.



- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

22 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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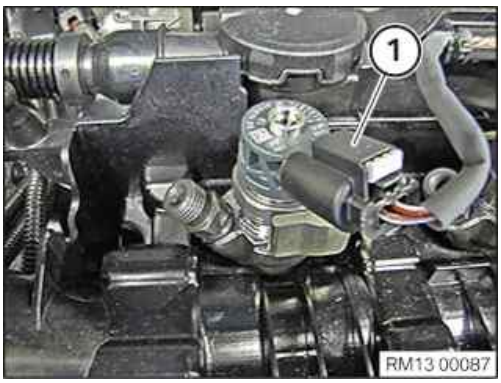
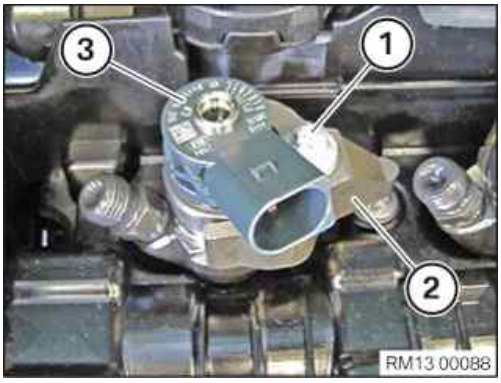
TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

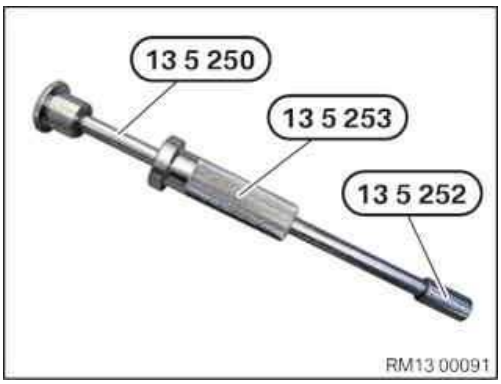
▶ **Loosen stuck injectors**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)** back onto the special tool **0 493 321 (13 5 250)**.

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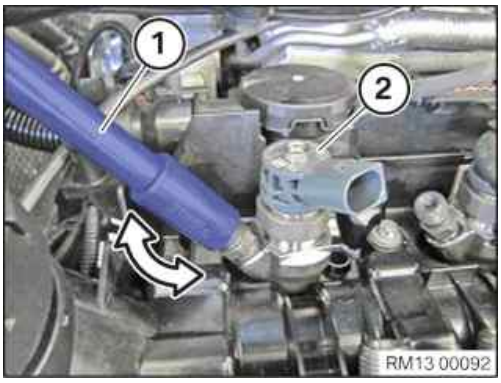


- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

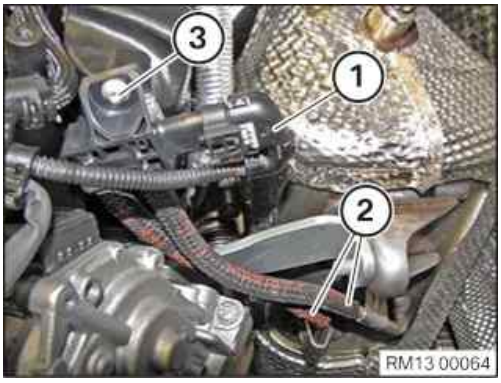
23 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

24 – Removing the cylinder head cover

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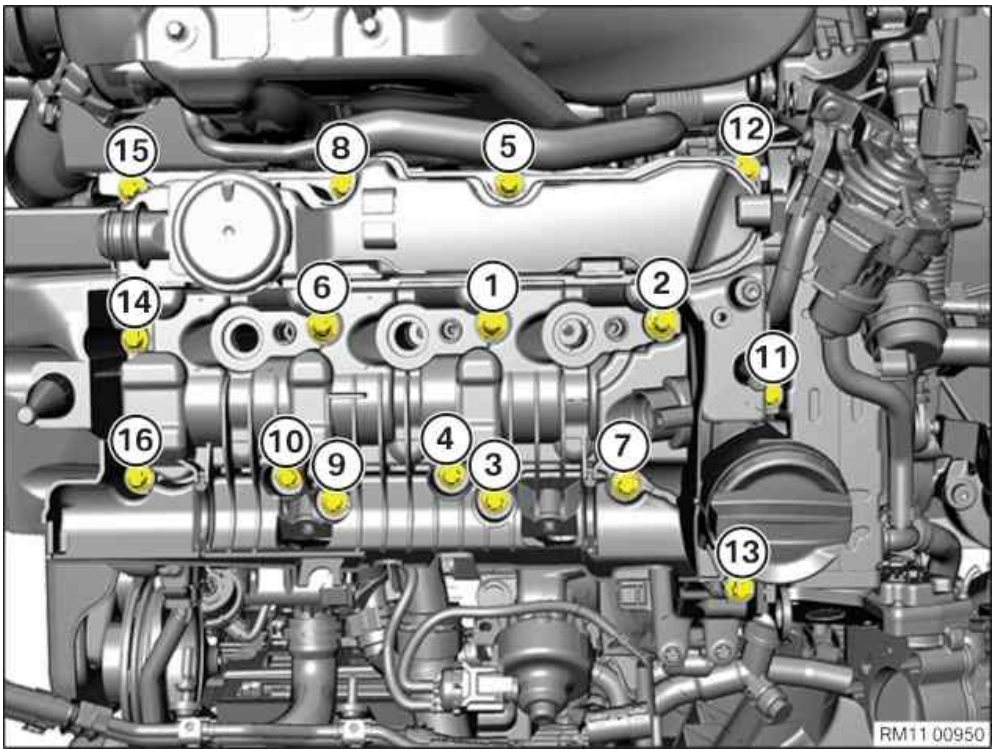
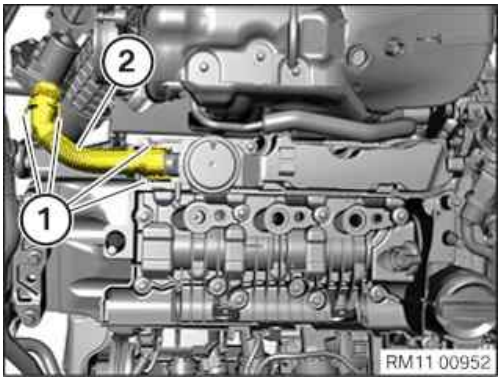
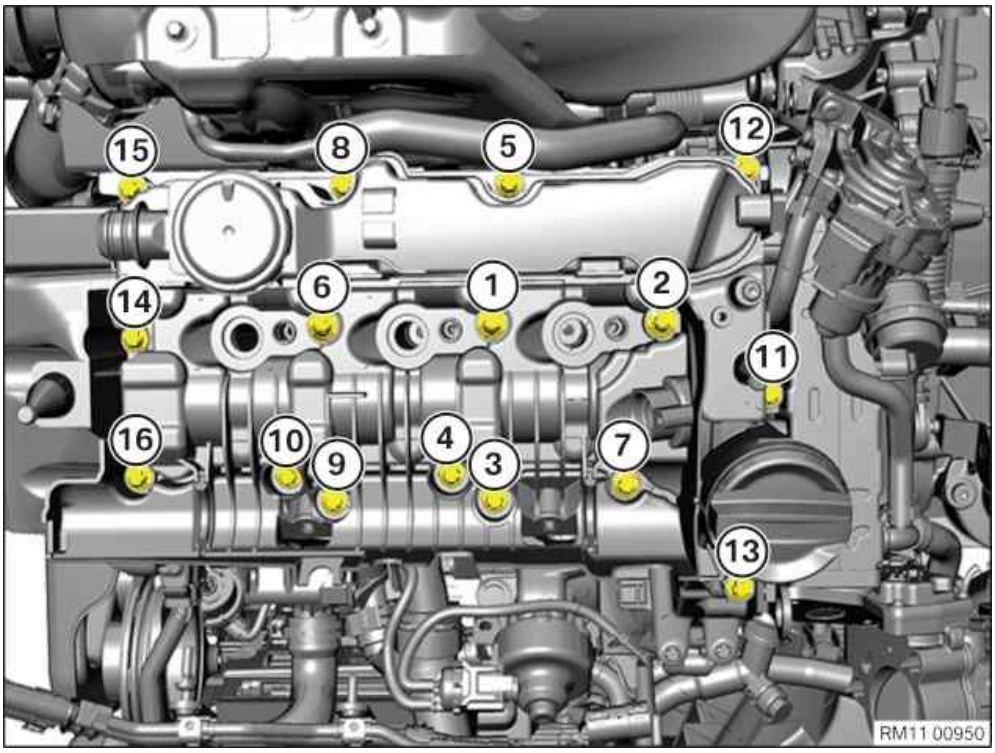
Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).



- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

25 – Remove front right wheel

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TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

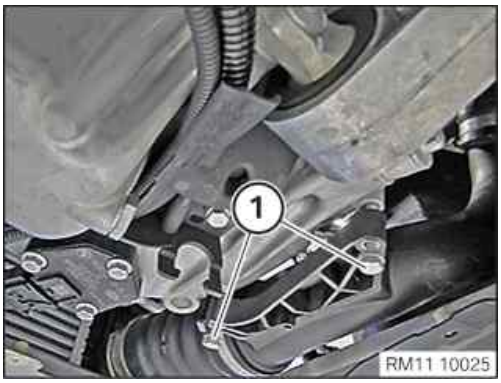
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

26 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).

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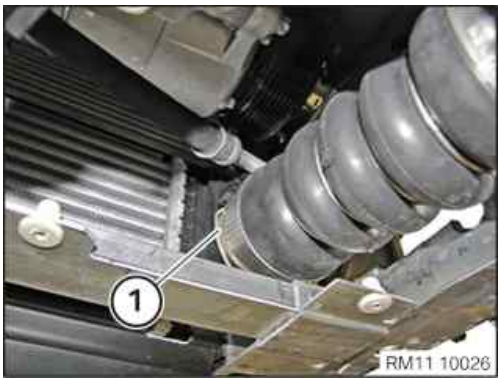
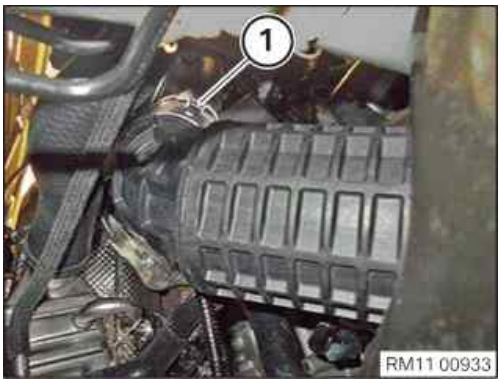
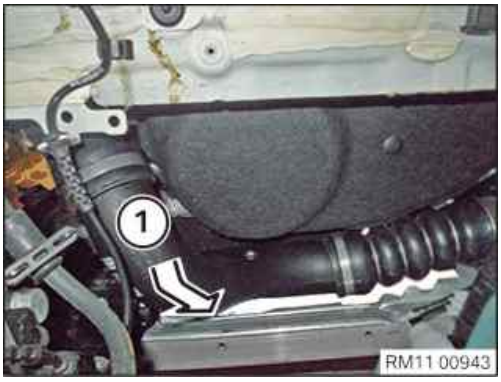


- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

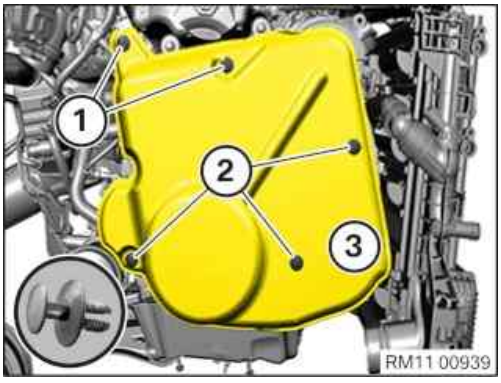


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

27 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

28 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

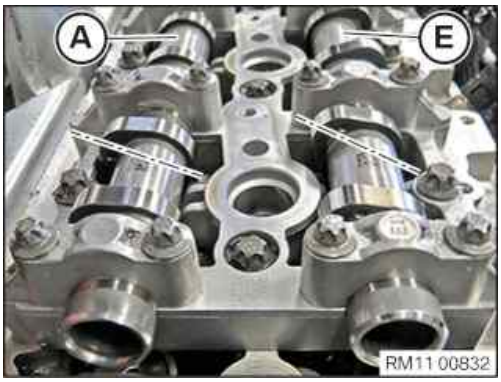
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

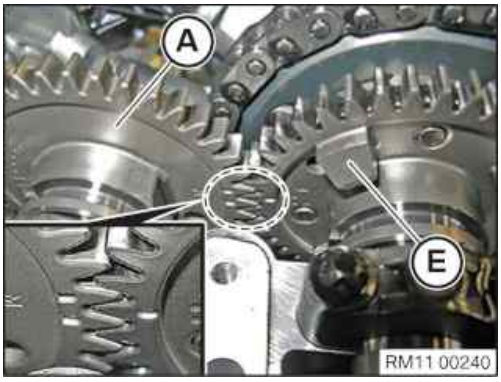
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

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- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

MAIN WORK

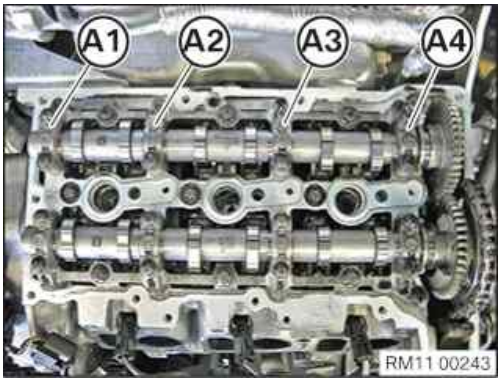
29 – Remove exhaust camshaft.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

30 – Installing exhaust camshaft

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

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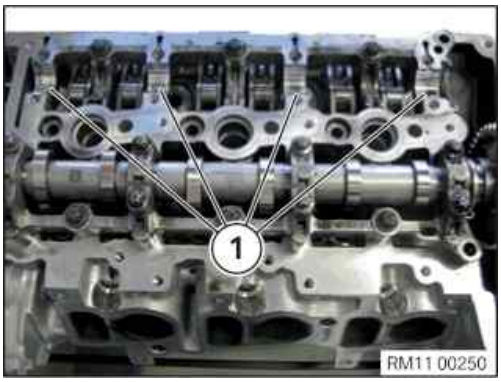
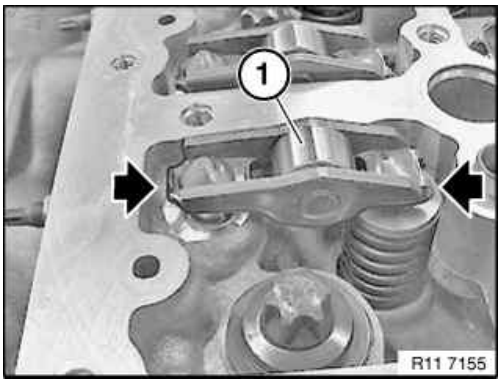
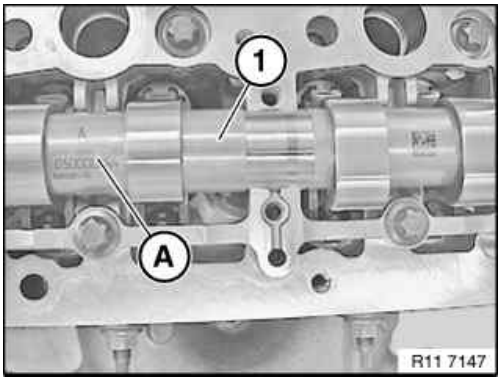


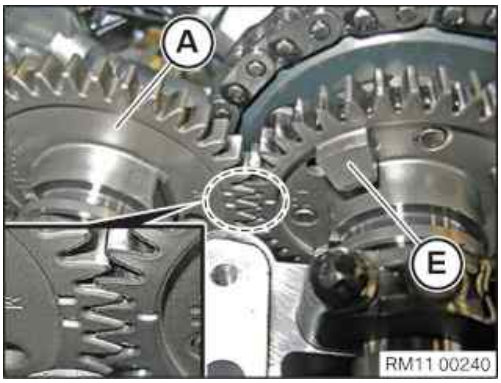
- Oil all bearing positions (1).



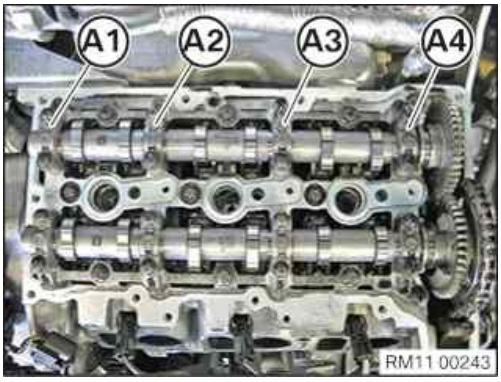
- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

POSTPROCESSES

31 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

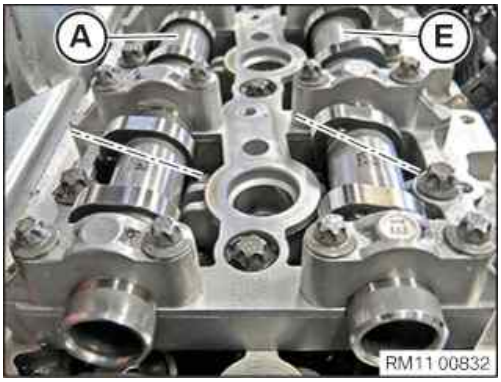
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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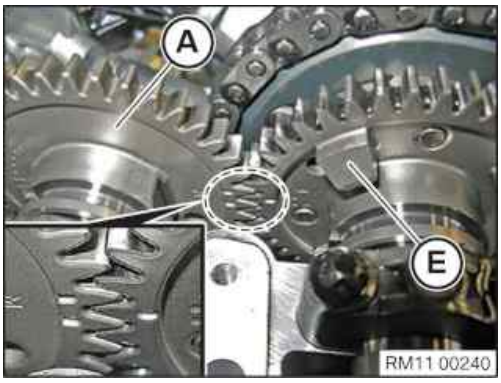


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

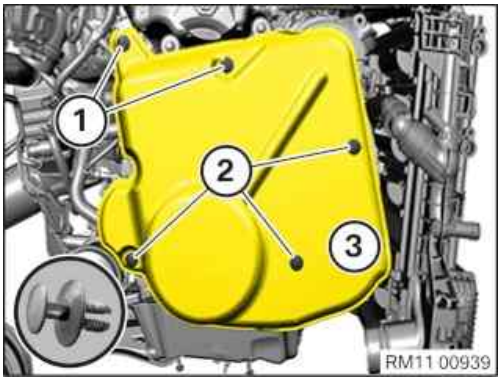
TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

32 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

33 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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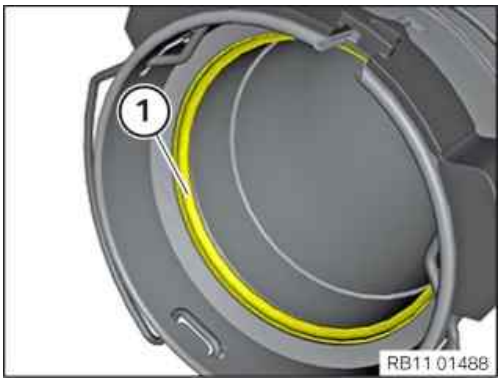
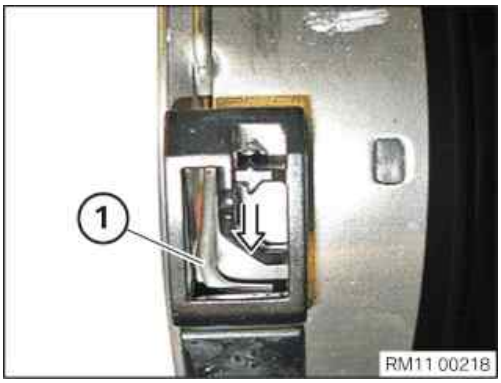
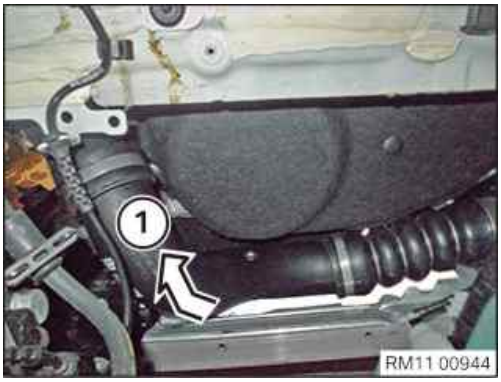


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

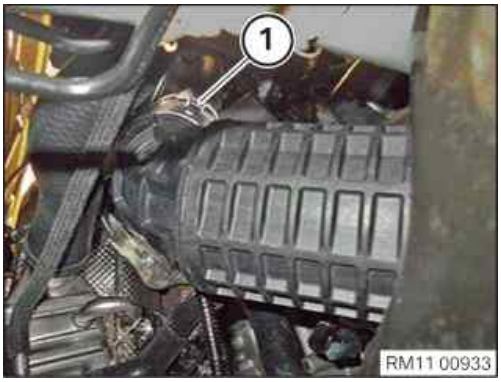
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

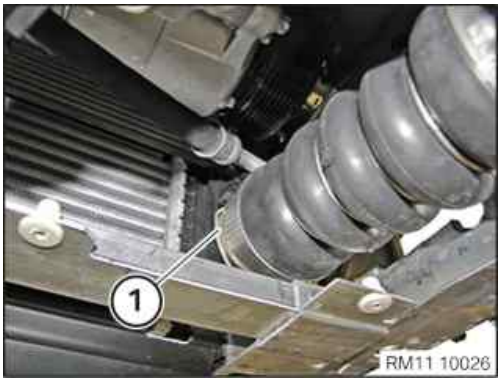


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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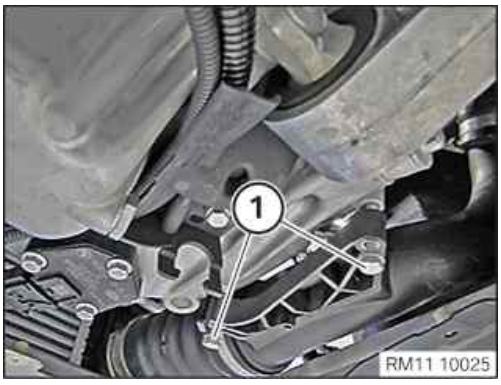
- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

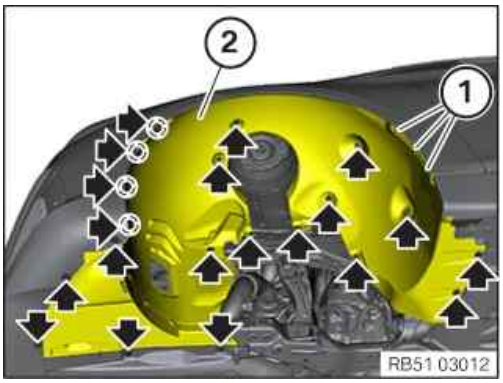


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

34 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

35 – Installing cylinder head cover

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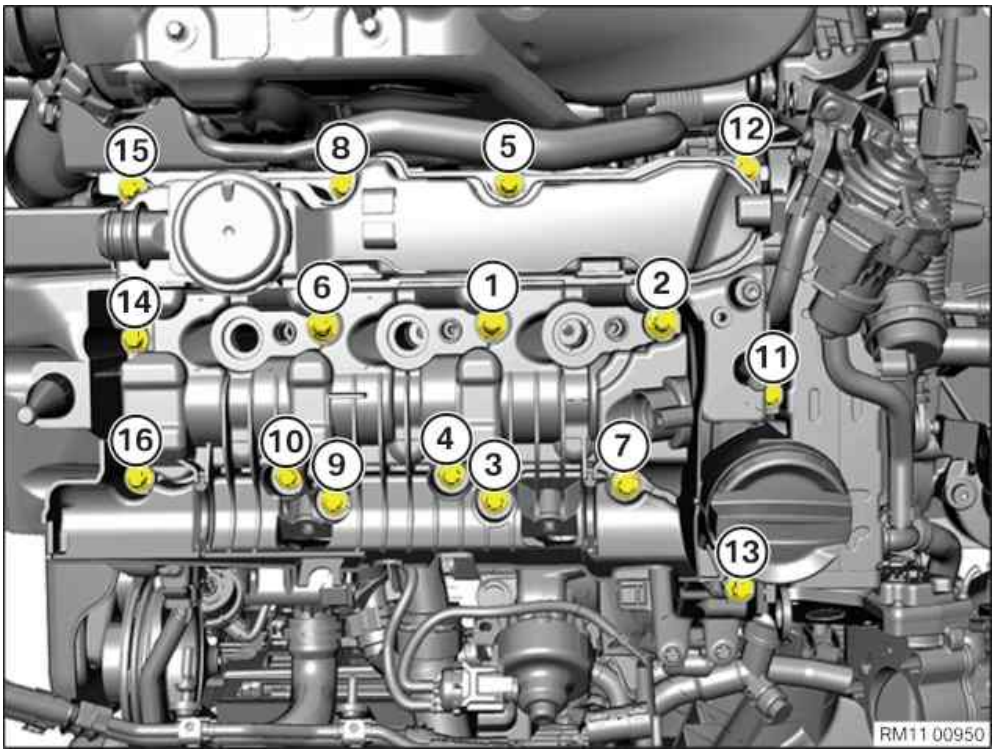
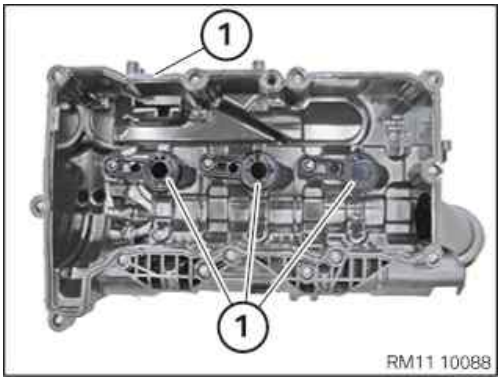
Overview: Screw connection of the cylinder head cover

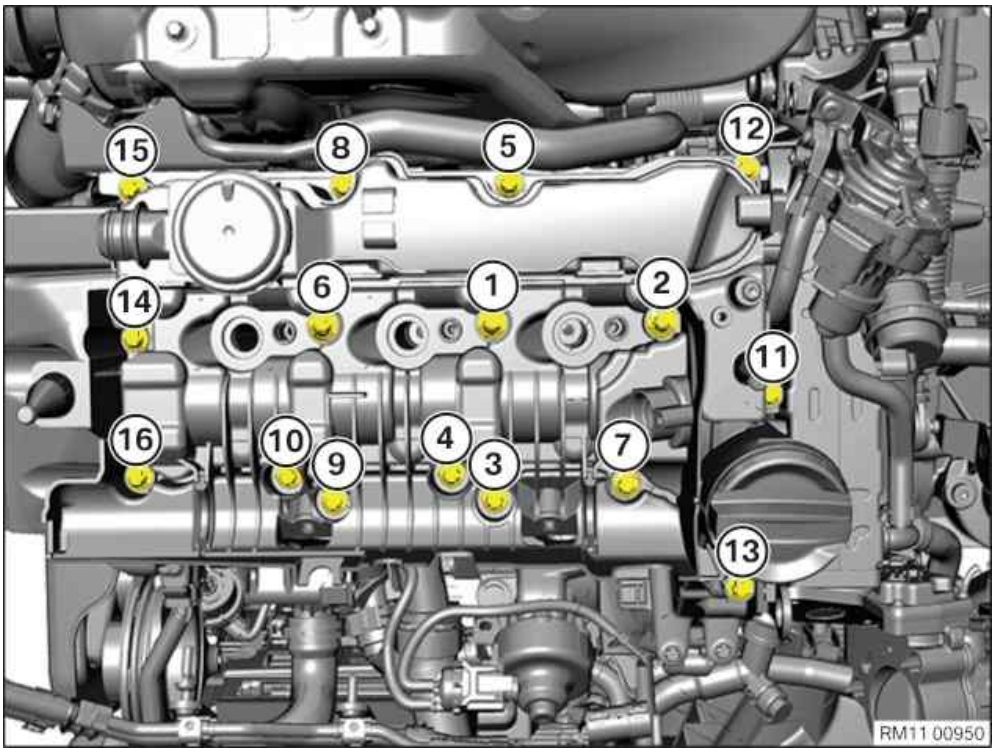


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nm

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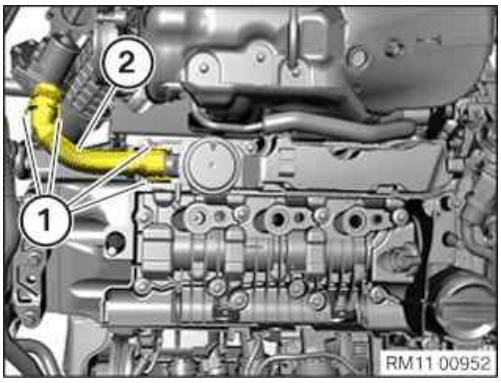
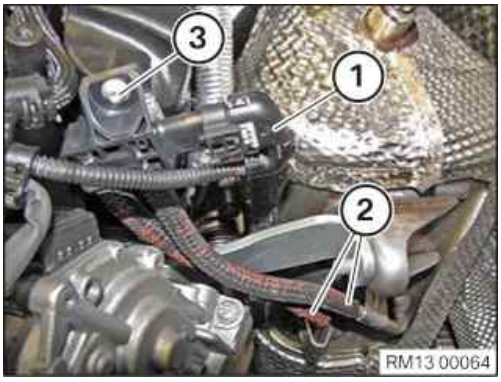


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

36 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

37 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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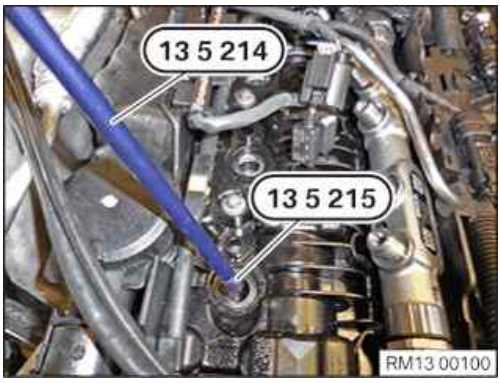
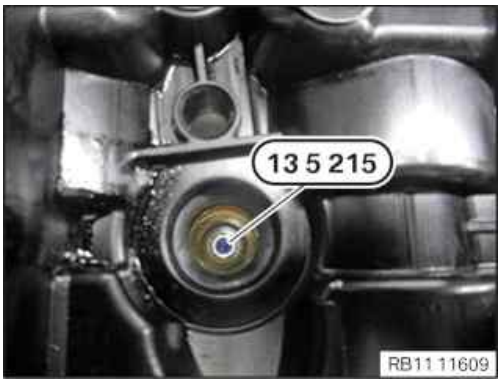


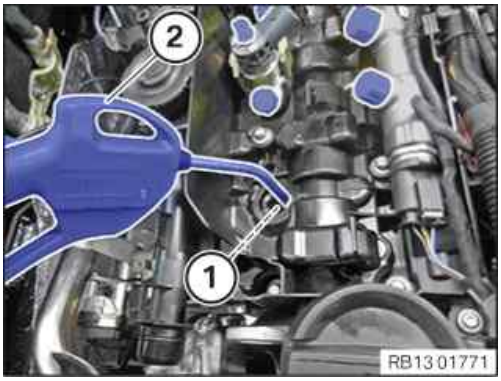
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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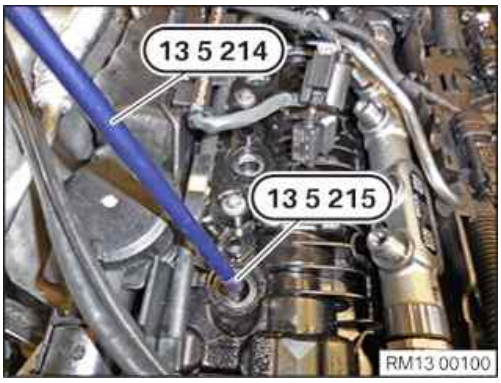


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

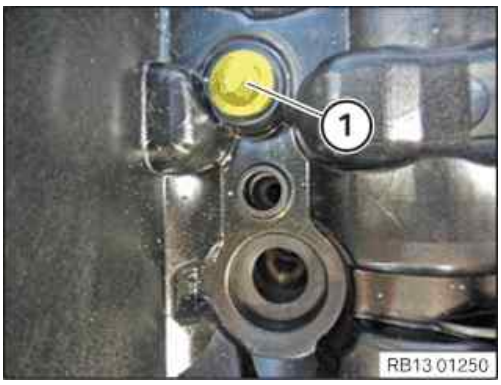
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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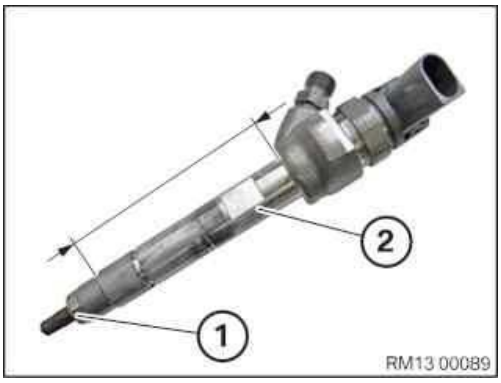


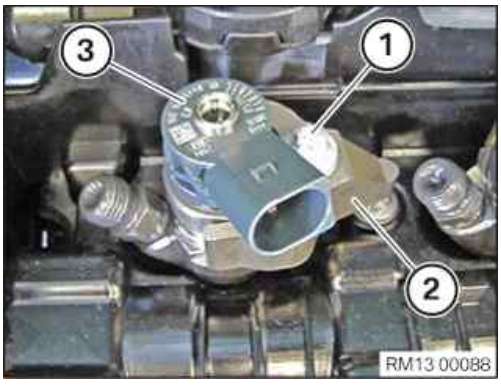
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

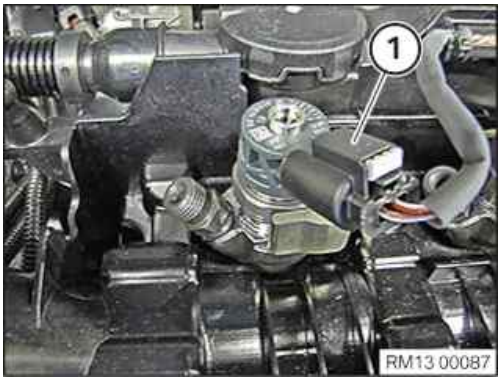
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

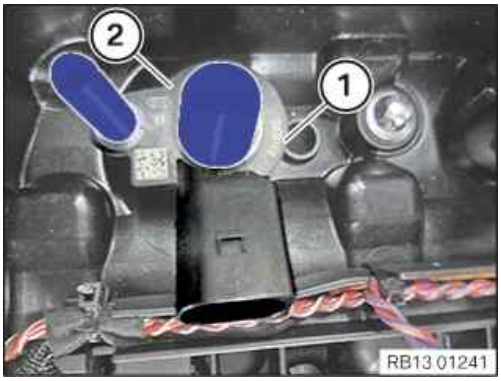
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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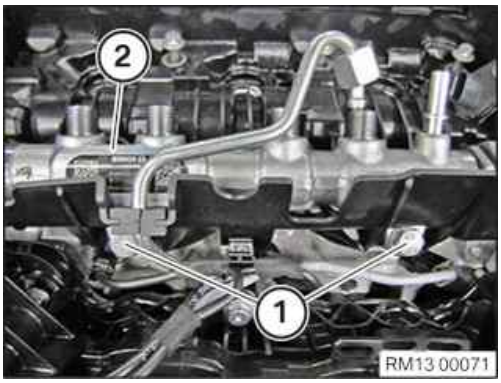
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

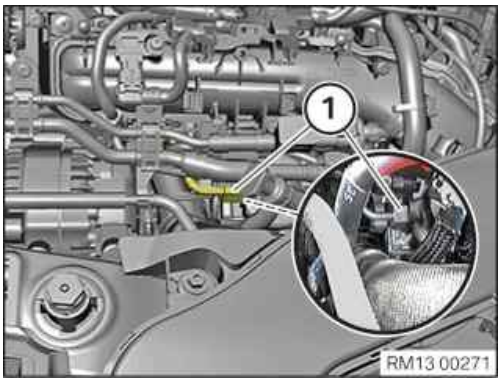
38 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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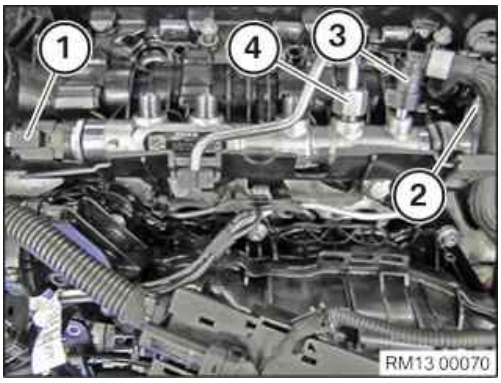

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

39 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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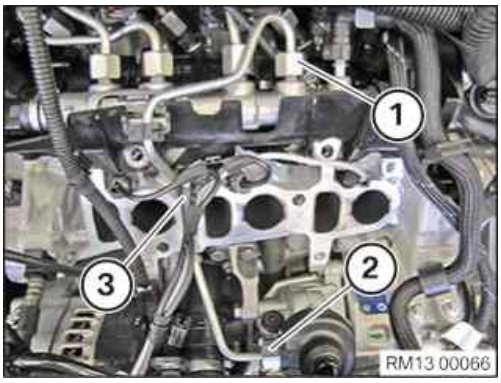

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

40 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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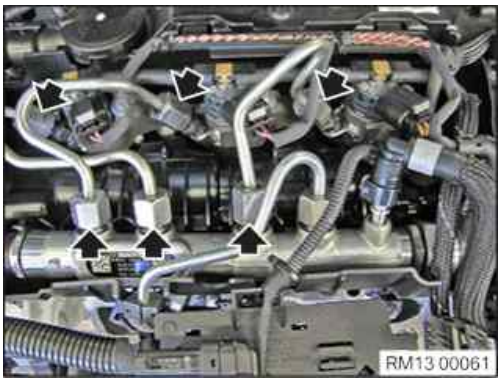


- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

41 – Connect the leakage oil line on the injector

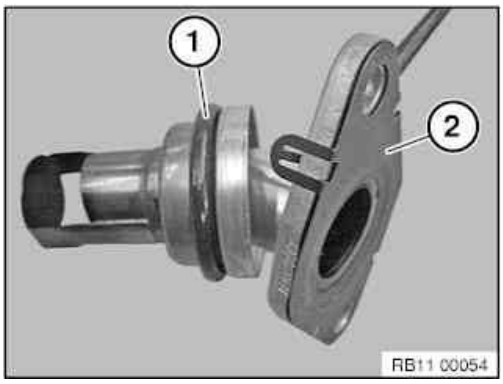
- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

42 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

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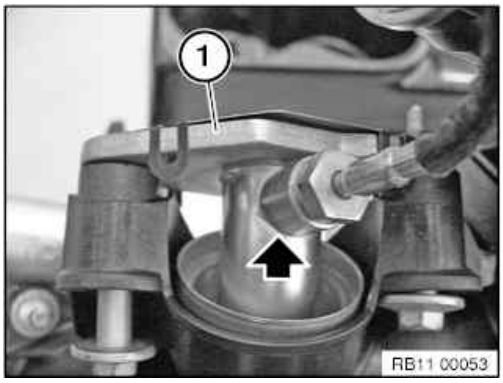
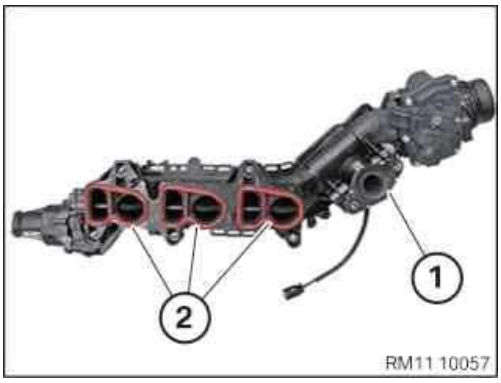
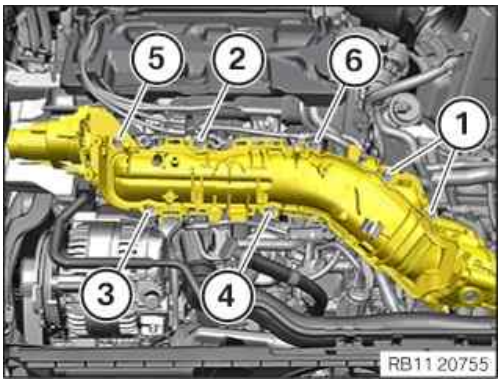


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

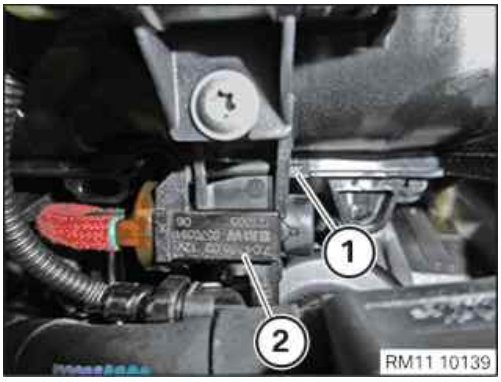
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



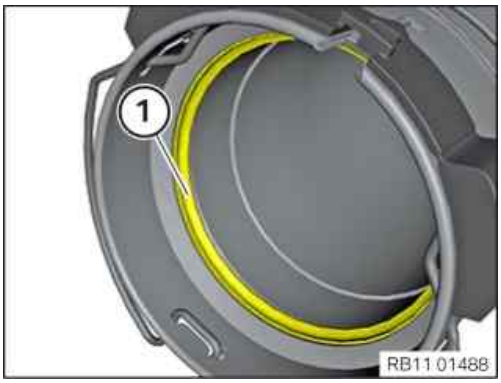
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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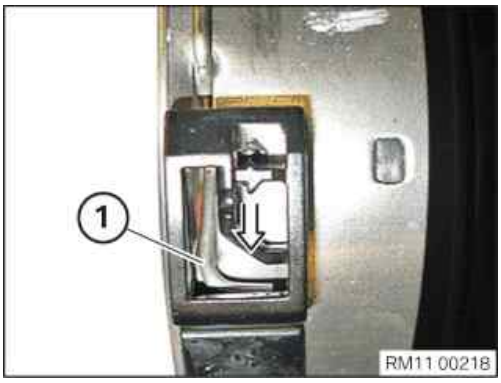
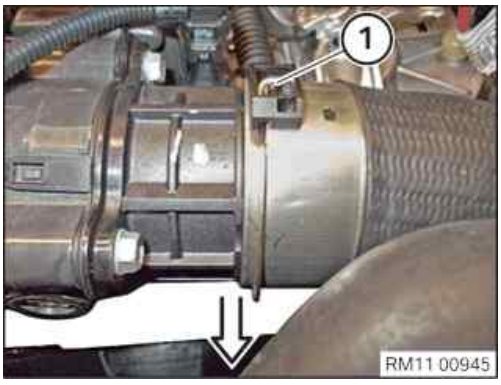
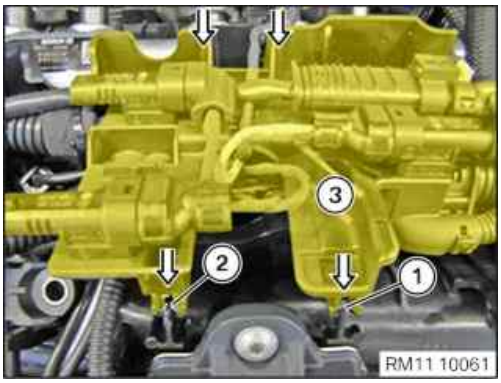


- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

43 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

44 – Fastening the wiring harness section for the intake plenum

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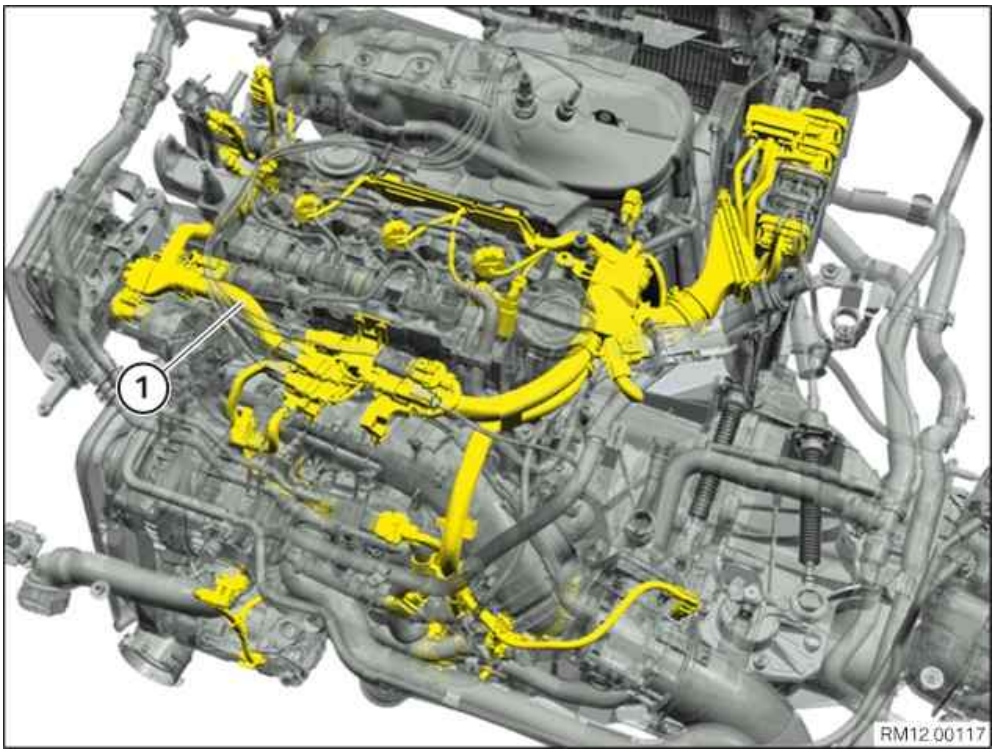
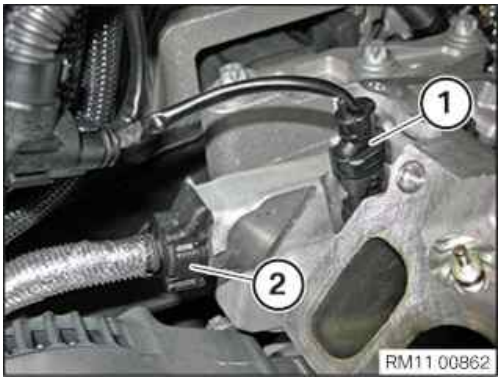
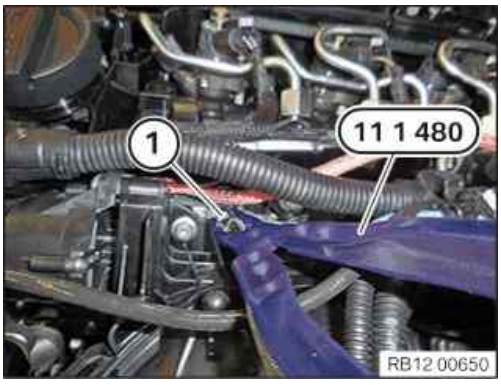
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

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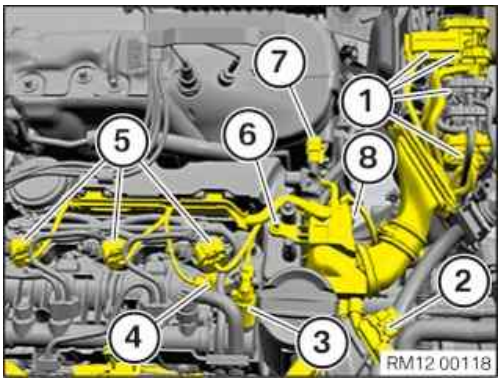
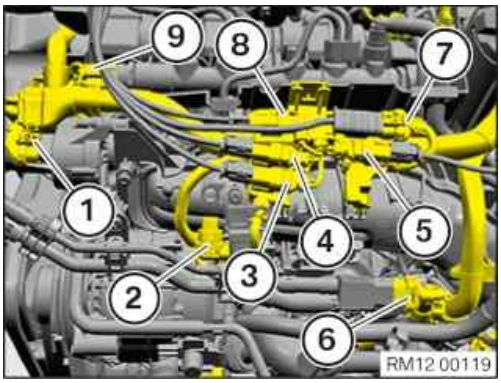


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

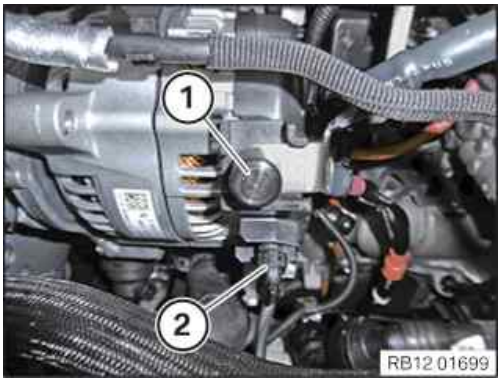
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

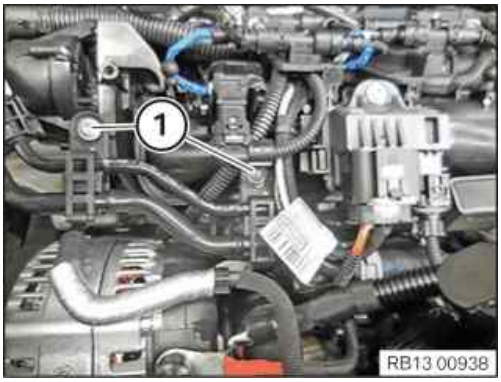


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm



- Position fuel lines.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

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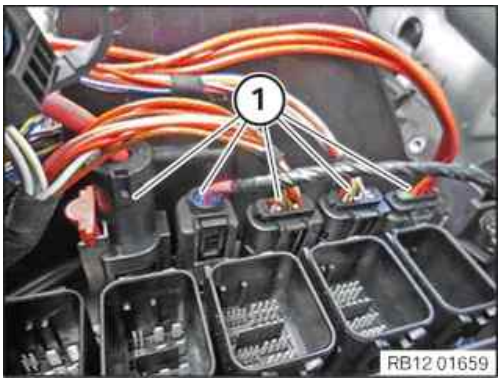
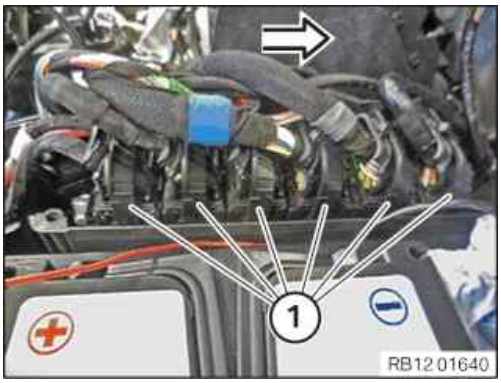
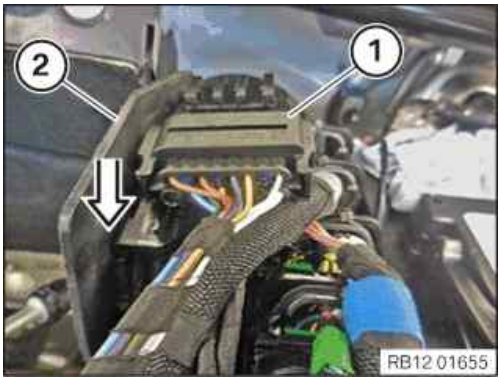


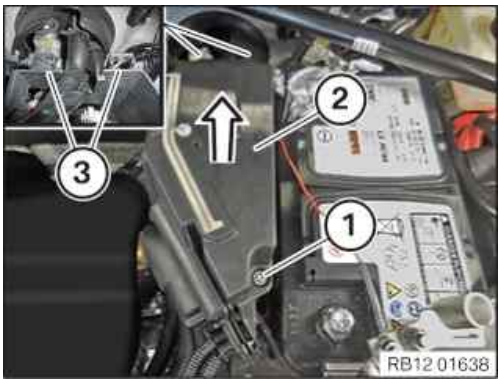
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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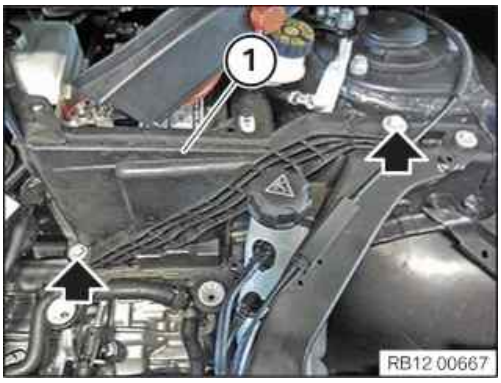


- Feed in and install tension strut (1).
- Tighten screws (arrows).

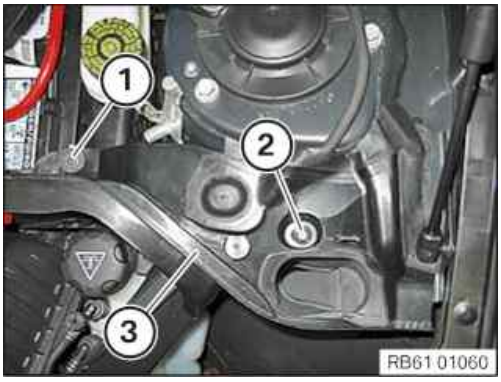
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

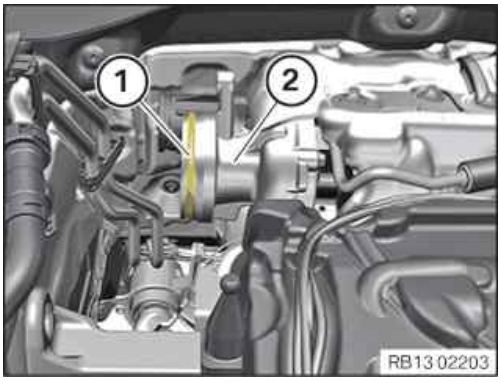


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

45 – Partially securing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.

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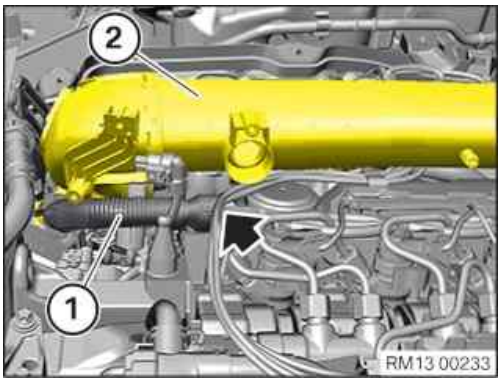
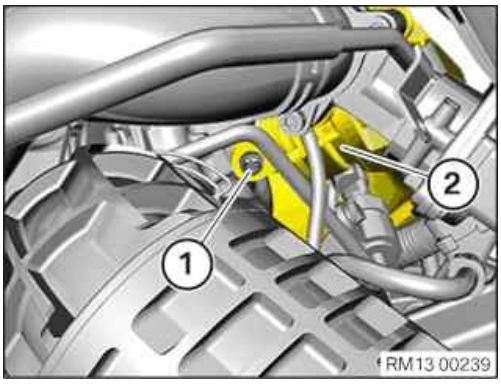


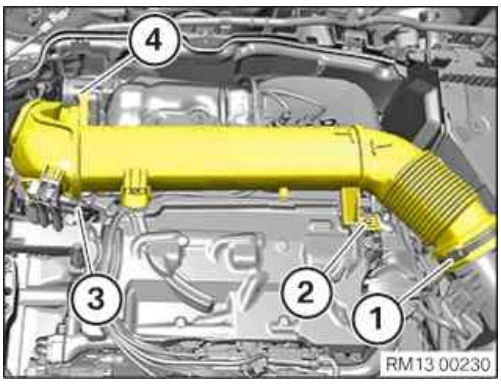
- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

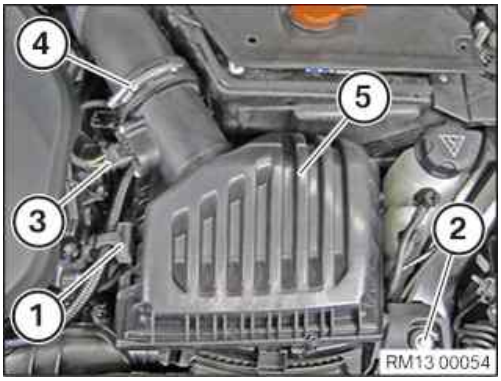
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

46 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

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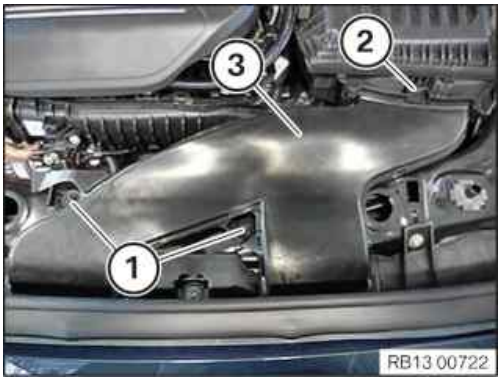
47 – Install the intake neck for the intake filter housing



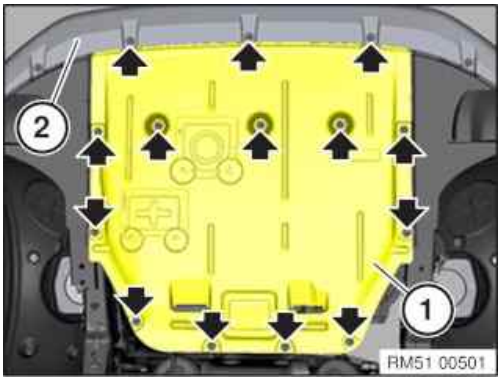
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

48 – Installing the front underbody protection

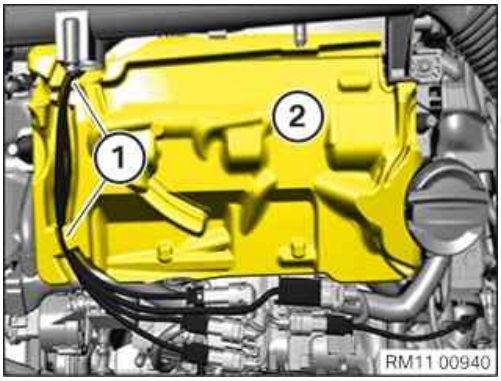


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

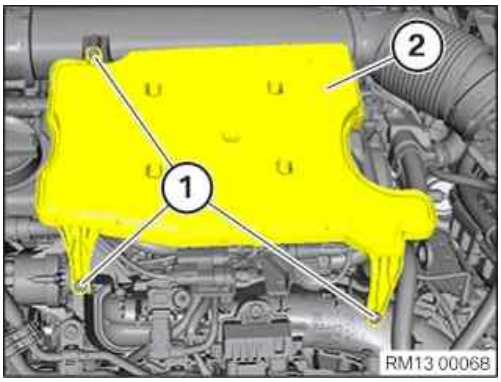
			3 Nm

49 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

50 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

51 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

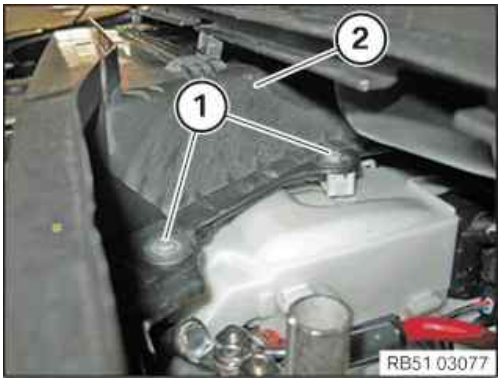
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

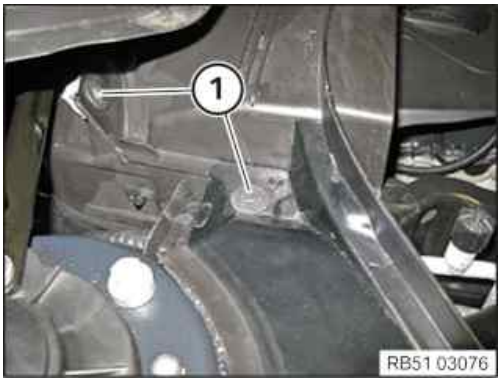
52 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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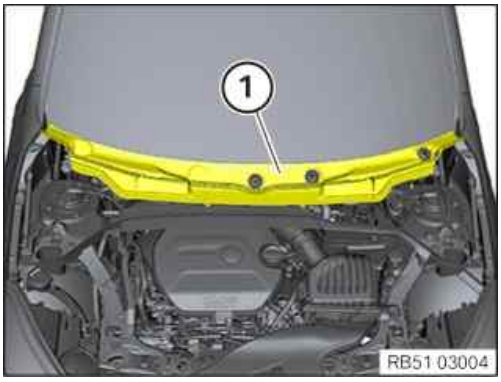
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

53 – Install the rear cowl panel cover



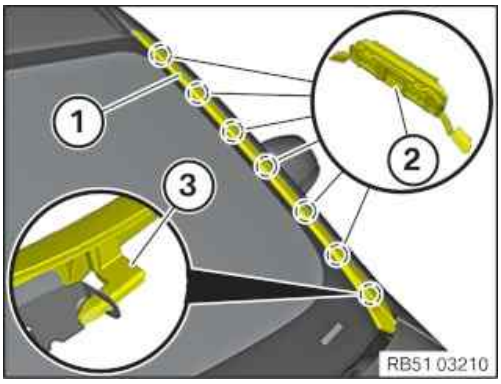
- Feed in and engage the rear cowl panel cover (1).

54 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

55 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the wiper arm**

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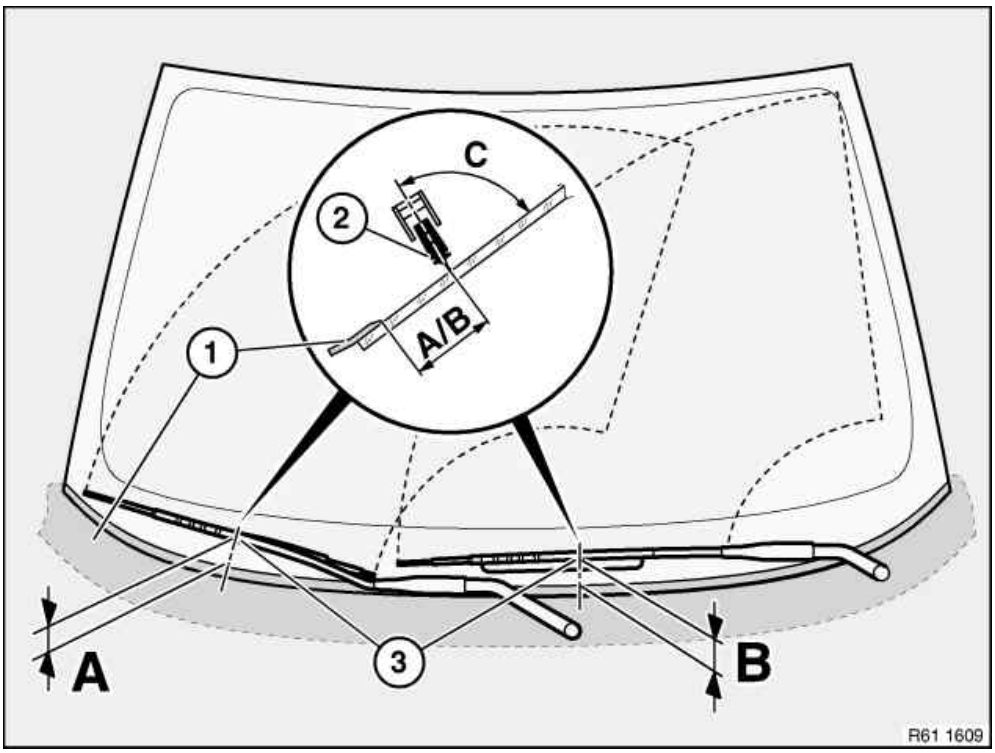
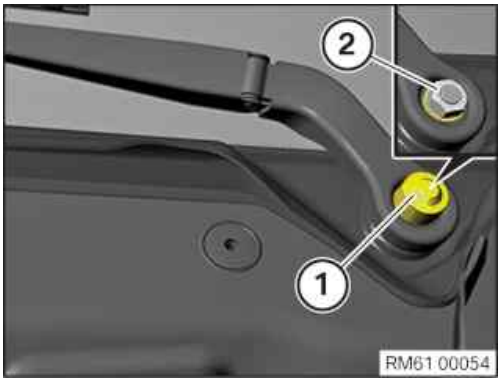
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

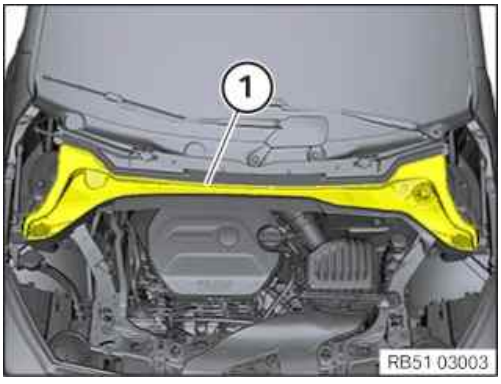
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

56 – Installing front cowl panel cover



- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

57 – Install the seal for the bonnet

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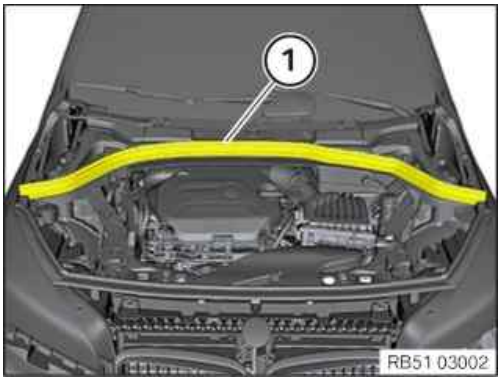
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

58 – Disconnecting all battery earth leads

- See additional information.

Additional Information

Overview of Tightening Torques

Intake and exhaust camshaft in camshaft support — Used in step 30

M6x31		Tightening torque	10 Nm

Charge air line to crankcase — Used in step 33

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 33

M6		Tightening torque	8 Nm

Wheel arch cover — Used in step 34

Screw			3 Nm
Plastic nut			2,6 Nm

Cylinder head cover to cylinder head — Used in step 35

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder — Used in step 36

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 36

Clamp 15–19mm		Tightening torque	3 Nm

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Clamping claw facing to cylinder head cover

Used in step 37

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 37

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 38

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 38 39

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 40

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 42

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover

Used in step 44

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 44

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 44

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 44

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 44

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 44

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 44

		Tightening torque	3 Nm

Battery cover

Used in step 44

Screw			2,8 Nm

Clean air pipe to exhaust turbocharger

Used in step 45

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover

Used in step 45

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 45 46

Clamp		Tightening torque	3 Nm

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Intake silencer housing to lock bridge — Used in step 46

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 47

M6		Tightening torque	8 Nm

Underbody protection front — Used in step 48

			3 Nm

Resonator to manifold and clean air pipe — Used in step 50

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 52

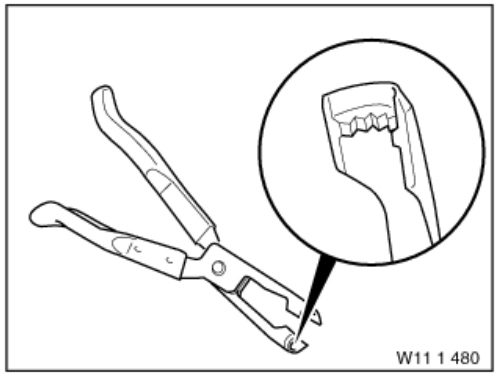
Screw		Tightening torque	3 Nm

Windscreen wiper arm — Used in step 55

Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 15

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common — Used in step 19 20 21 38 39 40

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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2 413 106 Fastener

Common

Used in step 19 20 39 40

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

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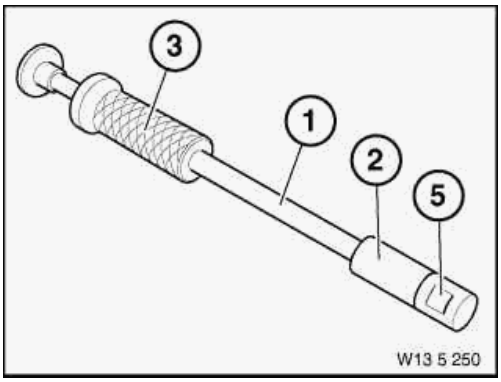
0 493 321 (13 5 250) Puller



Common

Used in step 22

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common

Used in step 22

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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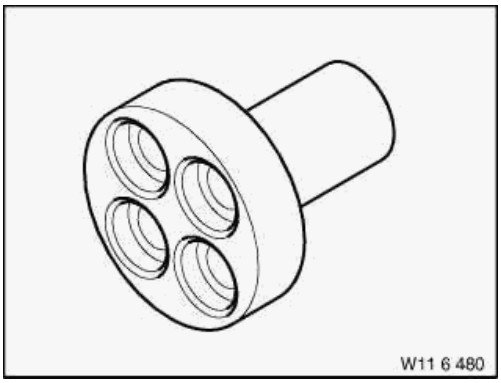
0 493 340 (13 5 253) Weight

Common	Used in step 22
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 28 31
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 28 31
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common	Used in step 28 31
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray

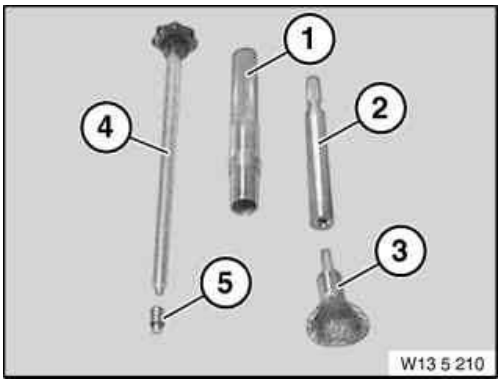
Common Used in step 29

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

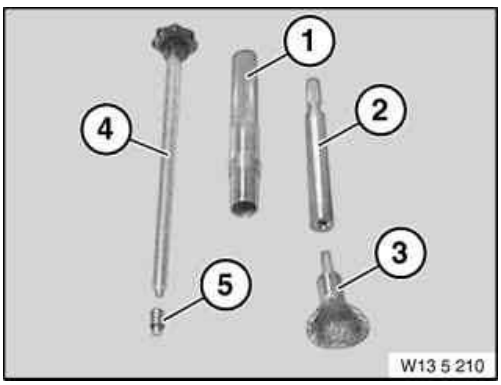
0 493 763 (13 5 215) Plug



Common Used in step 37

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common Used in step 37

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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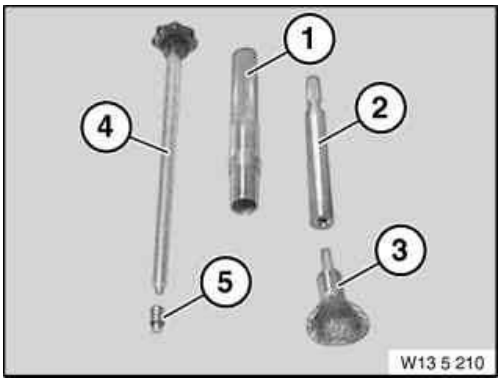
0 493 758 (13 5 210) Tool



Common Used in step 37

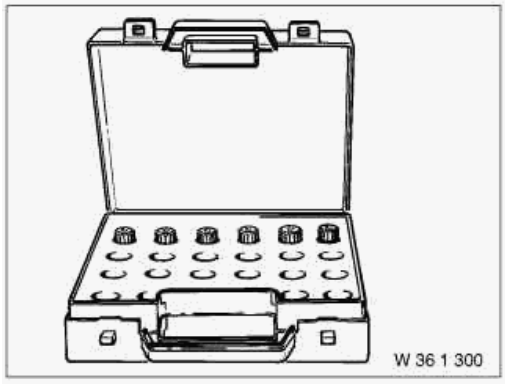
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common Used in step 25

Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud

Common	Used in step 25
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 25
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 25
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud

Common	Used in step 25
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 25
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 25
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 25
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Links

Repair instructions	Used in step

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61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	58
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	58
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
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61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
61 20 900 Disconnecting and connecting battery earth lead	1	58
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61 20 900 Disconnecting and connecting battery earth lead	1	58
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11 31 022 Removing and installing/replacing both camshafts

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

1 – Remove vehicle battery

WARNING

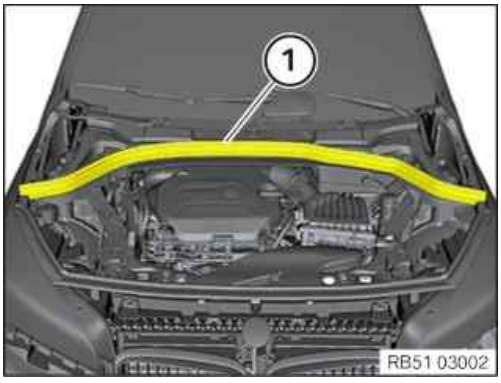
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

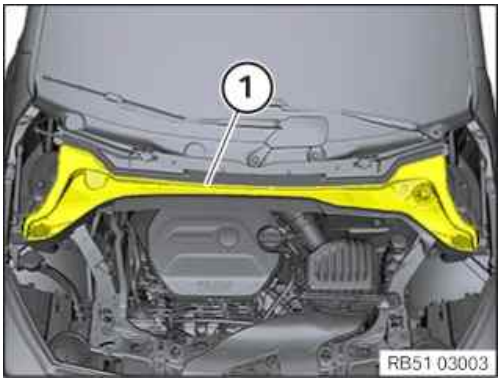
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.

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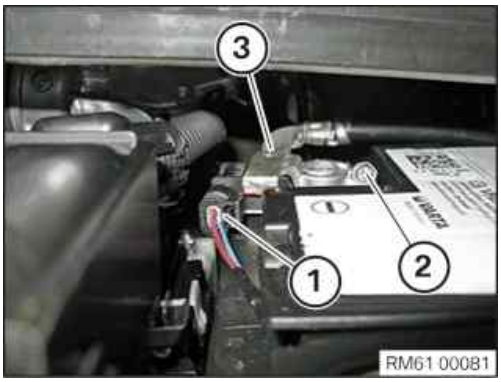
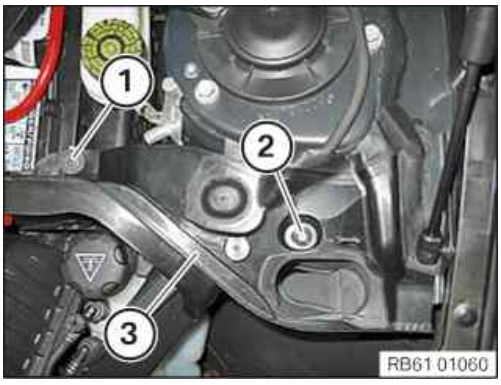
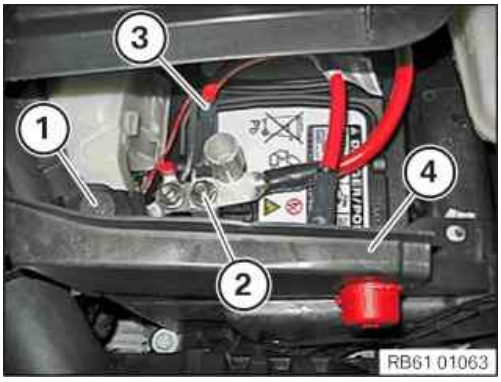


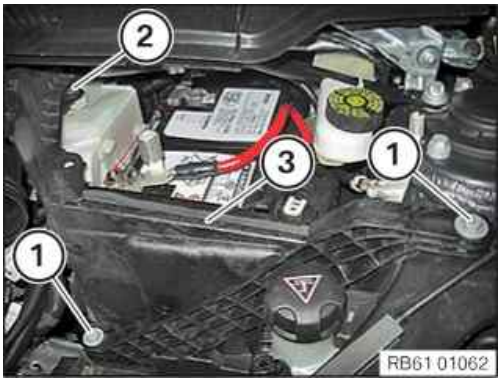
- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



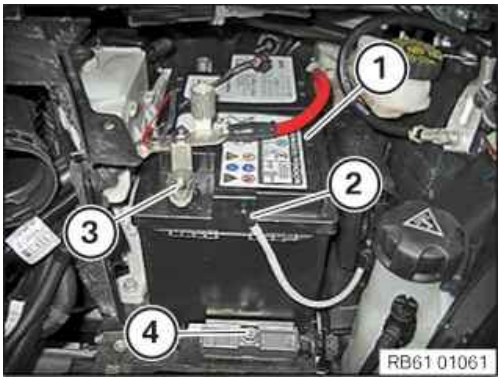
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Remove left and right wiper arm

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NOTICE

Description is for left component only. Procedure on the right side is identical.

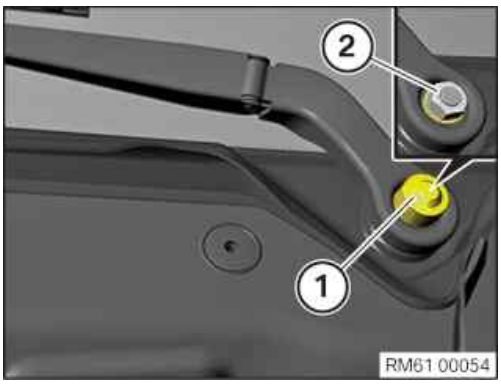
▶ **Remove the wiper arm**

RISK OF DAMAGE

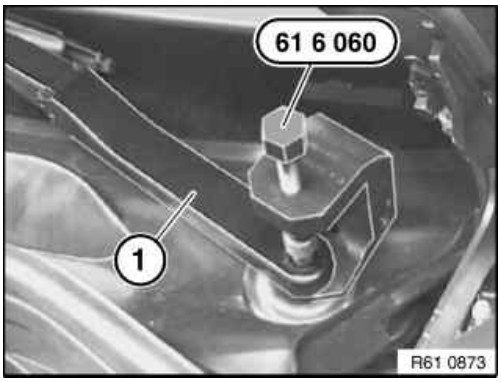
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

3 – Remove the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**

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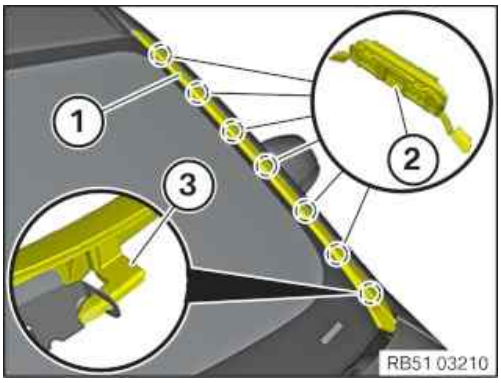
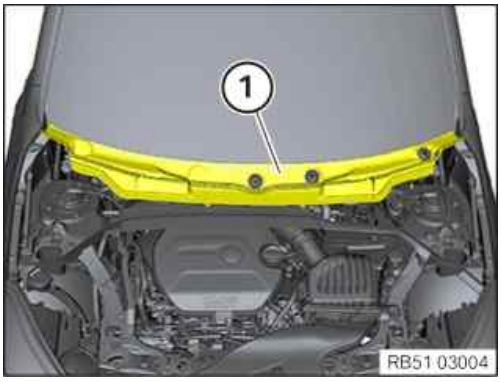


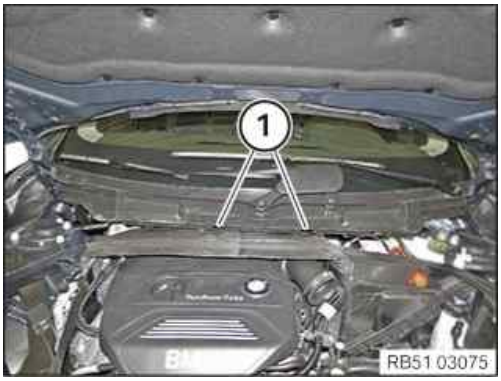
- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

4 – Remove the rear cowl panel cover

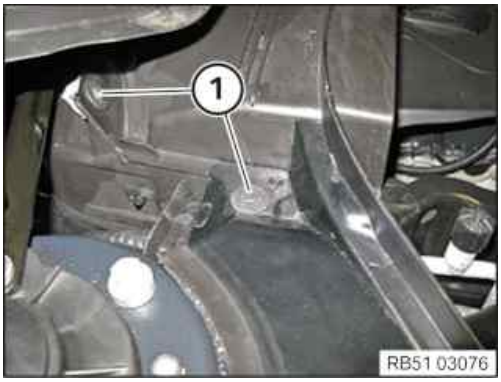


- Disengage and guide out the rear cowl panel cover (1) towards the top.

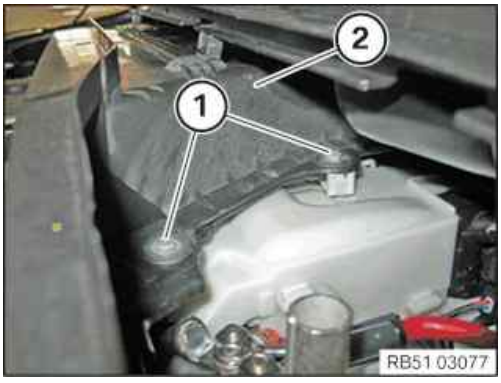
5 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

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6 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

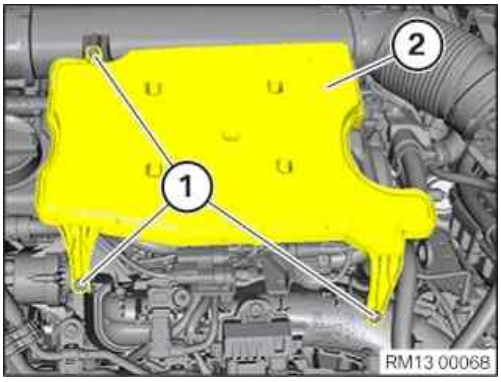
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

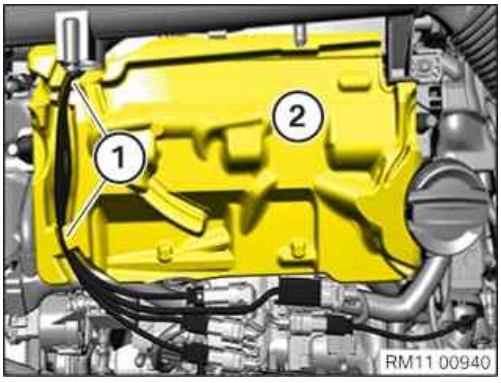
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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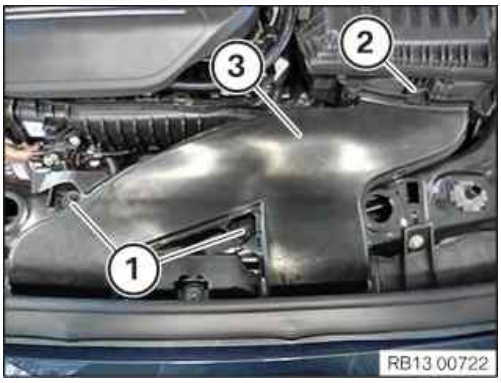
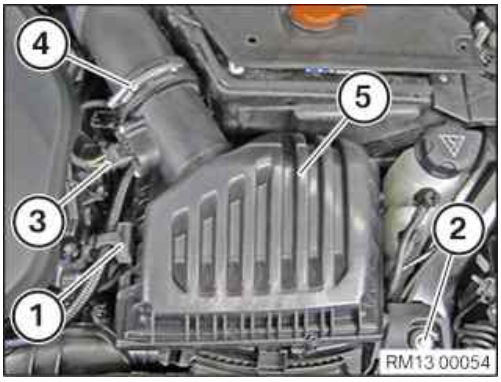


- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

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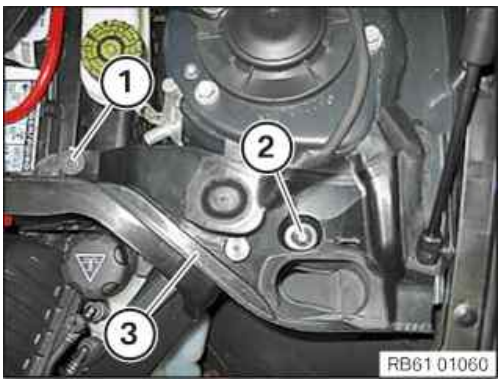
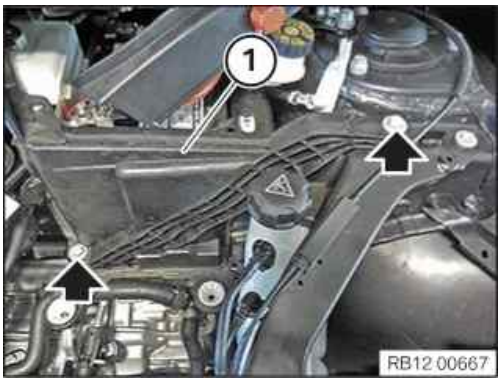
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

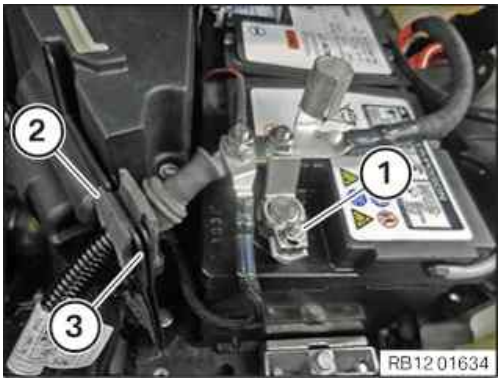


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

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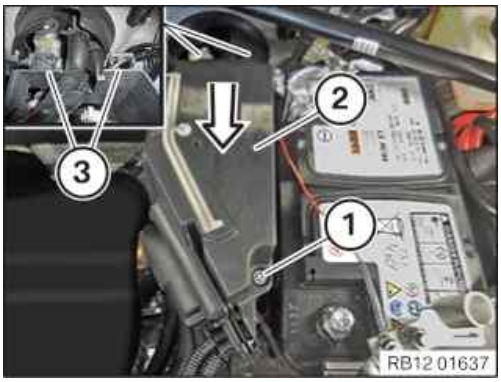
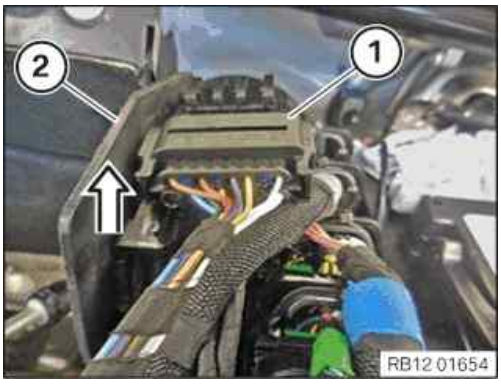
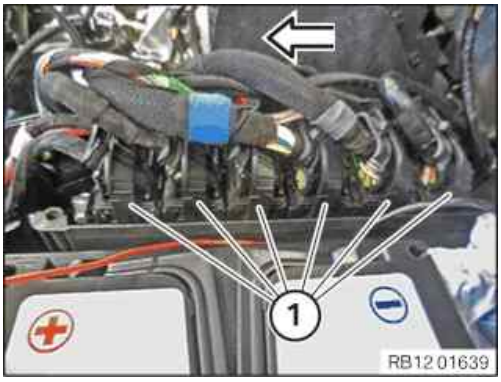


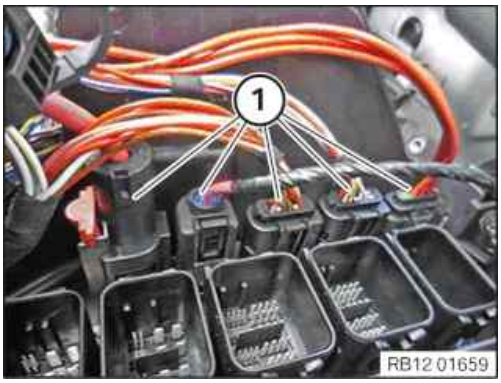
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



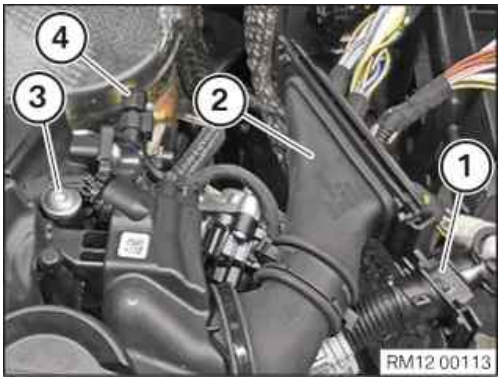
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

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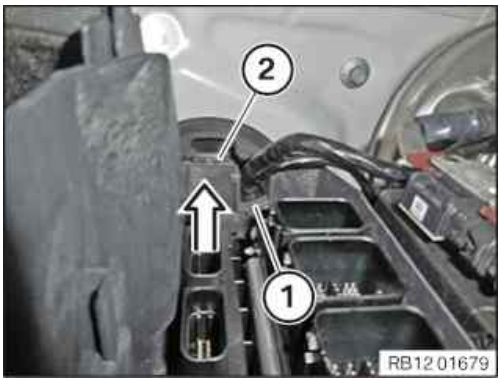
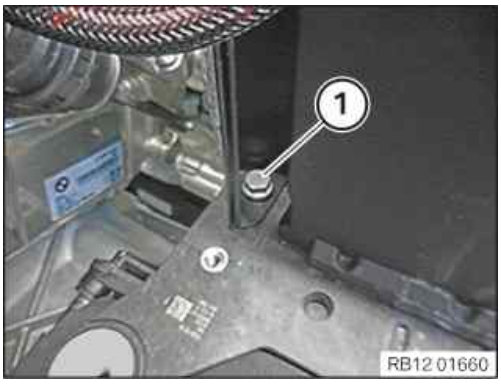
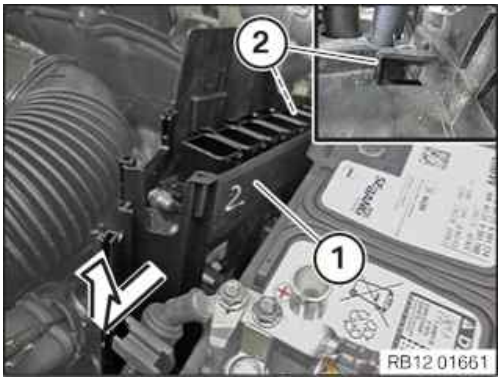


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

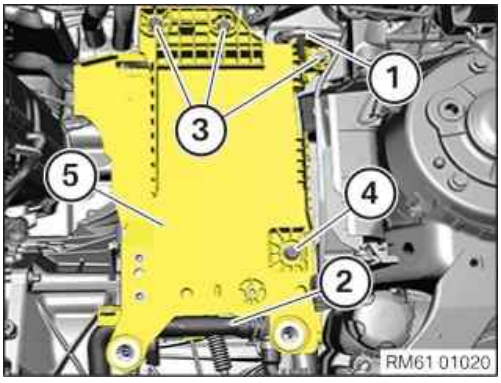


- Loosen screw (1).



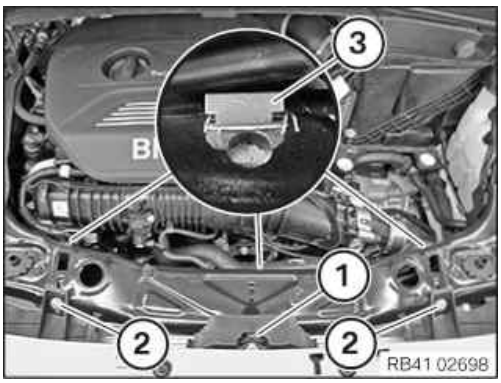
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

12 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

13 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.

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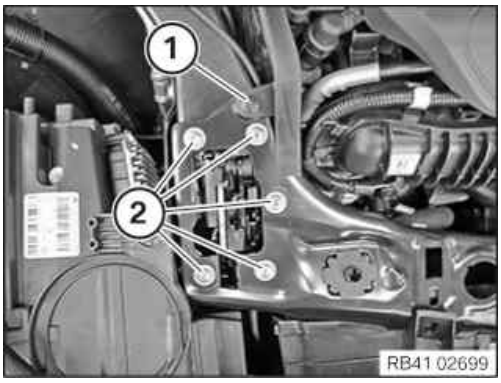
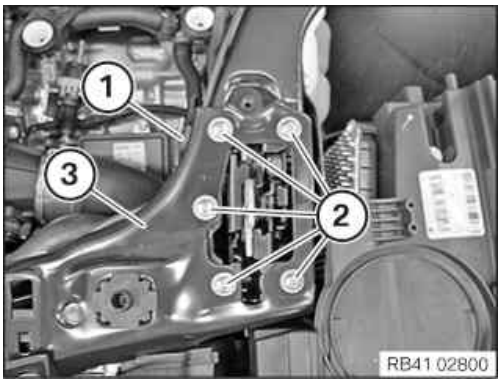
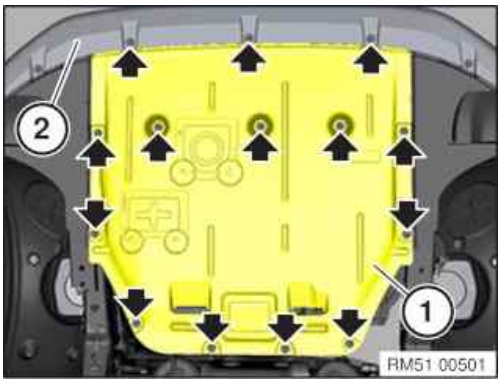


- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

14 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

15 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

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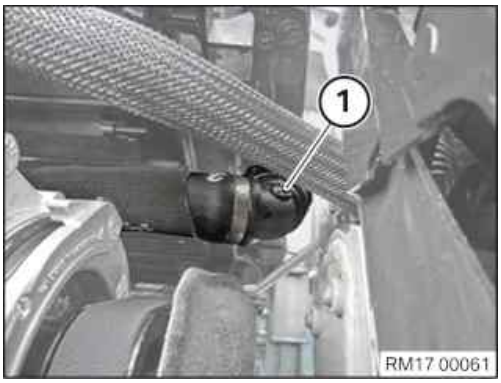
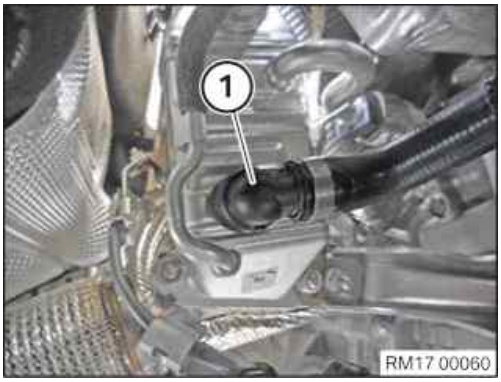
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

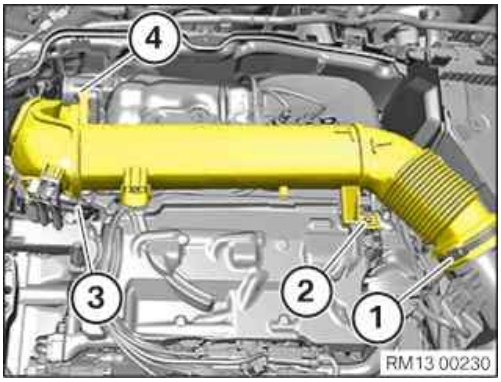


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

16 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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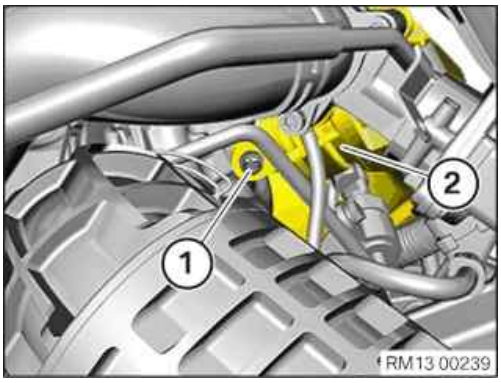
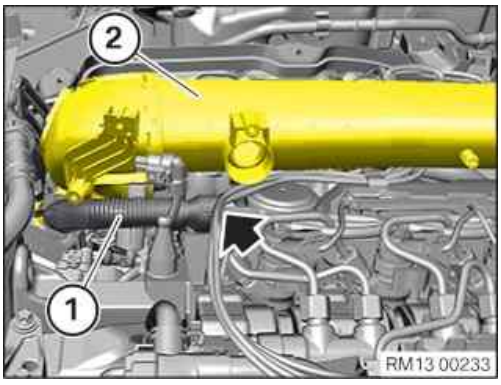


- Unscrew the screw (1) from the clean air pipe (2).



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

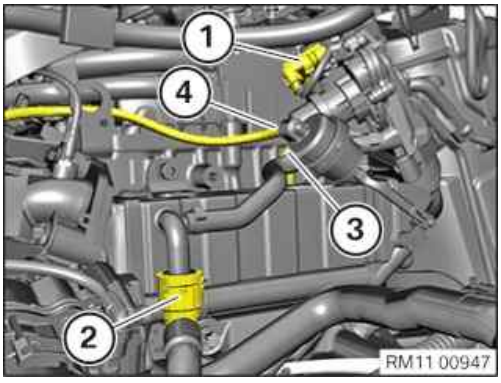
17 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.

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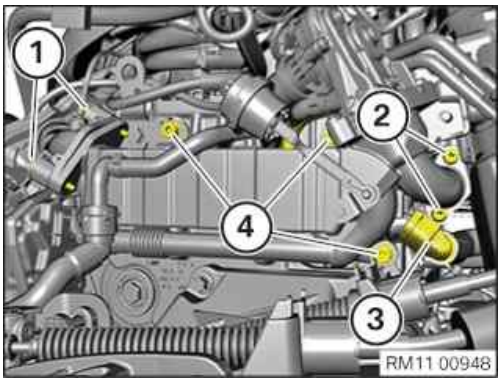
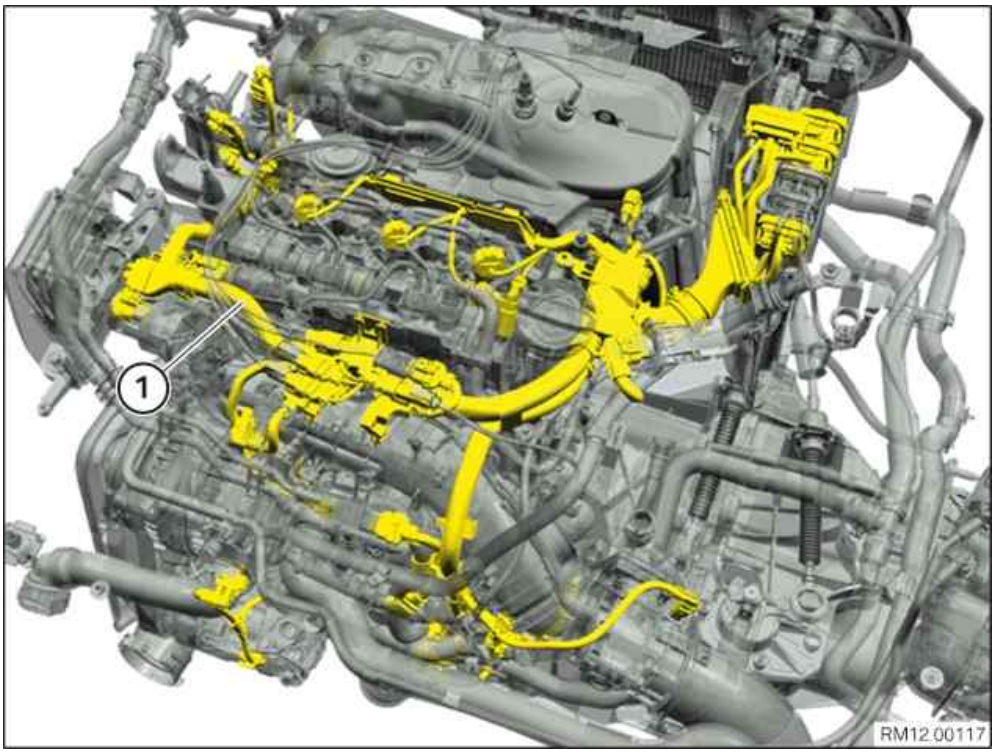


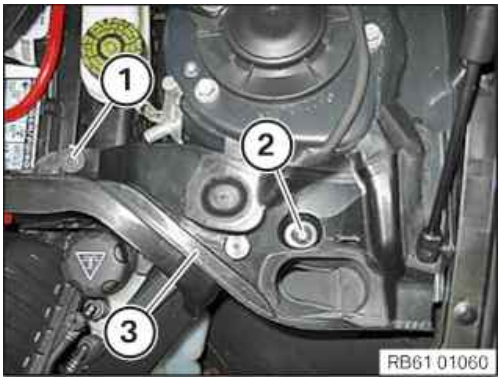
- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

18 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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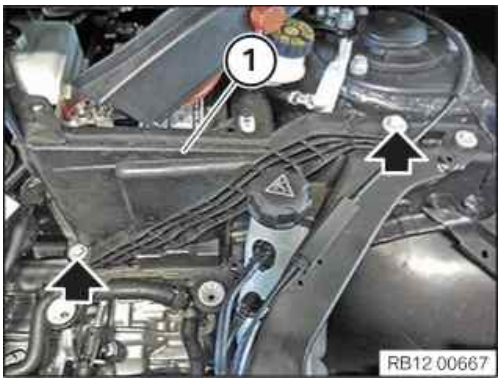
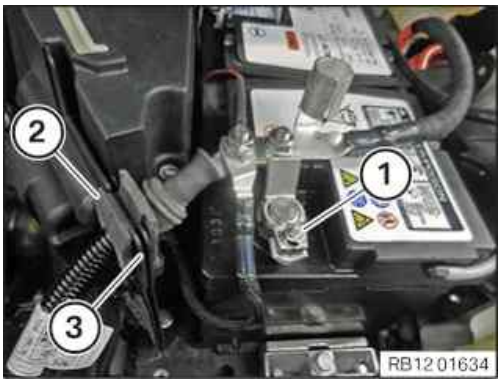
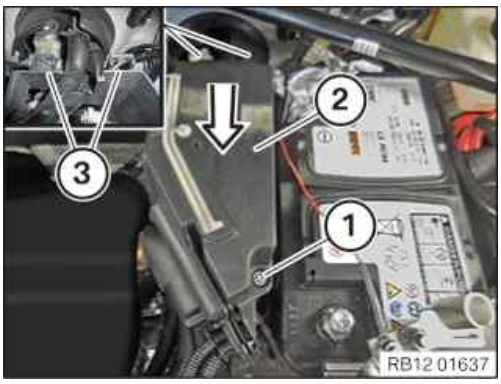


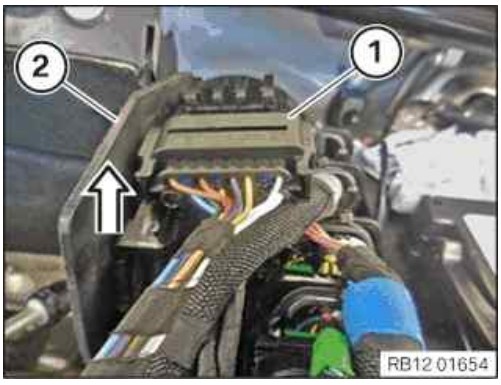
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



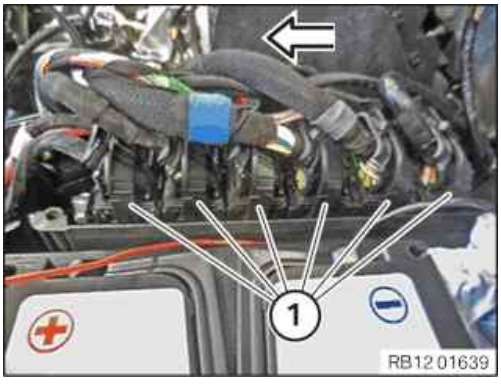
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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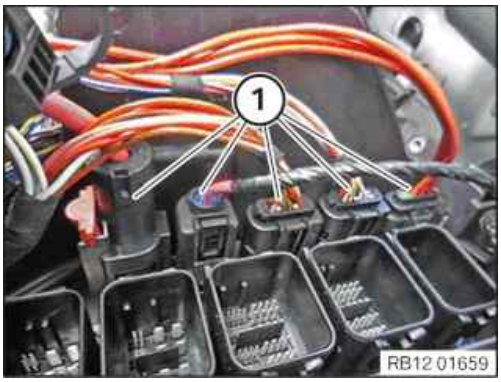
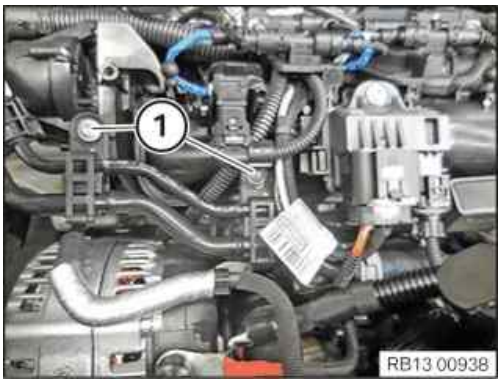
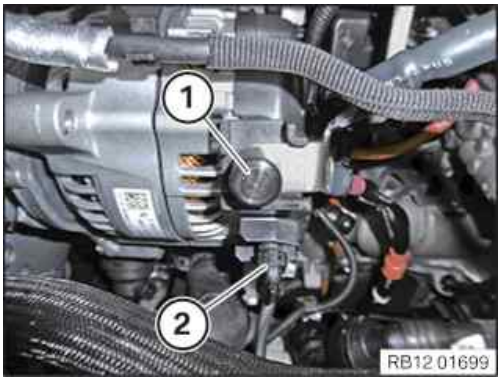


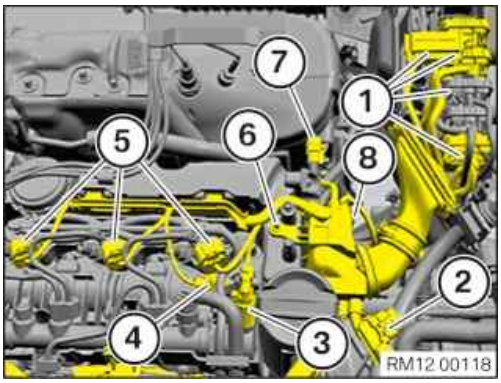
- Unlock and loosen connector (1).



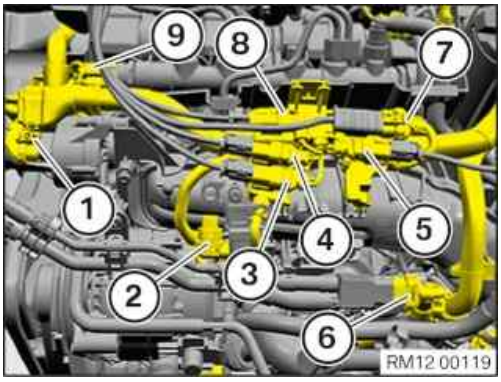
- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.

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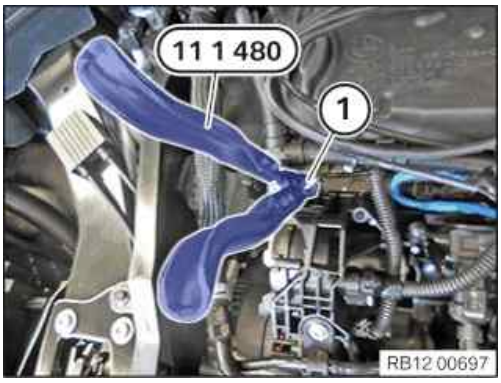
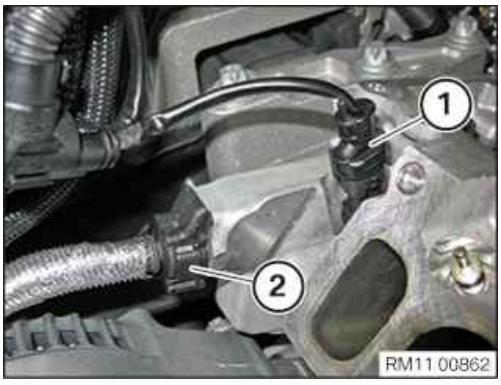
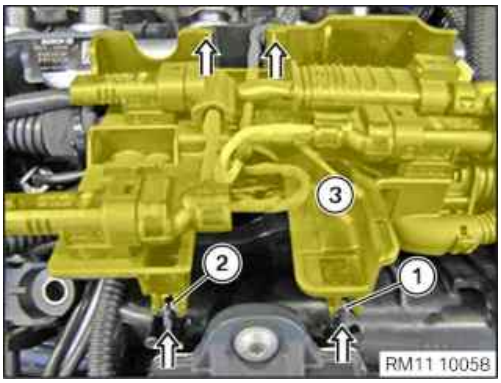


- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

19 – Removing the cable clips from the intake plenum



- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

20 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).

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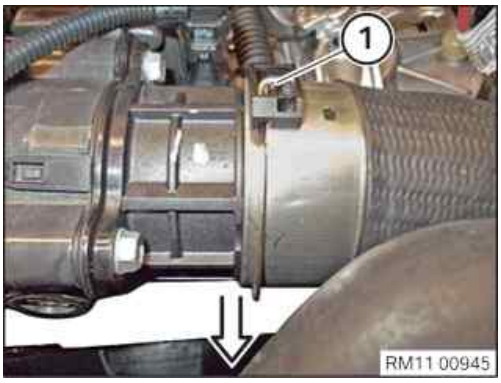
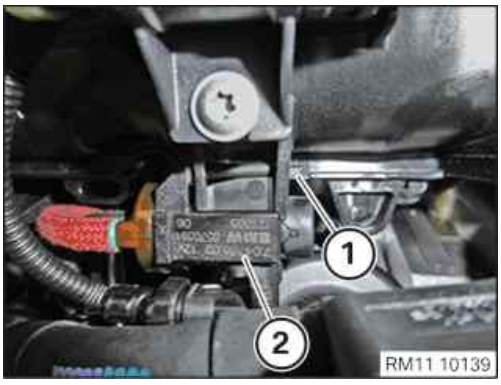
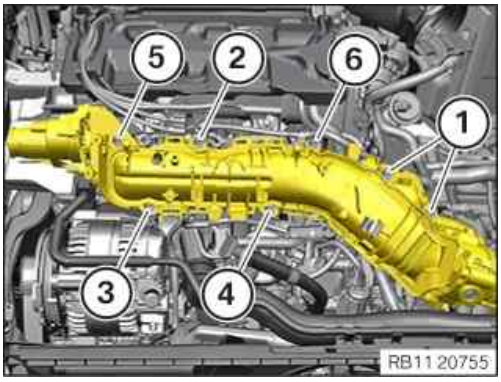


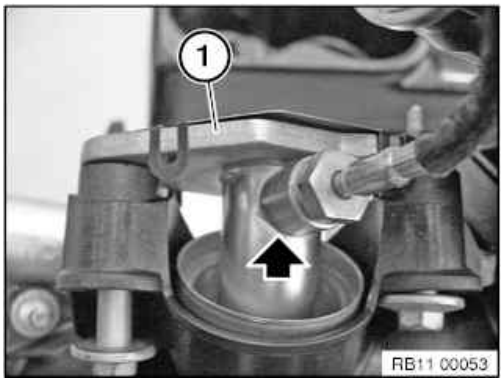
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

21 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

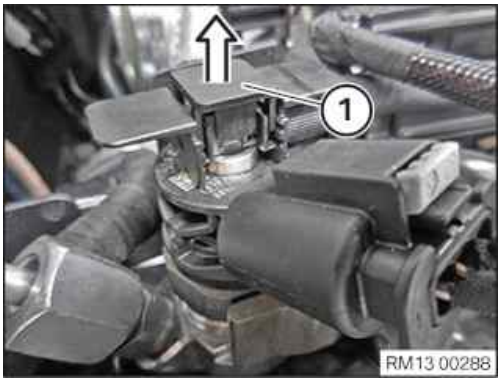
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

22 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

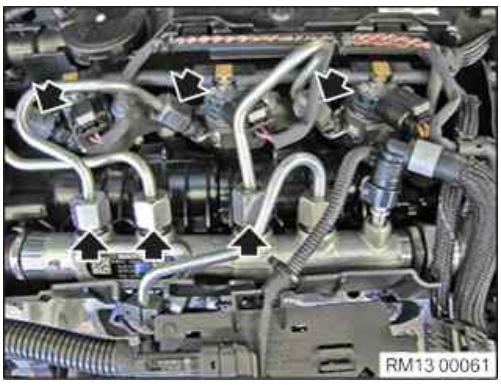
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

23 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

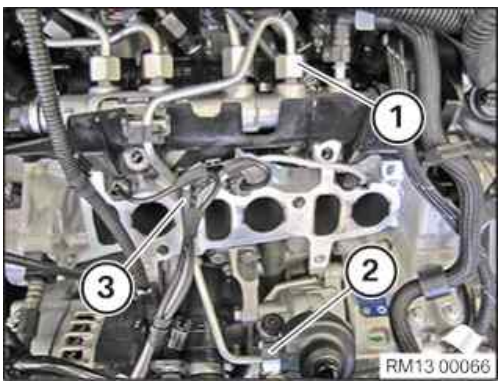
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

24 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

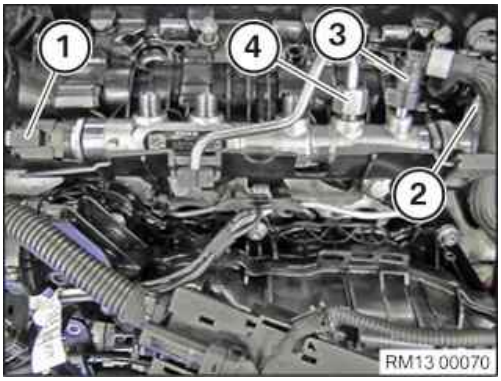
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

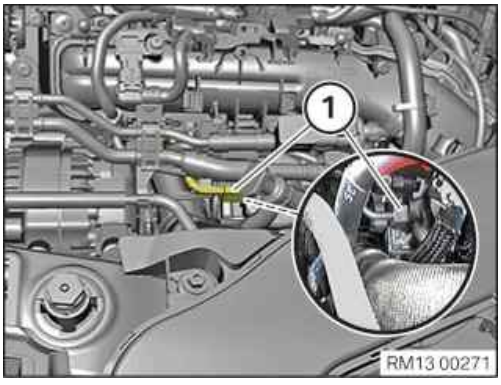
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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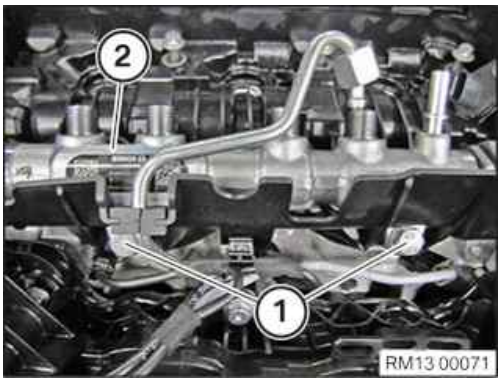

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

25 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

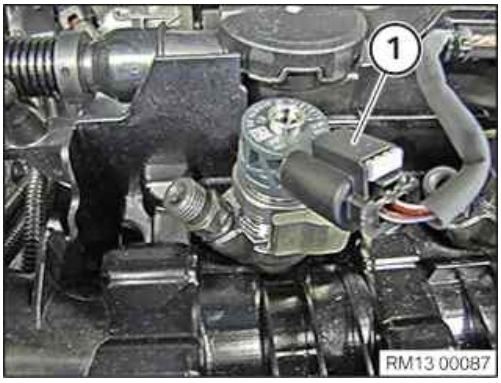
Electrostatic discharge.

Damage to or destruction of electrical components.

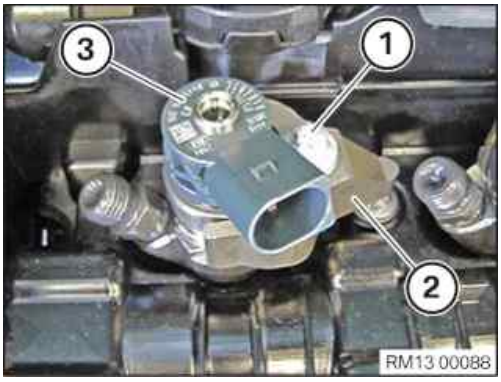
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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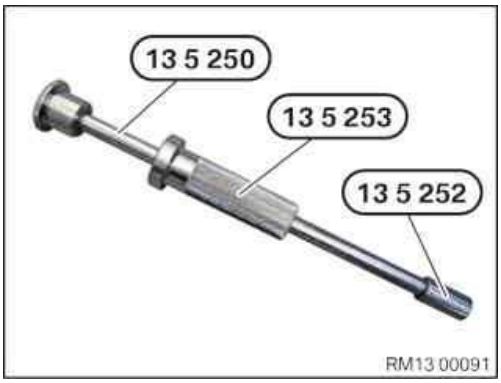
RISK OF DAMAGE

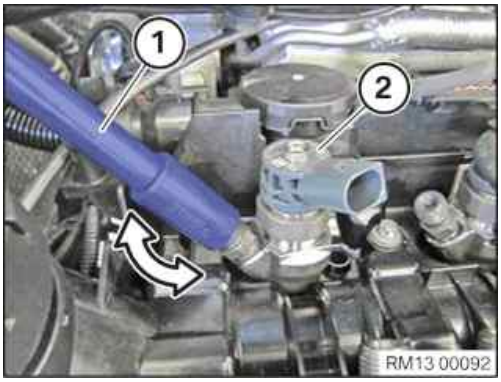
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

26 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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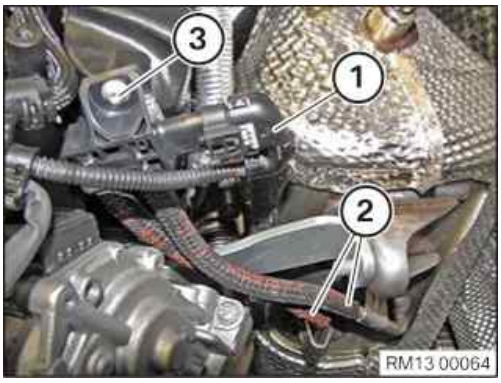
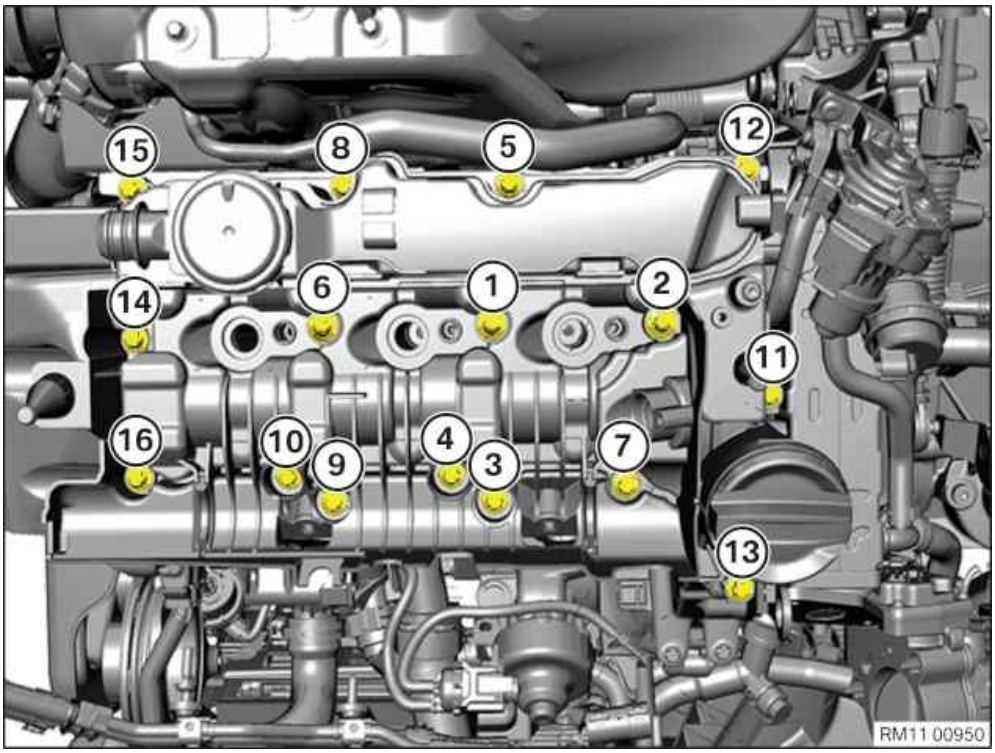


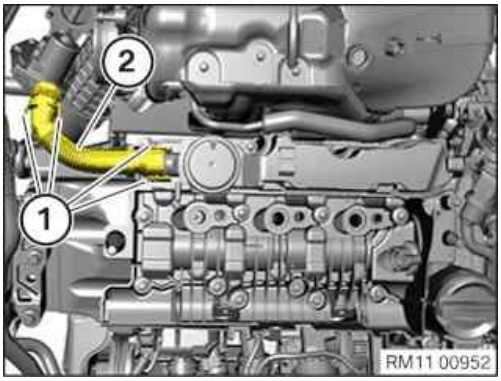
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

27 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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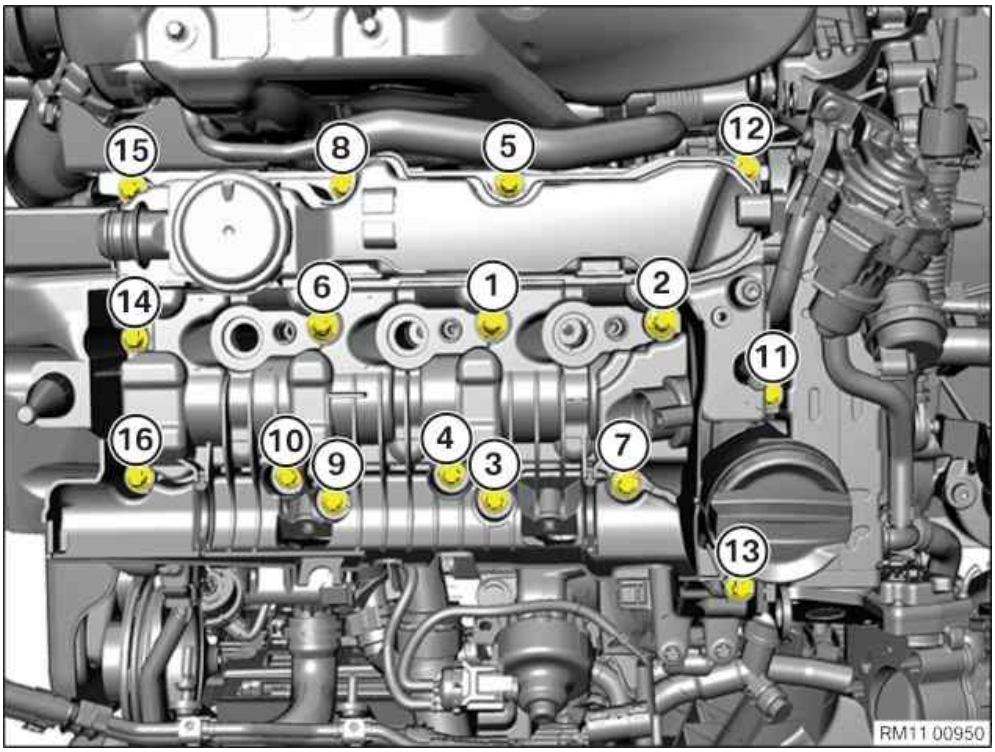

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

28 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

29 – Remove right charge-air line

- Release charge air duct screws (1) on oil sump.

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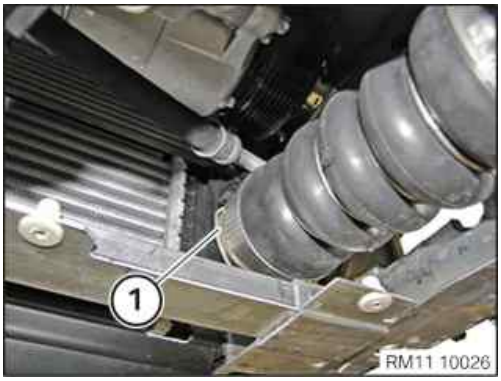
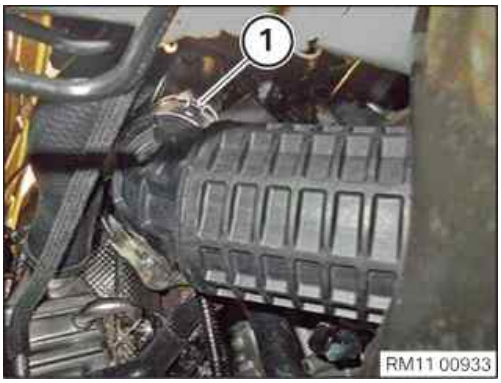
- Detach charge air duct screw connection (1) on crankcase.

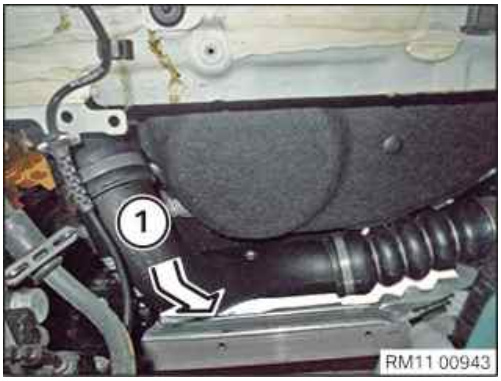
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

30 – Removing the acoustic cover for the engine at the front

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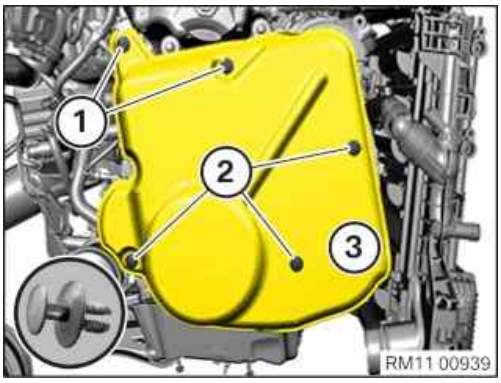


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

31 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

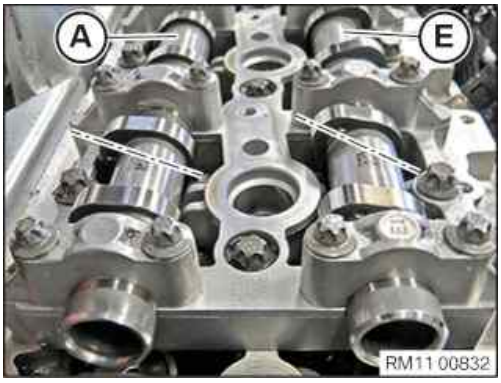
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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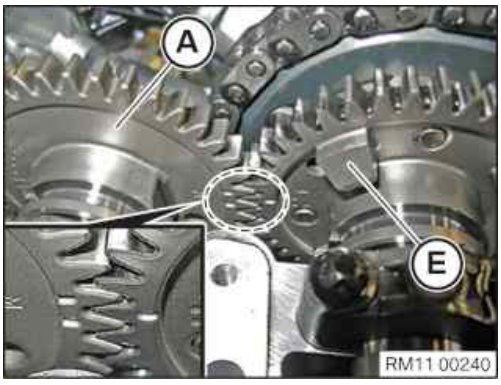
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

32 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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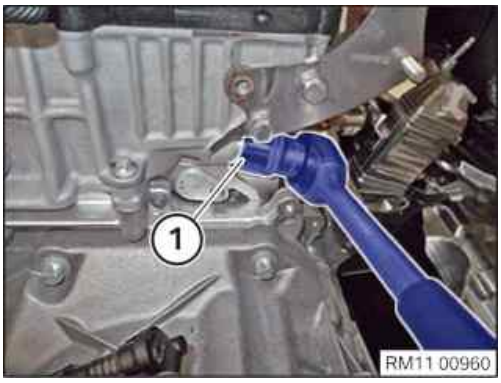
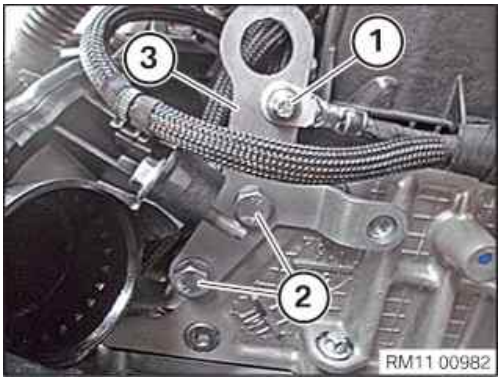


TECHNICAL INFORMATION

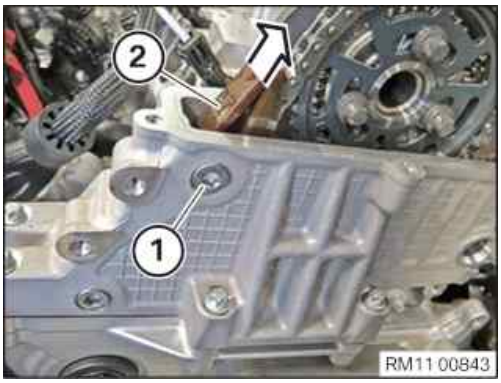
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

33 – Remove the timing chain guide rail

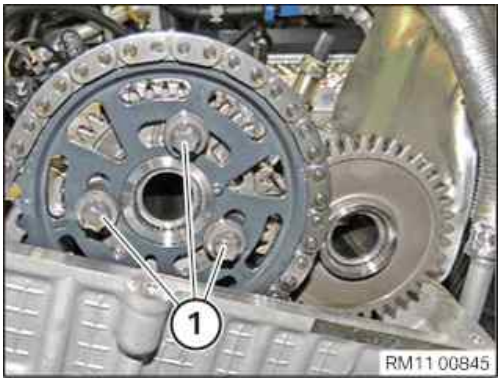


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

34 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

MAIN WORK

35 – Remove exhaust camshaft.

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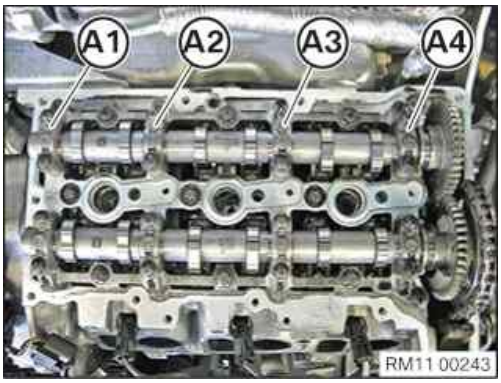
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

36 – Remove intake camshaft

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the intake camshaft bearing caps (E1) to (E4) from the outside towards the inside in 1/2 turn increments.
- Remove intake camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

37 – Installing exhaust camshaft

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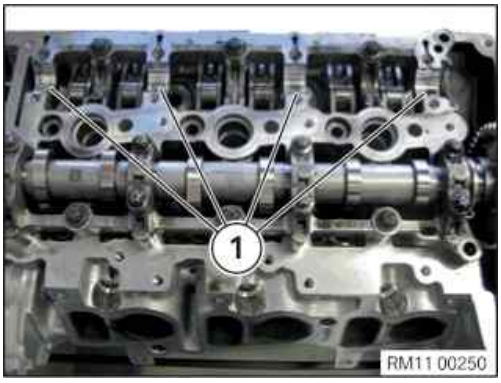
RISK OF DAMAGE

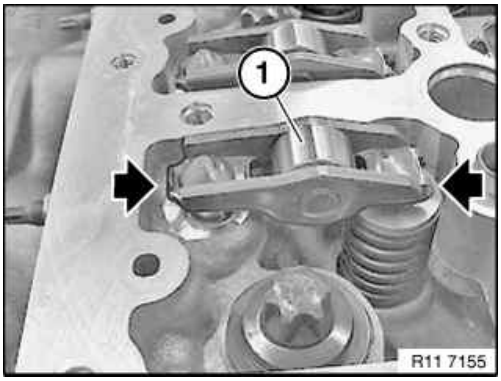
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

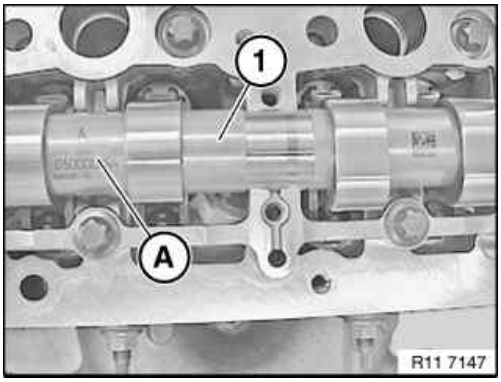
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



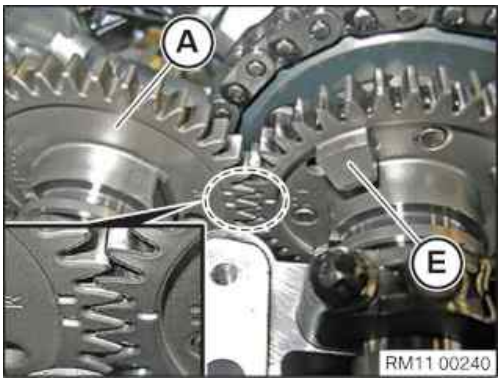
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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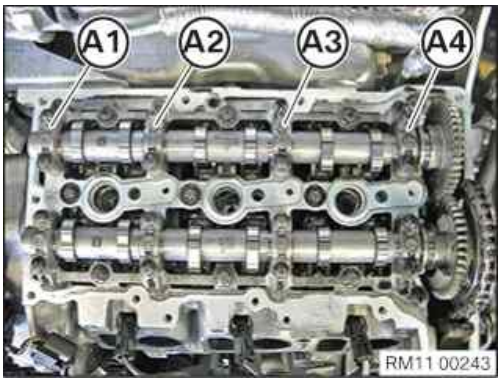


- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

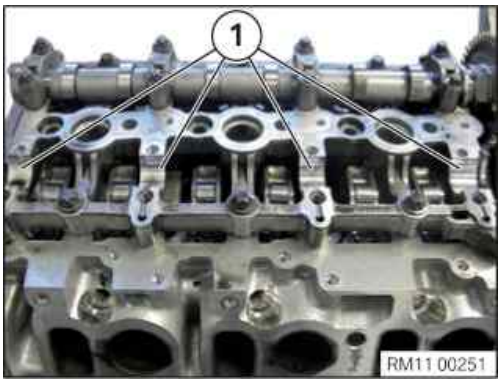
38 – Install intake camshaft

RISK OF DAMAGE

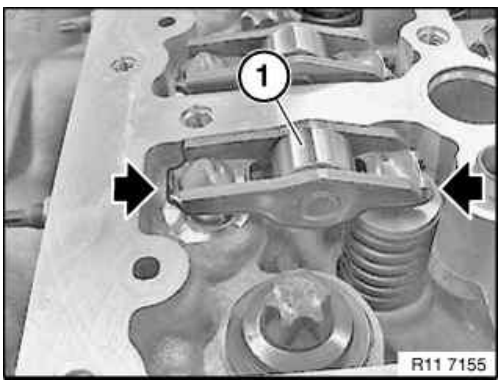
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

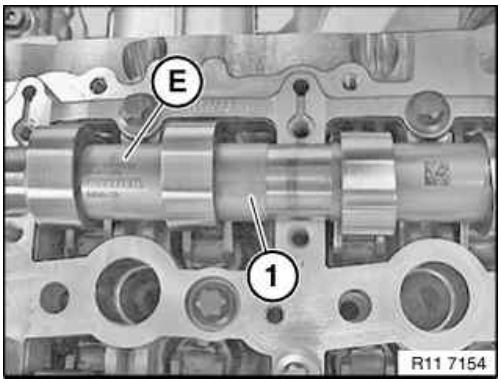
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert intake camshaft (1) so that the identification (E) points upwards.

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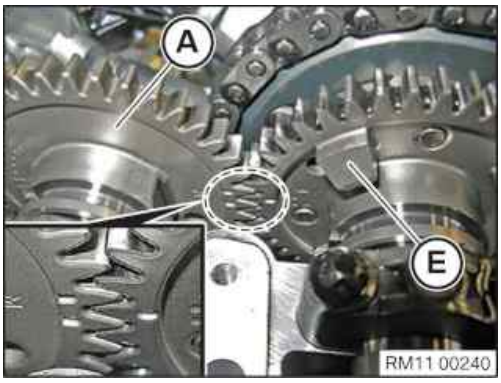


- Insert the intake camshaft (E) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

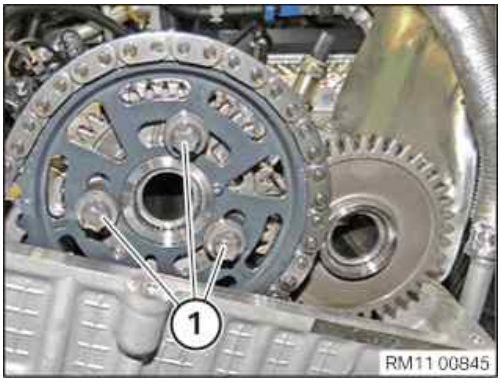
- Tighten all intake camshaft bearing caps (E1) to (E4) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

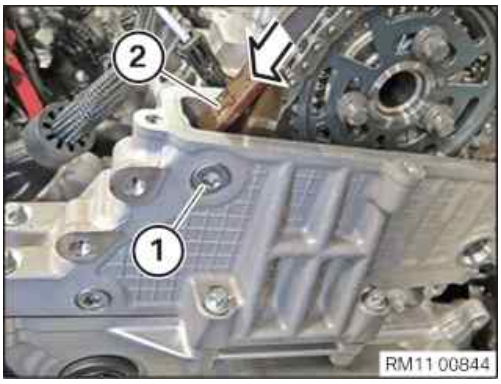
POSTPROCESSES

39 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

40 – Install the timing chain guide rail



- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

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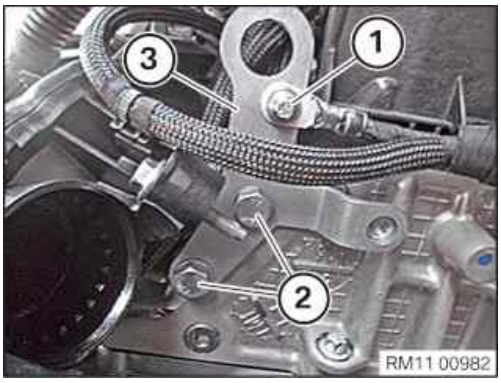


- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

41 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

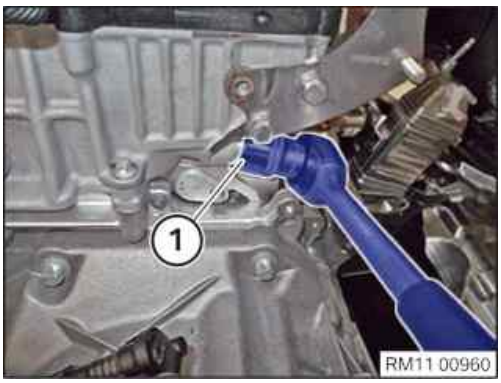
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

42 – Tightening the camshaft sprocket on the intake camshaft

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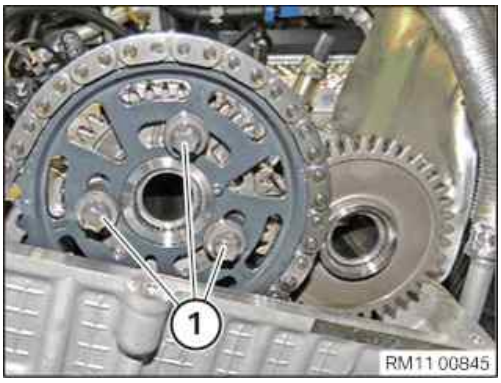

- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

43 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

44 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

45 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

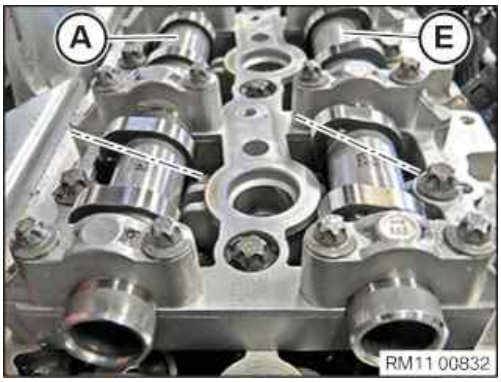
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

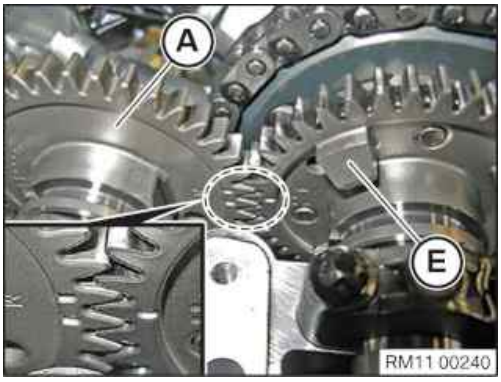
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

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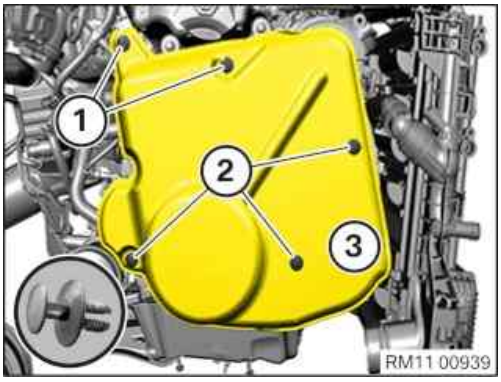
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

46 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

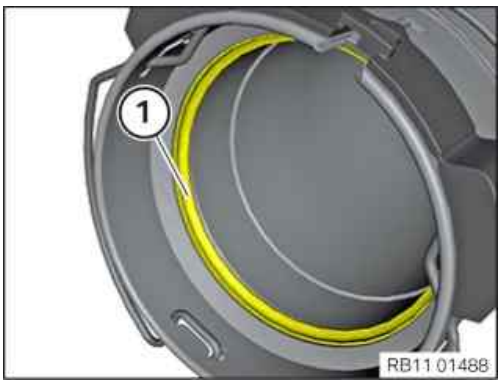
47 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

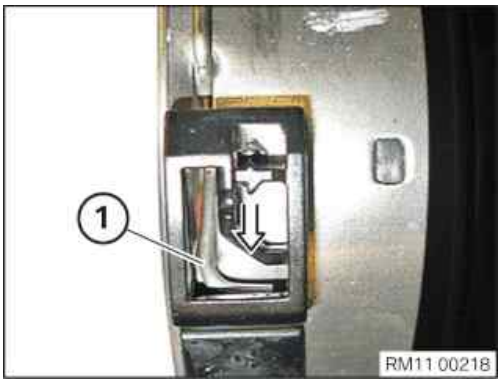
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

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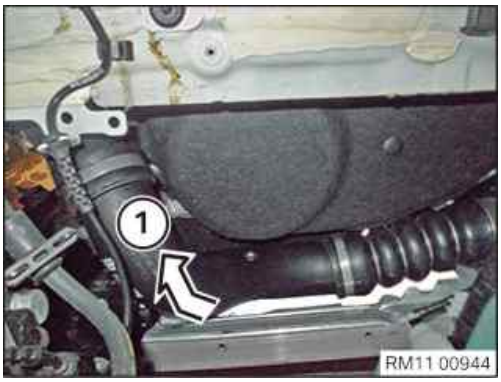
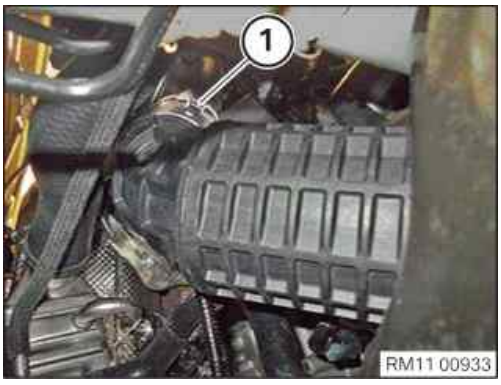
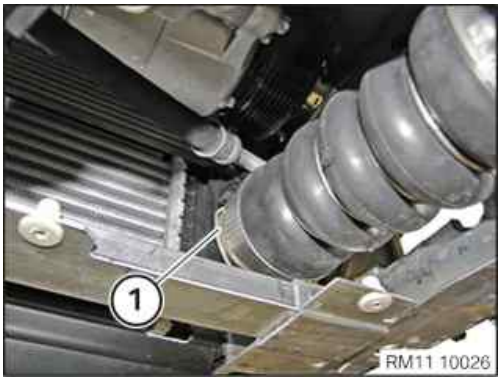


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



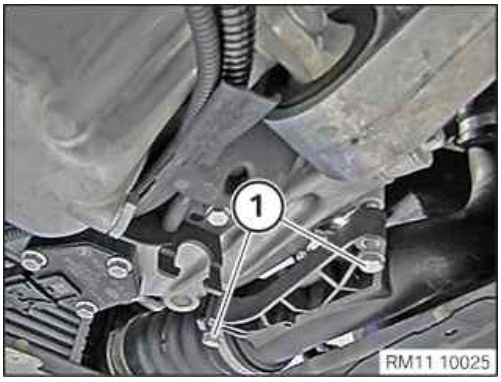
- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm



- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

48 – Installing the front right wheel arch cover

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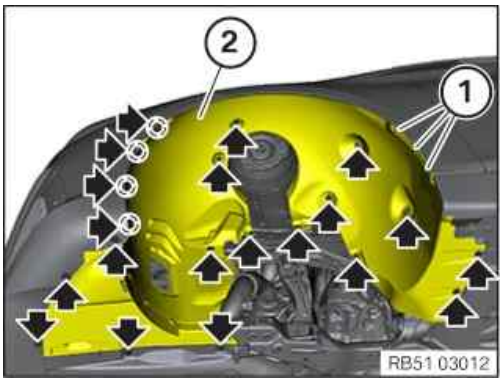


- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

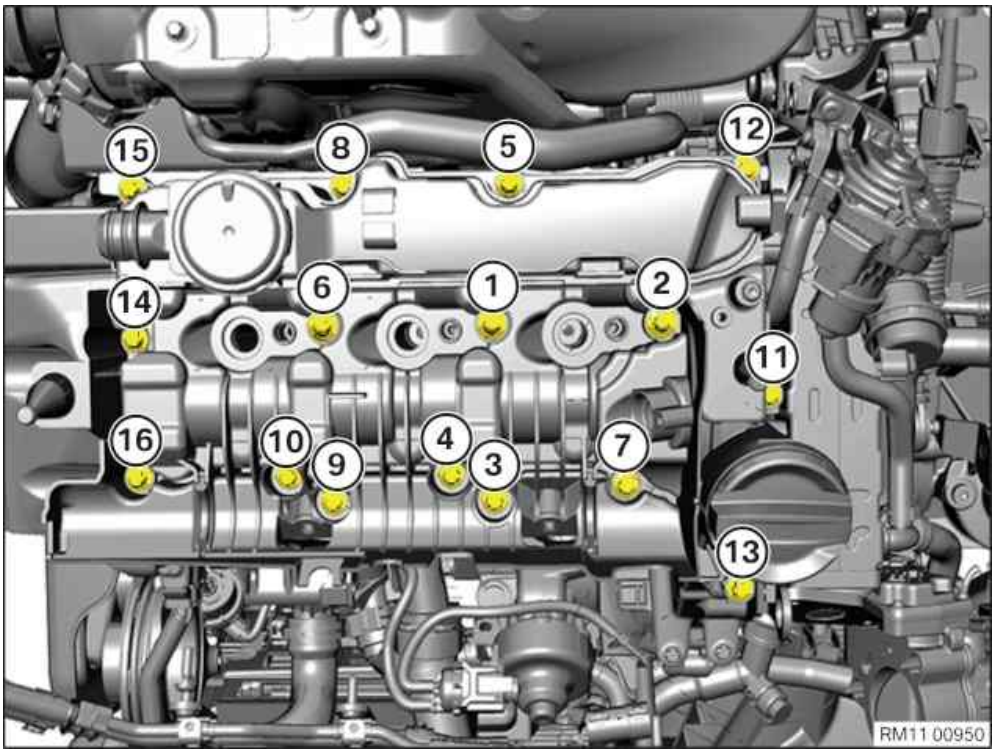
Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

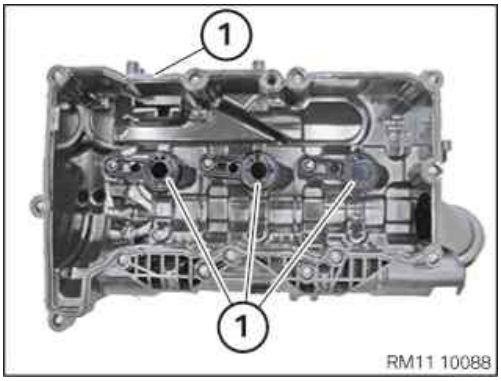
- Secure expanding rivet (1).

49 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

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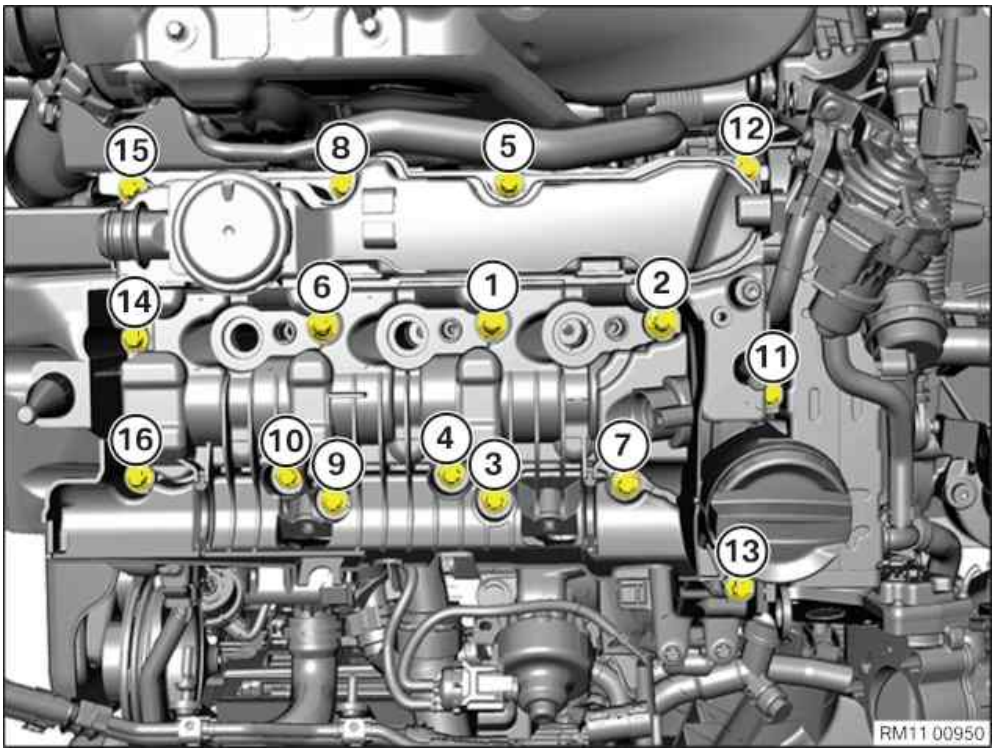
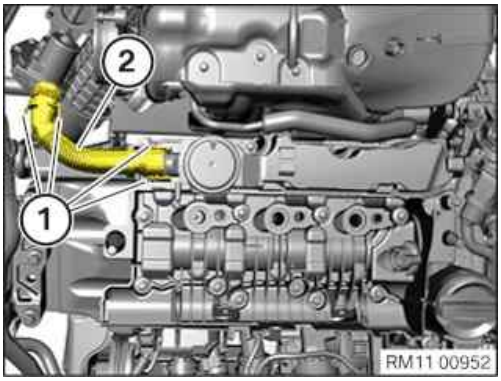


- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

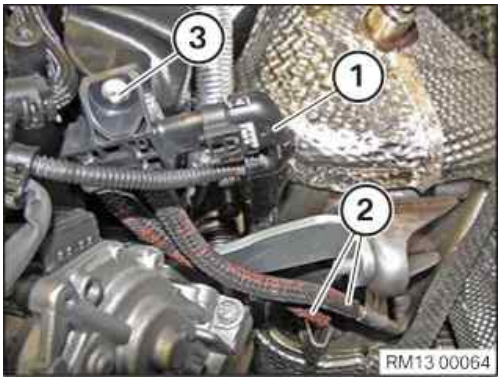
M6		Tightening torque.	8,5 Nm



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

50 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

51 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

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CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

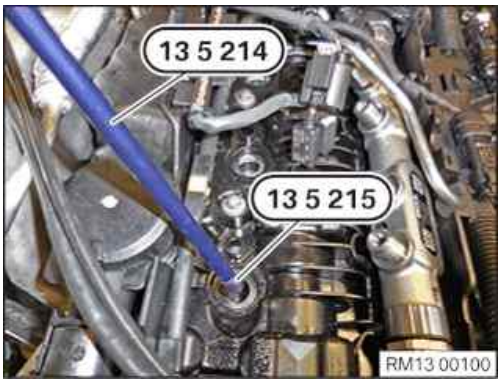
- Wear safety goggles.

RISK OF DAMAGE

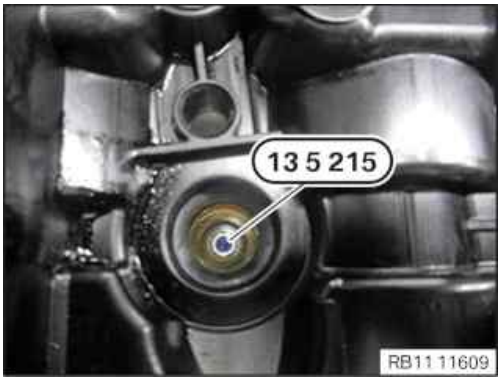
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

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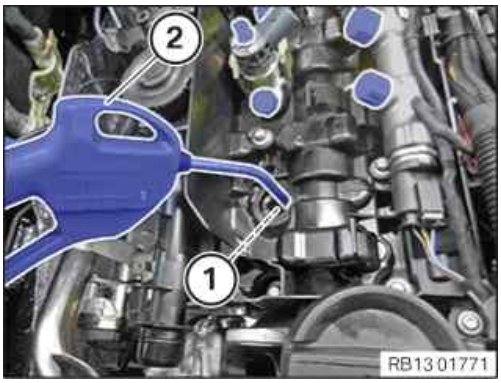
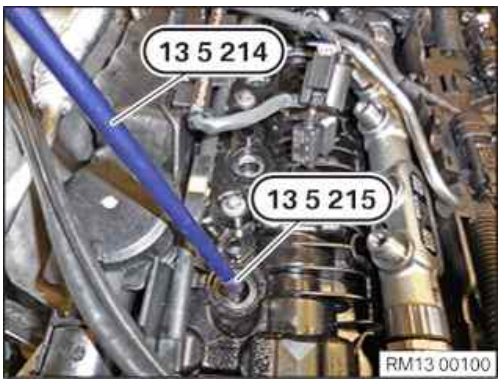
- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

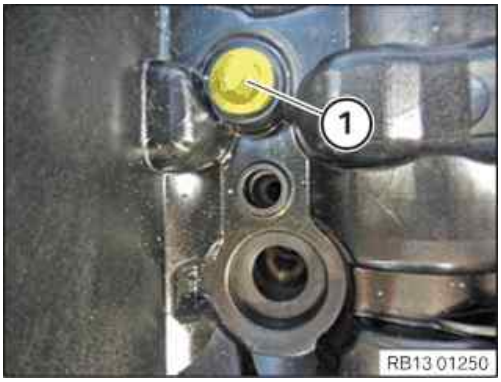
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

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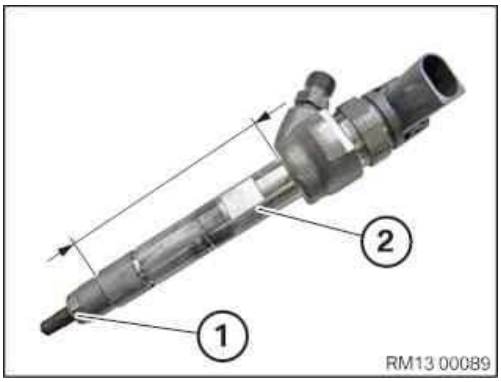
▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

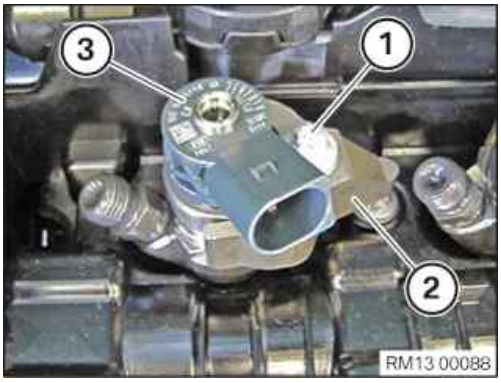


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

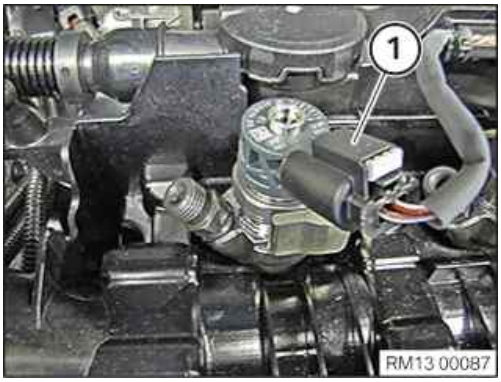
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

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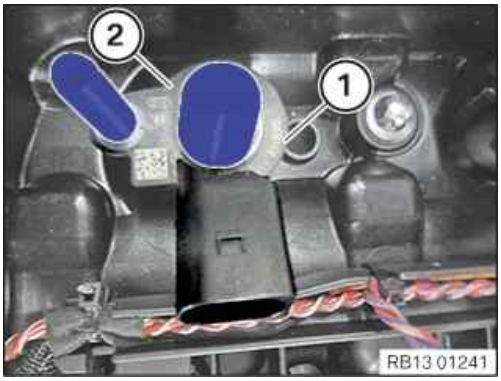
NOTICE

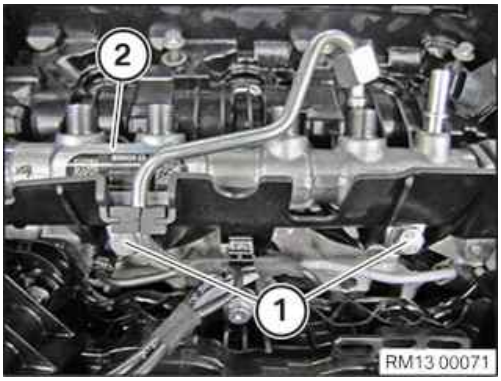
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

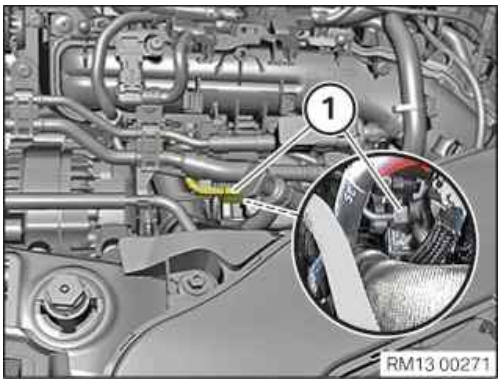
52 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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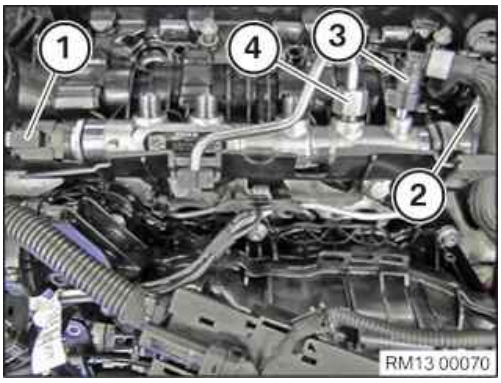

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

53 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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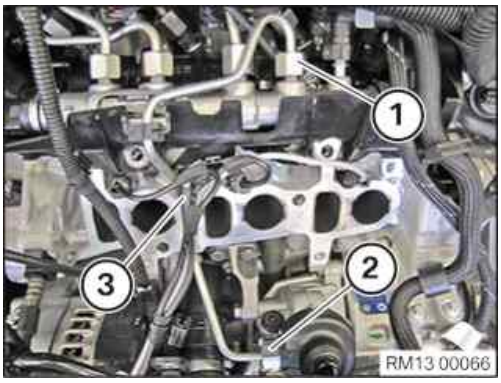

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

54 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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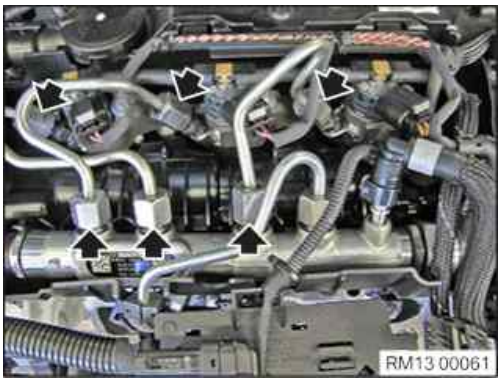

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

55 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

56 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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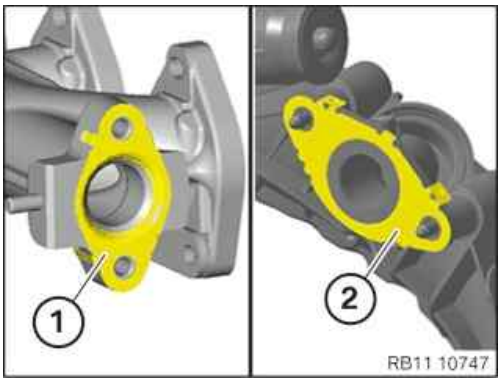
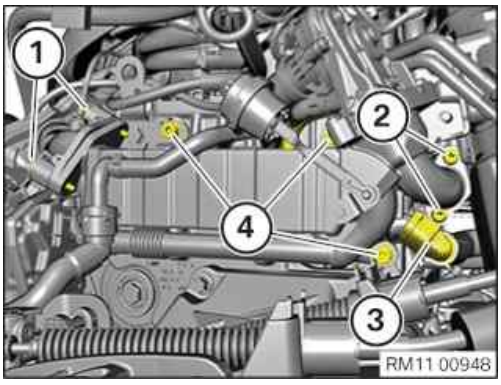


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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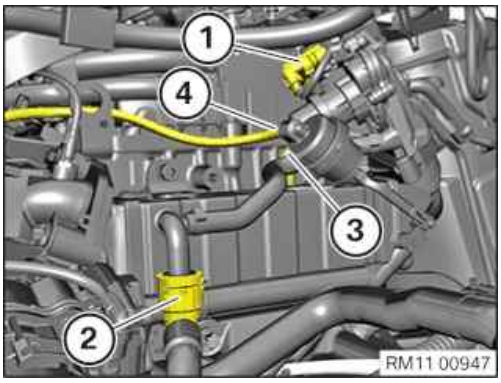


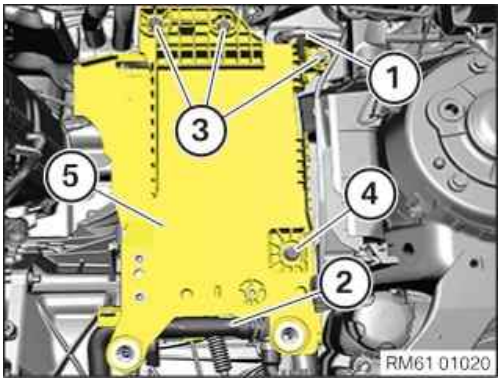
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

57 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

58 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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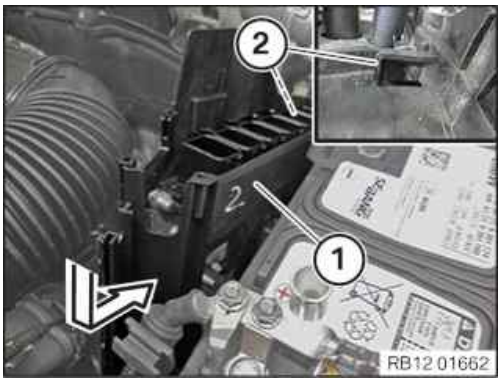
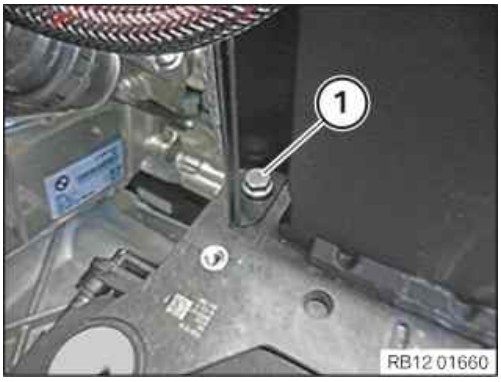


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

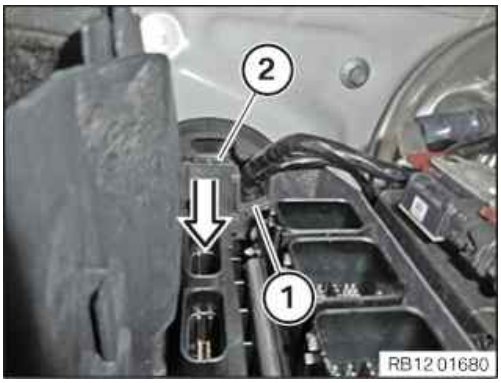
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



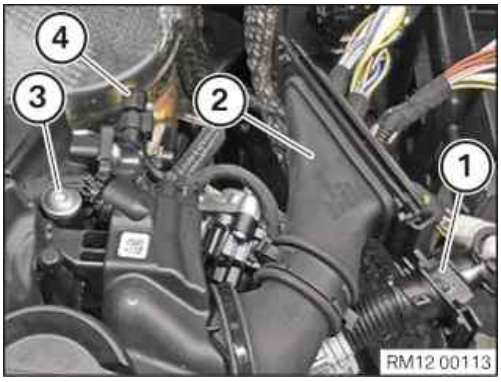
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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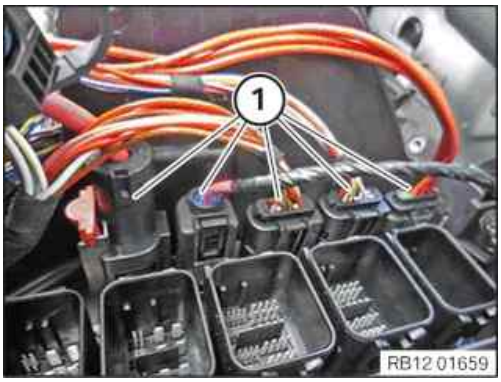
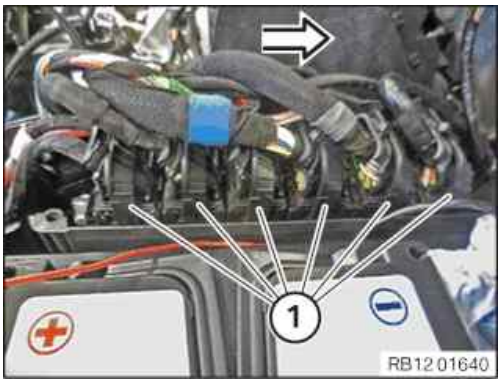
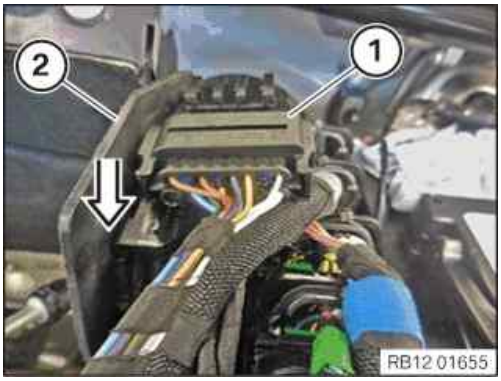


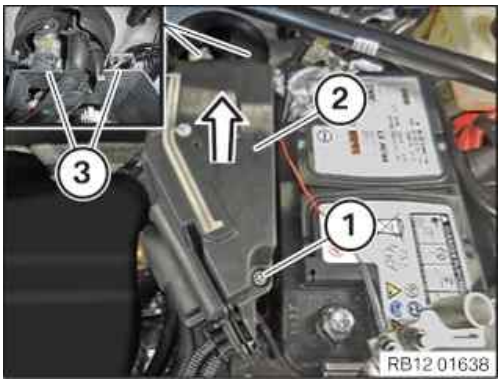
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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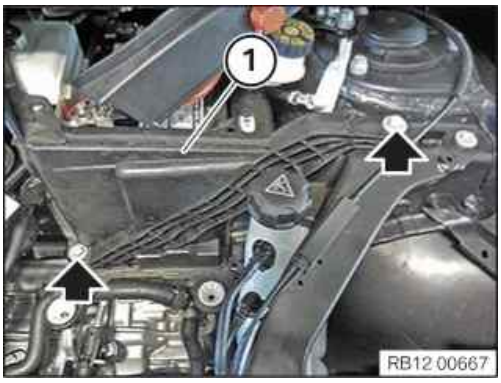


- Feed in and install tension strut (1).
- Tighten screws (arrows).

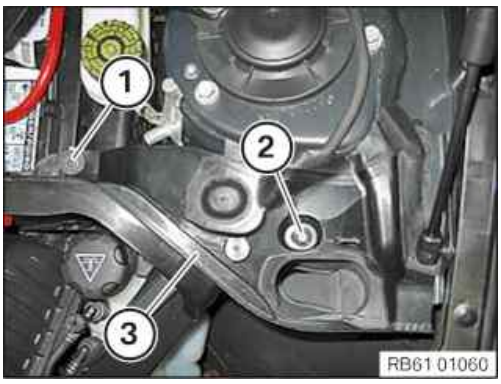
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

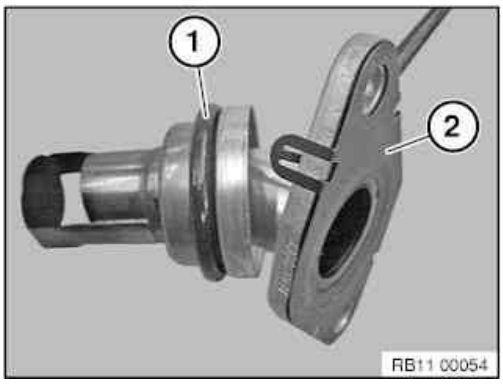


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

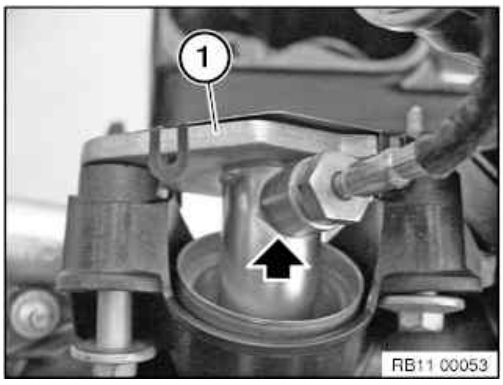
59 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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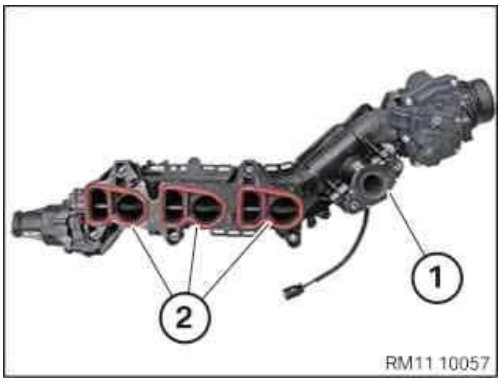
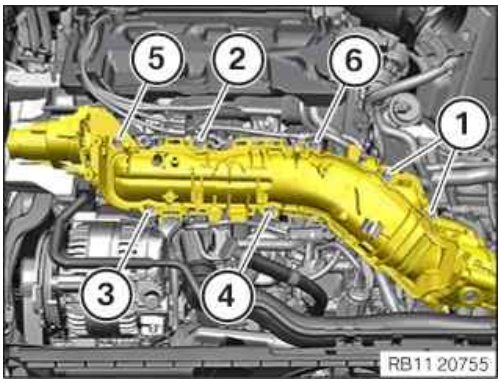


- Renew gaskets (2).

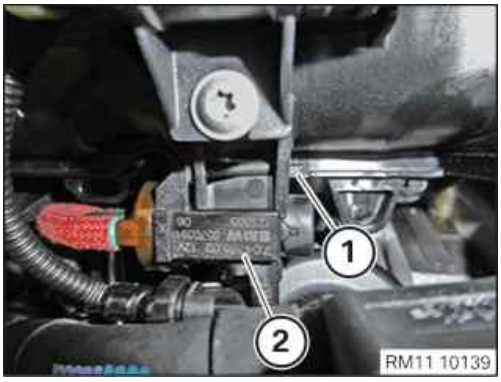
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



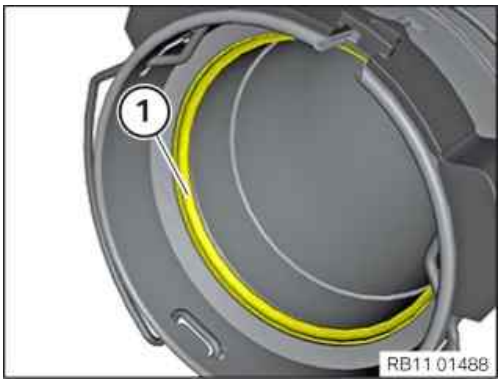
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

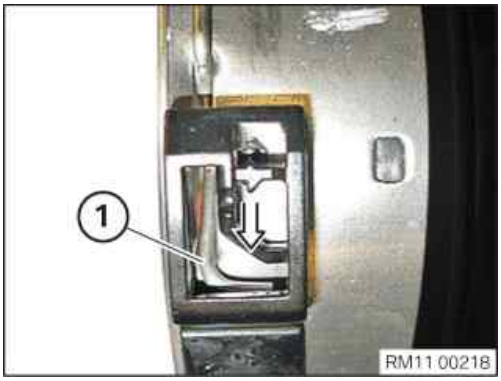


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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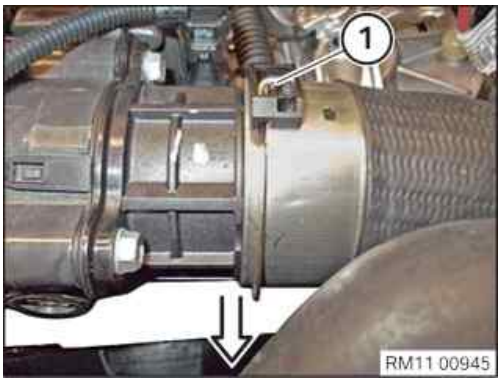
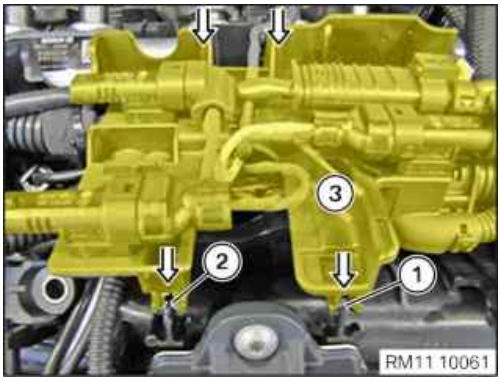


- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

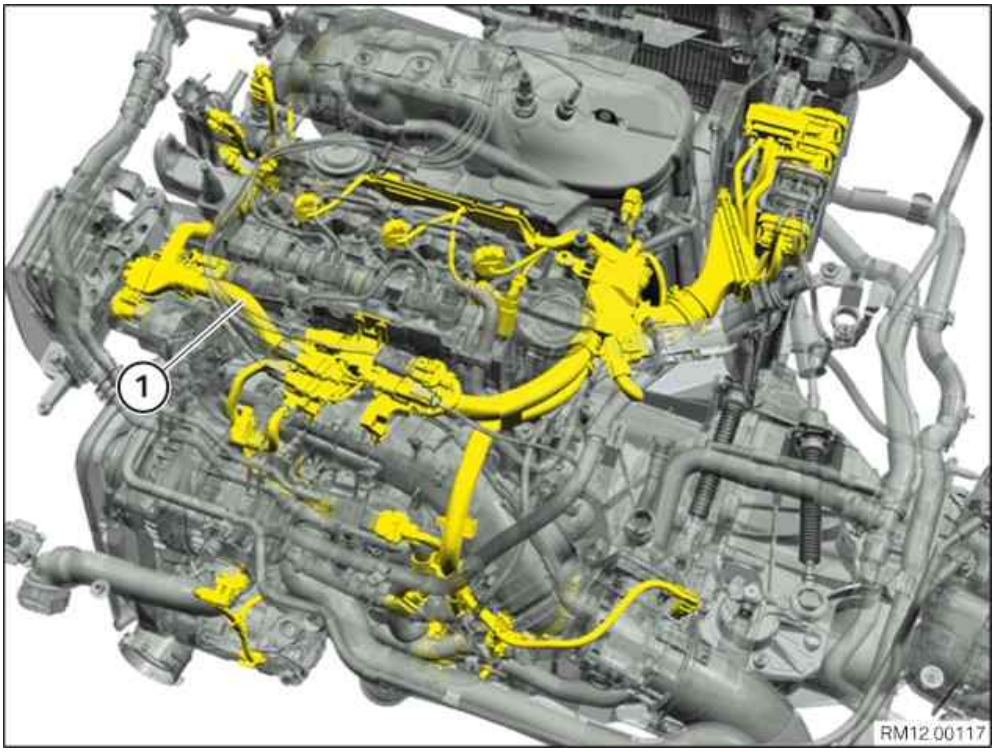
60 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

61 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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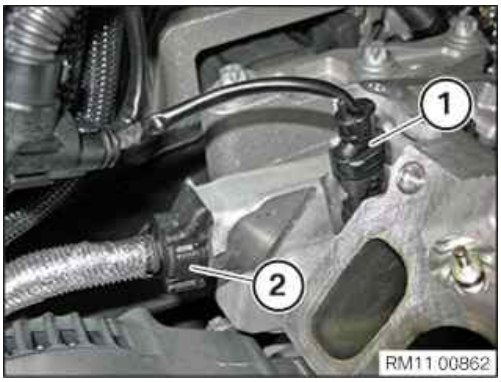
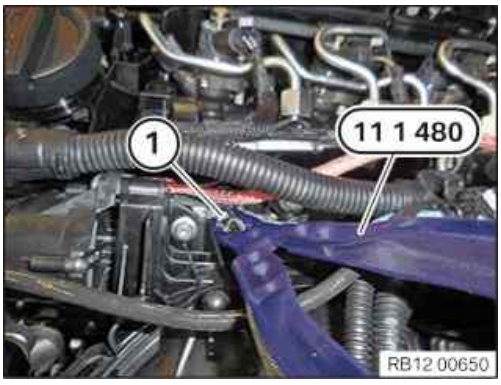
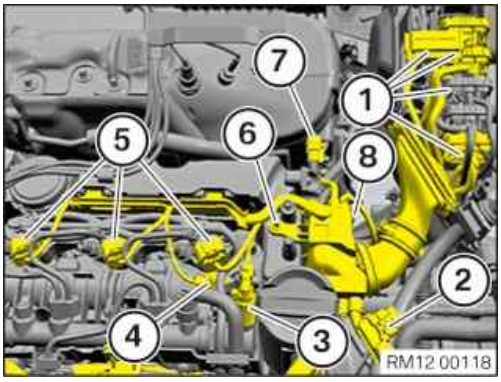


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

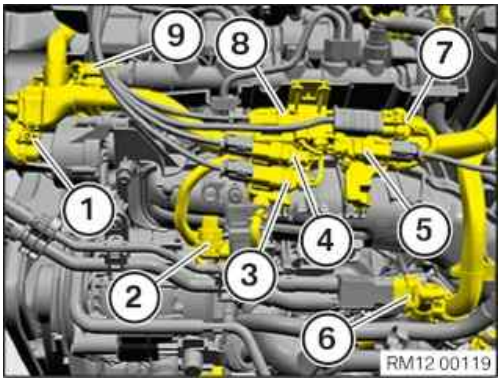


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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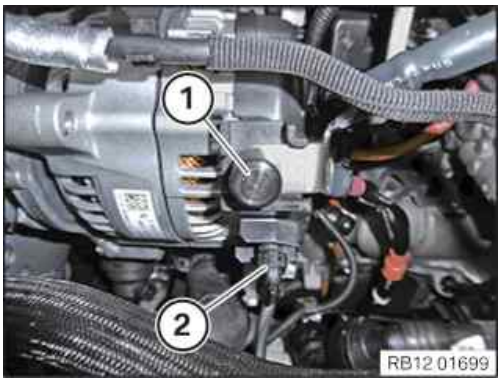
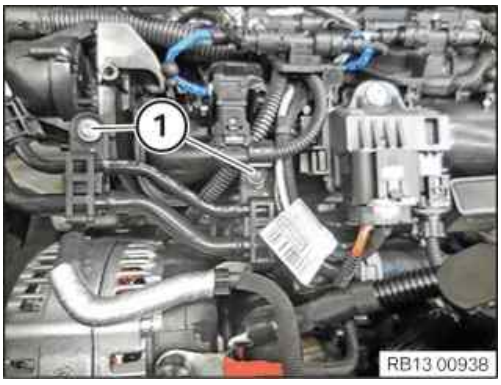


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

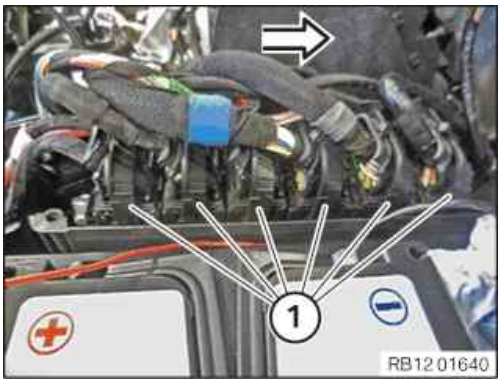


- Position fuel lines.
- Tighten the screws (1).

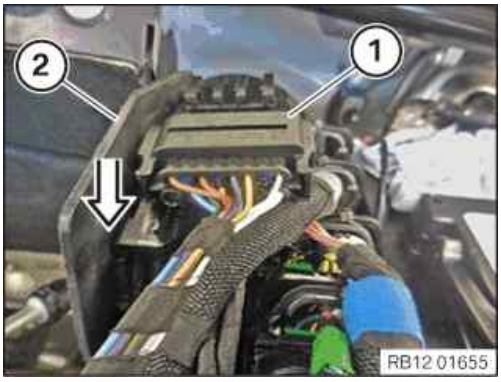
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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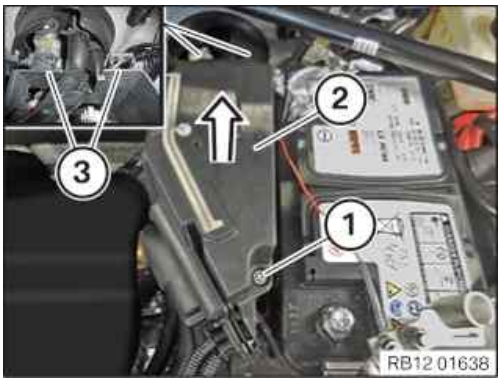
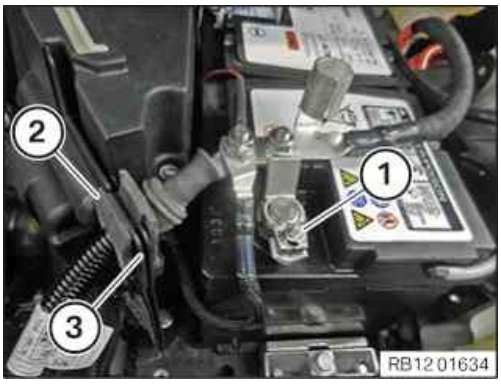


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

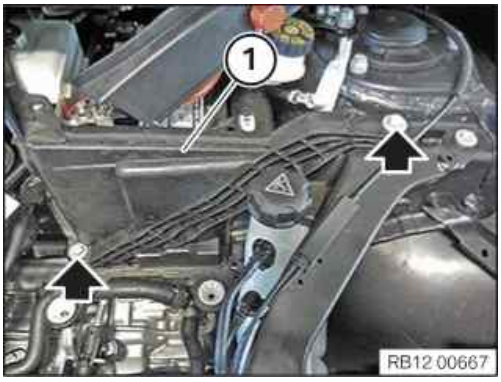
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

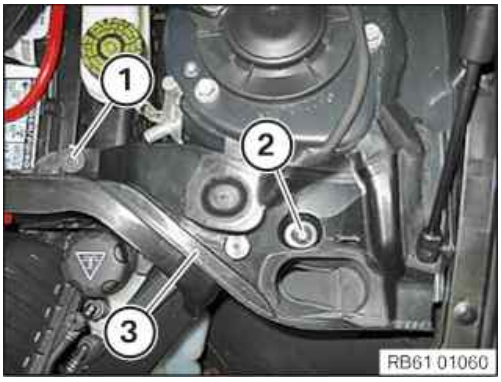
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm

62 – Partially securing clean air pipe

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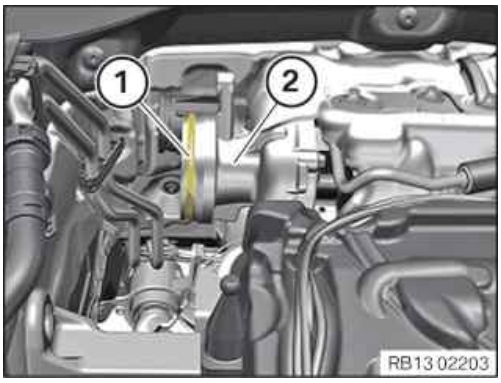
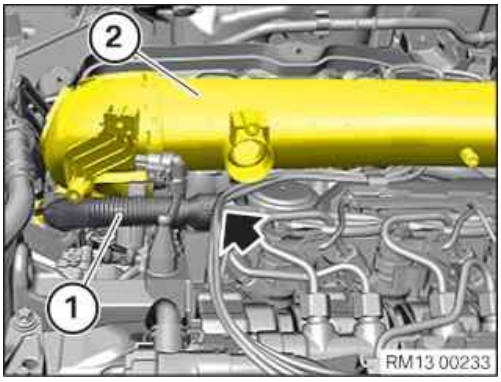
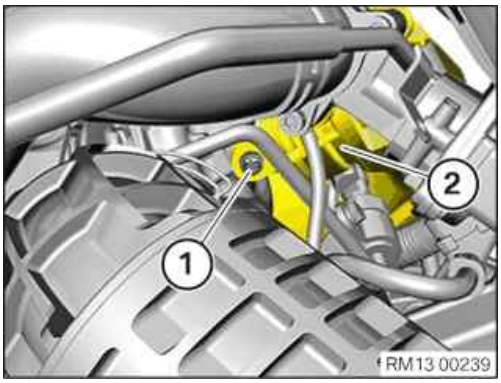


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

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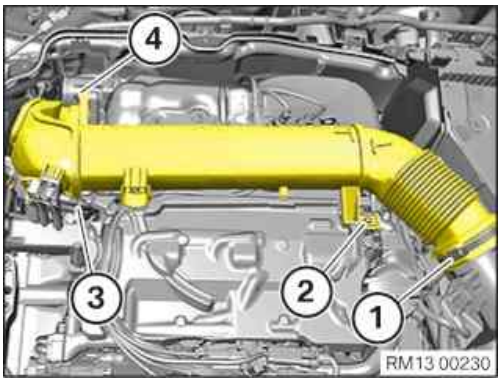


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

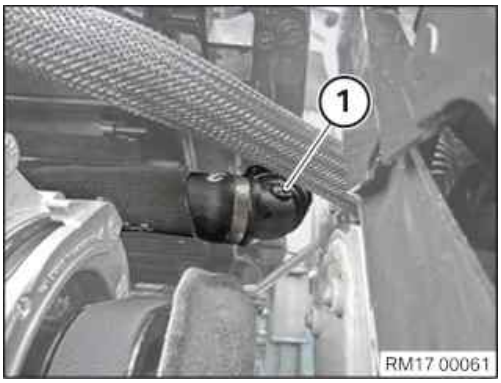
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

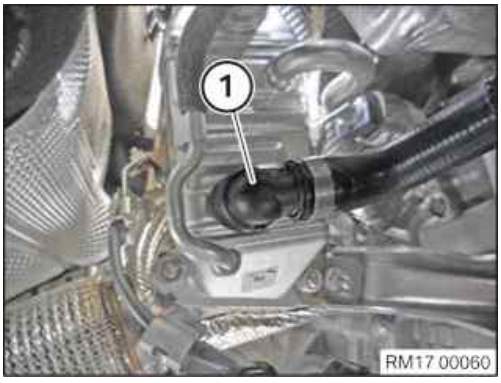
63 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

64 – Installing the front underbody protection

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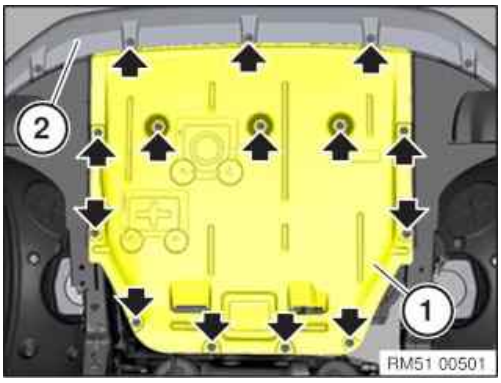
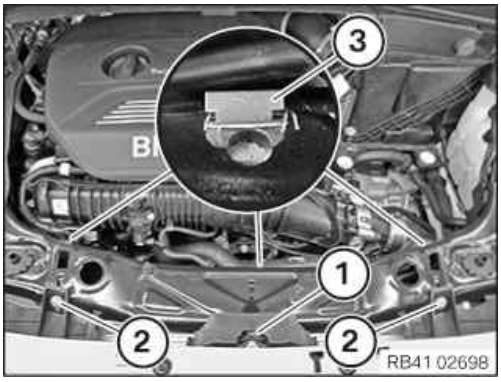


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

65 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

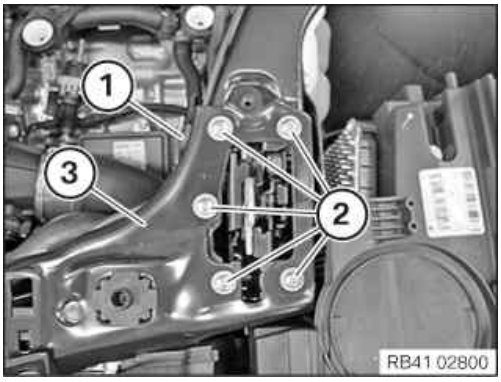
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

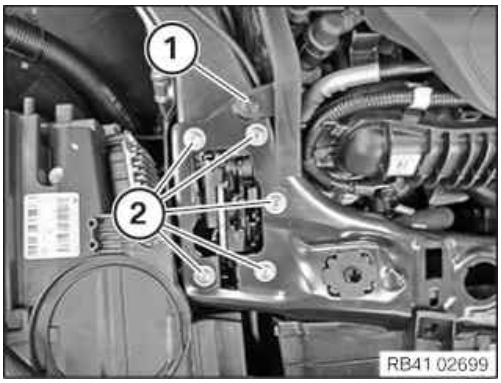


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

66 – Installing intake silencer housing

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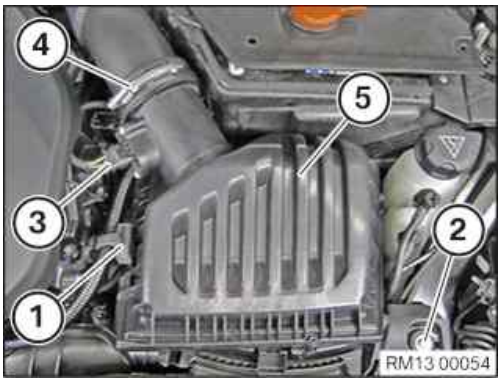


- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

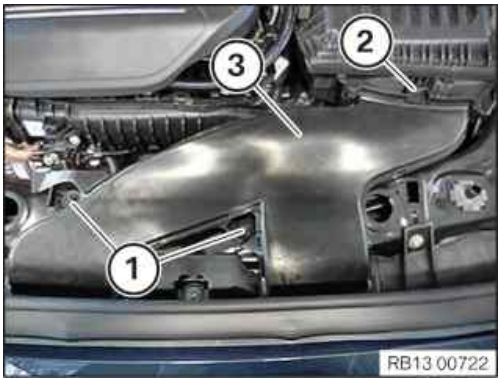
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

67 – Install the intake neck for the intake filter housing

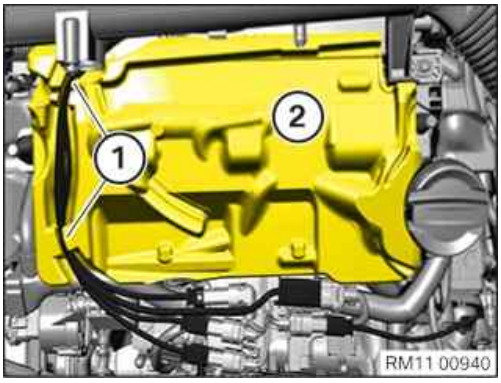


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

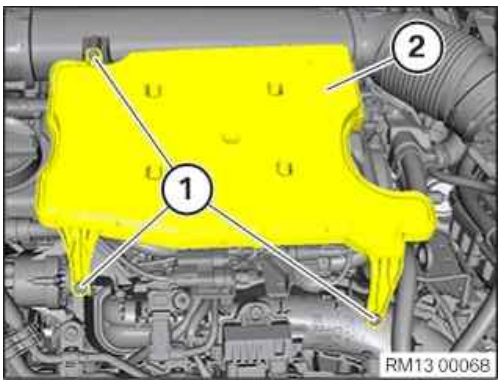
M6		Tightening torque	8 Nm

68 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

69 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

70 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

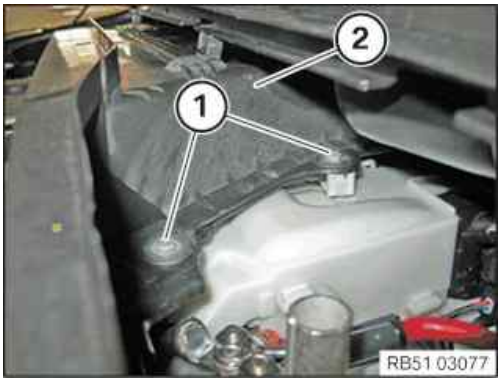
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

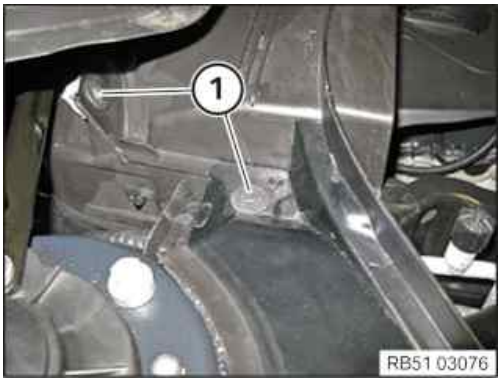
71 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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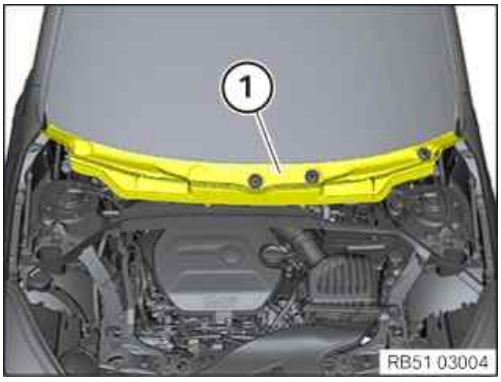
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

72 – Install the rear cowl panel cover



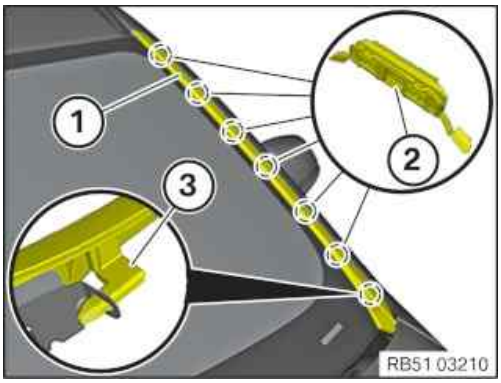
- Feed in and engage the rear cowl panel cover (1).

73 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

74 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the wiper arm**

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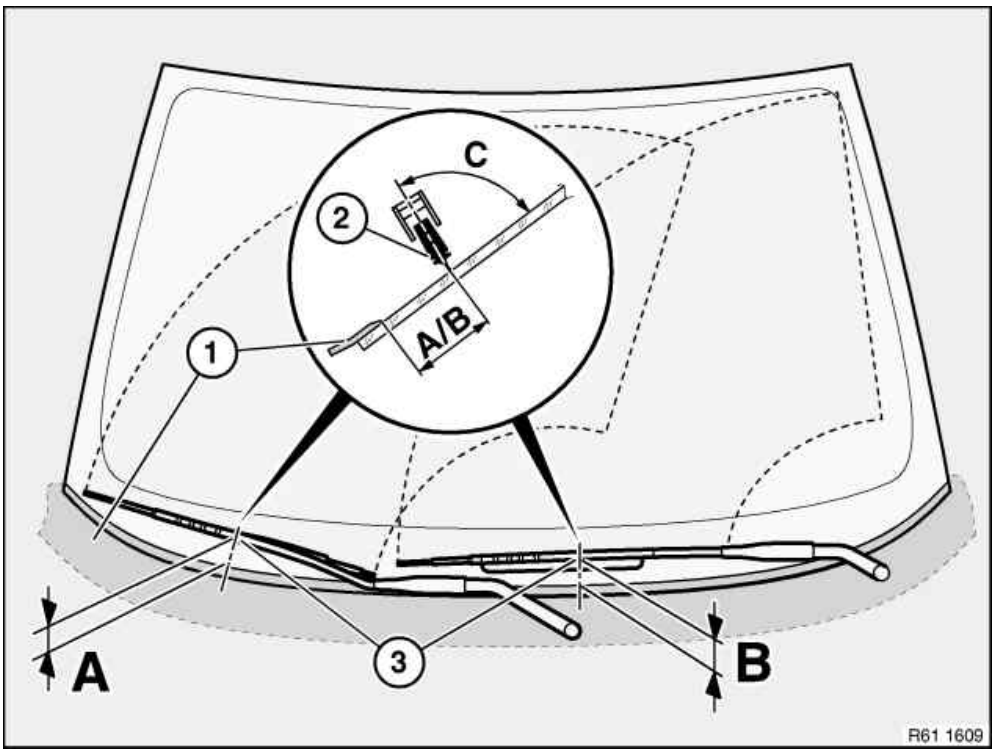
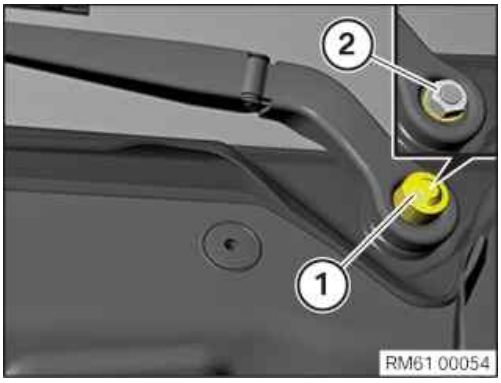
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

75 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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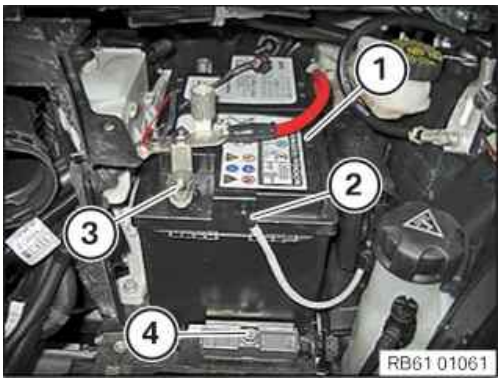


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

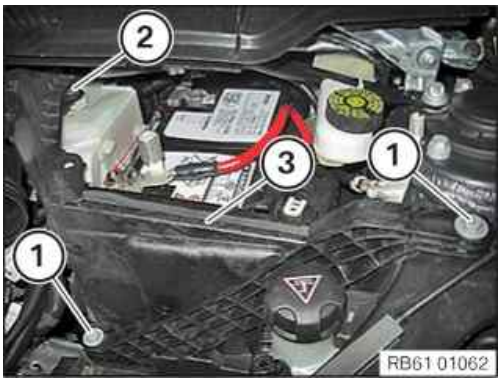
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

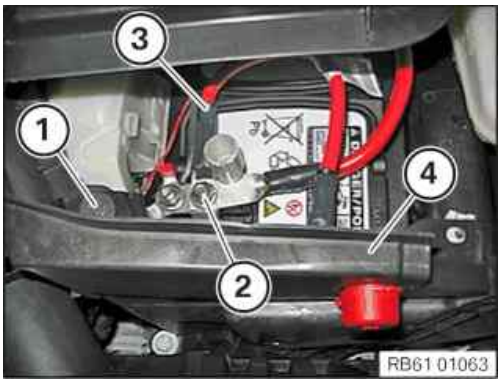
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

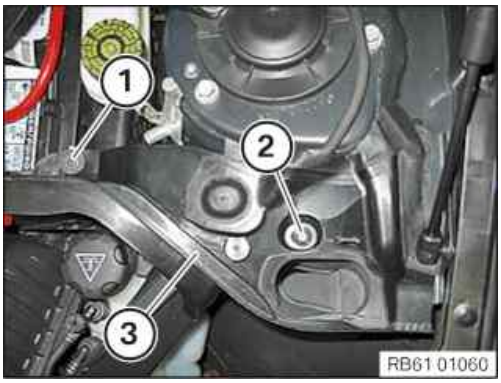
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

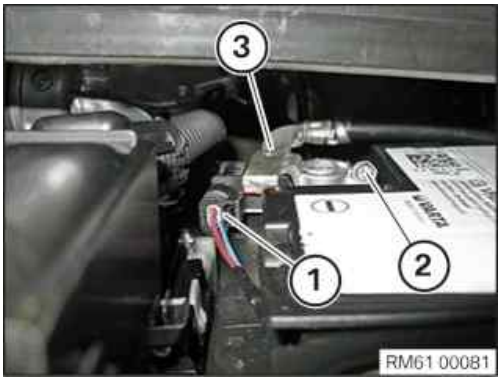
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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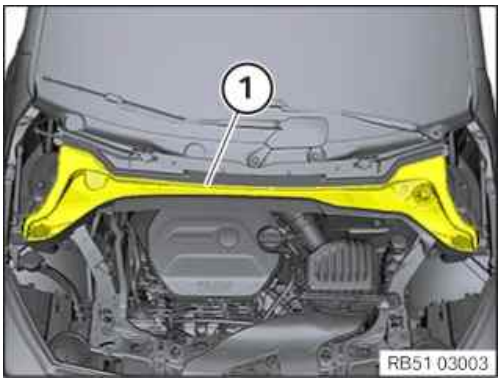
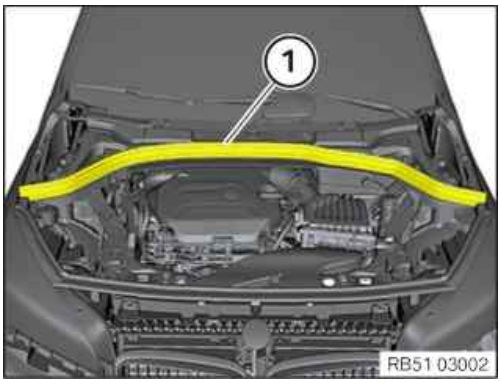


- Feed in the cowl panel cover (1).



- Press the gasket (1) in a downwards direction.

76 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

- See additional information.

Additional Information

Overview of Tightening Torques

Intake and exhaust camshaft in camshaft support			Used in step 37 38
M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head			Used in step 40
M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8			Used in step 40
M8		Tightening torque	19 Nm

Standard screw connection M6			Used in step 40
M6			8 Nm

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Chain tensioner piston to cylinder head

Used in step 41

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 42

M7x17.			17 Nm

Charge air line to crankcase

Used in step 47

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 47

M6		Tightening torque	8 Nm

Wheel arch cover

Used in step 48

Screw			3 Nm
Plastic nut			2,6 Nm

Cylinder head cover to cylinder head

Used in step 49

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 50

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 50

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 51

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 51

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 52

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 52 53

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 54

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 56

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 56

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 56

M8x28	Replace screws	Tightening torque	32 Nm

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Exhaust-gas recirculation cooler to cylinder head — Used in step 56

M8x20		Tightening torque	19 Nm

Battery holder to engine support — Used in step 57

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray — Used in step 58

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 58 61

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 58 61

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 58 61

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 58 61

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 58 61

		Tightening torque	3 Nm

Battery cover — Used in step 58 61 75

Screw			2,8 Nm

Intake plenum to cylinder head — Used in step 59

M6		Tightening torque	11 Nm

Positive battery cable to alternator — Used in step 61

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 61

TS6x20		Tightening torque	5 Nm

Clean air pipe to exhaust turbocharger — Used in step 62

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 62

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 62 66

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 64

			3 Nm

Bracing strut to top cross connection — Used in step 65

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 65

M6x20 screw		Tightening torque	6 Nm

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Cross connection on support for cross connection — Used in step 65

M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge — Used in step 66

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 67

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe — Used in step 69

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 71

Screw		Tightening torque	3 Nm

Windscreen wiper arm — Used in step 74

Combination hexagon nut		Tightening torque	35 Nm

Battery terminal rail to battery tray — Used in step 75

M8 screw		19 Nm

Positive battery terminal — Used in step 75

NutM6		5 Nm

Trailing link — Used in step 75

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 75

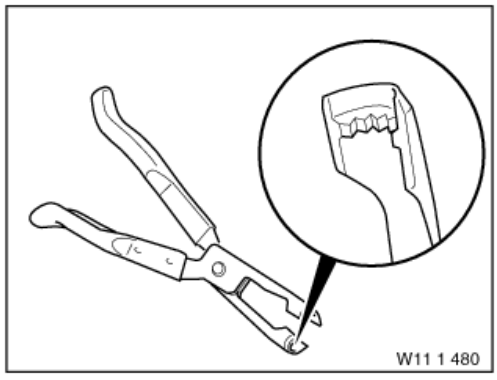
Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 75

NutM6		5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 18

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 495 910 (37 1 152) Socket wrench

Common	Used in step 22 23 24 52 53 54
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

2 413 106 Fastener

Common	Used in step 22 23 53 54
Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

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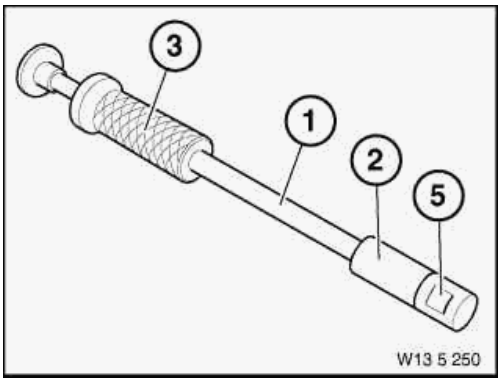
0 493 321 (13 5 250) Puller



Common

Used in step 25

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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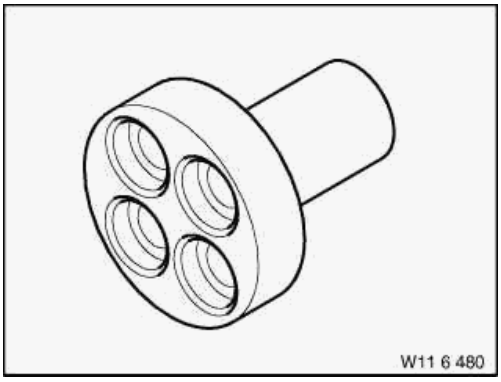
0 493 339 (13 5 252) Bush

Common	Used in step 25
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common	Used in step 25
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 31 45
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 31 44 45
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge

Common

Used in step 31 43 45

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 35 36

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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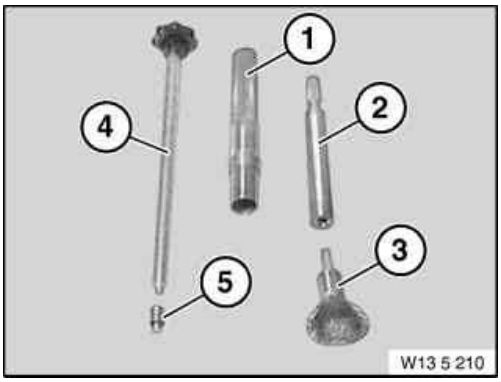
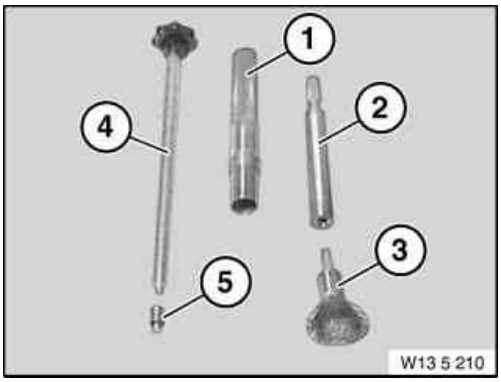
0 493 763 (13 5 215) Plug



Common	Used in step 51
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 51
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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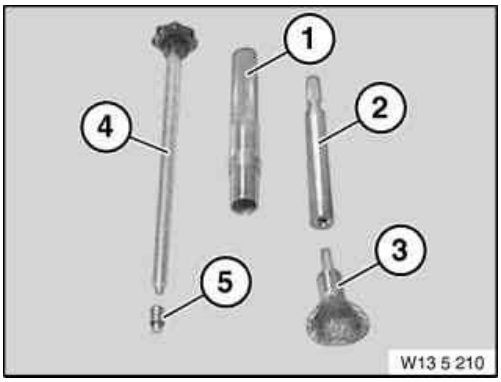
0 493 758 (13 5 210) Tool



Common

Used in step 51

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

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0 495 221 (36 1 323) Wheel stud

Common	Used in step 28
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 28
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 28
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud

Common	Used in step 28
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 28
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 28
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud

Common	Used in step 28
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 28
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	17 56
EGR controller	17 56

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 75
61 12 ... Notes on intelligent battery sensor (IBS)	1 75
61 00 ... Notes for disconnecting and connecting battery	1 75

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Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	11 25 26
17 00 008 Draining and topping up coolant for high-temperature circuit	76
17 00 008 Draining and topping up coolant for high-temperature circuit	76
17 00 008 Draining and topping up coolant for high-temperature circuit	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	76
17 00 039 Bleeding cooling system (B37, B47)	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	76
17 00 008 Draining and topping up the high-temperature coolant circuit	76
17 00 008 Draining and topping up the high-temperature coolant circuit	76
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	76
17 00 008 Draining and topping up the high-temperature coolant circuit	76
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	76
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	76

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	41
Exhaust-gas recirculation cooler seal on exhaust manifold	56
Exhaust-gas recirculation cooler seal on intake plenum	56

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11 31 025 Removing and installing/replacing intake camshaft

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

1 – Remove vehicle battery

WARNING

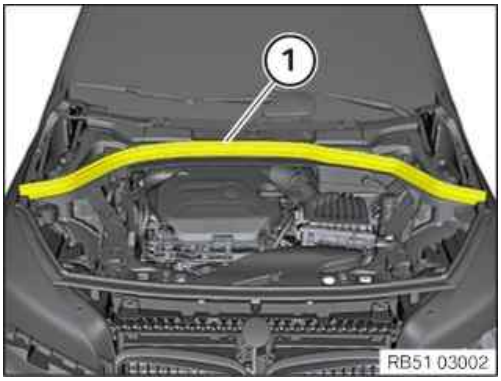
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

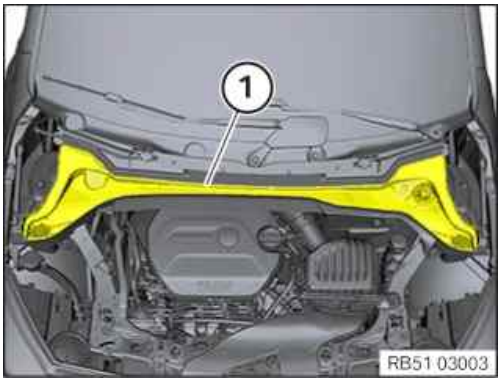
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.

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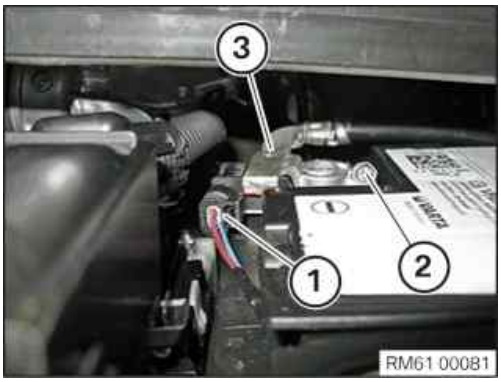
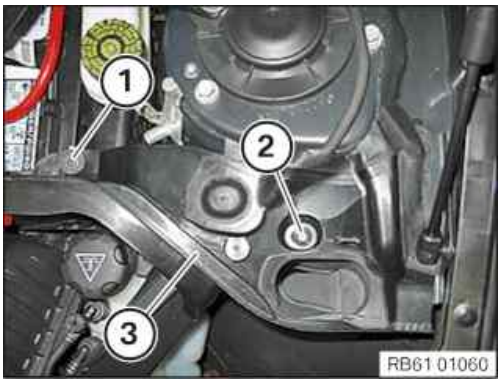
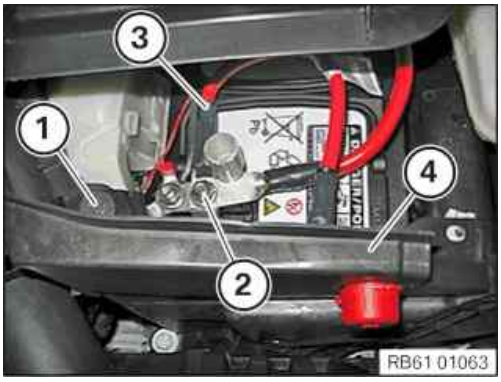


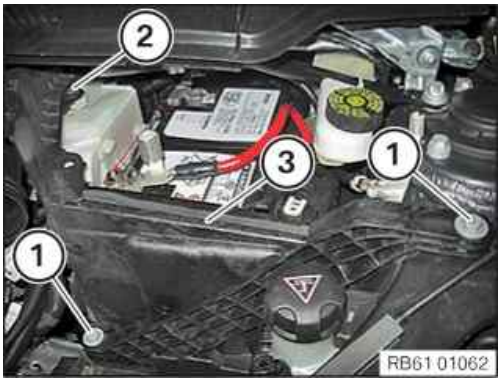
- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



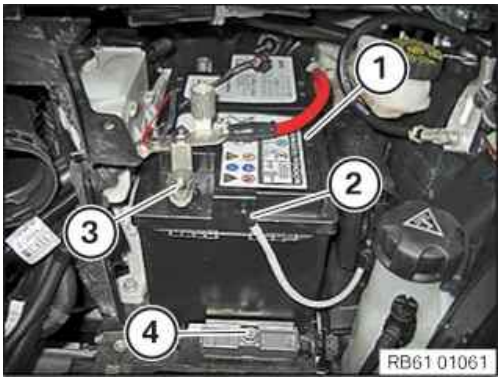
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Remove left and right wiper arm

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NOTICE

Description is for left component only. Procedure on the right side is identical.

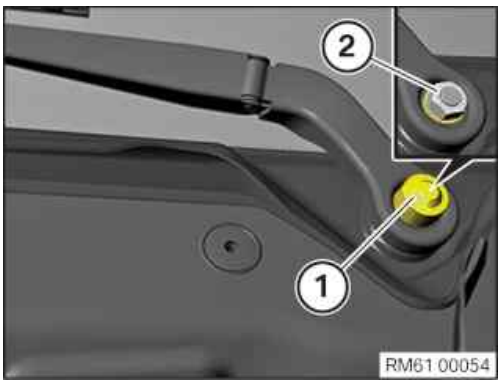
▶ **Remove the wiper arm**

RISK OF DAMAGE

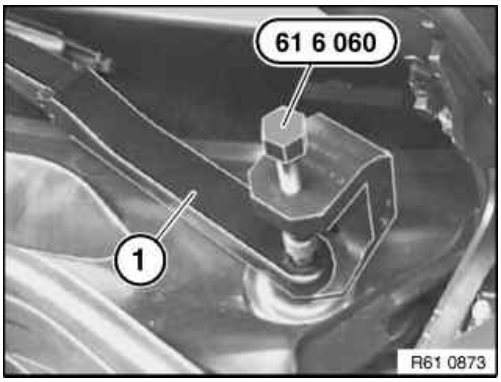
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

3 – Remove the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**

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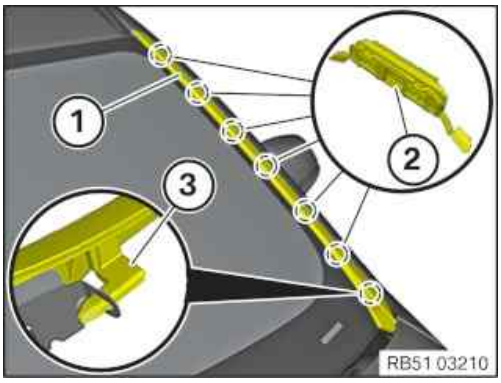
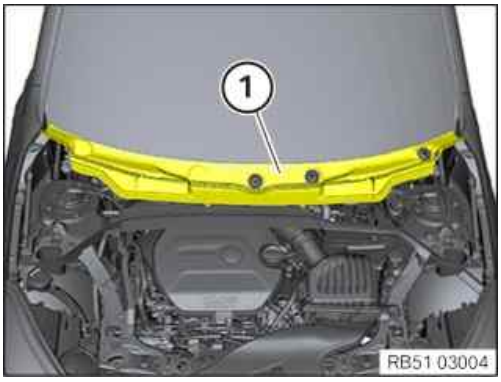


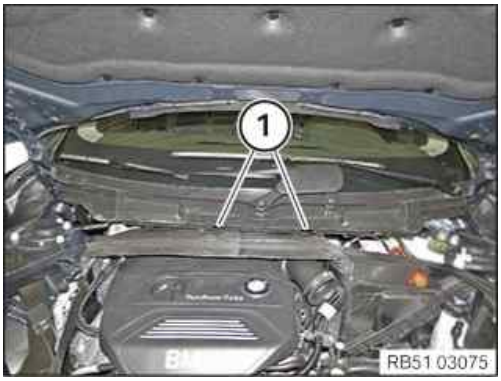
- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

4 – Remove the rear cowl panel cover

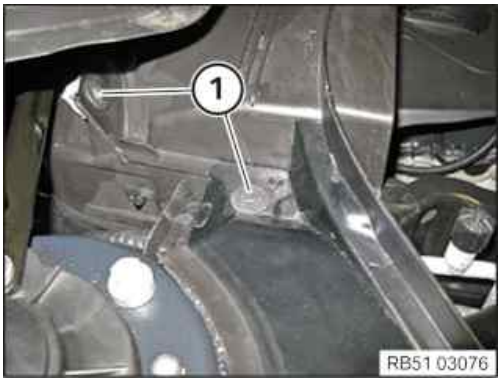


- Disengage and guide out the rear cowl panel cover (1) towards the top.

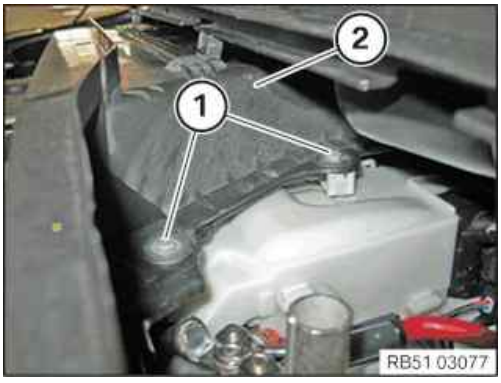
5 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

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6 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

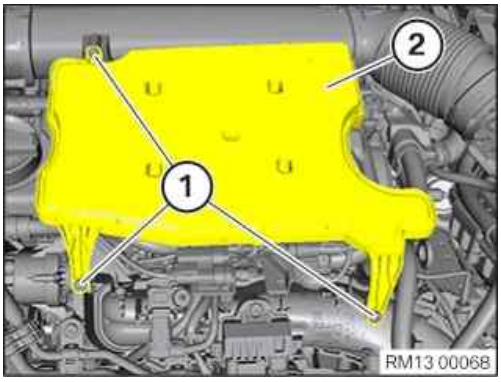
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

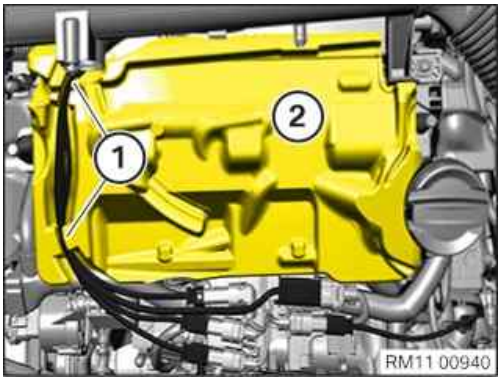
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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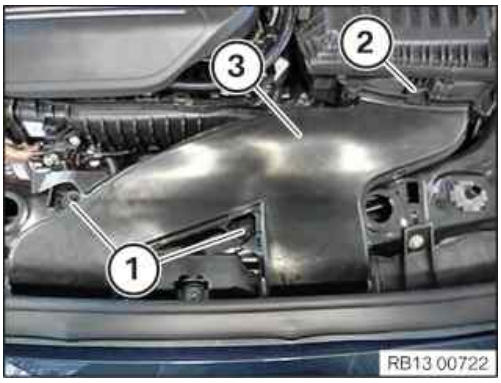
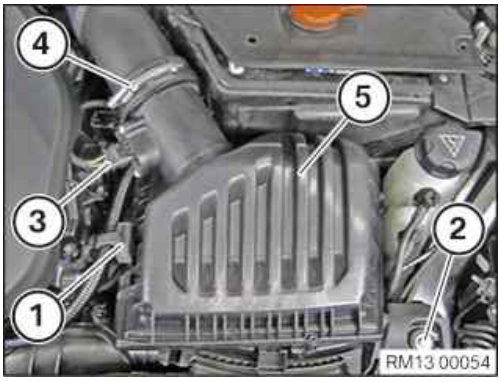


- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

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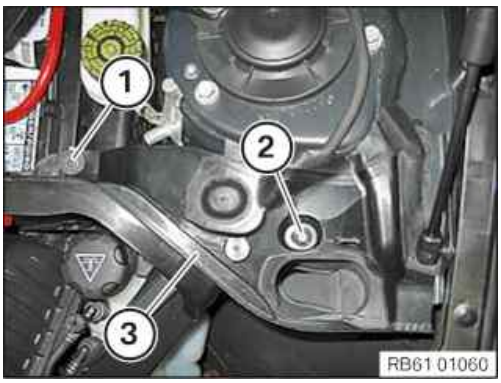
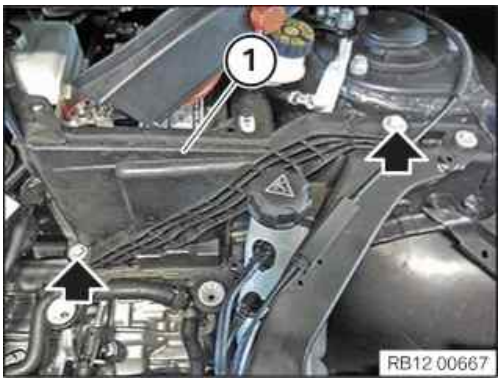
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

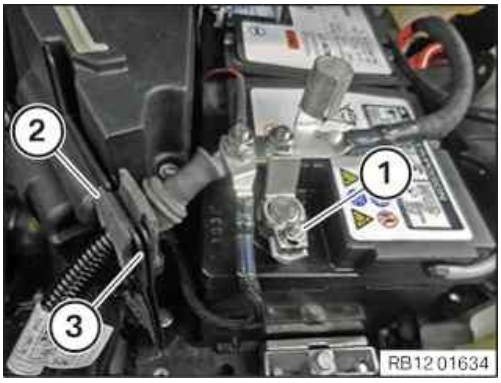


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

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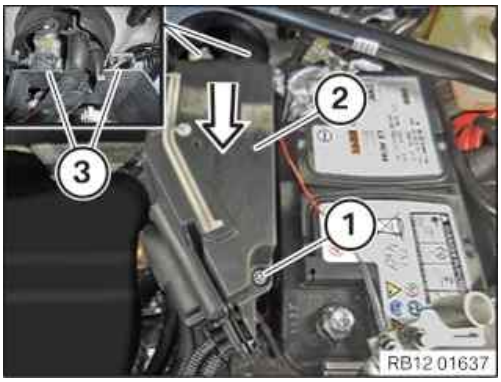
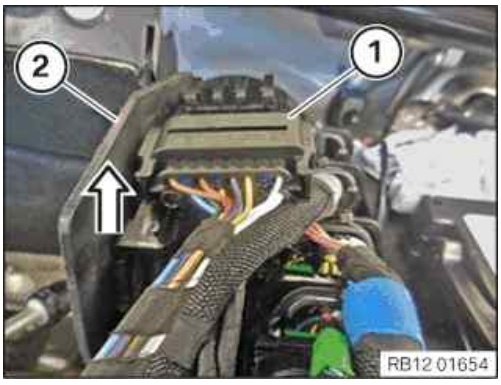
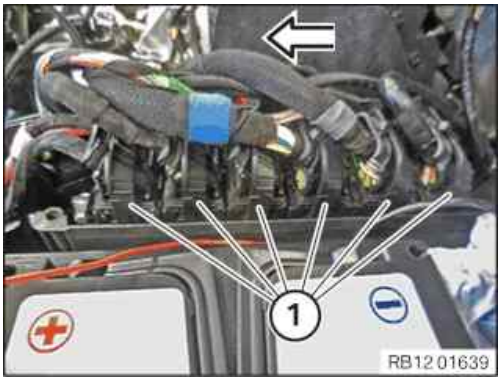


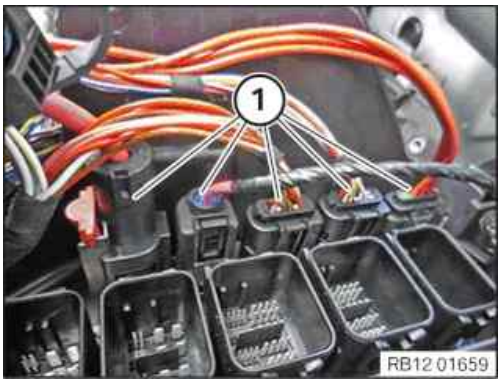
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



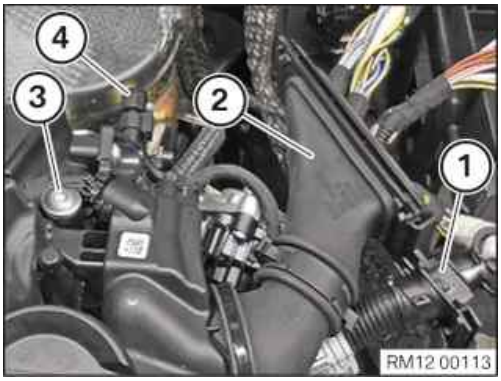
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

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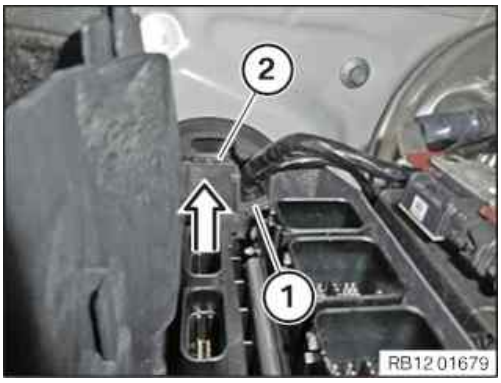
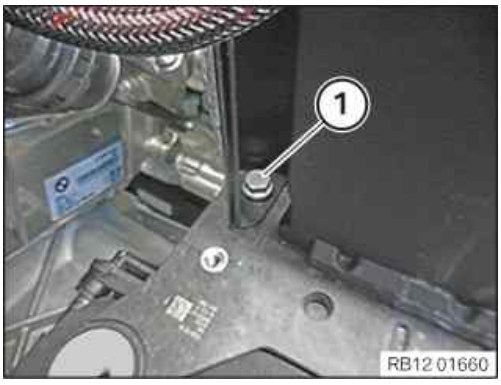
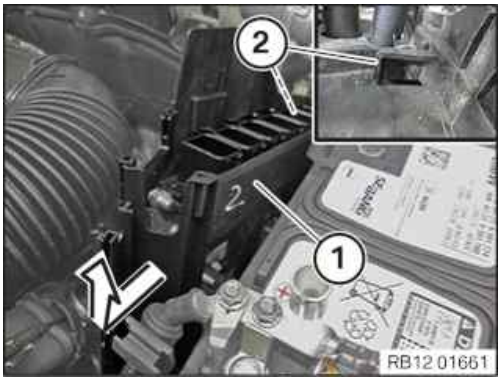


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

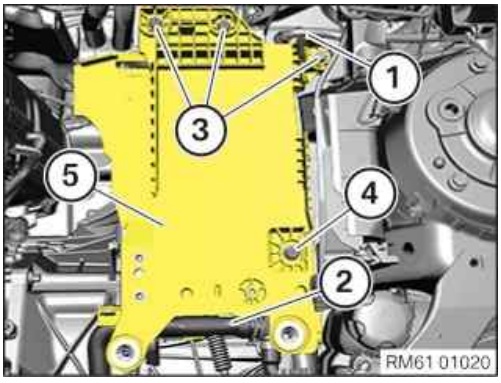


- Loosen screw (1).



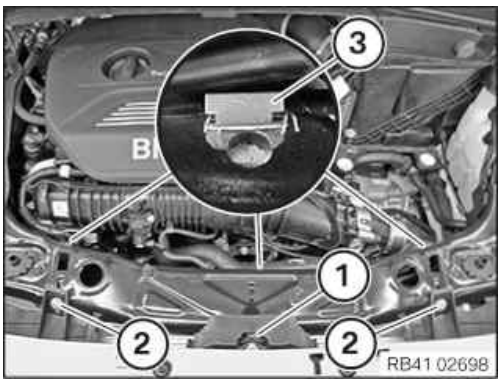
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

12 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

13 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.

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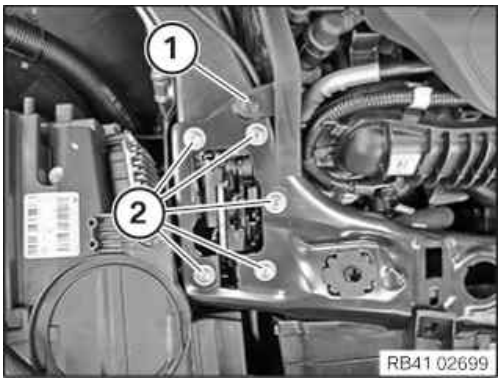
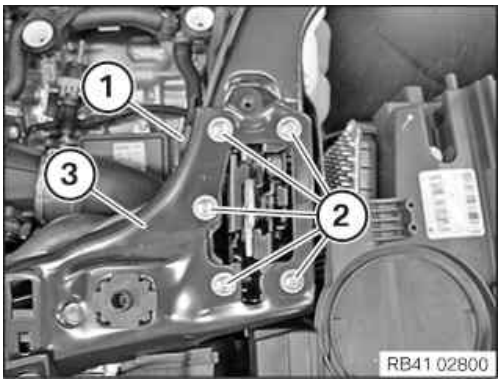
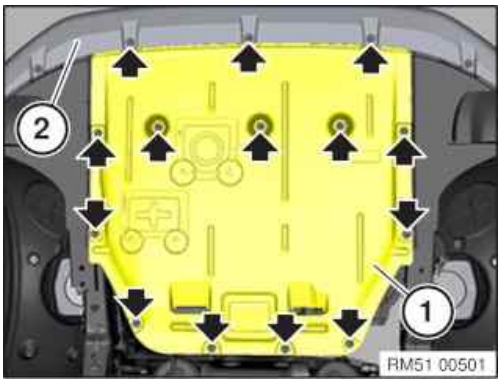


- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

14 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

15 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

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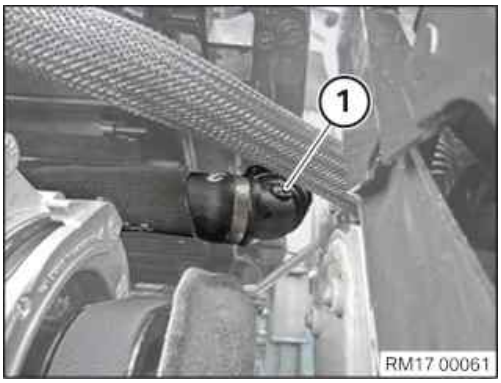
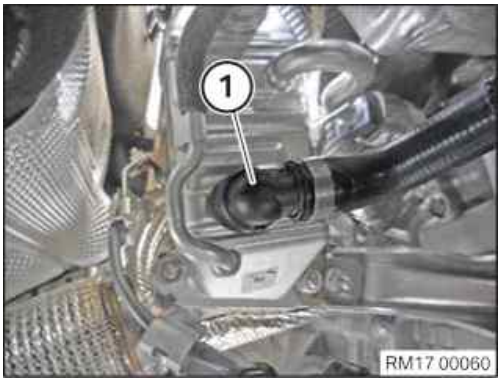
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

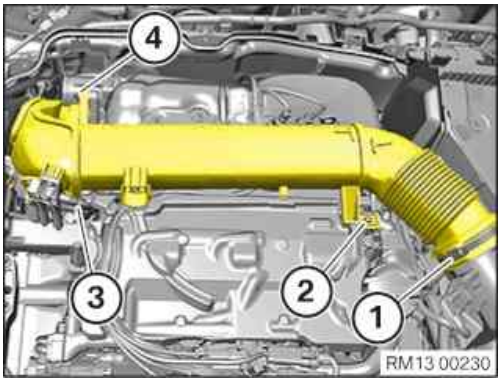


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

16 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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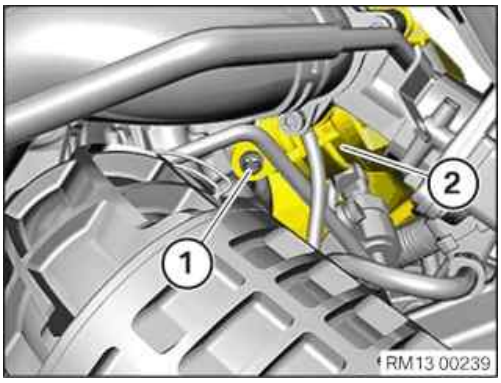
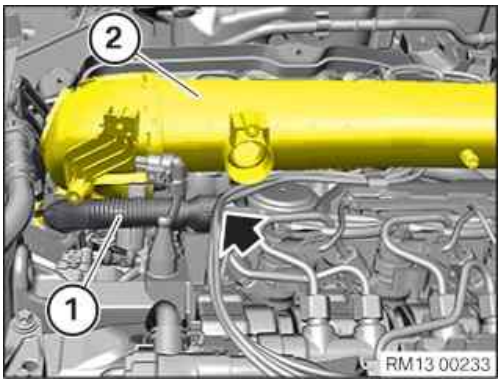


- Unscrew the screw (1) from the clean air pipe (2).



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

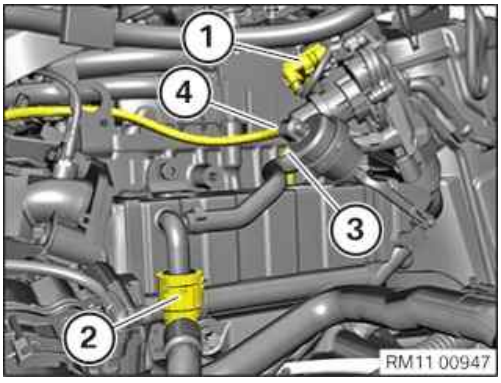
17 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.

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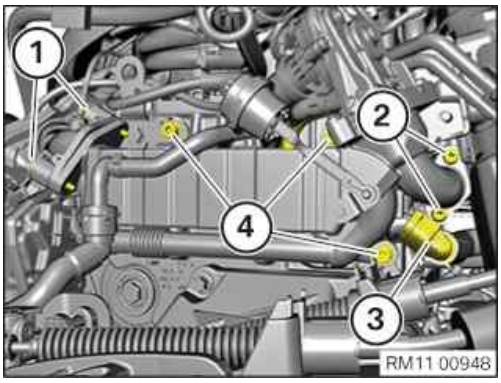
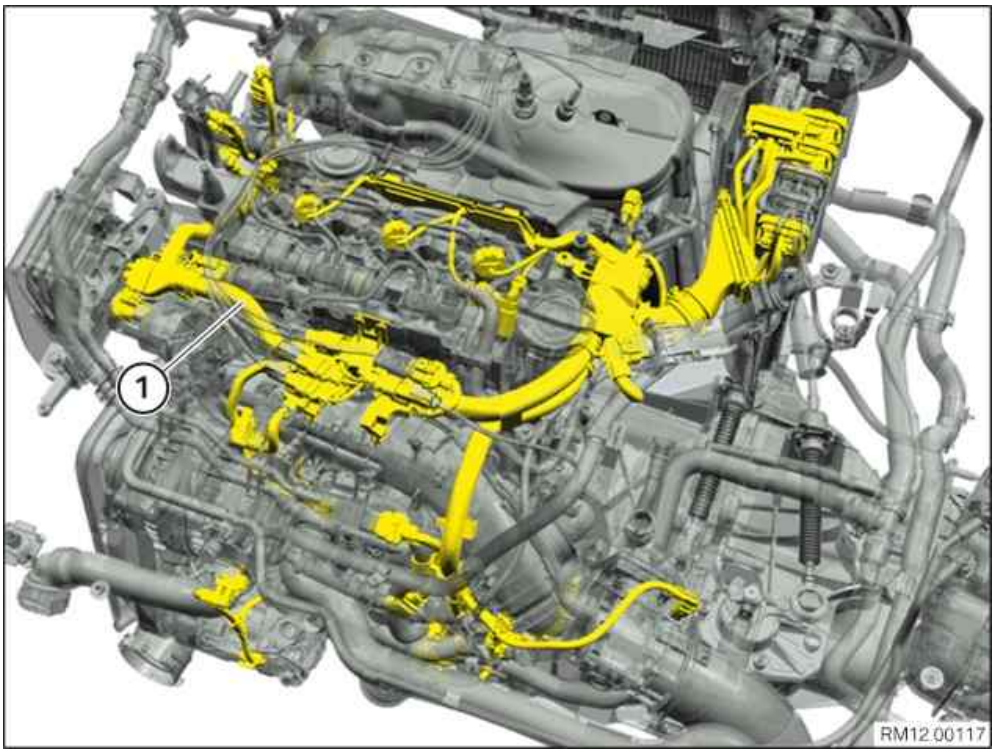


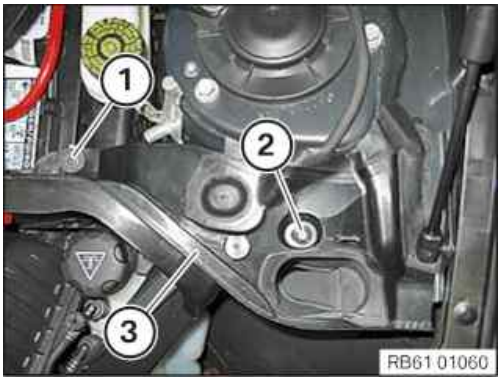
- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

18 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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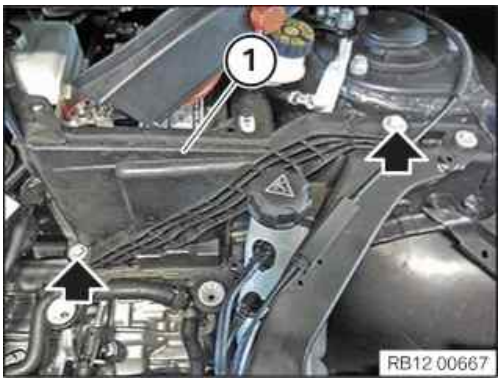
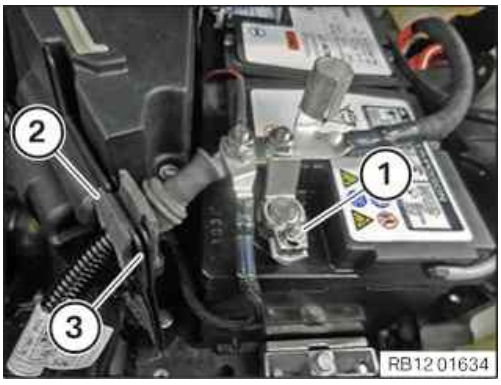
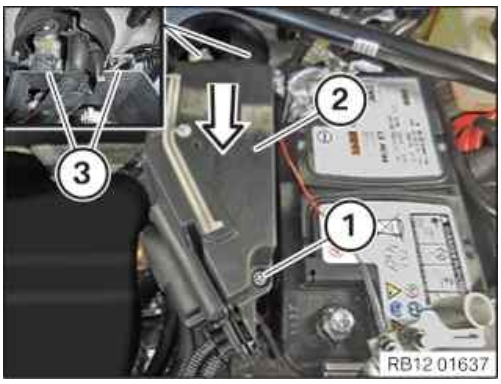


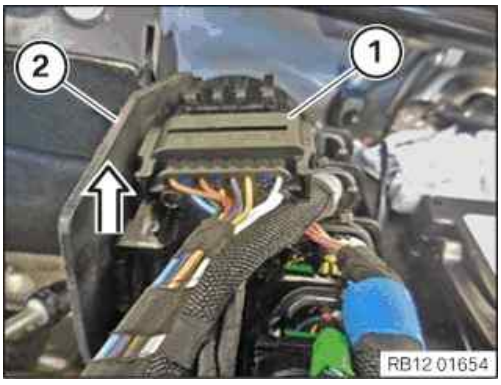
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



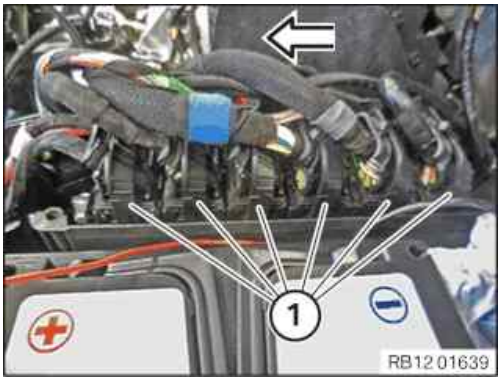
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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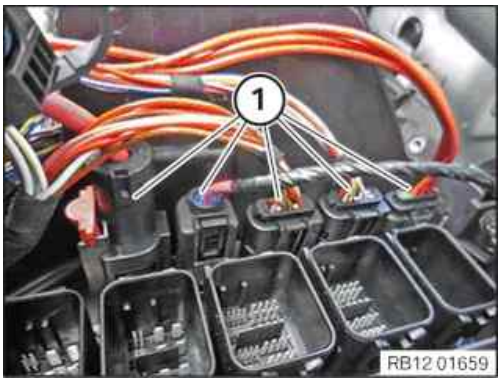
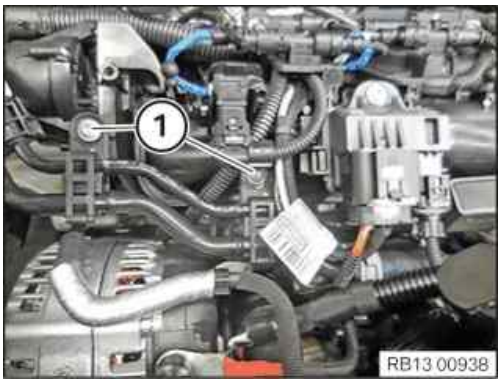
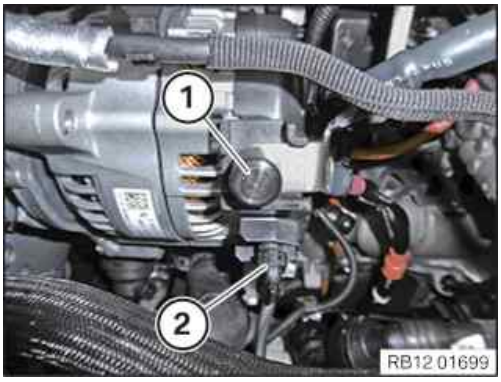


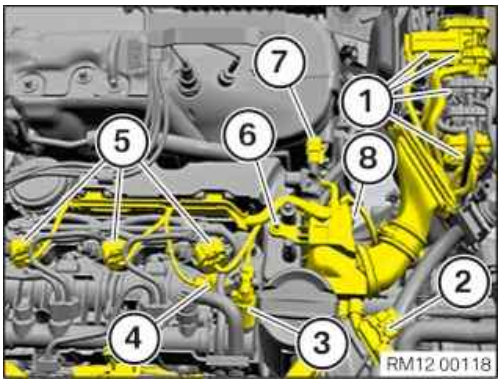
- Unlock and loosen connector (1).



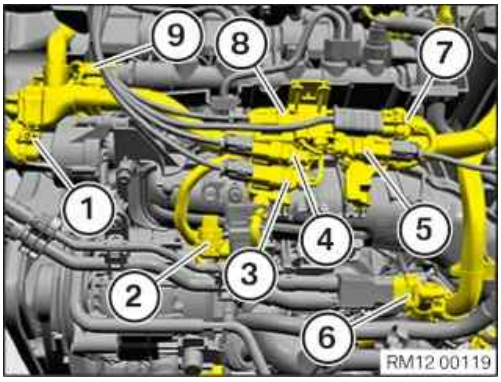
- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.

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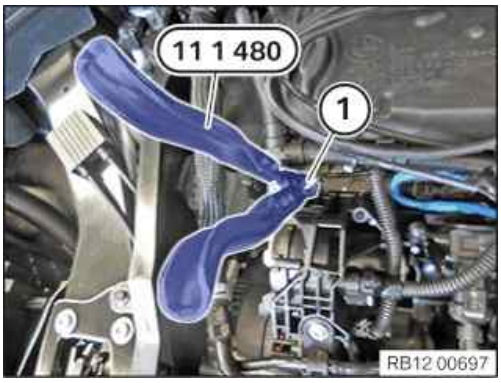
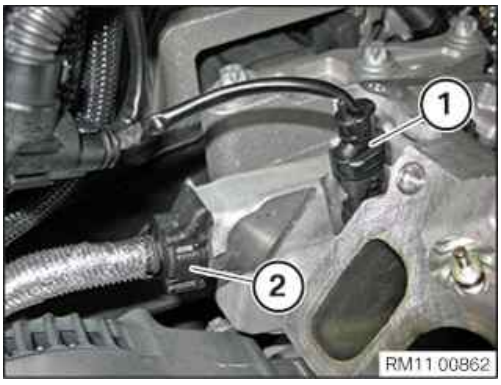
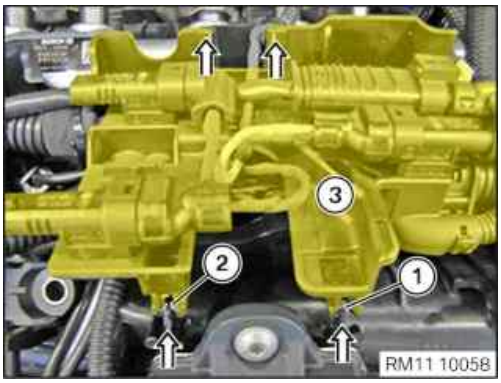


- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

19 – Removing the cable clips from the intake plenum



- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

20 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).

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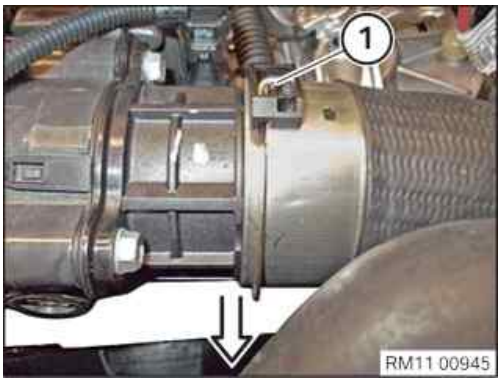
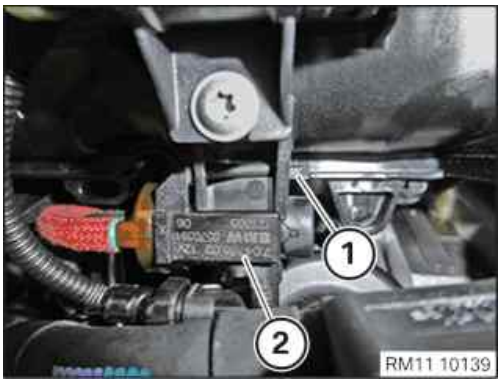
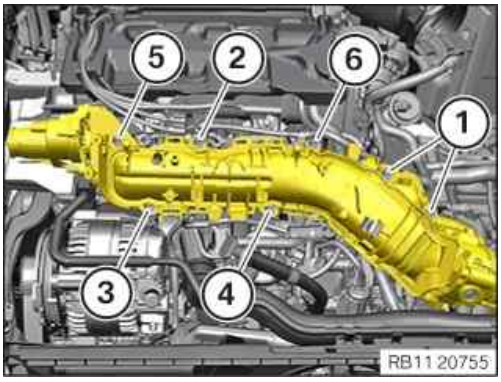


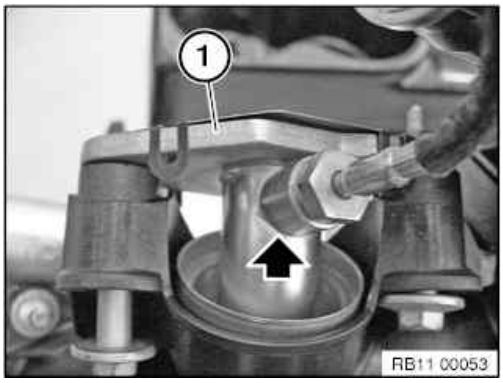
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

21 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

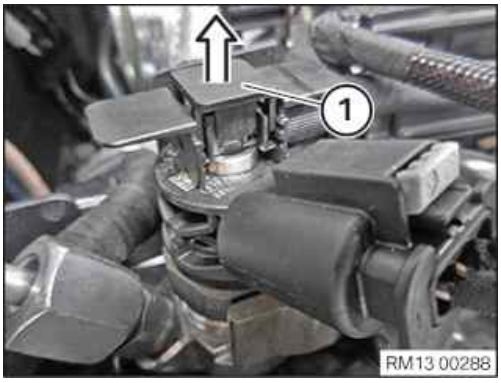
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

22 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

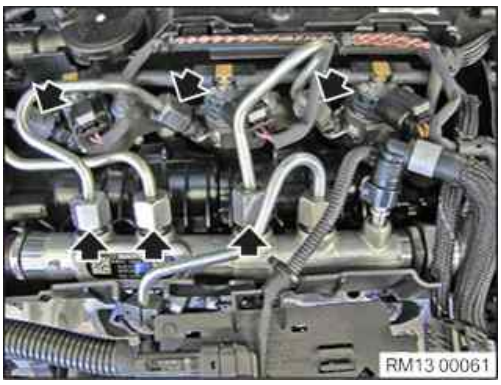
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

23 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

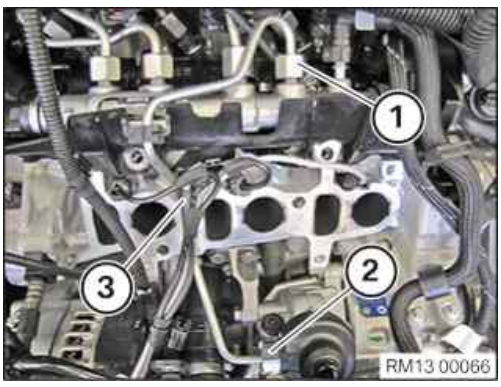
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

24 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

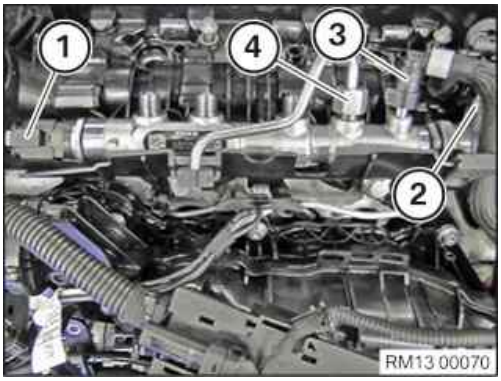
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

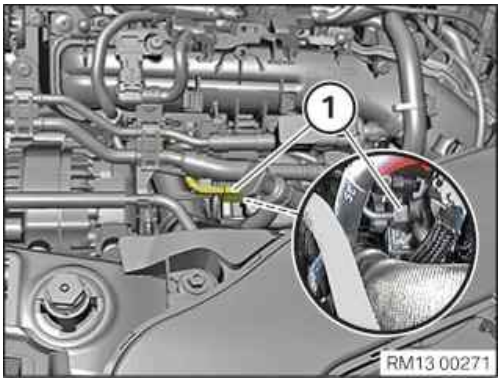
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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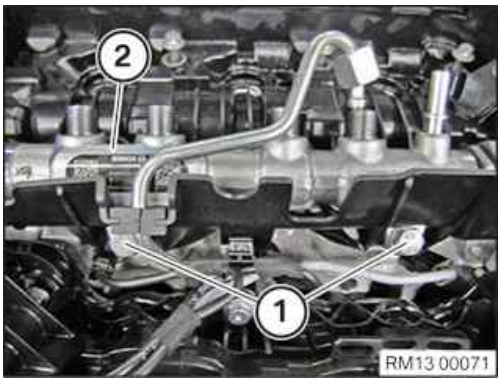

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

25 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

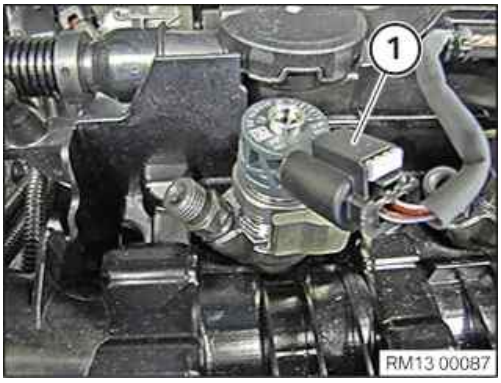
Electrostatic discharge.

Damage to or destruction of electrical components.

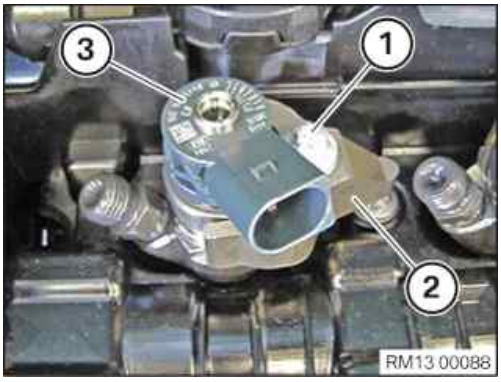
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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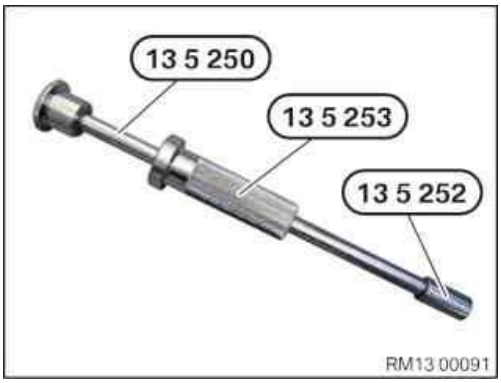
RISK OF DAMAGE

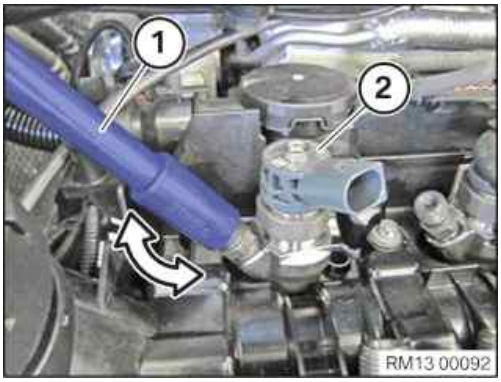
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

26 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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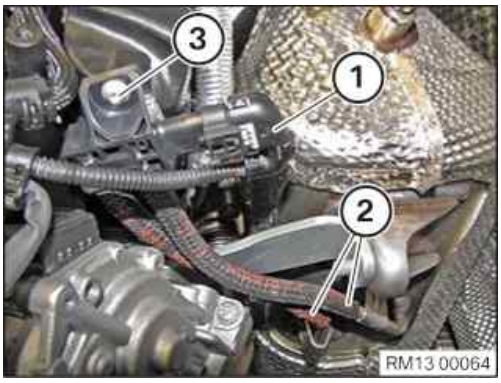
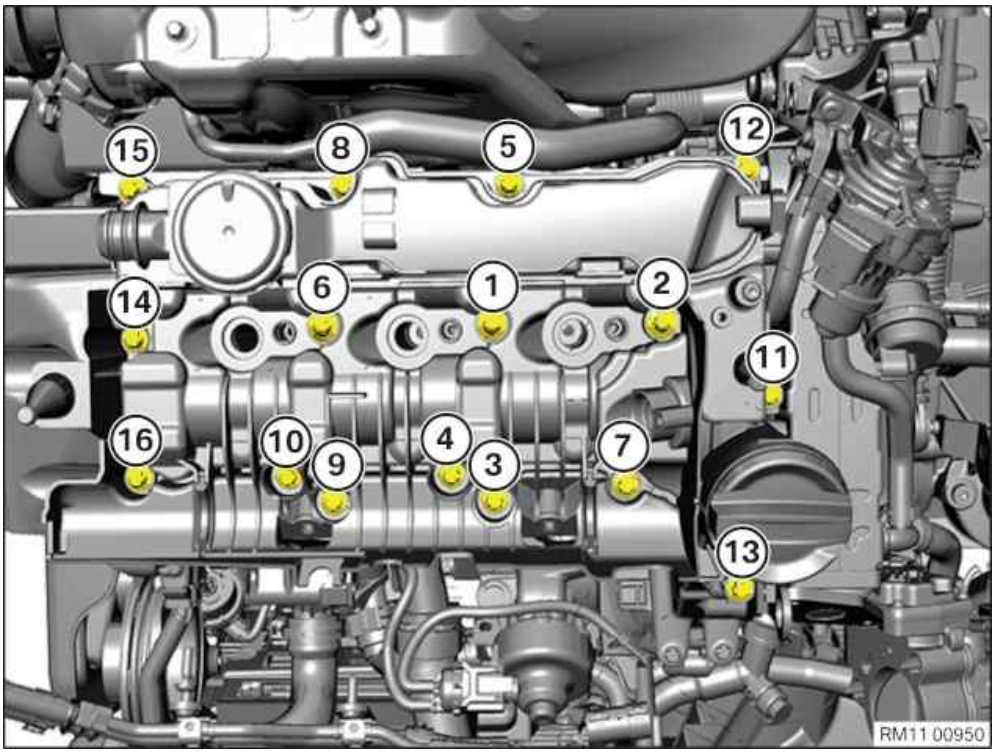


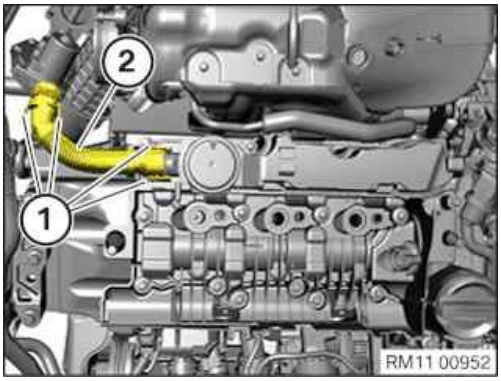
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

27 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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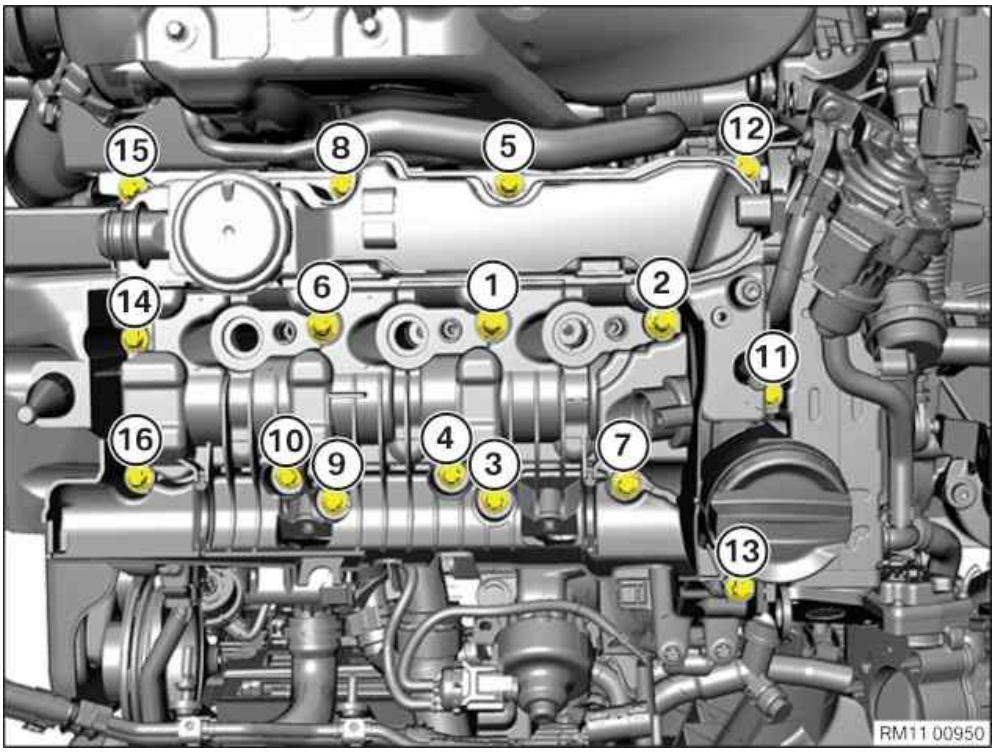

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

28 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

29 – Remove right charge-air line

- Release charge air duct screws (1) on oil sump.

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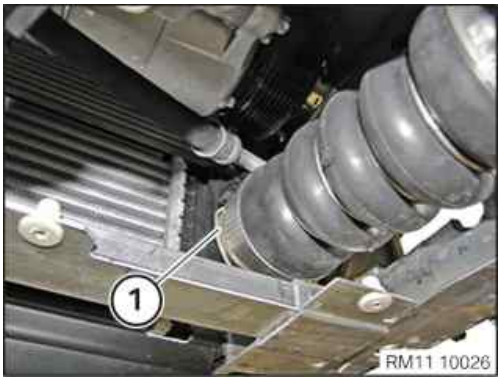
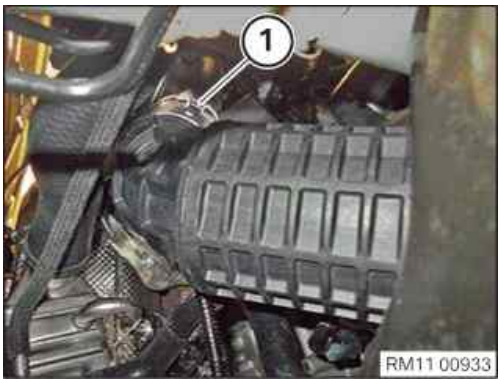
- Detach charge air duct screw connection (1) on crankcase.

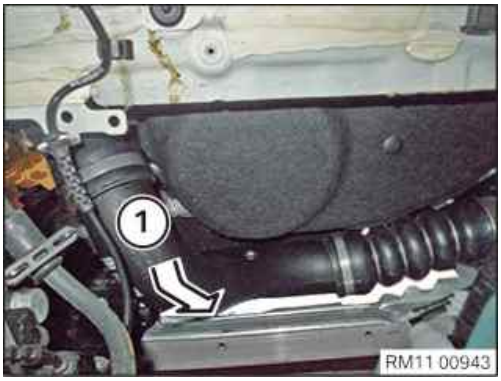
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

30 – Removing the acoustic cover for the engine at the front

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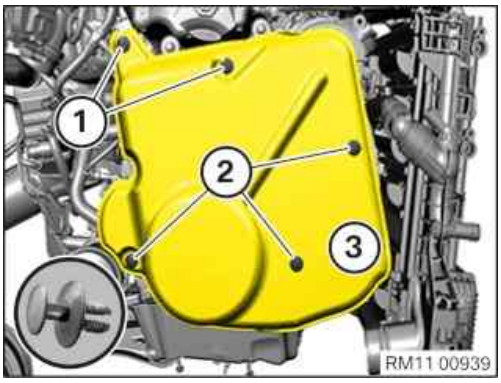


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

31 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

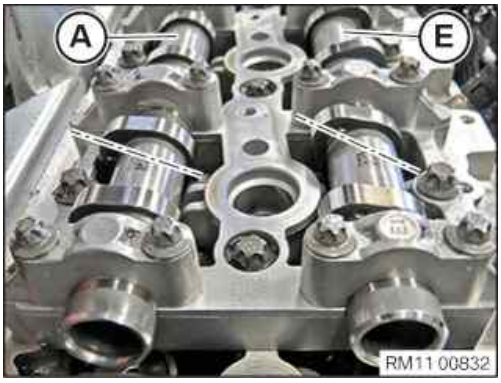
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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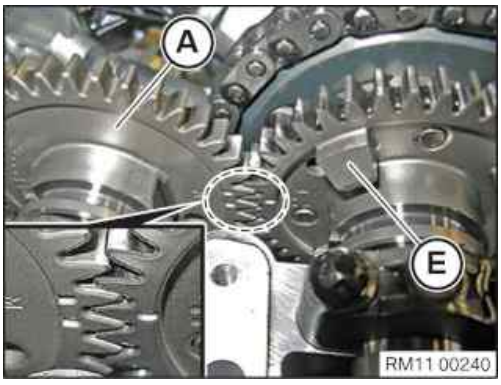
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

32 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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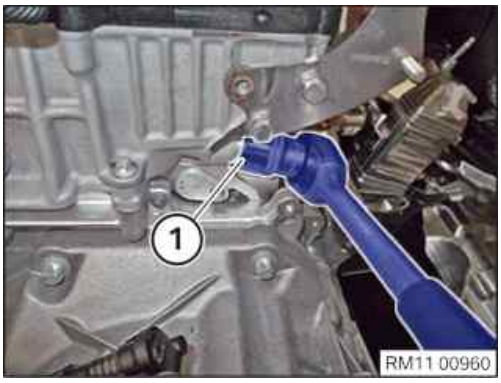
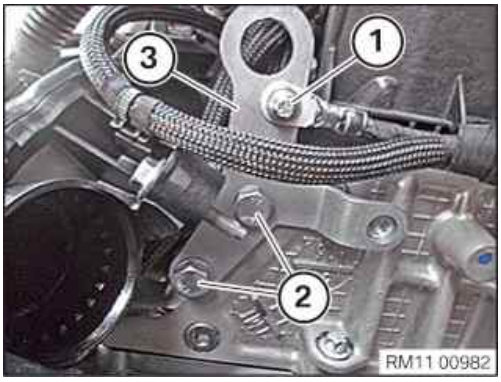


TECHNICAL INFORMATION

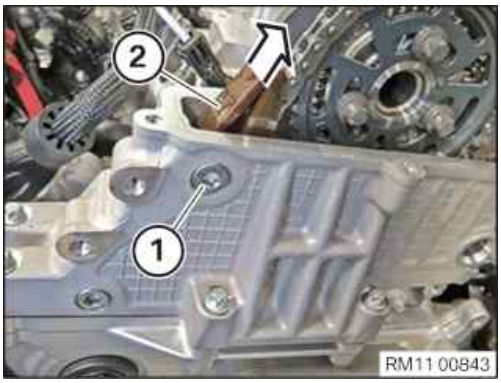
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

33 – Remove the timing chain guide rail

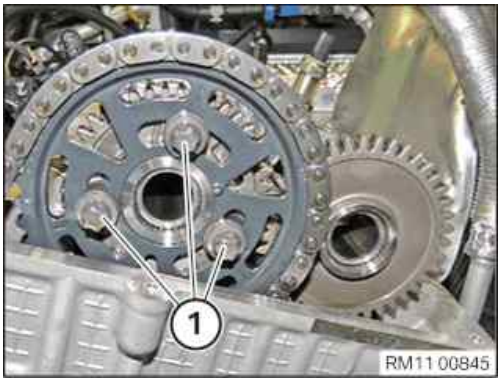


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

34 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

MAIN WORK

35 – Remove intake camshaft

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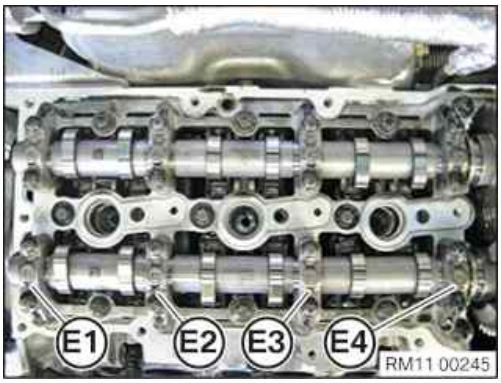
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the intake camshaft bearing caps (E1) to (E4) from the outside towards the inside in 1/2 turn increments.
- Remove intake camshaft in upward direction.
- Place all components on special tool **0 495 105 (11 4 480)** in a tidy and orderly fashion.

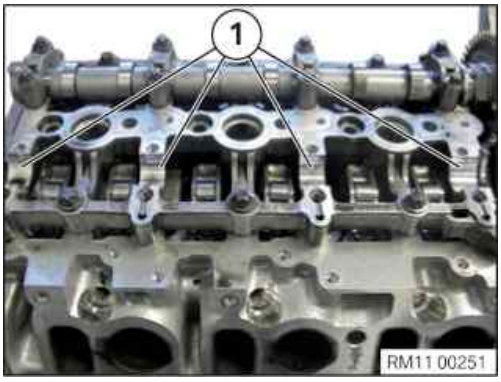
36 – Install intake camshaft

RISK OF DAMAGE

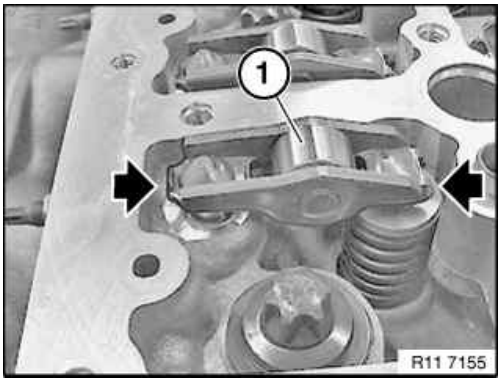
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.

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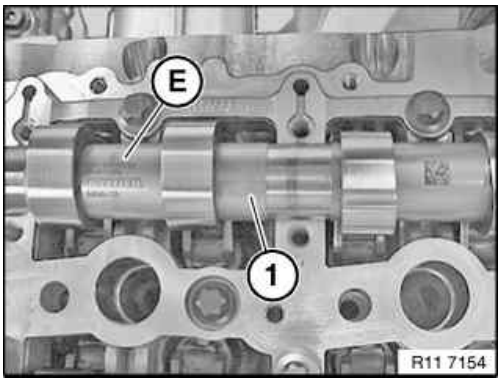
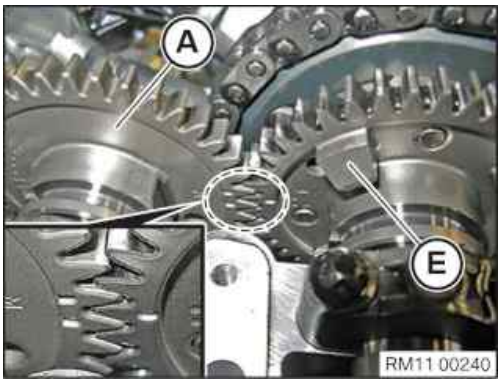
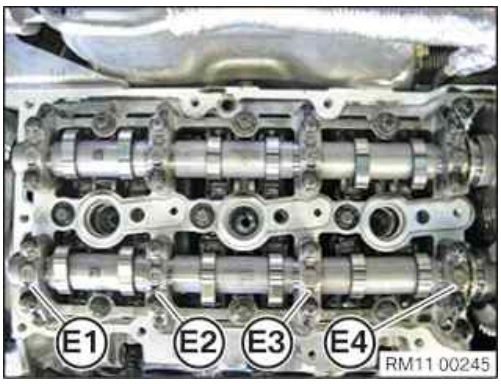


- Insert intake camshaft (1) so that the identification (E) points upwards.



- Insert the intake camshaft (E) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



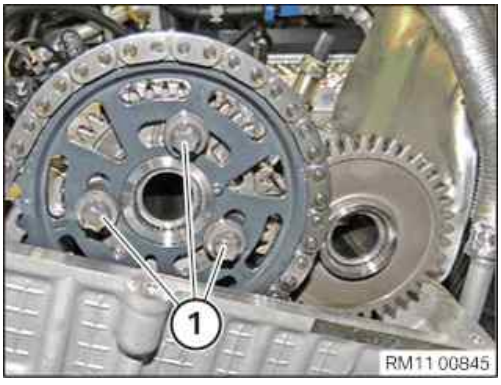
- Tighten all intake camshaft bearing caps (E1) to (E4) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

POSTPROCESSES

37 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

38 – Install the timing chain guide rail

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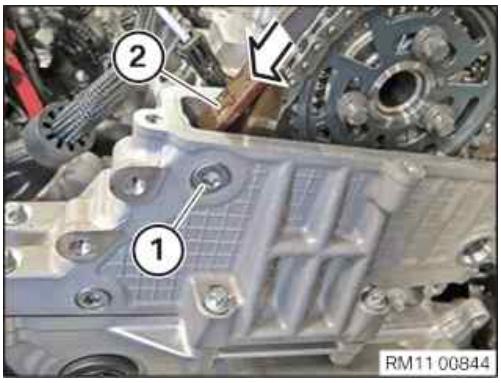


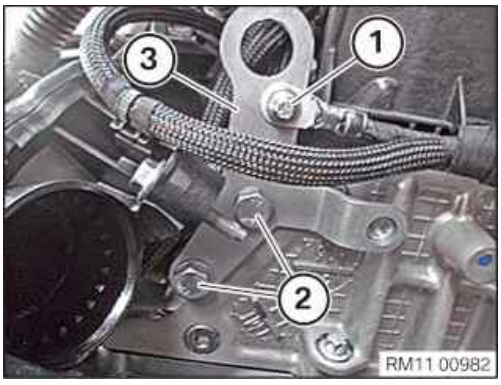
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

39 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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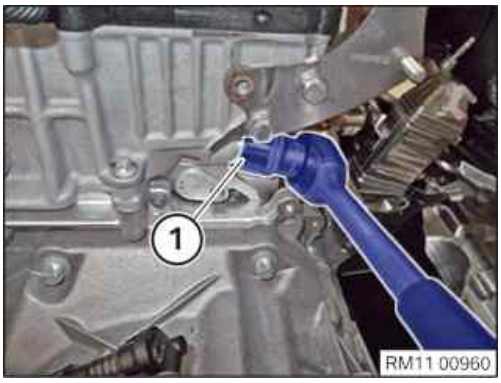
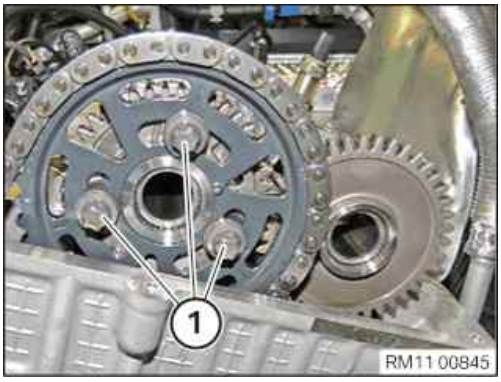


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

40 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

41 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

42 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

43 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

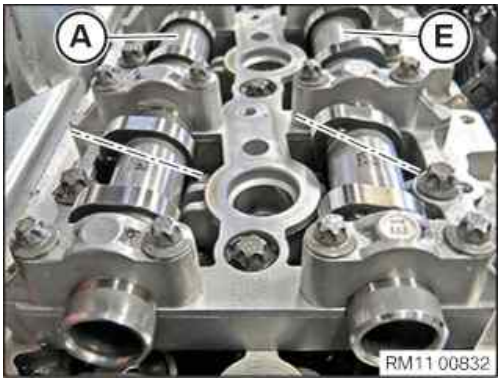
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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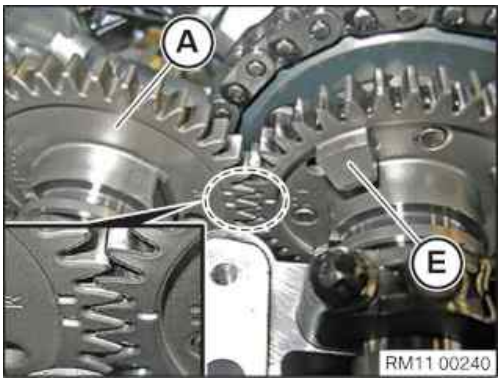


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

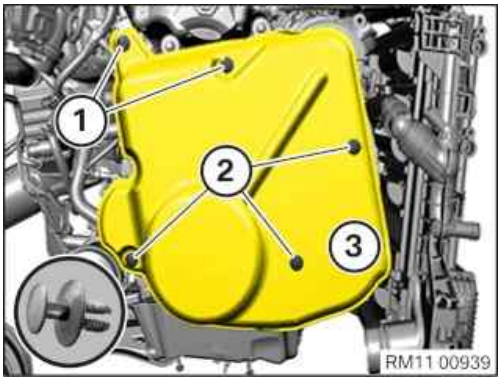
TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

44 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

45 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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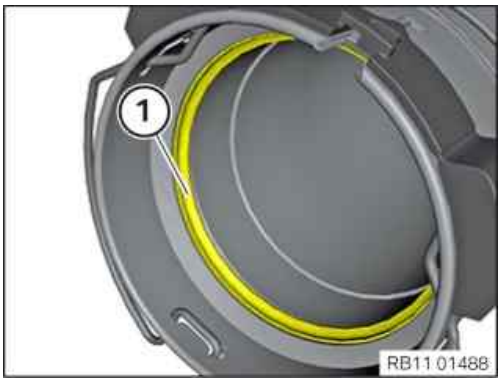
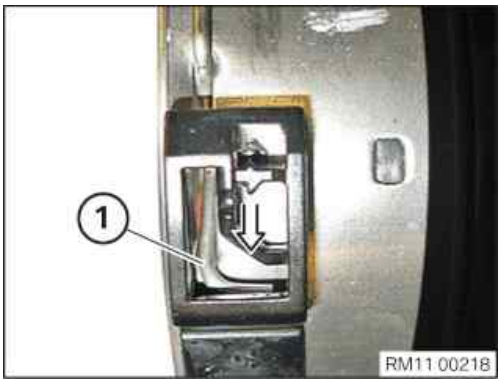
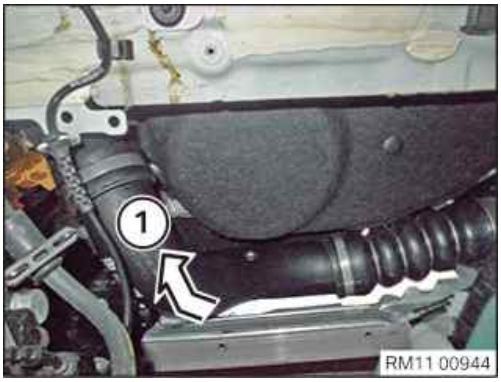


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

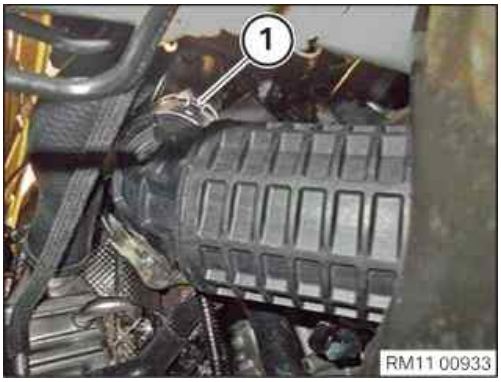
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

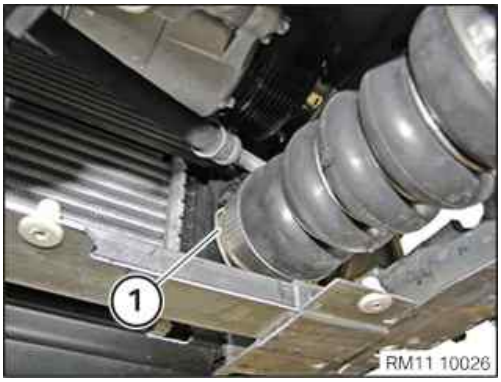


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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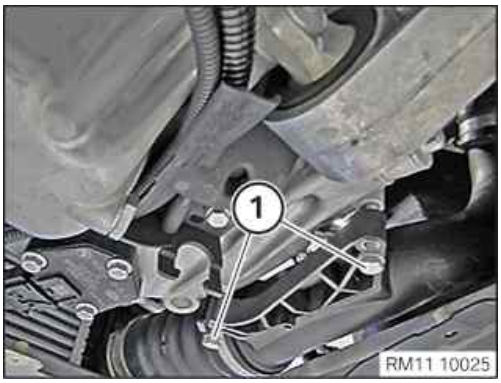
- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

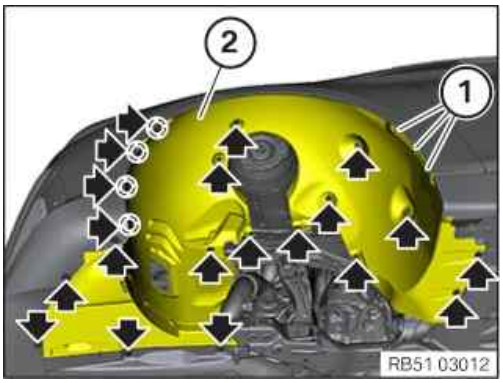


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

46 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

47 – Installing cylinder head cover

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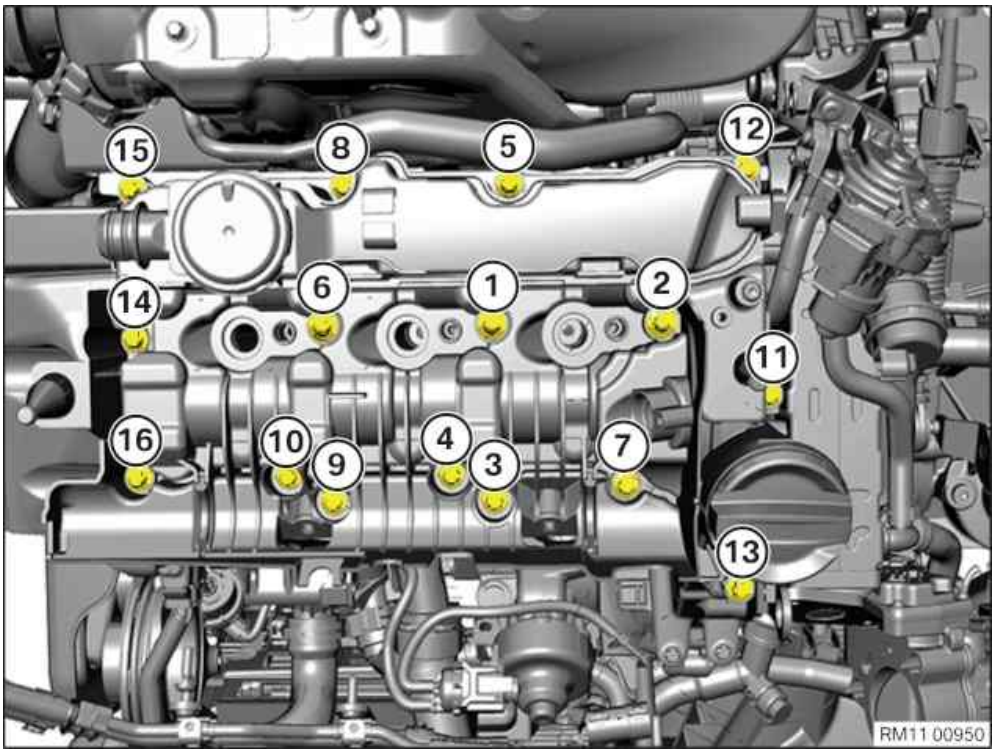
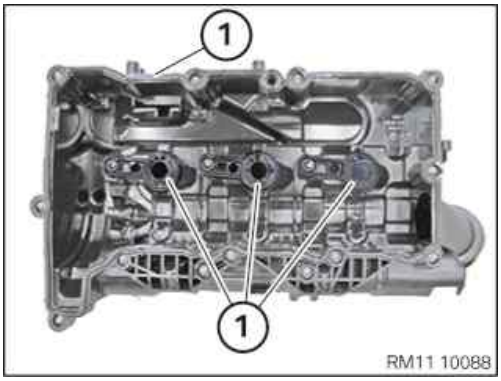
Overview: Screw connection of the cylinder head cover

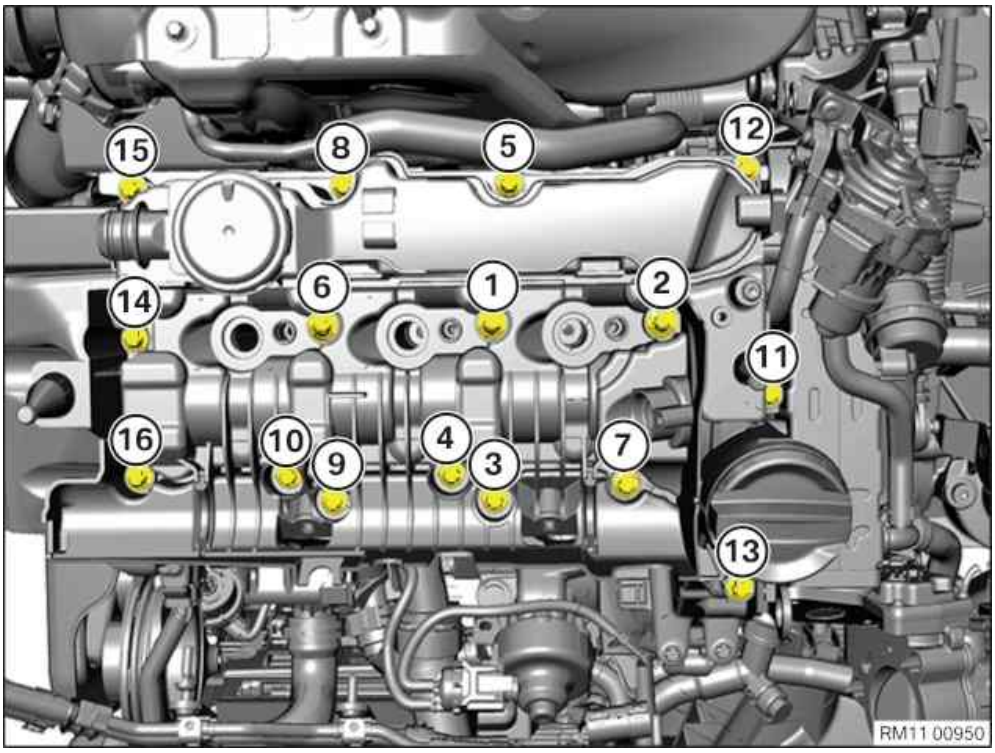


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nm

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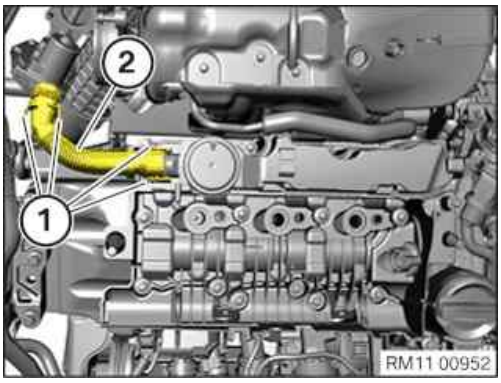
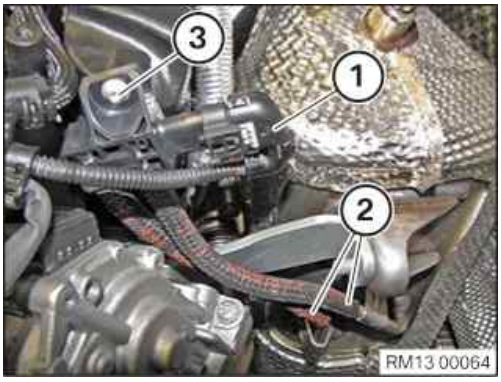


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

48 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

49 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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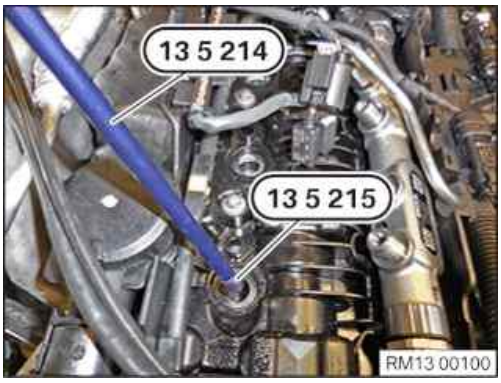
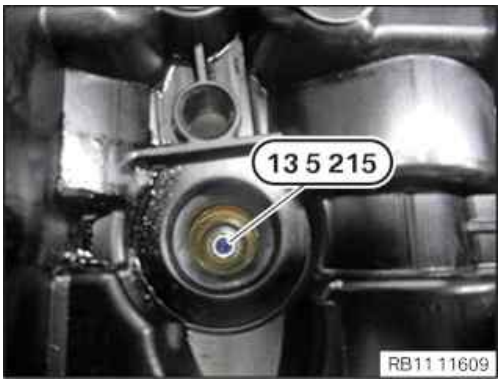


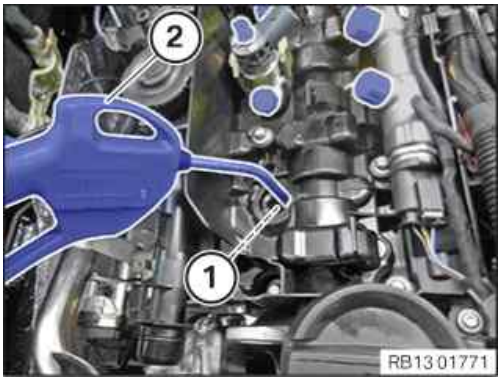
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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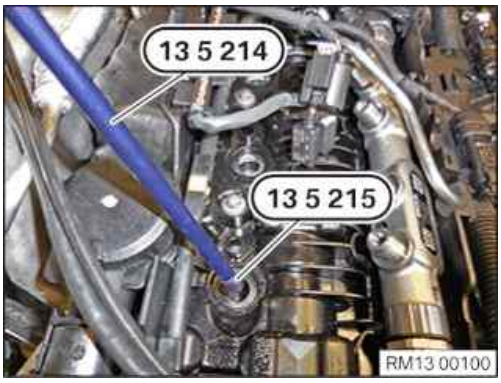


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

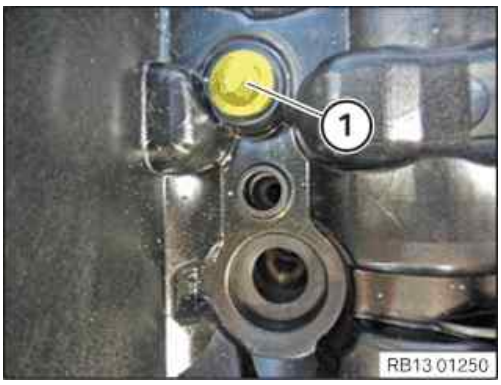
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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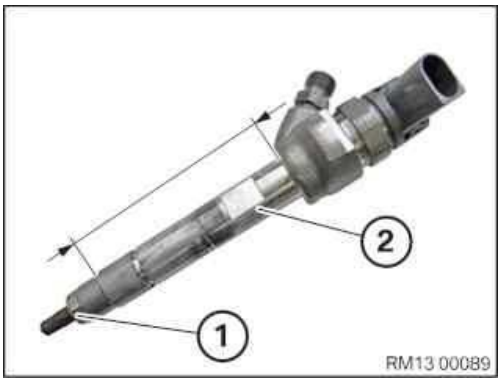


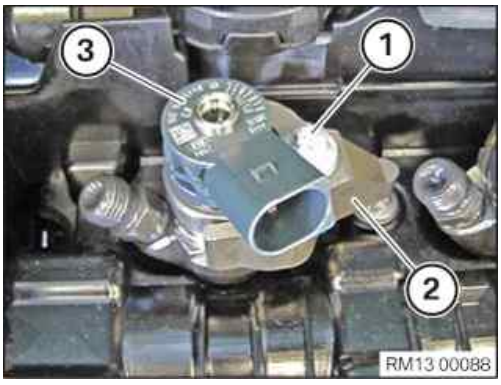
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

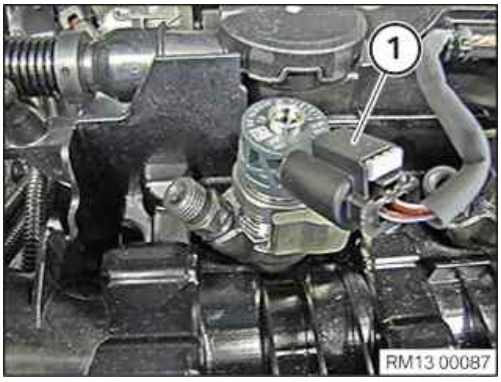
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

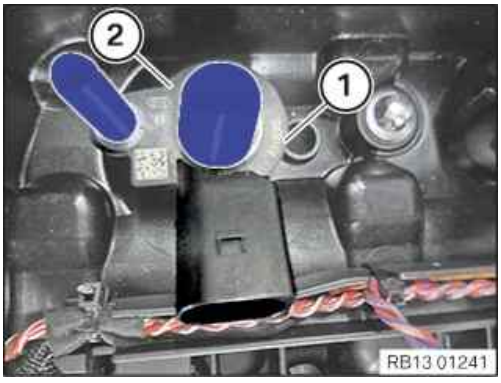
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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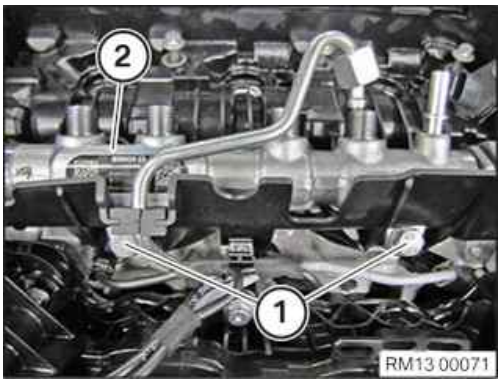
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

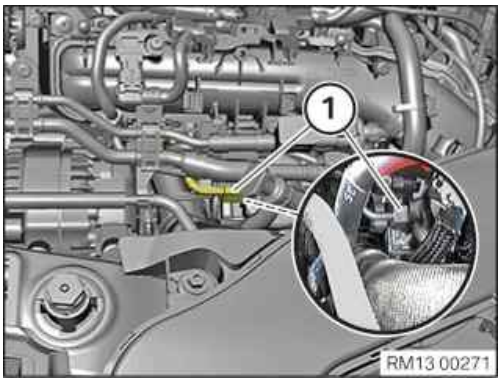
50 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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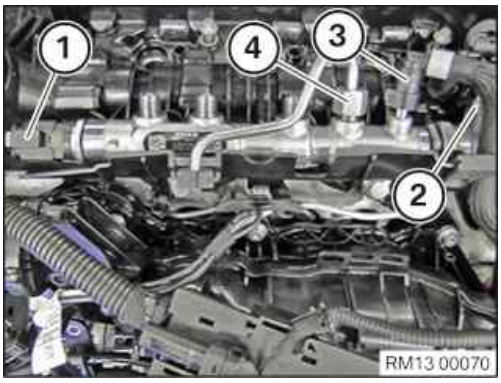

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

51 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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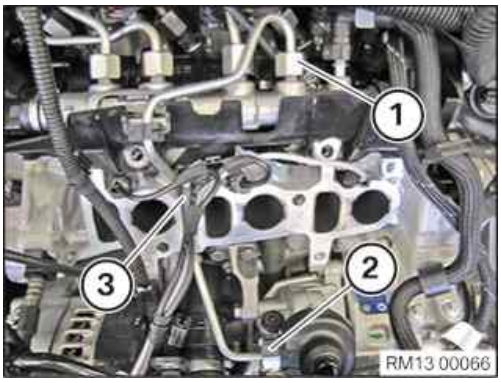

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

52 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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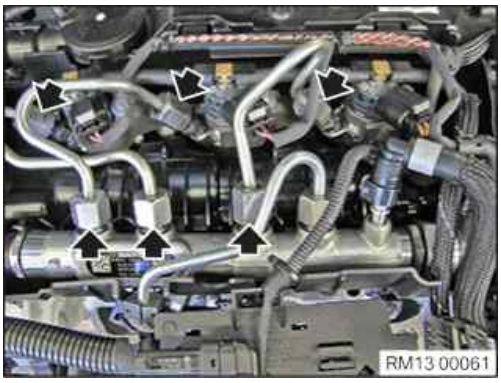

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

53 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

54 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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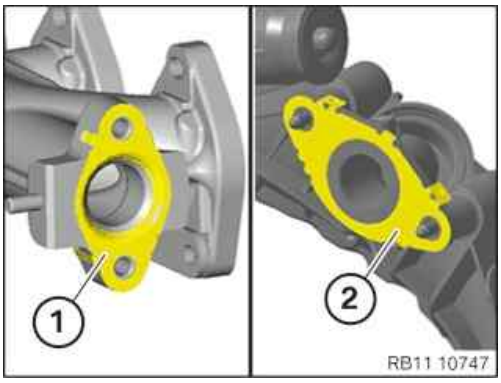
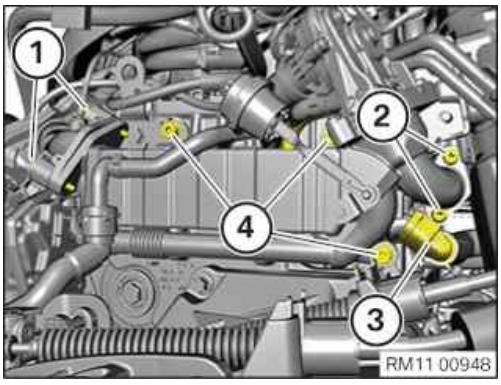


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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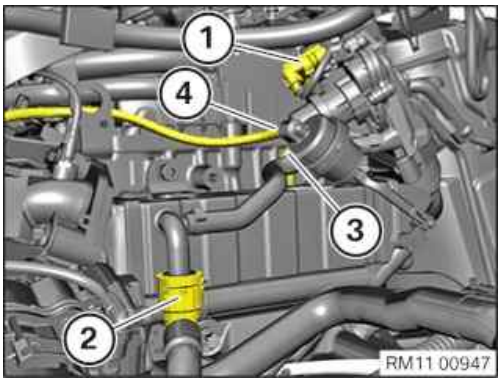


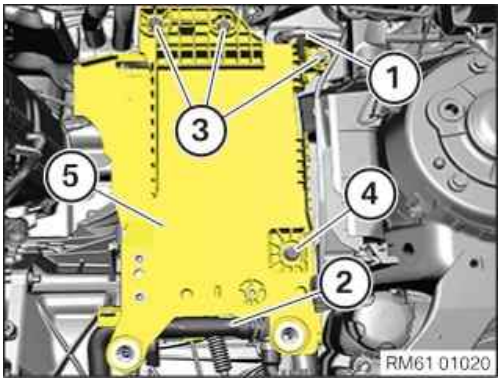
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

55 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

56 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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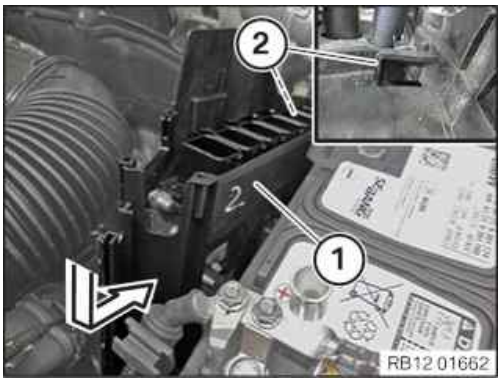
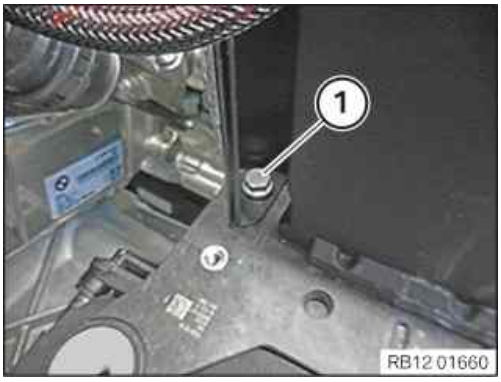


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

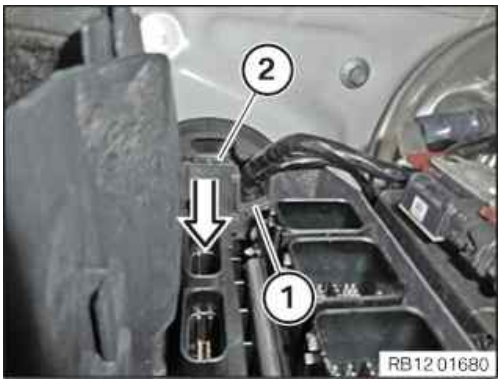
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



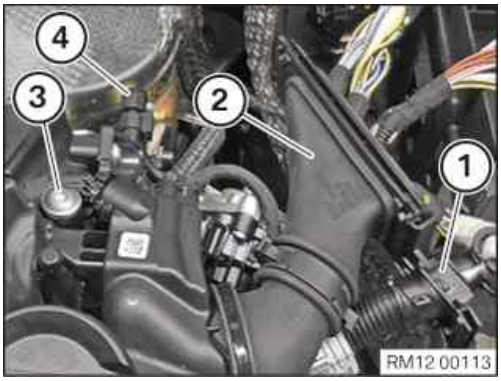
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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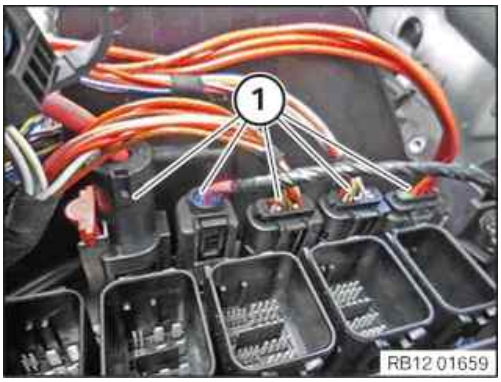
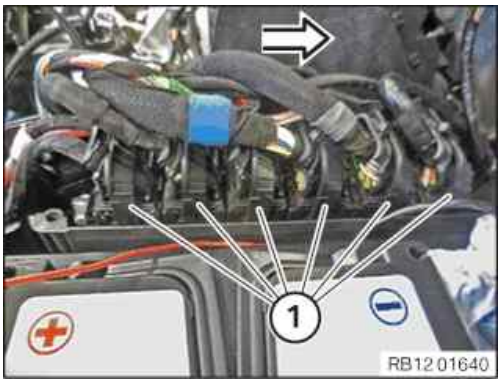
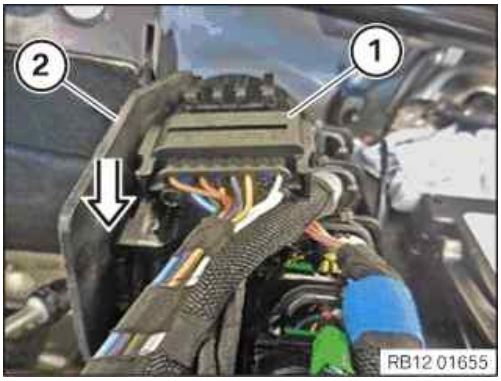


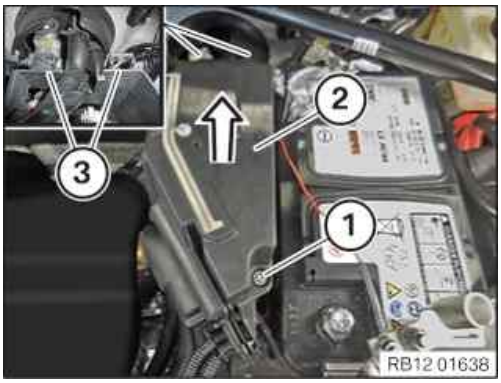
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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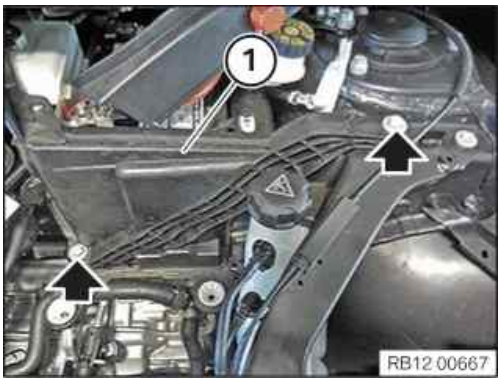


- Feed in and install tension strut (1).
- Tighten screws (arrows).

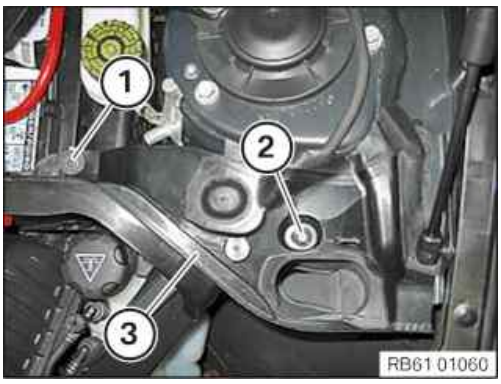
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

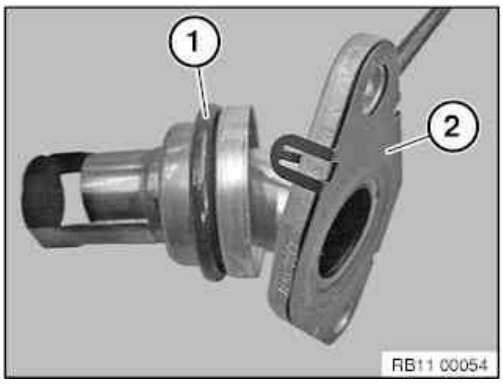


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

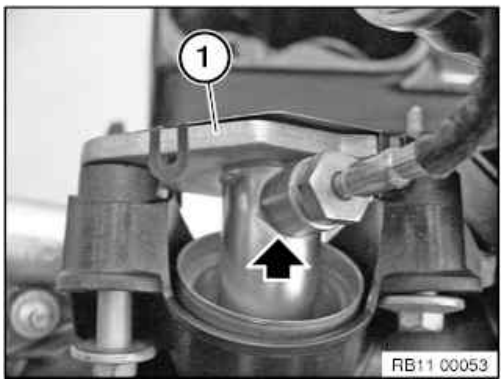
57 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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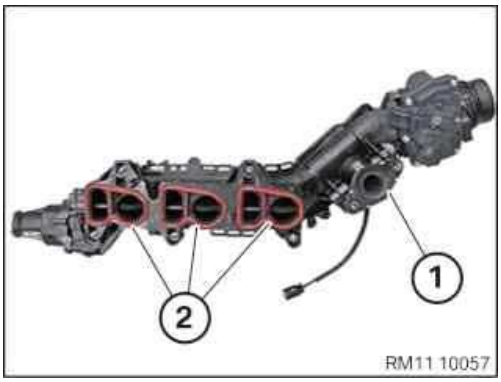
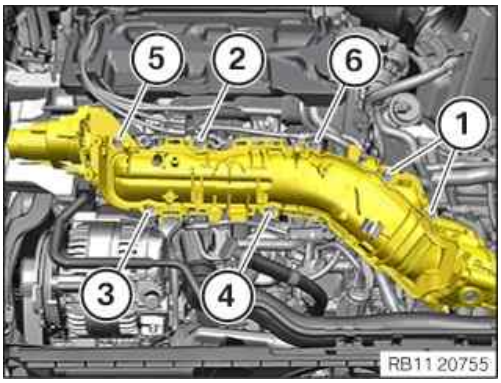


- Renew gaskets (2).

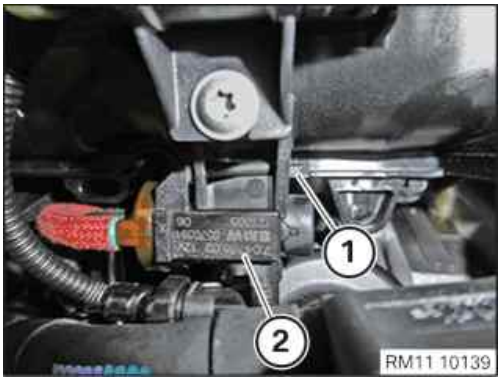
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



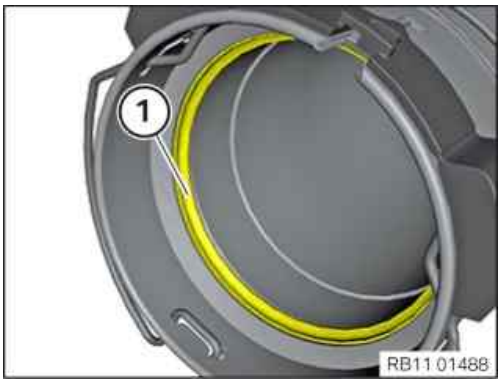
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

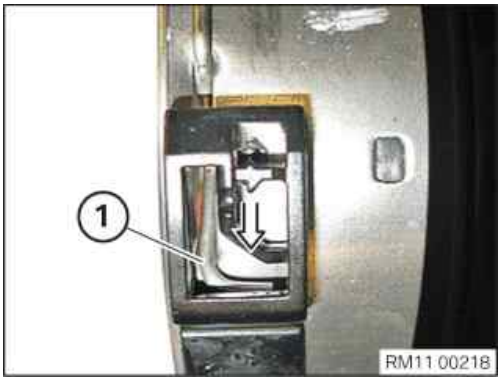


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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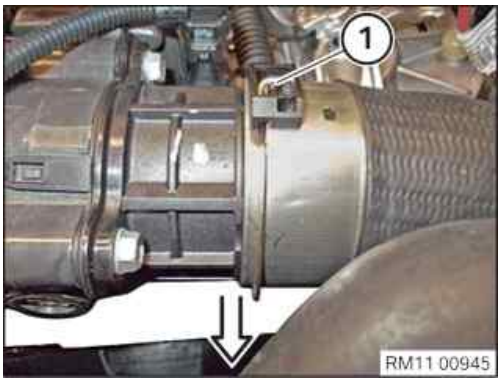
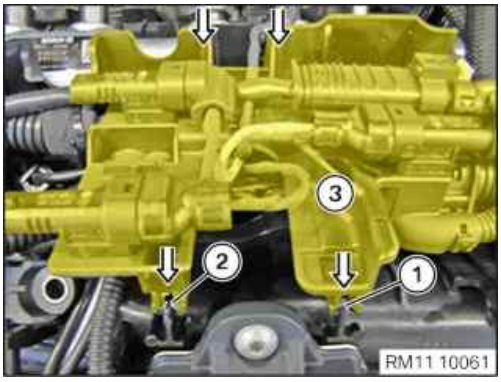


- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

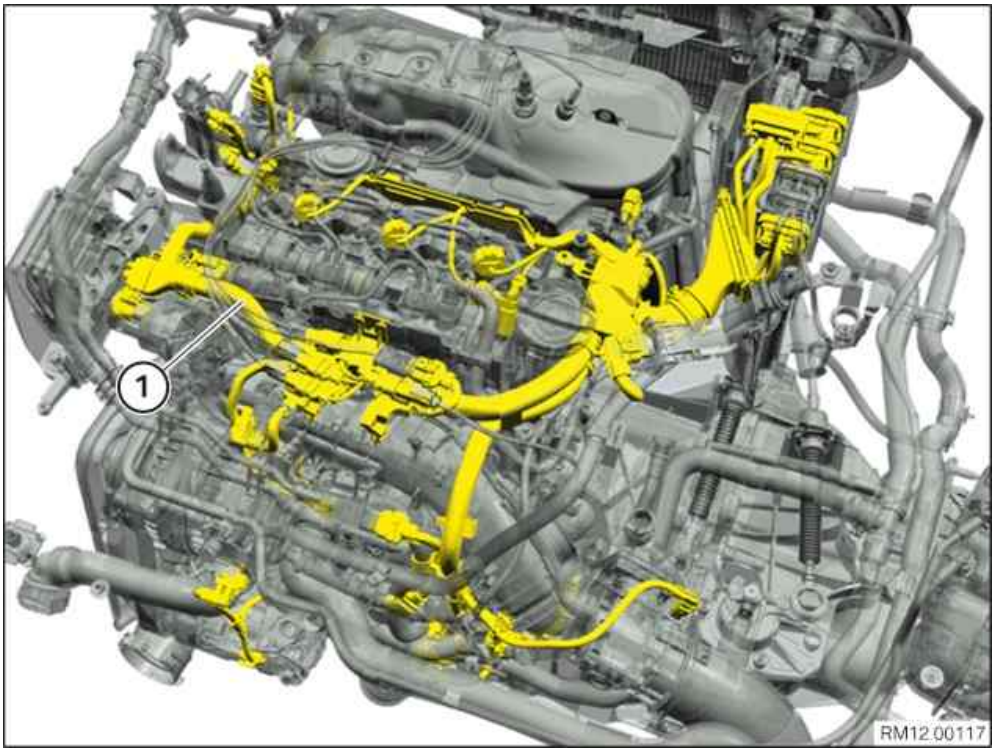
58 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

59 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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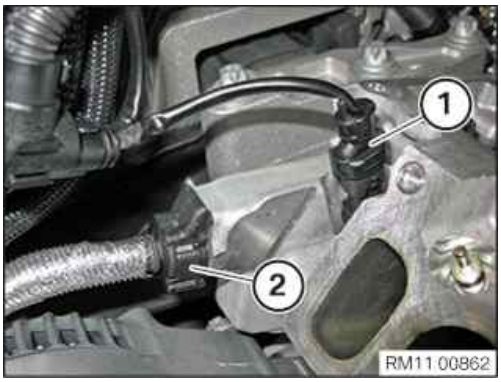
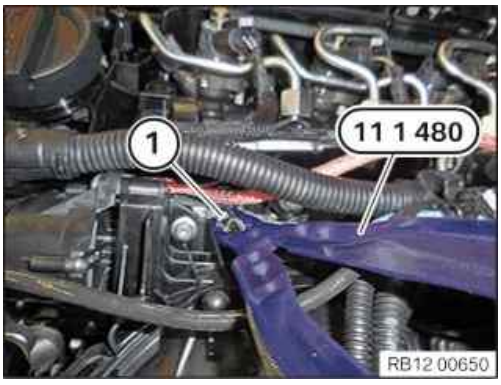
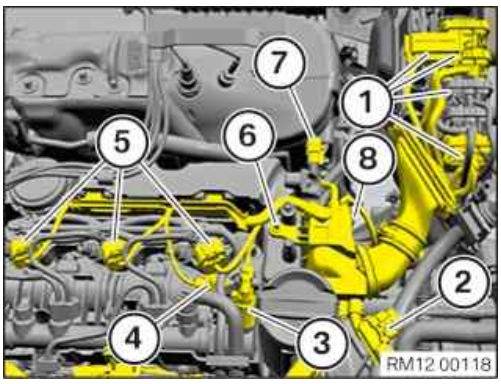


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

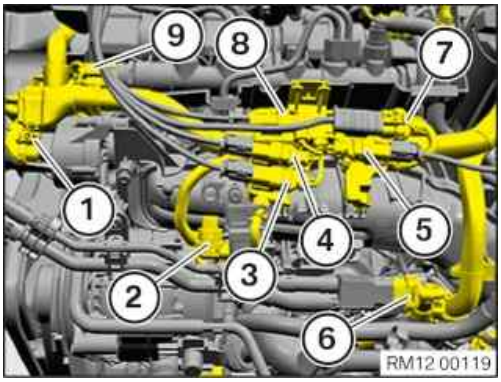


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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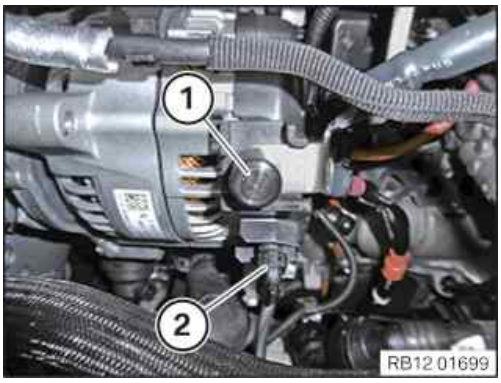
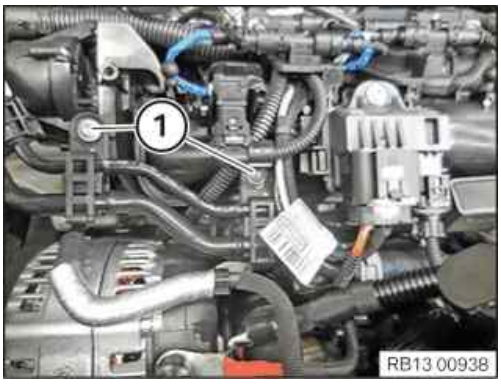


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

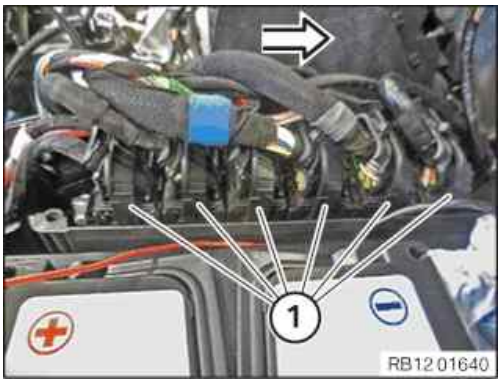


- Position fuel lines.
- Tighten the screws (1).

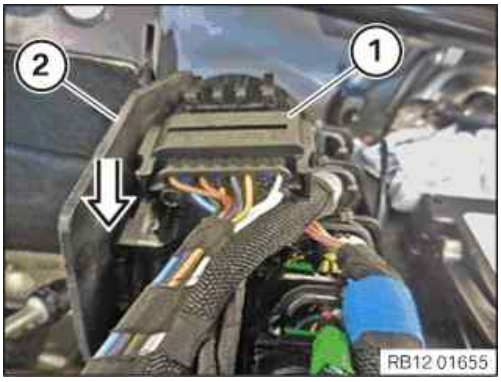
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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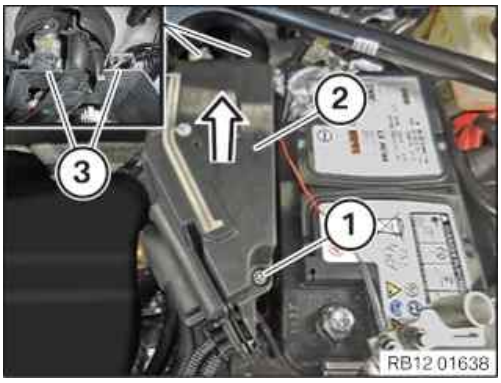
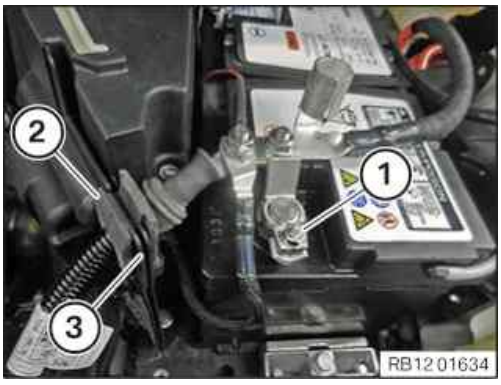


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

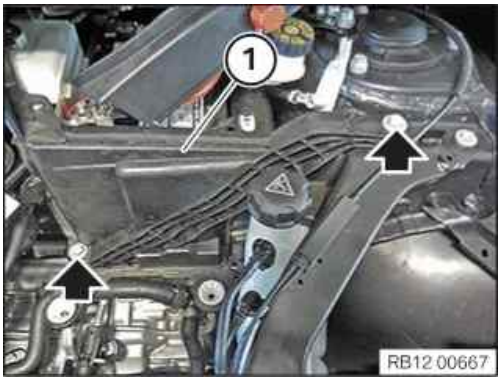
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

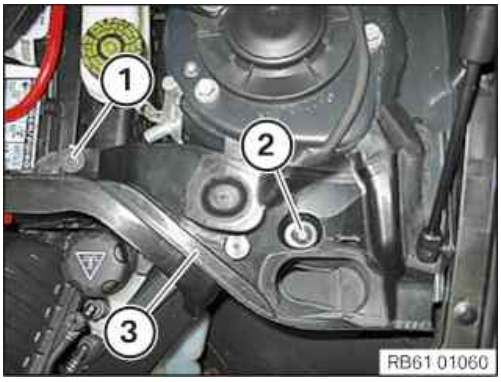
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm

60 – Partially securing clean air pipe

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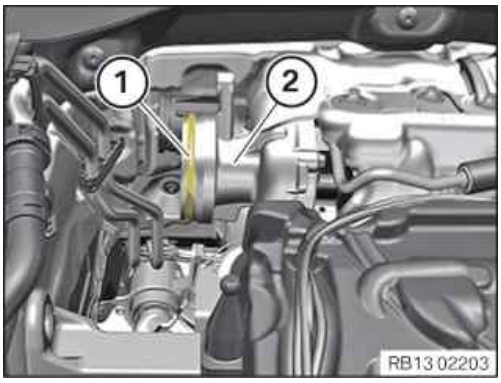
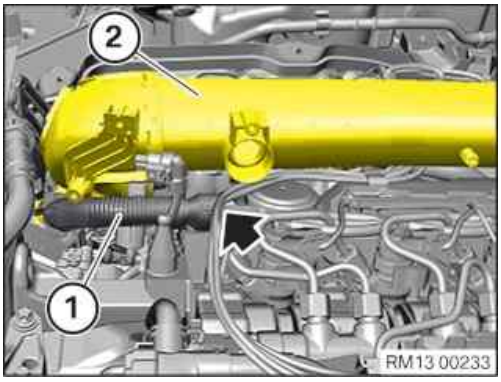
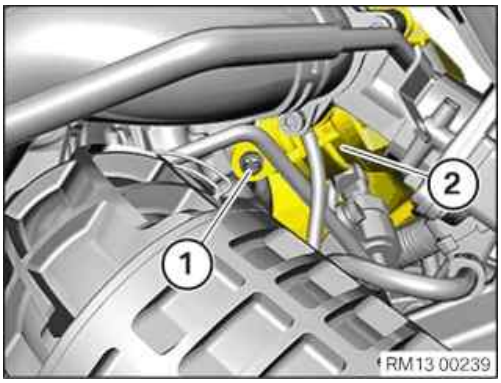


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

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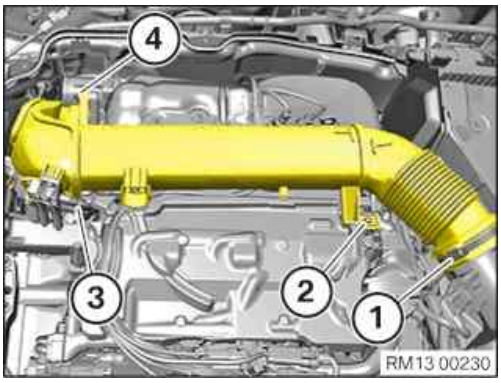


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

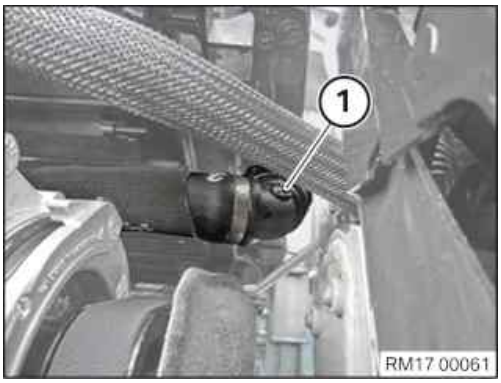
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

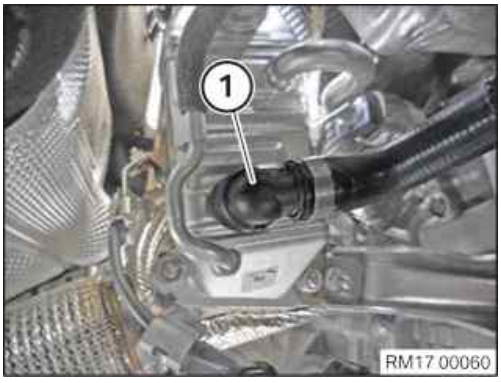
61 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

62 – Installing the front underbody protection

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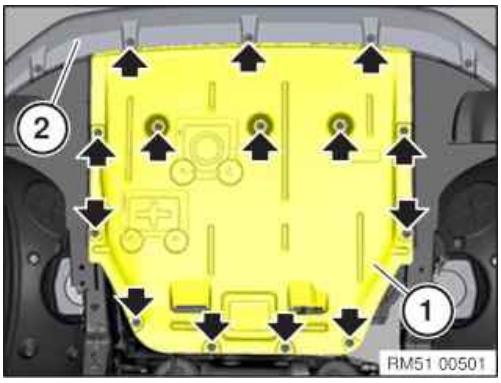
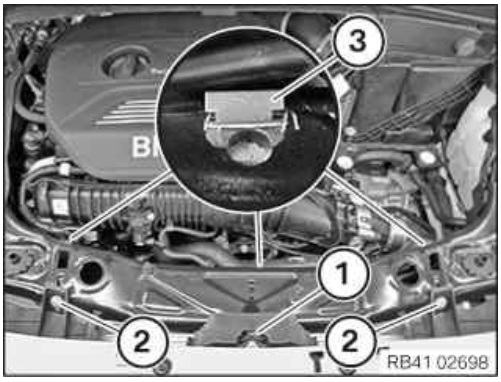


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

63 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

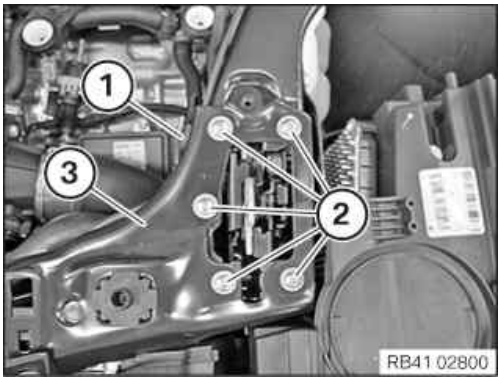
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

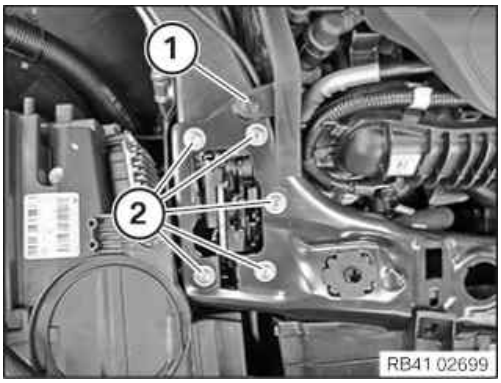


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

64 – Installing intake silencer housing

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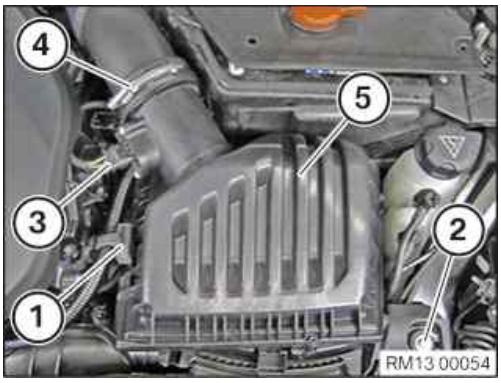


- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

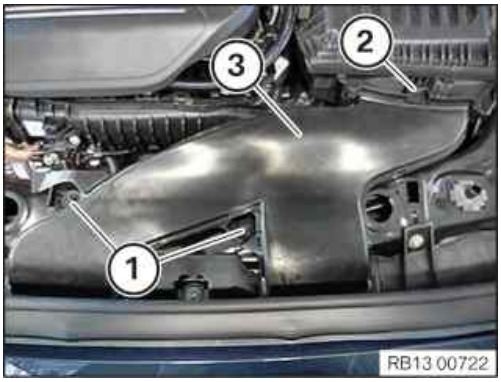
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

65 – Install the intake neck for the intake filter housing

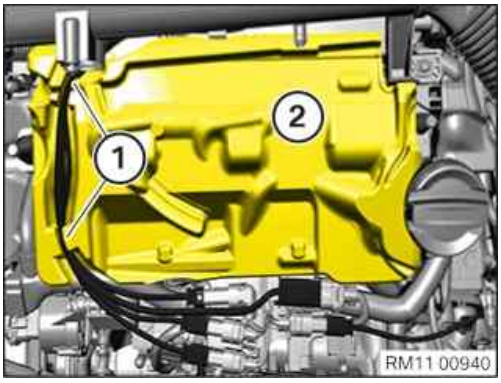


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

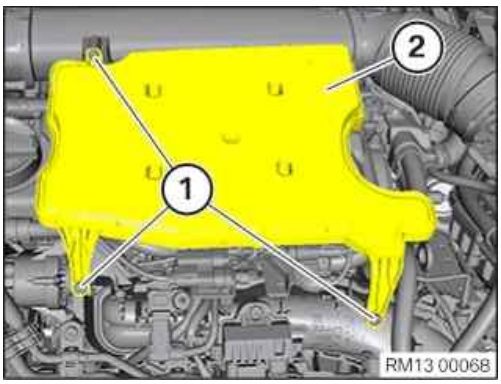
M6		Tightening torque	8 Nm

66 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

67 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

68 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

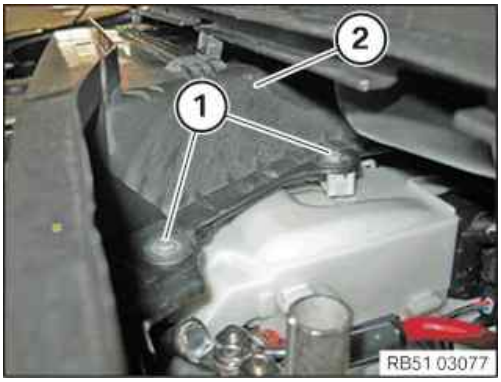
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

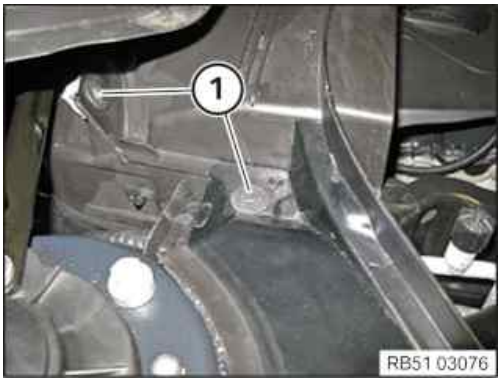
69 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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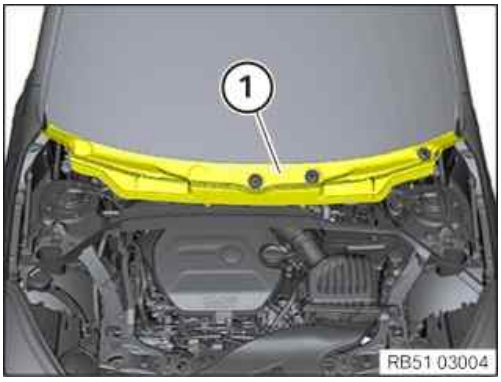
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

70 – Install the rear cowl panel cover



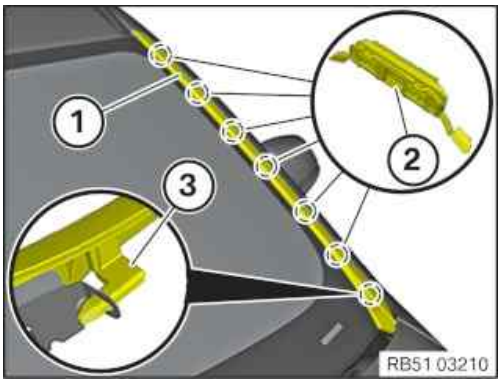
- Feed in and engage the rear cowl panel cover (1).

71 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

72 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the wiper arm**

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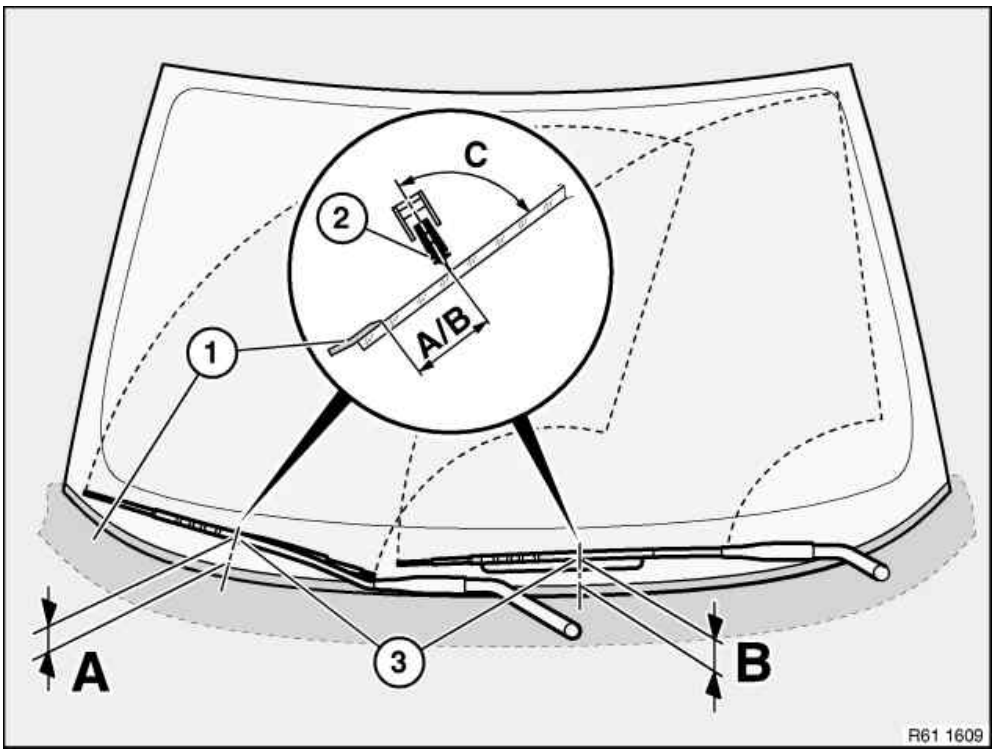
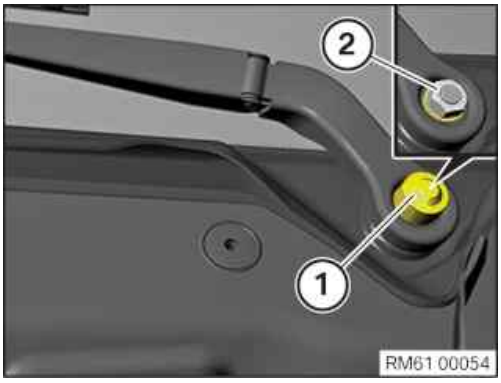
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

73 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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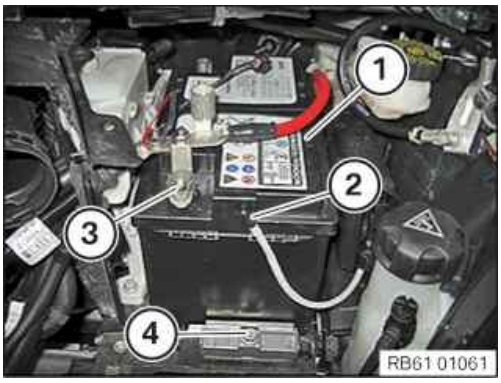


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

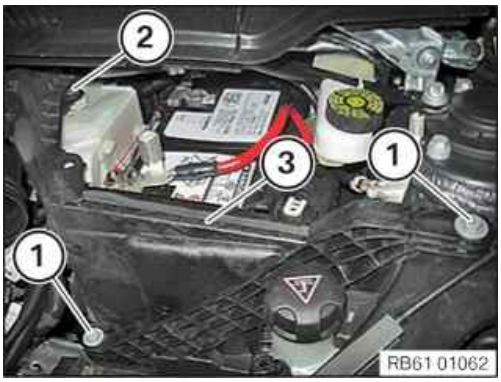
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

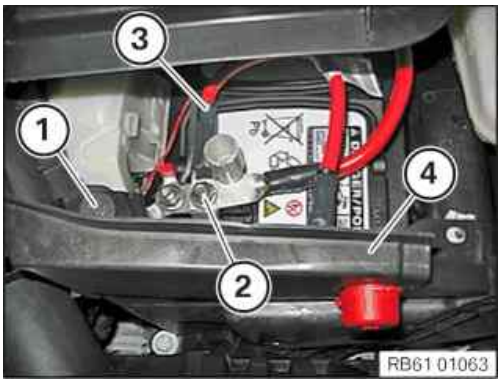
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

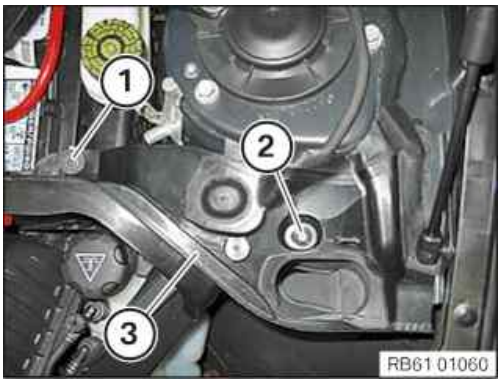
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

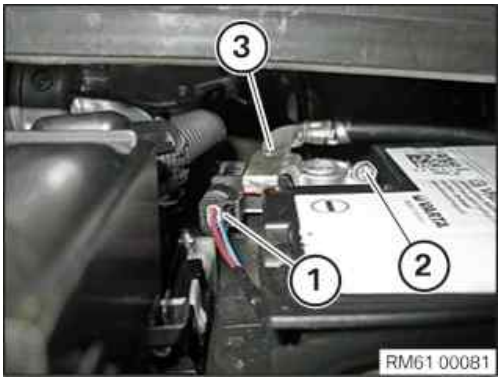
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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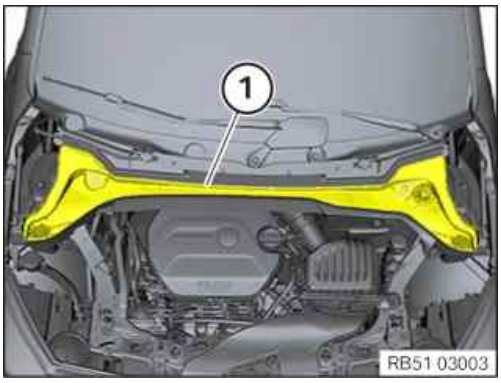
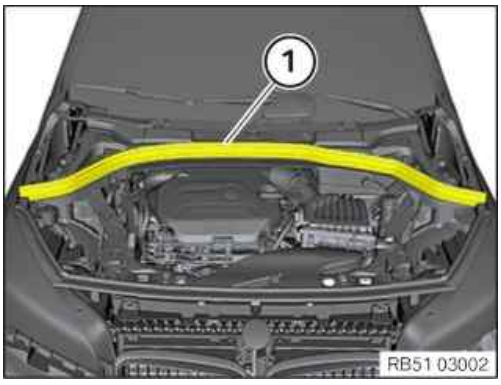


- Feed in the cowl panel cover (1).



- Press the gasket (1) in a downwards direction.

74 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

- See additional information.

Additional Information

Overview of Tightening Torques

Intake and exhaust camshaft in camshaft support			Used in step 36
M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head			Used in step 38
M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8			Used in step 38
M8		Tightening torque	19 Nm

Standard screw connection M6			Used in step 38
M6			8 Nm

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Chain tensioner piston to cylinder head

Used in step 39

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 40

M7x17.			17 Nm

Charge air line to crankcase

Used in step 45

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 45

M6		Tightening torque	8 Nm

Wheel arch cover

Used in step 46

Screw			3 Nm
Plastic nut			2,6 Nm

Cylinder head cover to cylinder head

Used in step 47

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 48

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 48

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 49

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 49

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 50

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 50 51

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 52

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 54

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 54

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 54

M8x28	Replace screws	Tightening torque	32 Nm

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Exhaust-gas recirculation cooler to cylinder head — Used in step 54

M8x20		Tightening torque	19 Nm

Battery holder to engine support — Used in step 55

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray — Used in step 56

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 56 59

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 56 59

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 56 59

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 56 59

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 56 59

		Tightening torque	3 Nm

Battery cover — Used in step 56 59 73

Screw			2,8 Nm

Intake plenum to cylinder head — Used in step 57

M6		Tightening torque	11 Nm

Positive battery cable to alternator — Used in step 59

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 59

TS6x20		Tightening torque	5 Nm

Clean air pipe to exhaust turbocharger — Used in step 60

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 60

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 60 64

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 62

			3 Nm

Bracing strut to top cross connection — Used in step 63

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 63

M6x20 screw		Tightening torque	6 Nm

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Cross connection on support for cross connection — Used in step 63

M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge — Used in step 64

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 65

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe — Used in step 67

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 69

Screw		Tightening torque	3 Nm

Windscreen wiper arm — Used in step 72

Combination hexagon nut		Tightening torque	35 Nm

Battery terminal rail to battery tray — Used in step 73

M8 screw		19 Nm

Positive battery terminal — Used in step 73

NutM6		5 Nm

Trailing link — Used in step 73

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 73

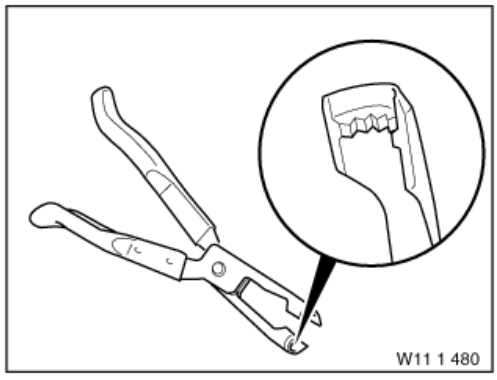
Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 73

NutM6		5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 18

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 495 910 (37 1 152) Socket wrench

Common	Used in step 22 23 24 50 51 52
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

2 413 106 Fastener

Common	Used in step 22 23 51 52
Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

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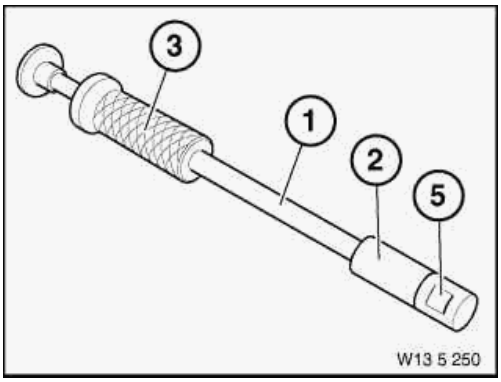
0 493 321 (13 5 250) Puller



Common

Used in step 25

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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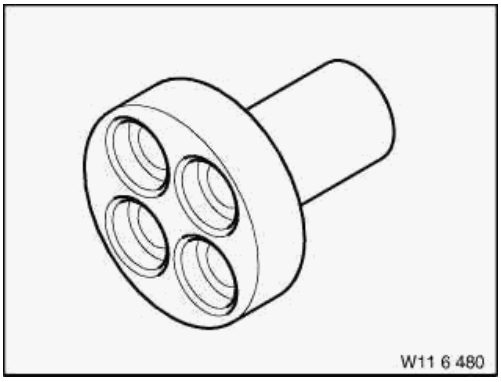
0 493 339 (13 5 252) Bush

Common	Used in step 25
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common	Used in step 25
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 31 43
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 31 42 43
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge

Common

Used in step 31 41 43

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 35

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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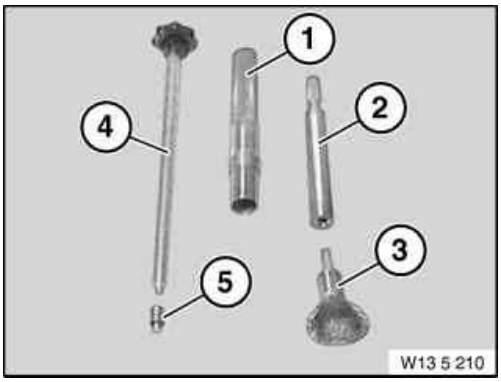
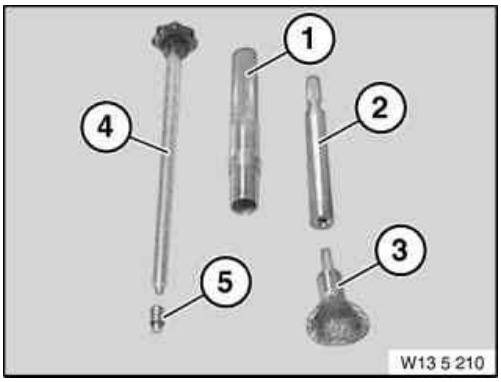
0 493 763 (13 5 215) Plug



Common	Used in step 49
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 49
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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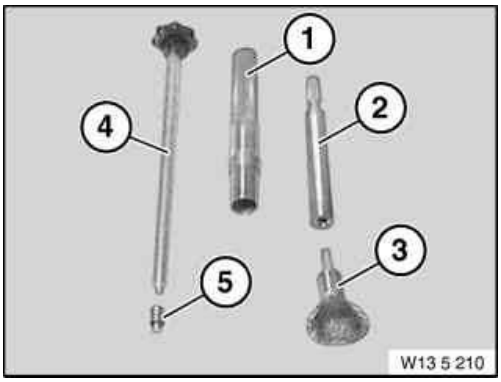
0 493 758 (13 5 210) Tool



Common

Used in step 49

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

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0 495 221 (36 1 323) Wheel stud

Common	Used in step 28
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 28
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 28
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud

Common	Used in step 28
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 28
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 28
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud

Common	Used in step 28
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 28
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	17 54
EGR controller	17 54

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 73
61 12 ... Notes on intelligent battery sensor (IBS)	1 73
61 00 ... Notes for disconnecting and connecting battery	1 73

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Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	11 25 26
17 00 008 Draining and topping up coolant for high-temperature circuit	74
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	74
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	74
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17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	74
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	74
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	74
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17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	74
17 00 008 Draining and topping up the high-temperature coolant circuit	74
17 00 008 Draining and topping up the high-temperature coolant circuit	74
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17 00 008 Draining and topping up the high-temperature coolant circuit	74
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	74
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	74
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	74
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	74

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	39
Exhaust-gas recirculation cooler seal on exhaust manifold	54
Exhaust-gas recirculation cooler seal on intake plenum	54

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This documentation refers to special tools that were not yet available when going to press.

11 31 091 Removing and installing/replacing the hydraulic chain tensioner

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

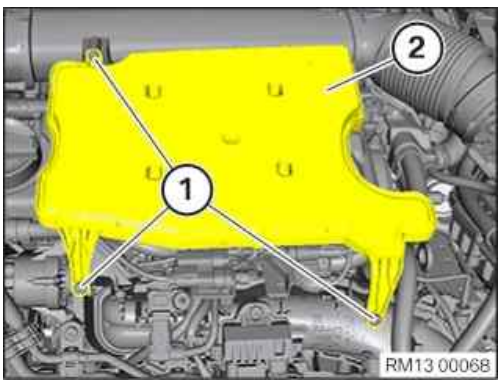
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

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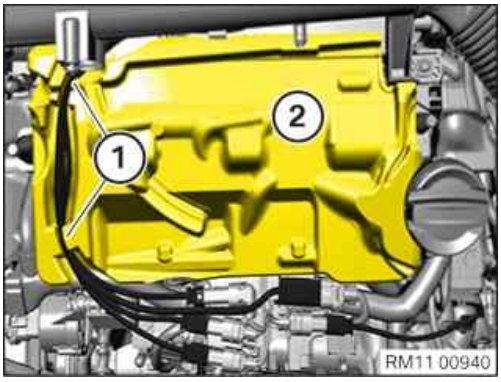
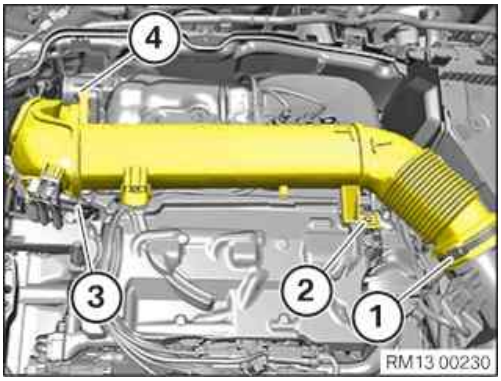
4 – Remove the acoustic cover for the injectors

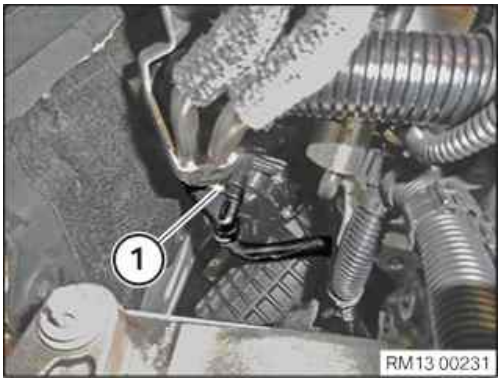


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

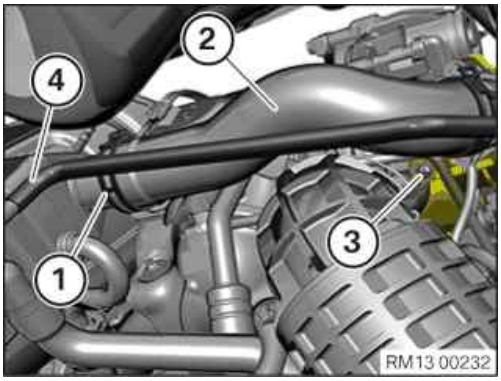
5 – Removing clean air pipe



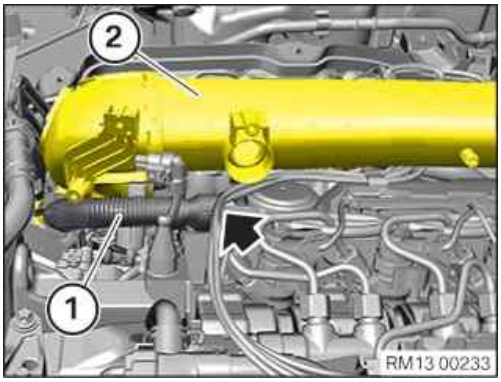
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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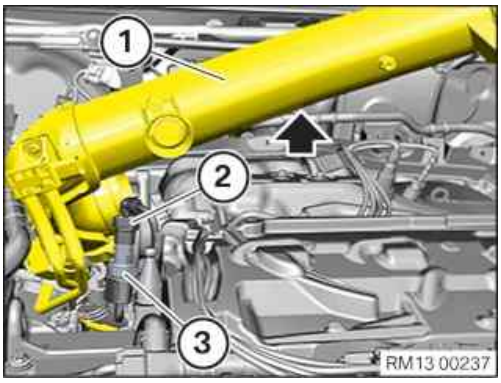


- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

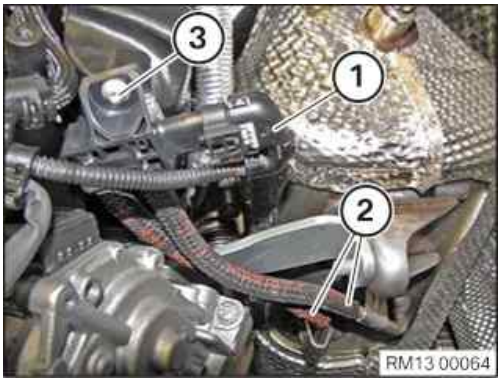
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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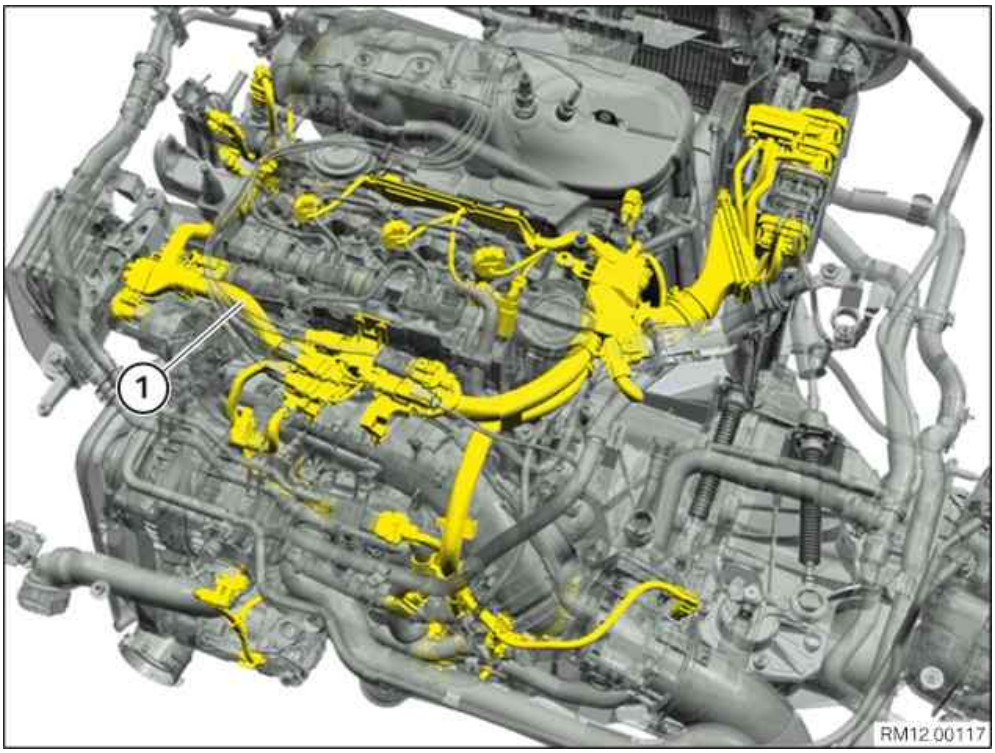
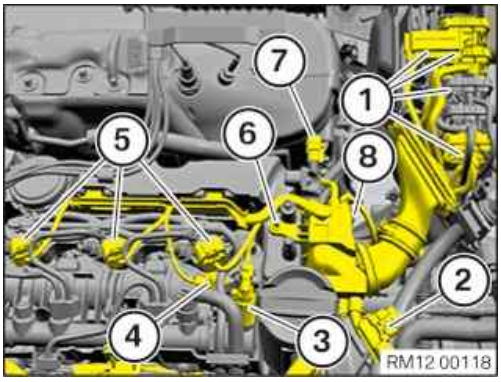
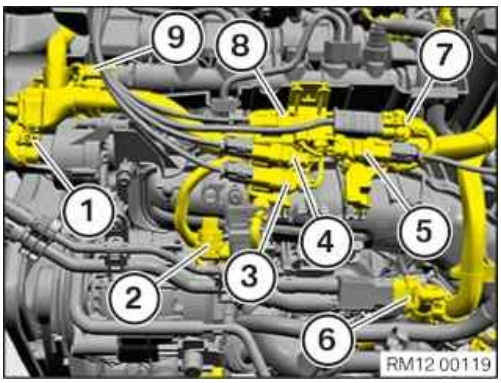
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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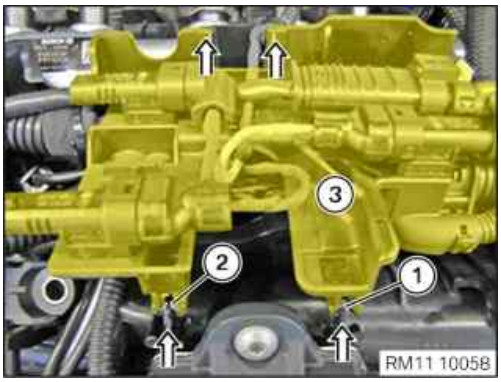
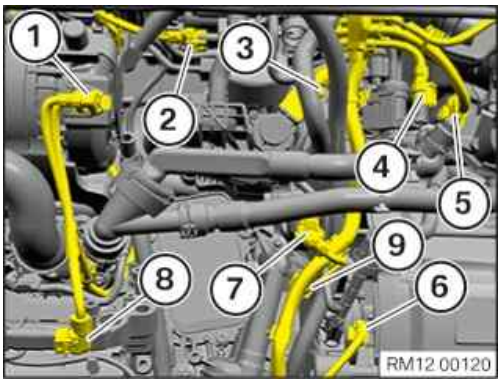
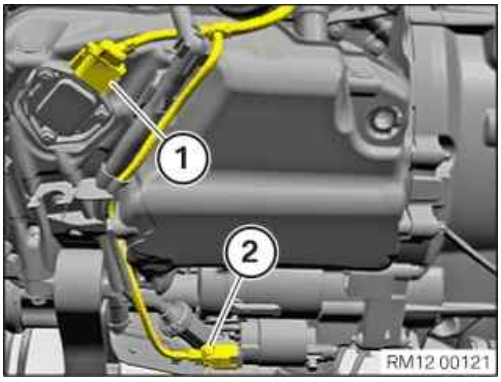


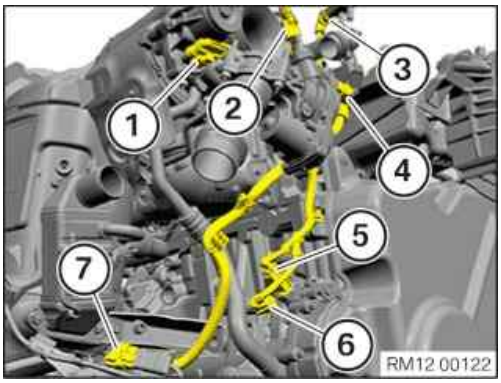
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



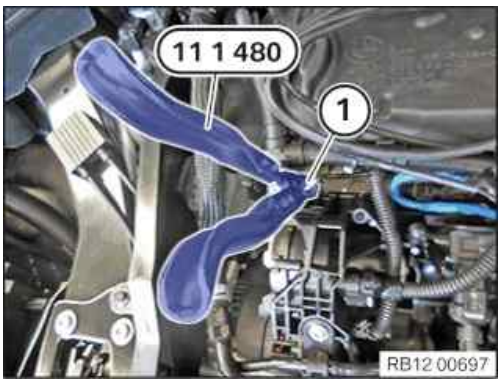
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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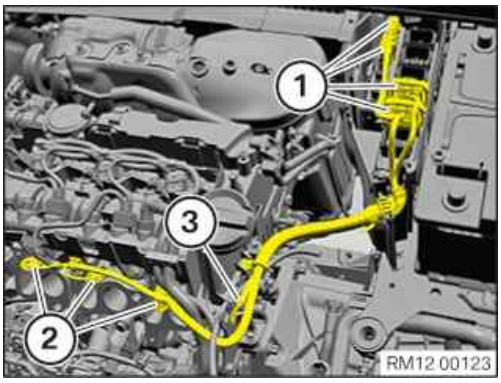


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

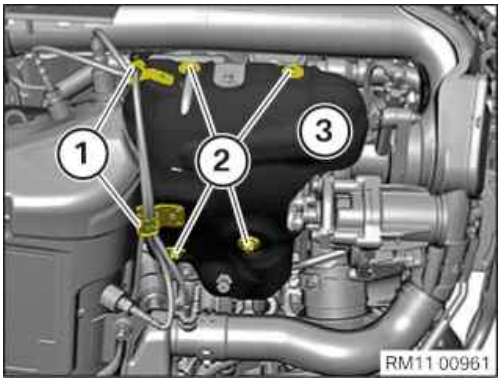
▶ Removing heat shield from top exhaust turbocharger

WARNING

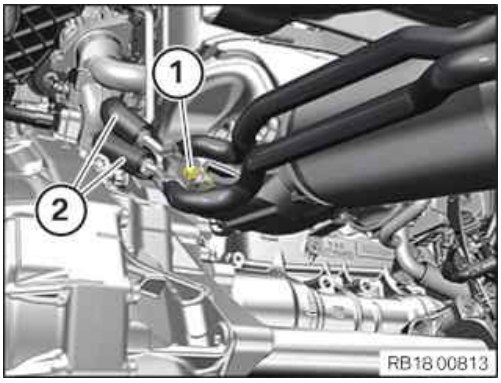
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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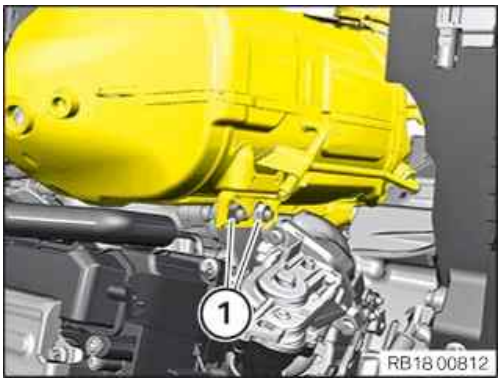
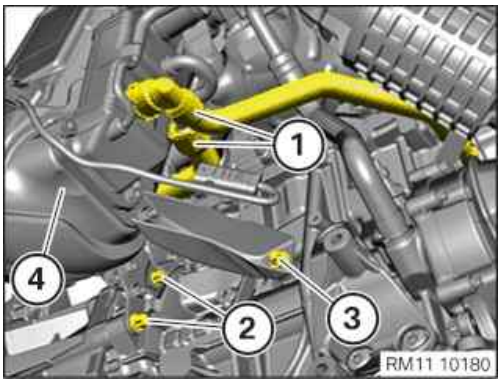


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

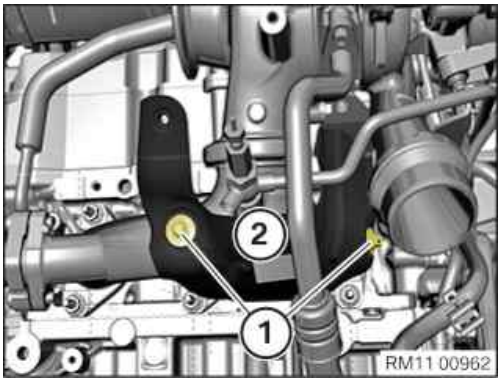
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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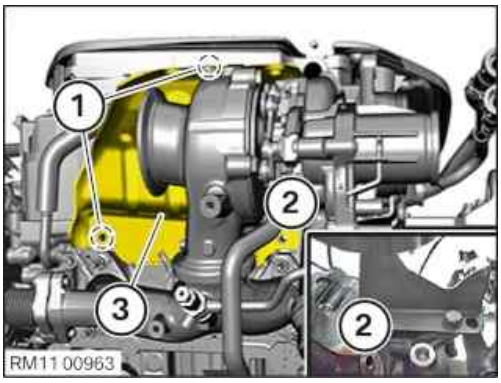


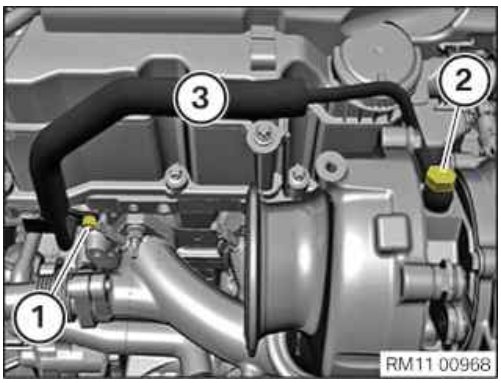
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

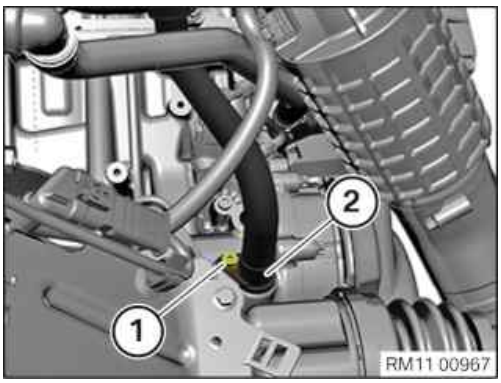
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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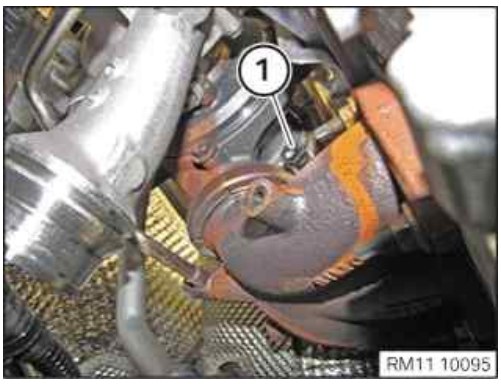
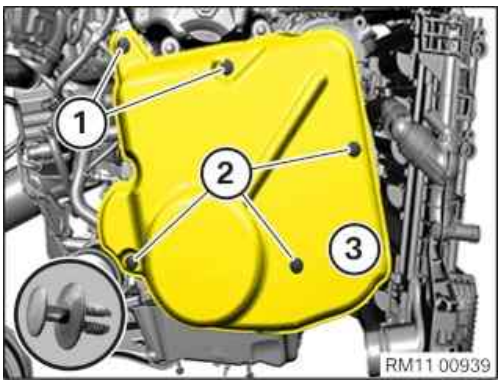
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

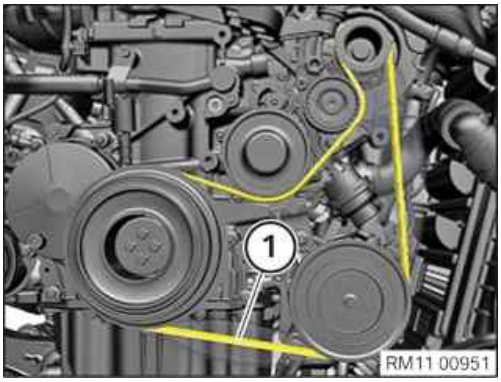
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

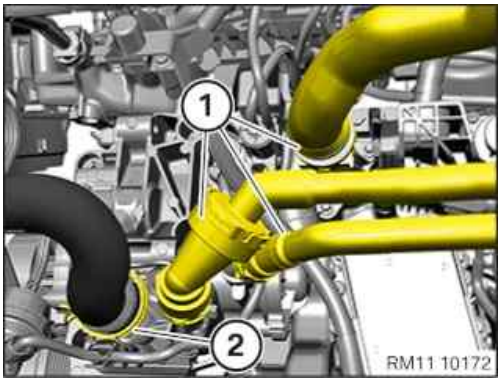
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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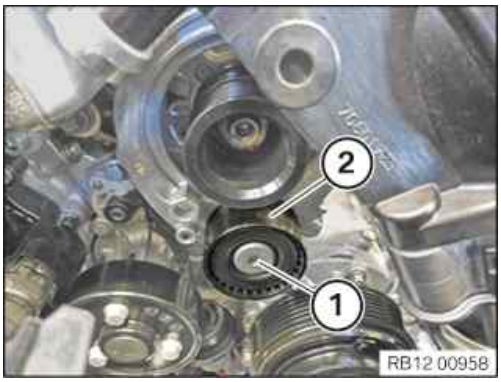
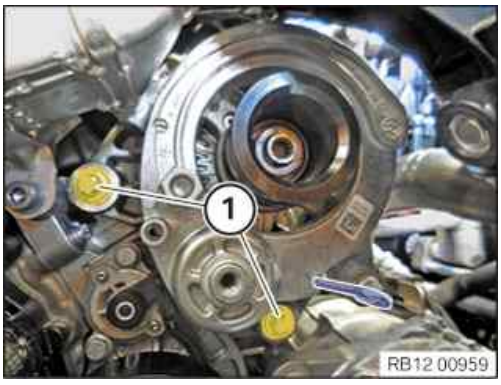
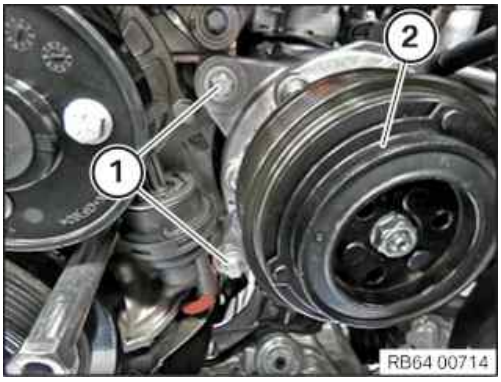


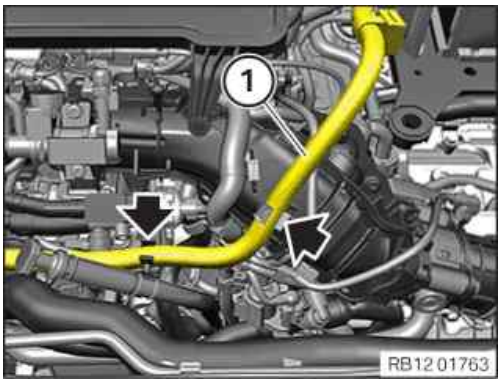
- Loosen screw (1).
- Remove the deflecting element (2).



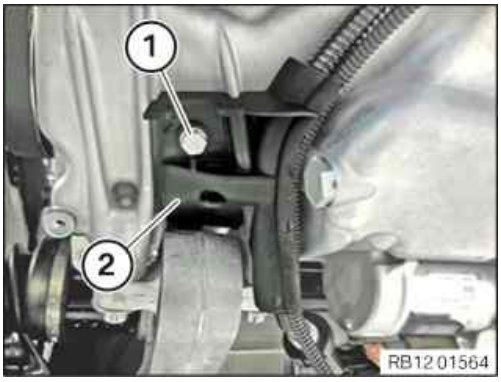
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

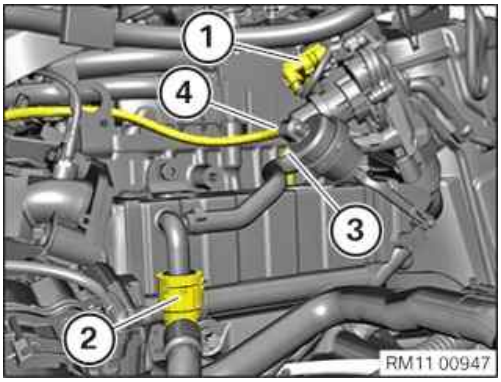
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

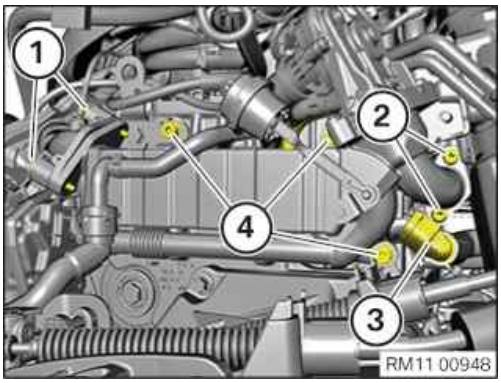
- Perform all work only on components that have cooled down.



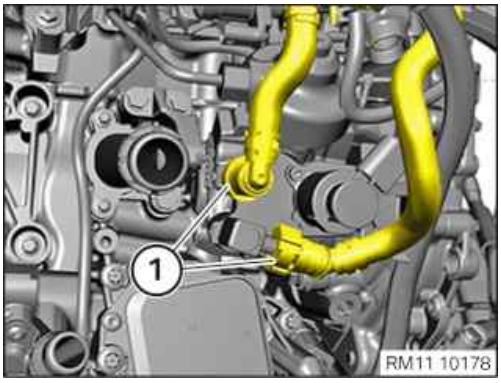
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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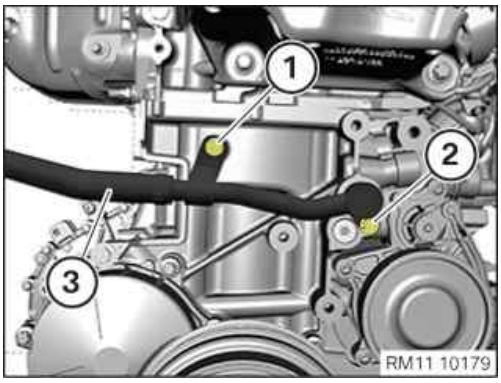


- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Detach the engine from the manual gearbox

Prerequisite

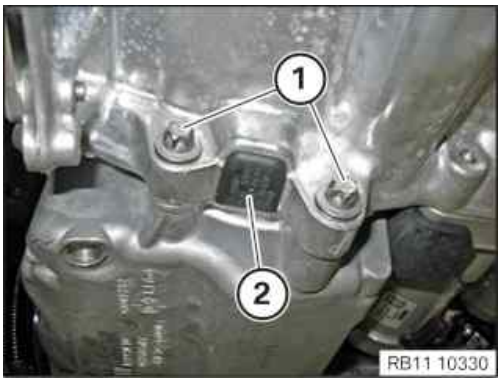
Engine has been removed.

CAUTION

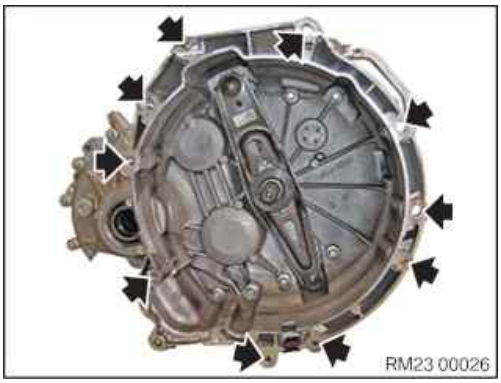
Heavy component.

Heavy components can lead to injury or damage.

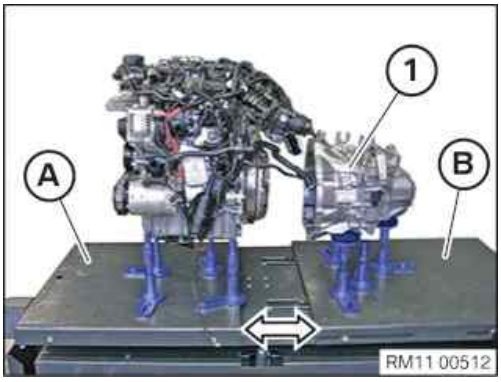
- Remove and install heavy components with the aid of another person/other persons.



- Loosen screws (1).
- Remove protective cap (2).



- Remove screws (arrows).



- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.

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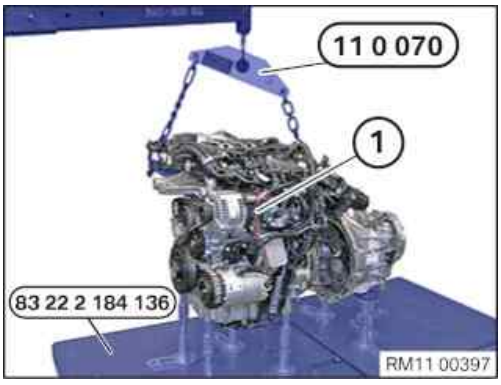
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool **0 490 579 (11 0 070)** and lift engine (1) off lifting table.

9 – Mount engine on assembly stand

CAUTION

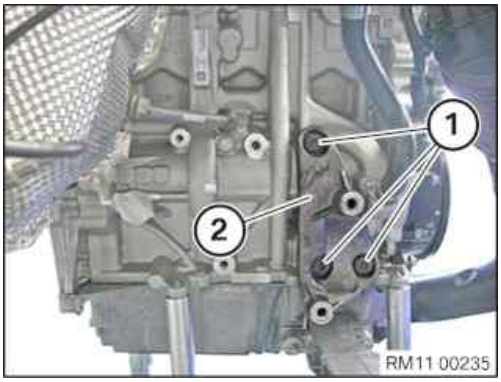
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

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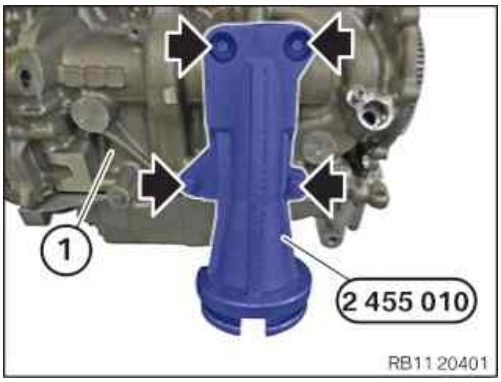
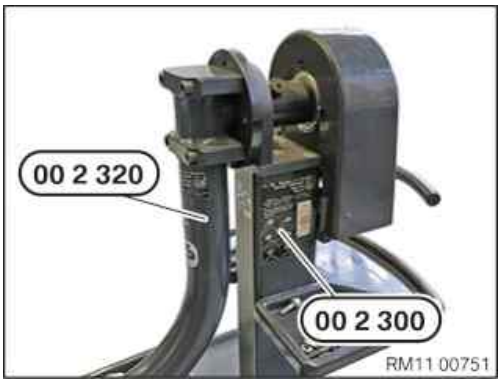


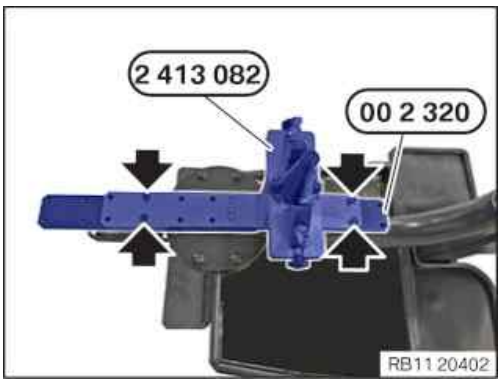
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.

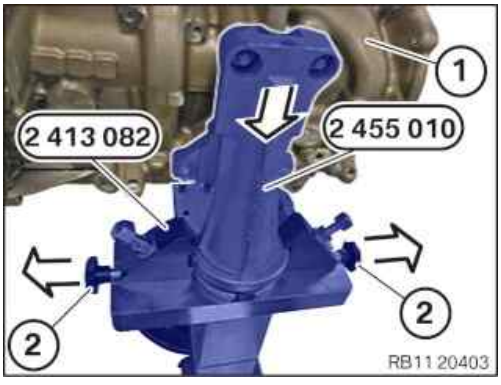


- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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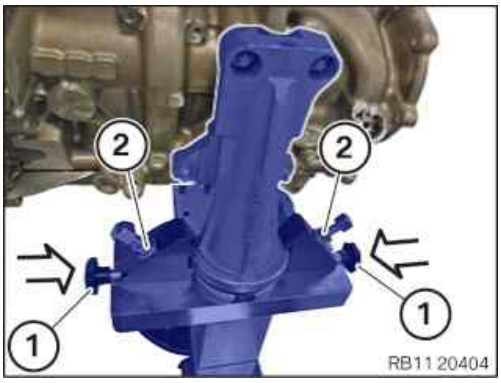


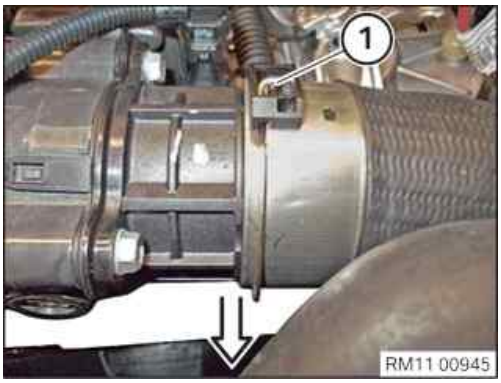
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

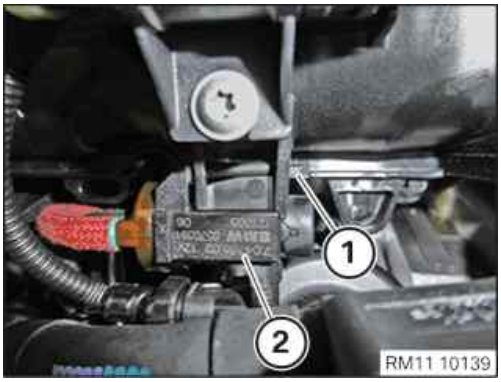
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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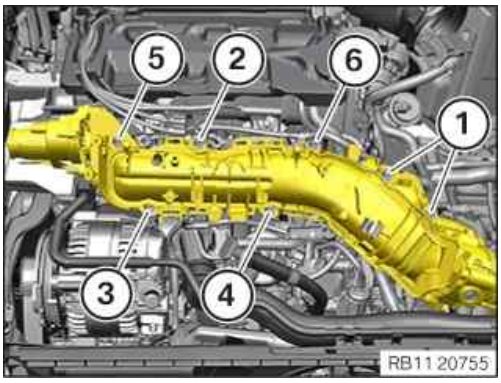
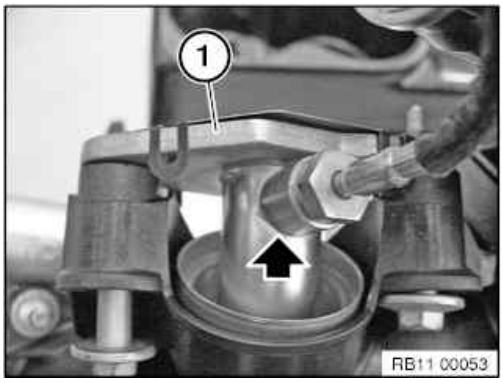


- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

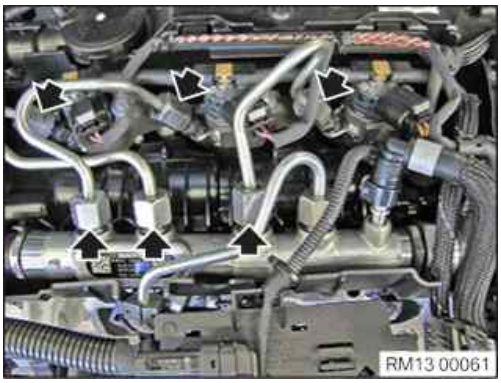
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

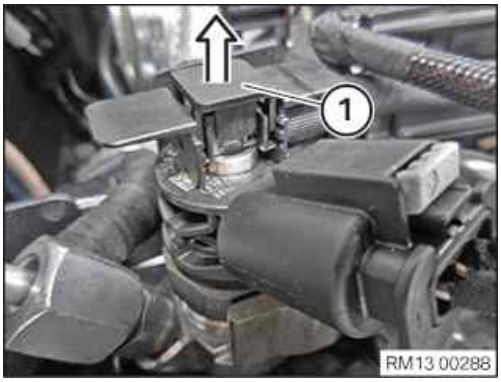
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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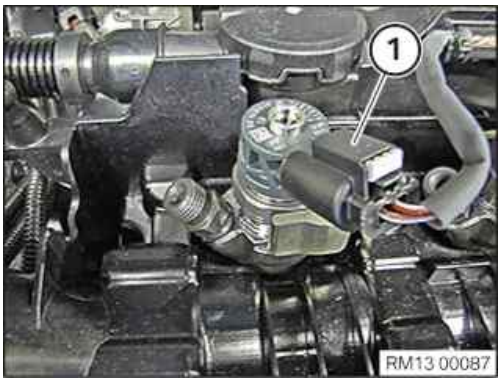
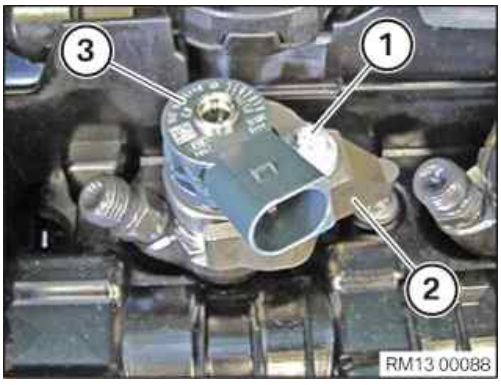


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

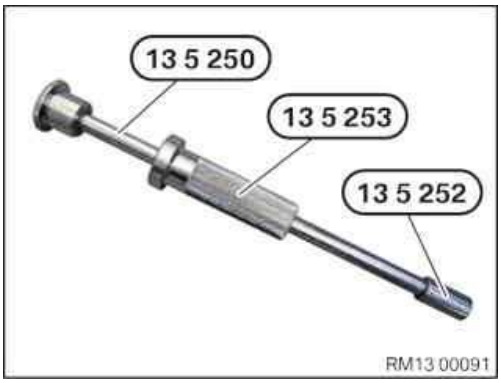
▶ **Loosen stuck injectors**

RISK OF DAMAGE

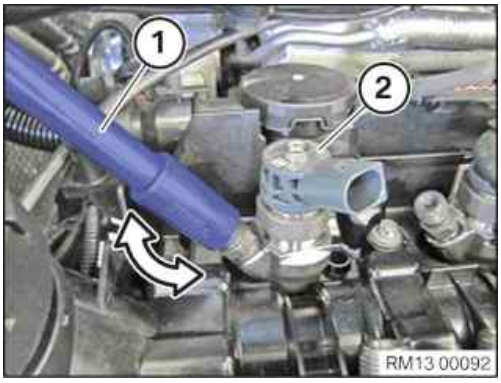
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

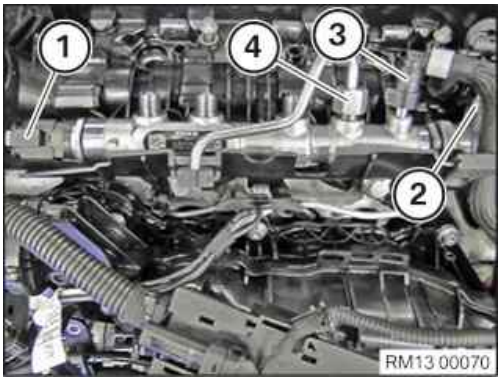
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

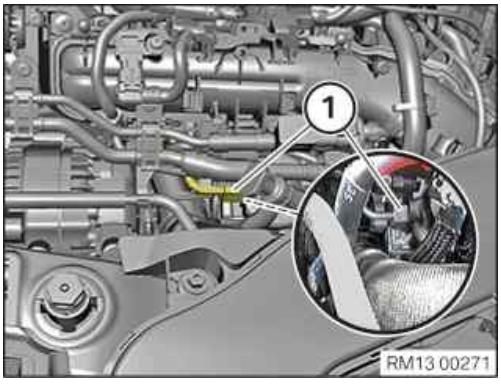
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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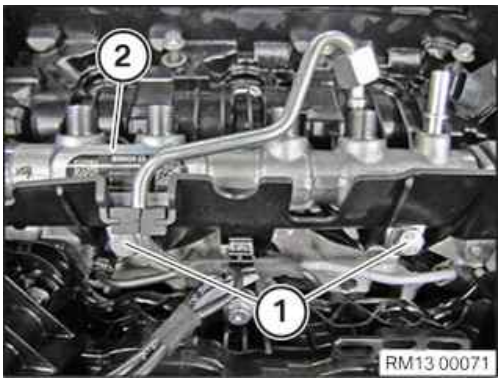
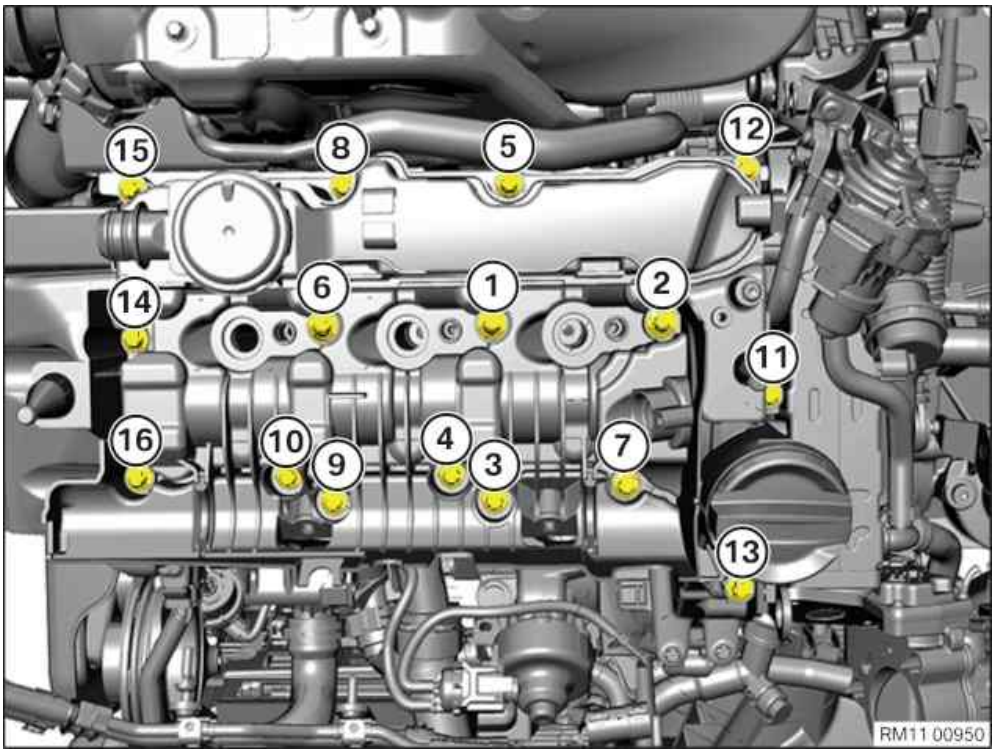


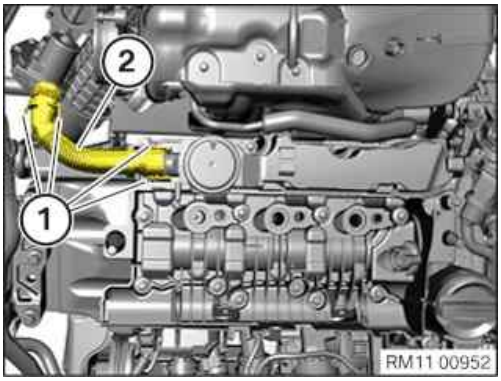
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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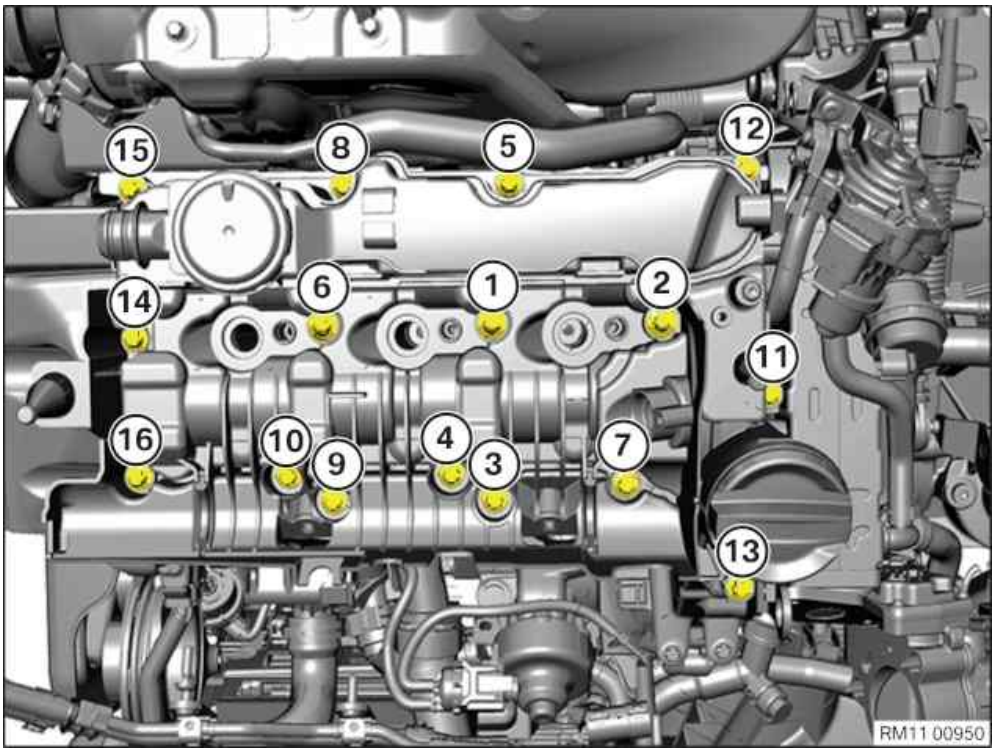

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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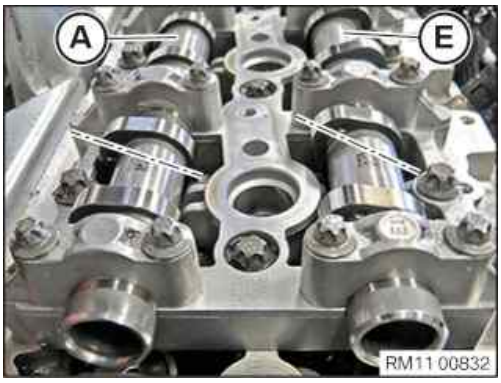
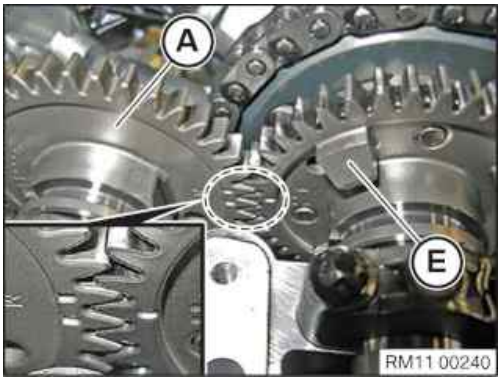


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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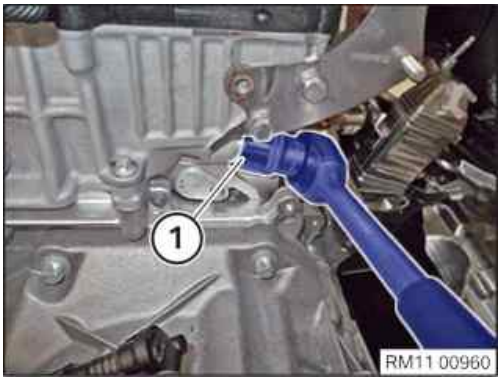
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

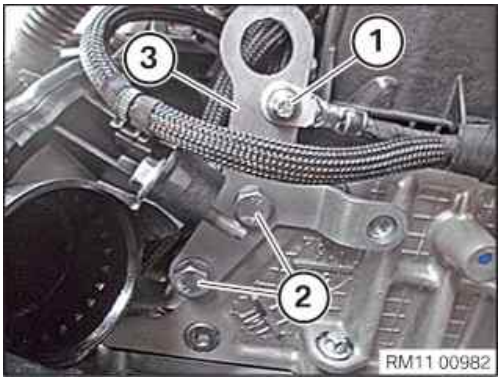


TECHNICAL INFORMATION

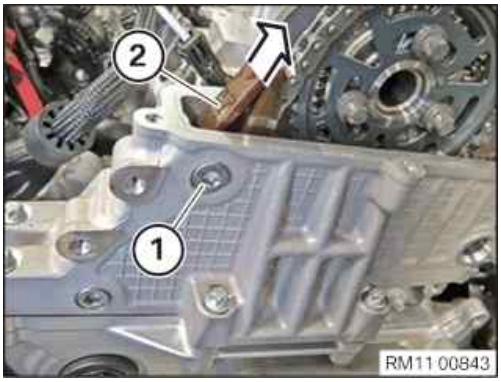
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

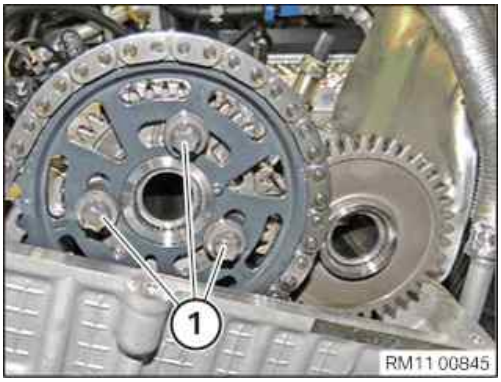


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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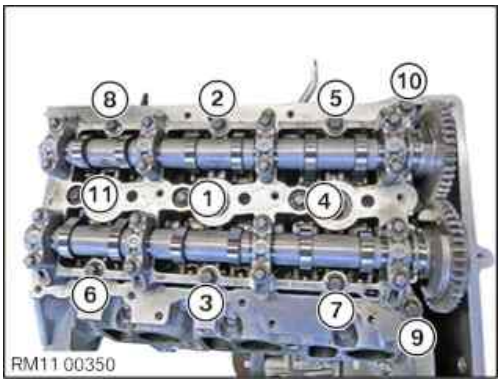
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

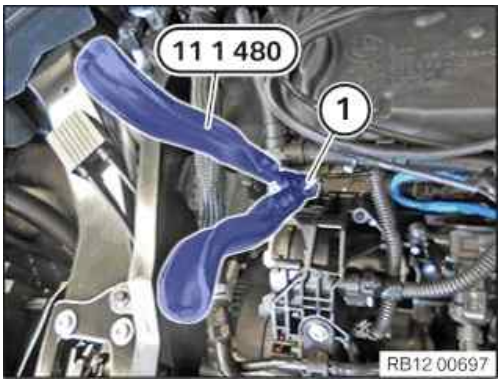
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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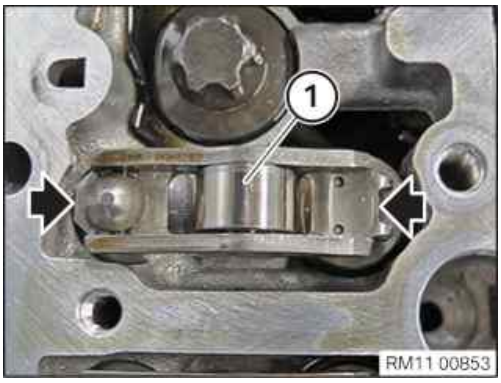


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

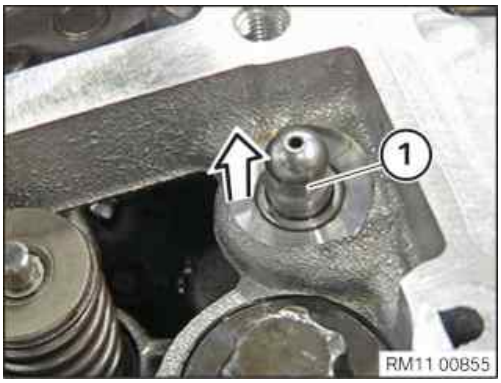
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

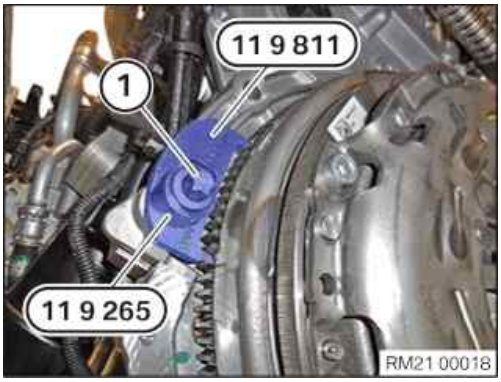
24 – Remove clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.

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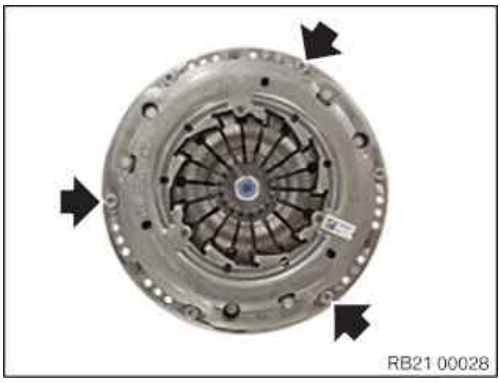
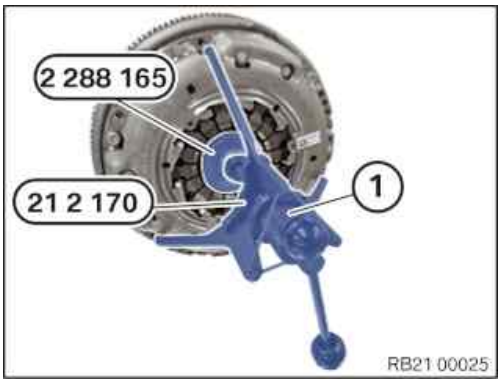
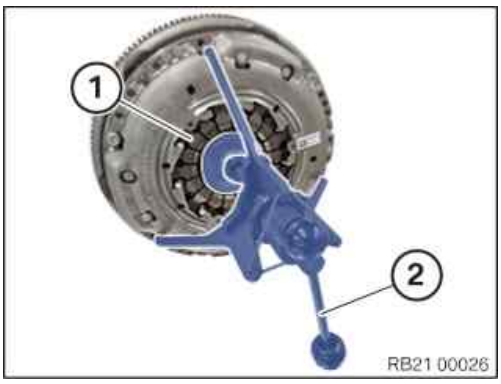


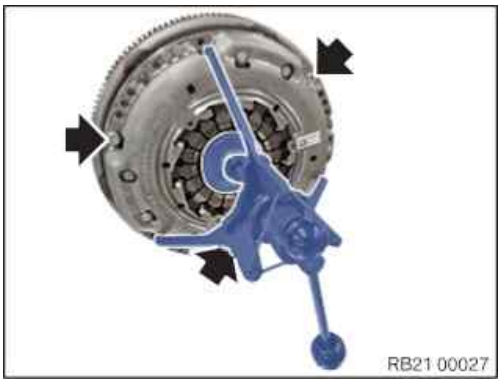
- Detach 3 screws to attach special tool **0 493 839 (21 2 170)** and **2 288 165**.



- Position special tool **0 493 839 (21 2 170)** and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

25 – Removing flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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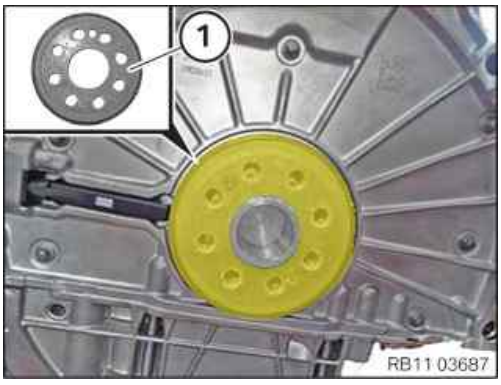
- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.



RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

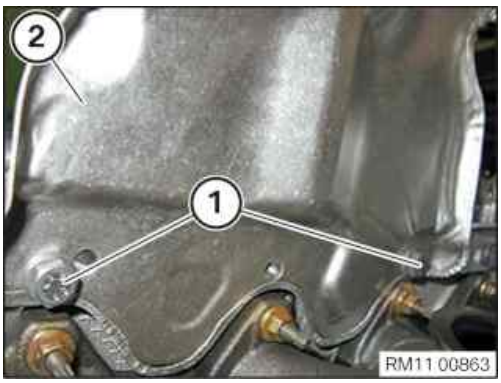
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

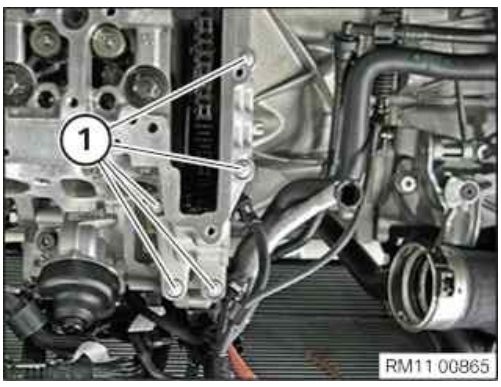
26 – Remove rear timing case cover

Prerequisite

Transmission is removed.



- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).

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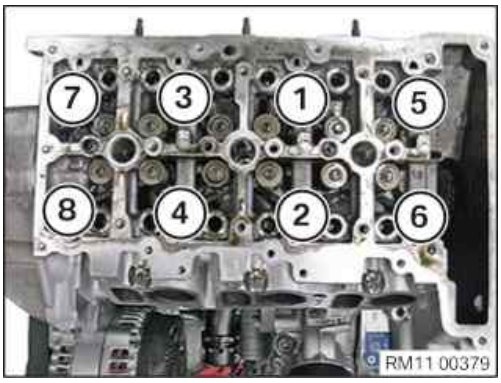
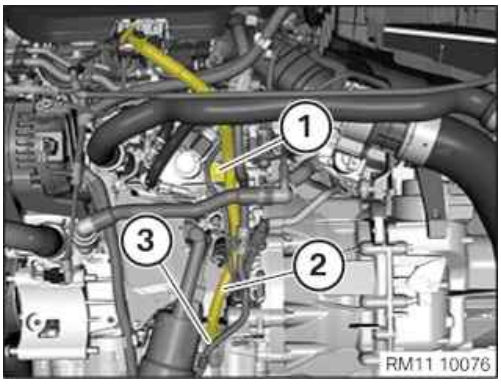
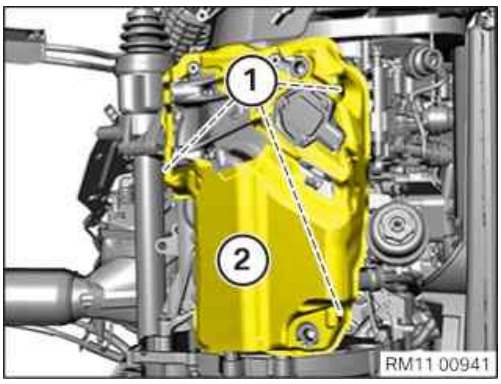


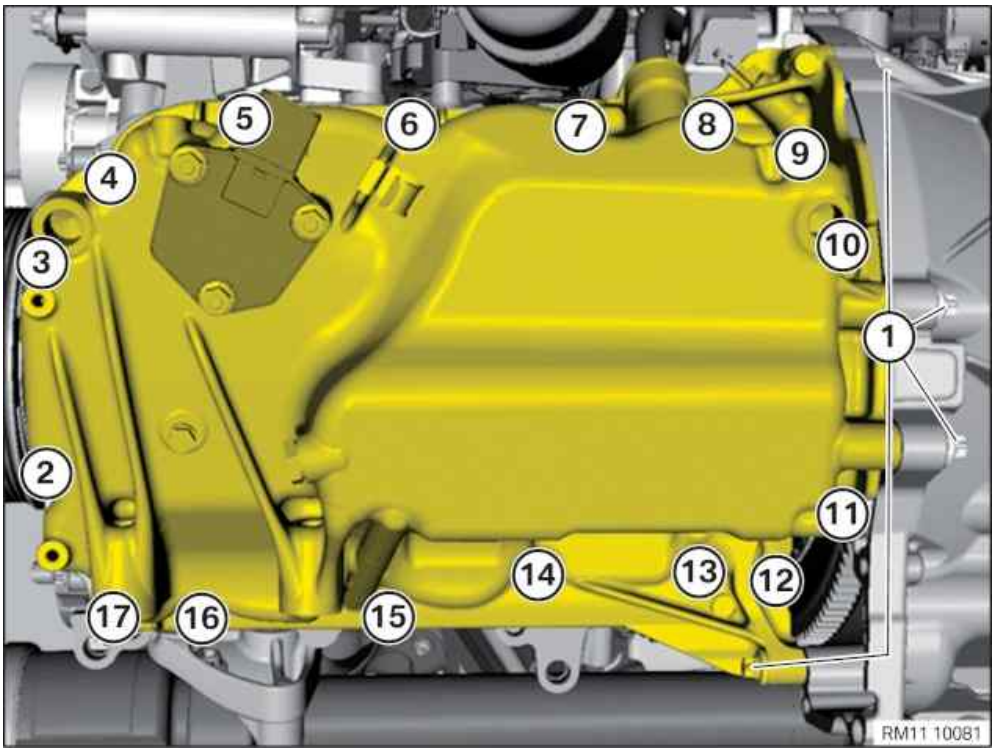
- Loosen the cylinder head bolts in the sequence from (8) to (1).



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- If required, remove sealing ring (3) from oil sump.



- Remove the expanding rivet (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).



- Tighten the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

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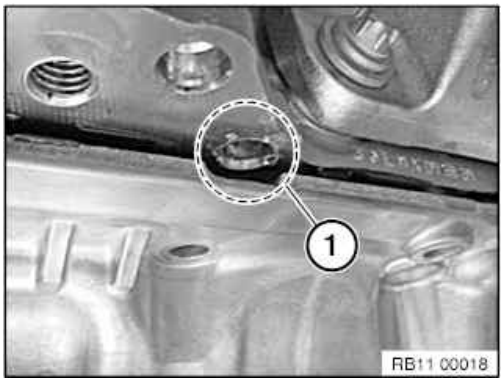
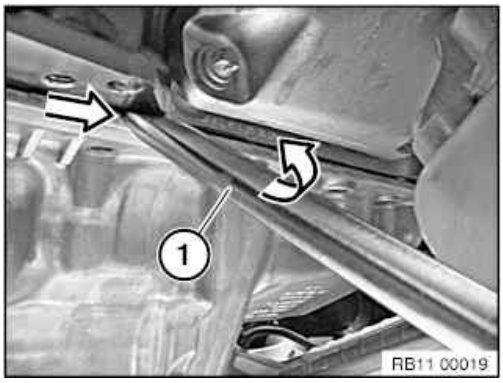
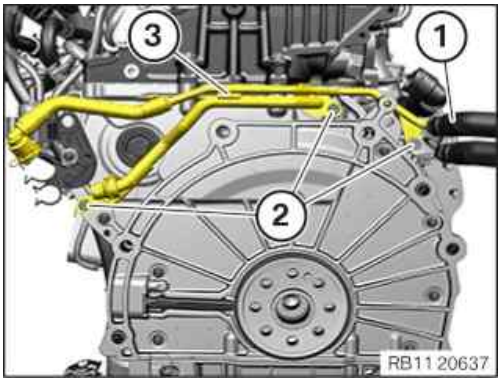


- Release oil sump only in area (1).

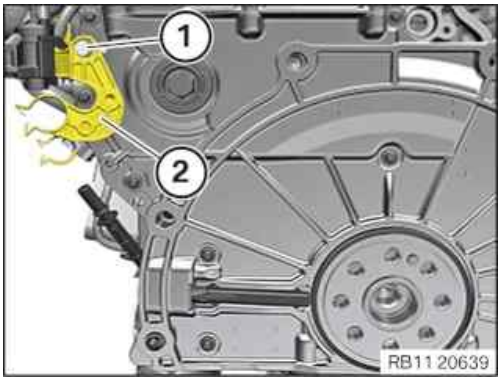


- Release the oil sump using a suitable mounting lever (1) carefully at the position intended for that.
- If required, secure the oil sump against falling.

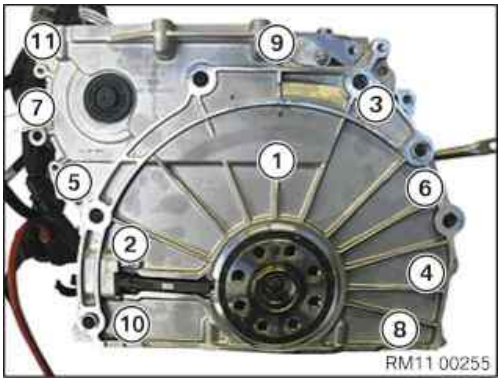
► **If installed: Remove coolant line of the SCR metering module**



- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).

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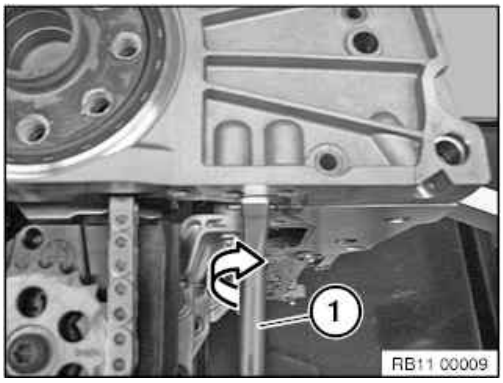
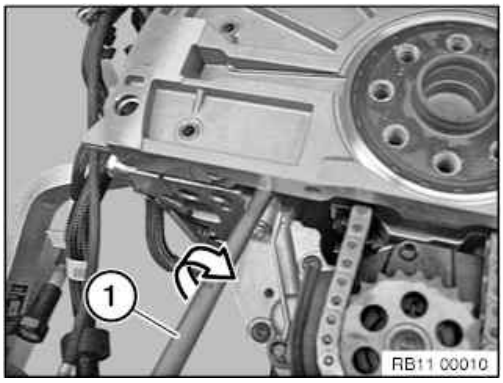


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

MAIN WORK

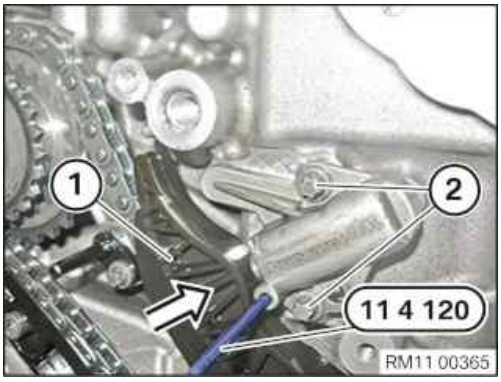
27 – Removing the hydraulic chain tensioner for the bottom timing chain

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.



- Press the hydraulic chain tensioner with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove hydraulic chain tensioner.

28 – Installing the hydraulic chain tensioner for the bottom timing chain

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

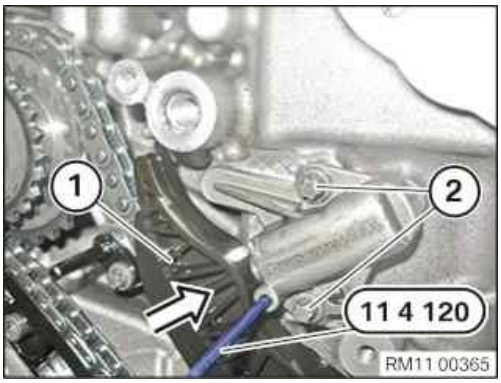
Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

- Clean sealing surfaces (1) with compressed air.



- Install the hydraulic chain tensioner.
- Tighten down screws (2).

Hydraulic chain tensioner to crankcase

M6x22		Tightening torque	9 Nm

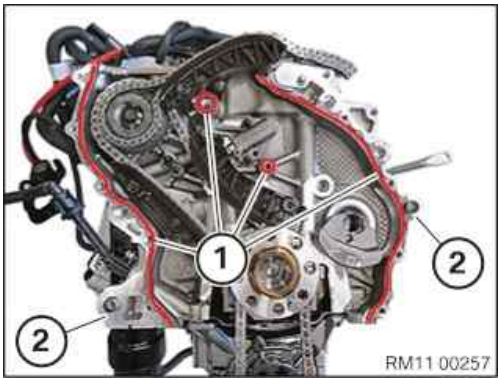
- Press the hydraulic chain tensioner with tensioning rail (1) in the direction of the arrow and remove the special tool **0 491 012 (11 4 120)**.

POSTPROCESSES

29 – Install the rear timing case cover

Prerequisite

Transmission is removed.



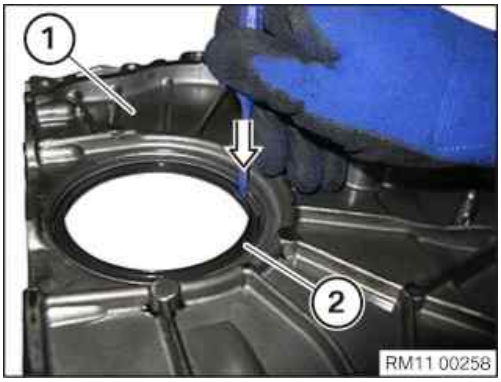
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.

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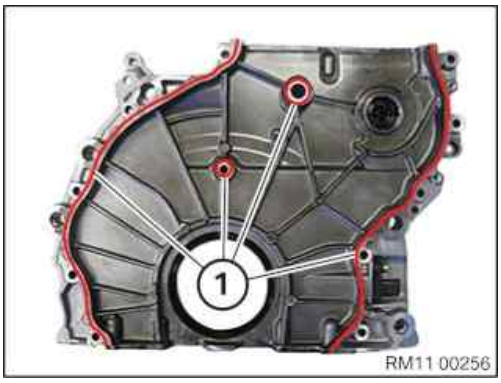
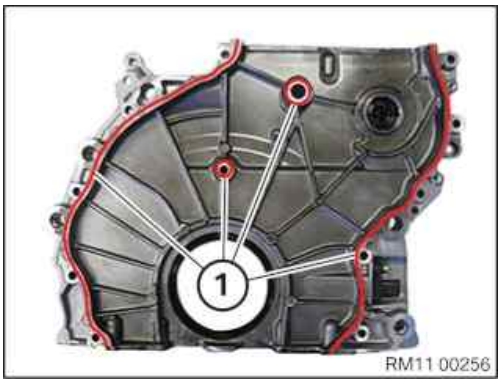


- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

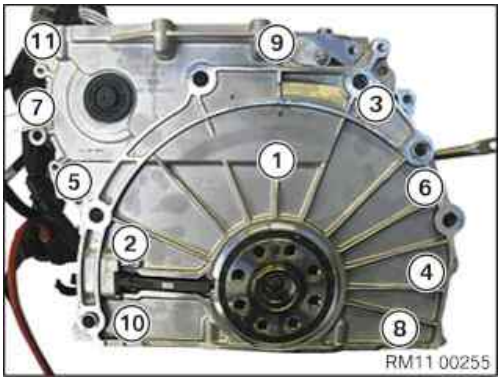


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

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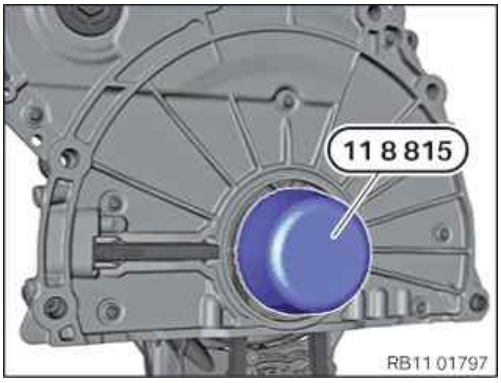
RISK OF DAMAGE

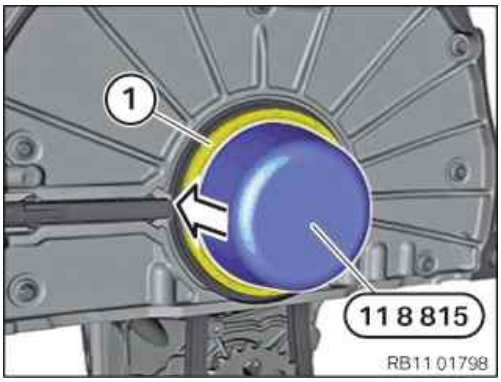
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

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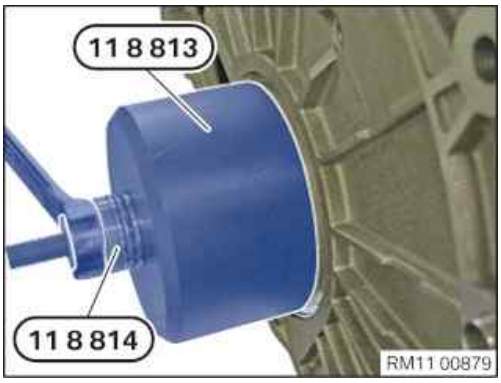
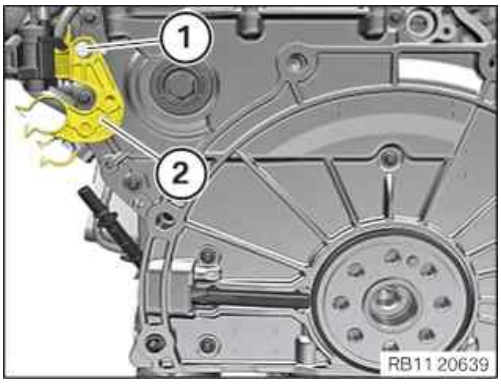
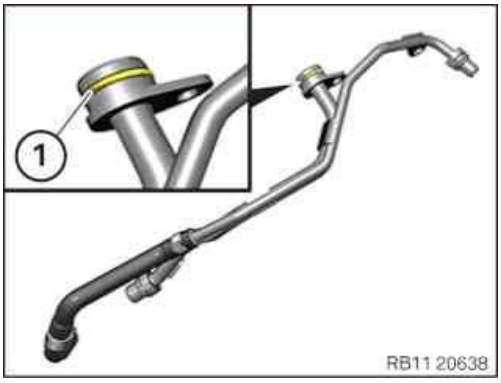


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



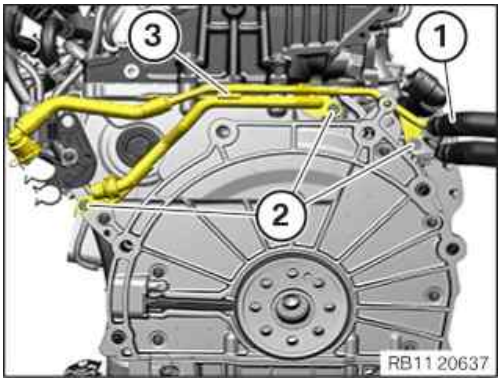
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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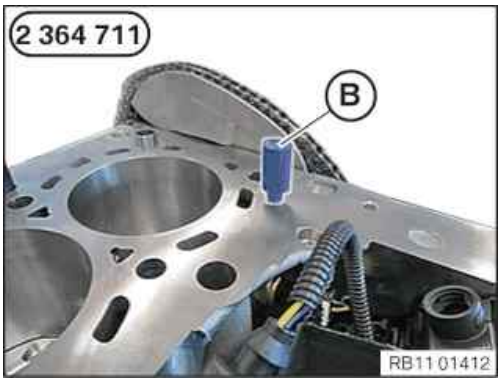


- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

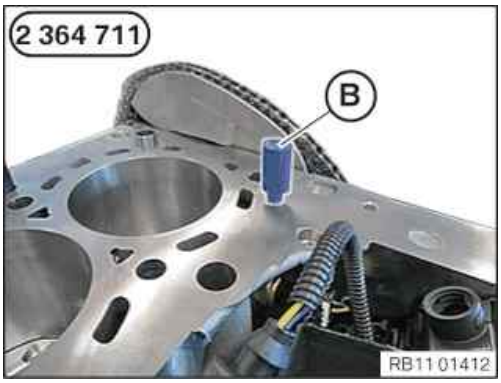
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

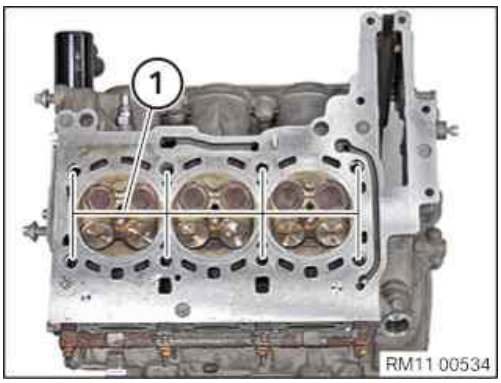
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ Renewing the cylinder head gasket



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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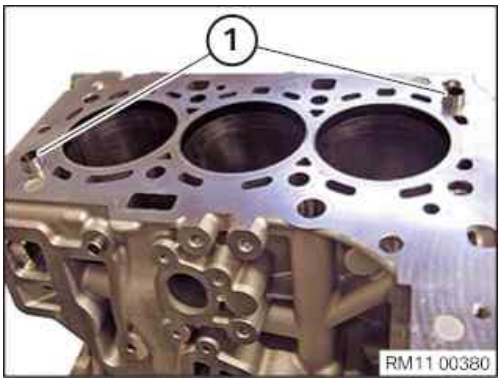
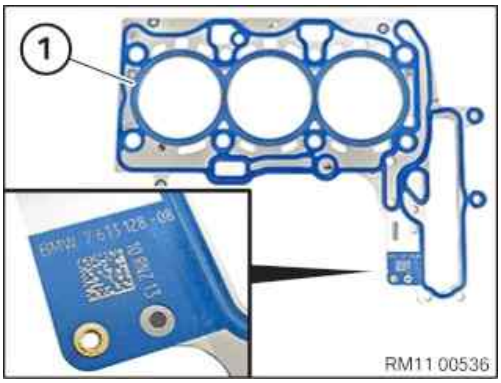
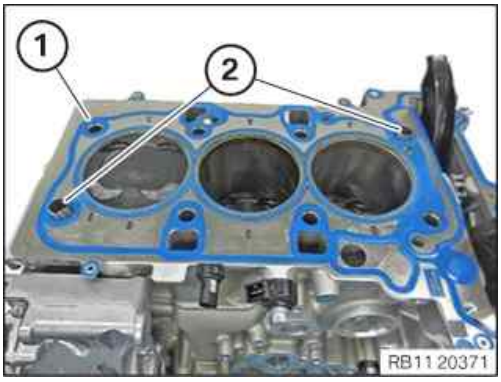


- Check the fitting sleeves (1) for secure fit and damage.

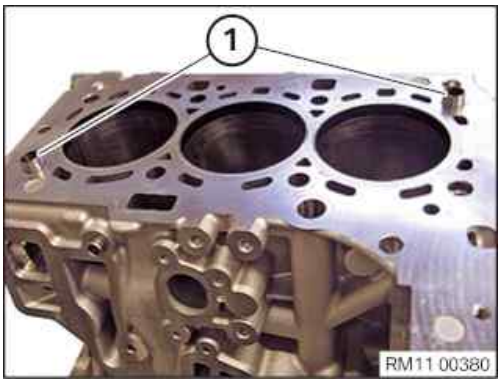


- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.

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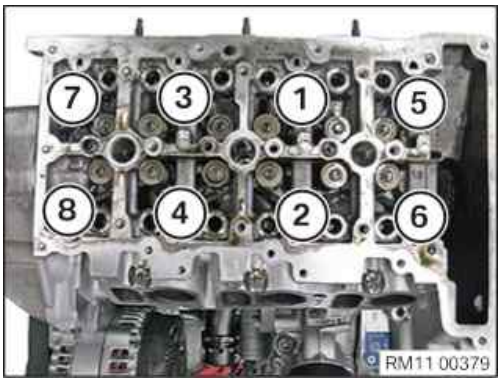


- Fit new cylinder head screws.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

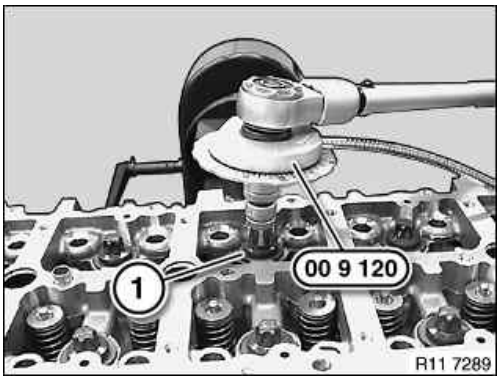
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

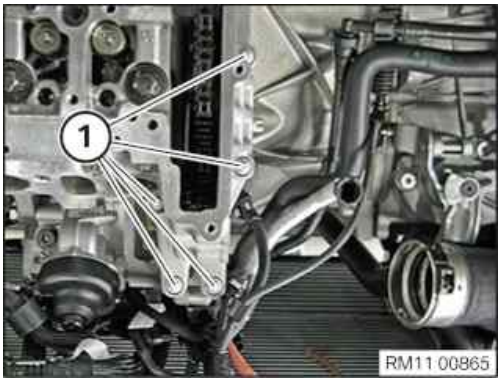
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolts in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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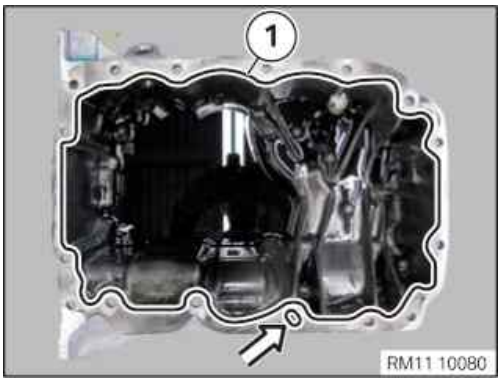


TECHNICAL INFORMATION

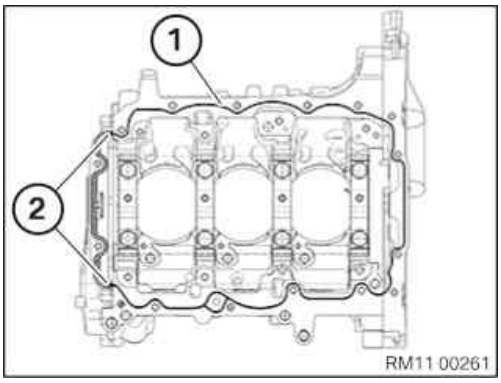
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

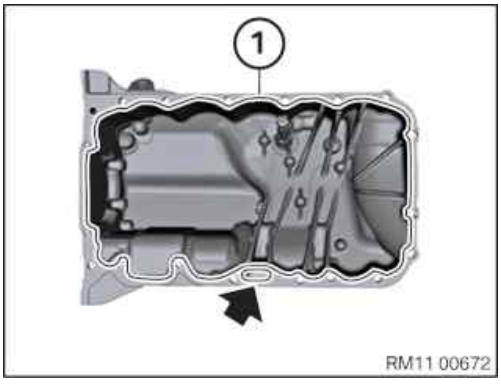
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

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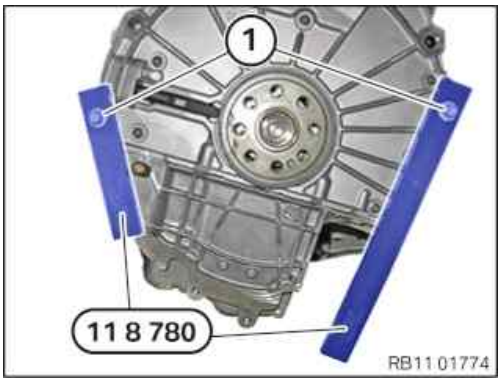
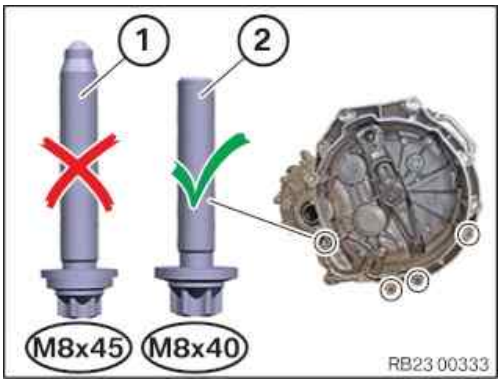


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

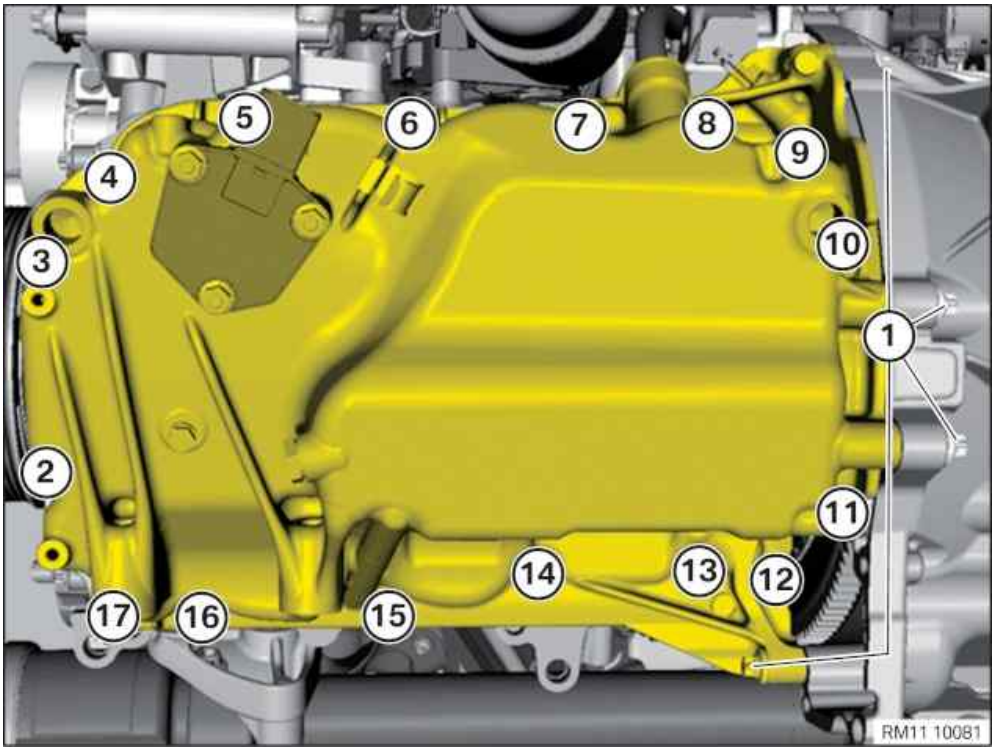
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Hand tighten the screws of oil sump (2) to (17) , but do **not** tighten completely yet.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

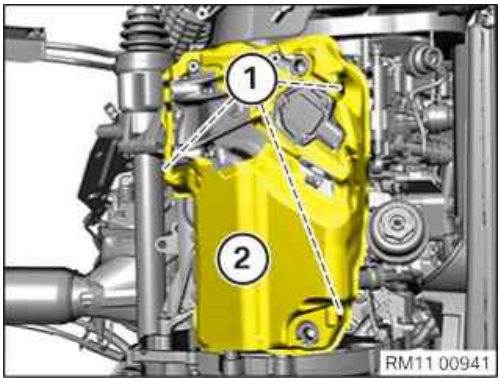
Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

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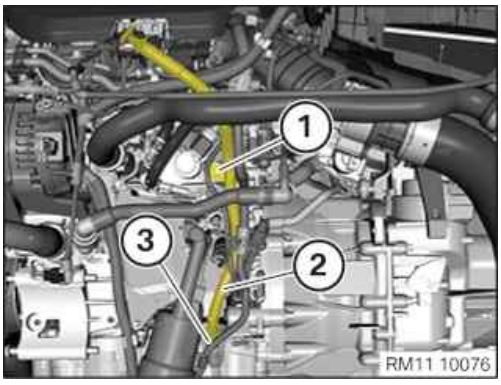
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

30 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).

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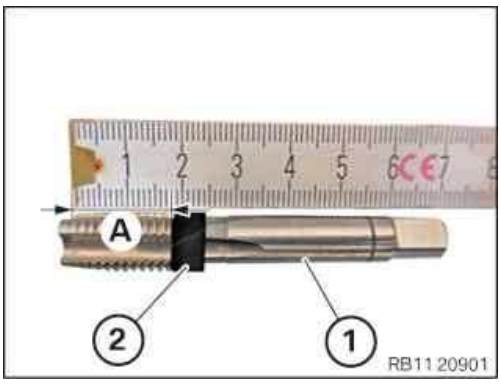
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

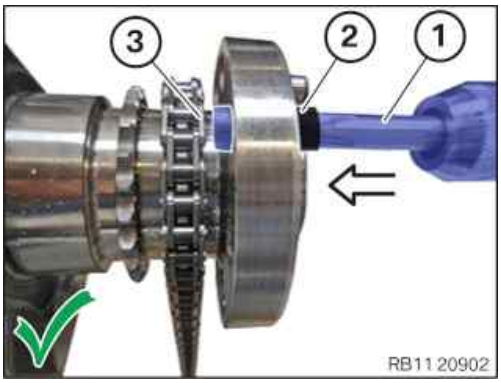
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

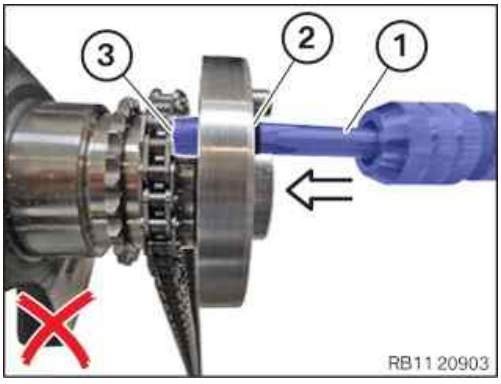
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).



TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).

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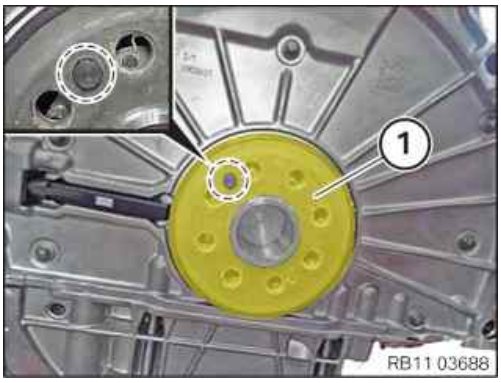
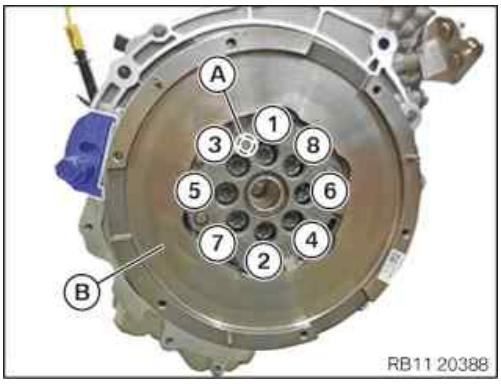


- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

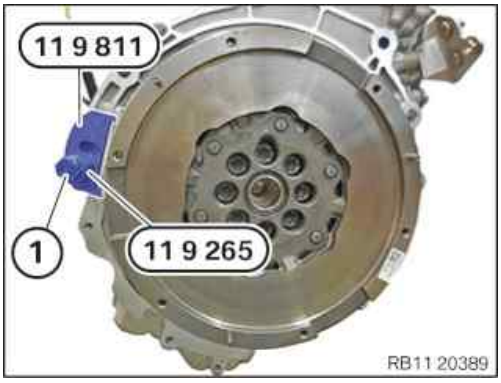


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

31 – Install clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.

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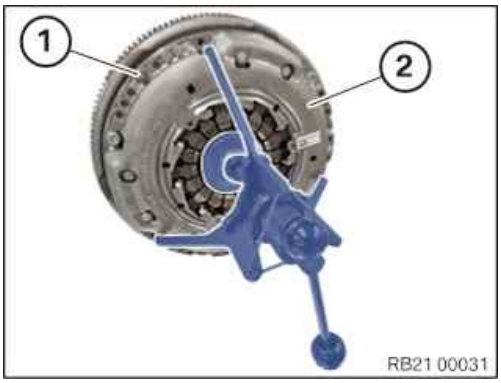
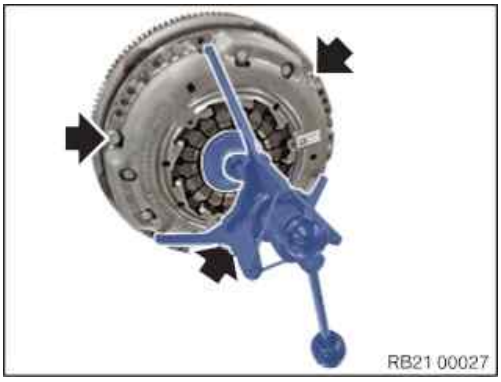
- Centre the clutch disc (1) using special tool **2 358 471**.



- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

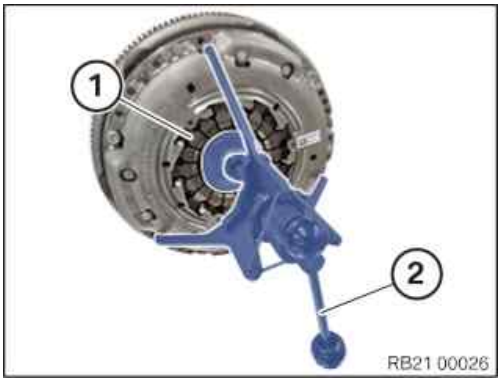


- Renew the bolts (arrows).

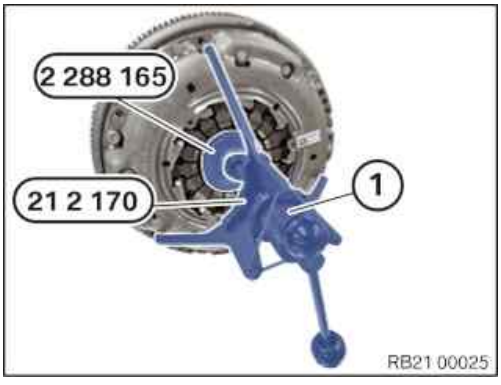
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool **0 493 839 (21 2 170)** with **2 288 165** from the clutch.

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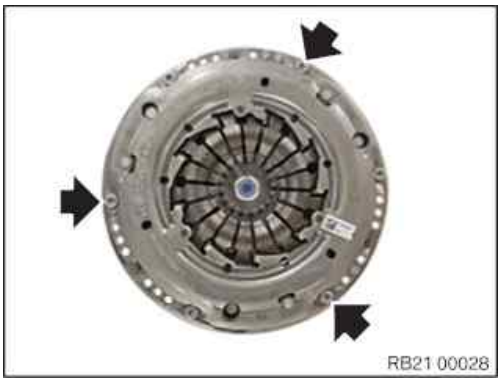


- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

- Withdraw special tool **2 358 471** from clutch disc with aid of accompanying screw.

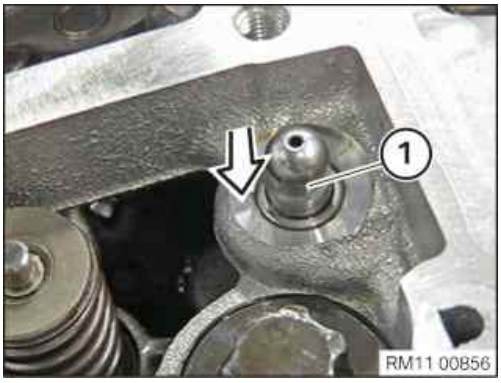
32 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

33 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

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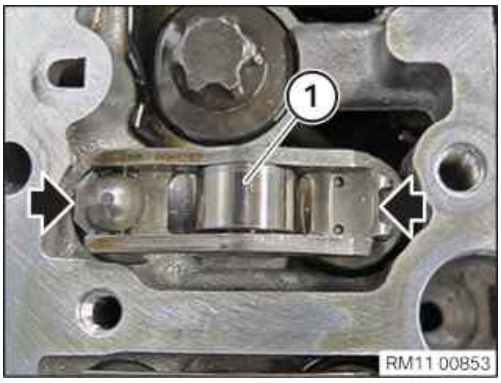
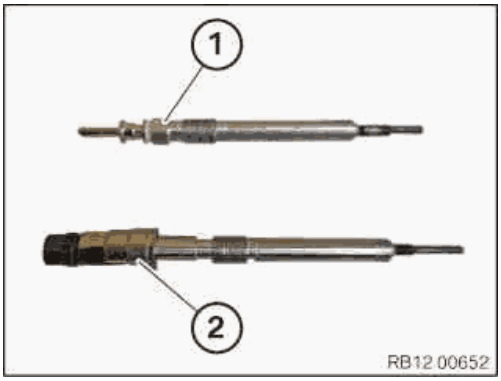


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

34 – Install glow elements

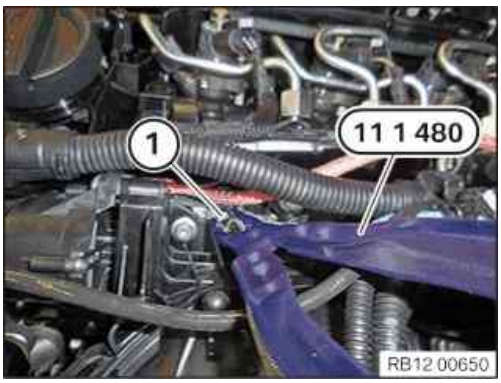


- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

35 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

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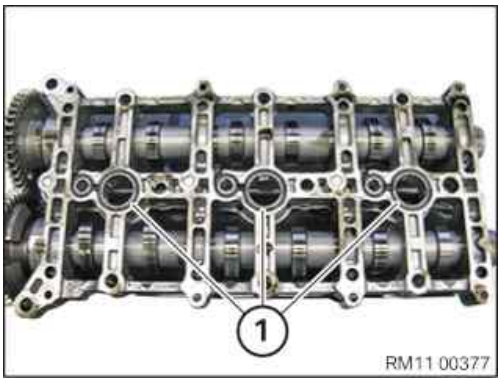
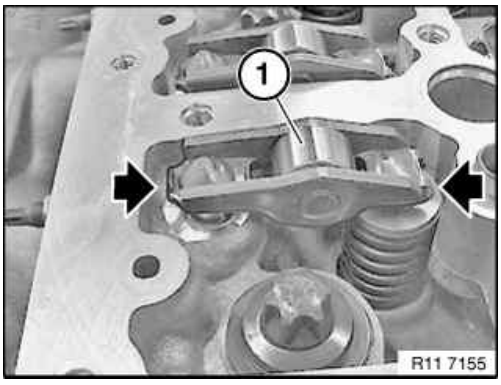
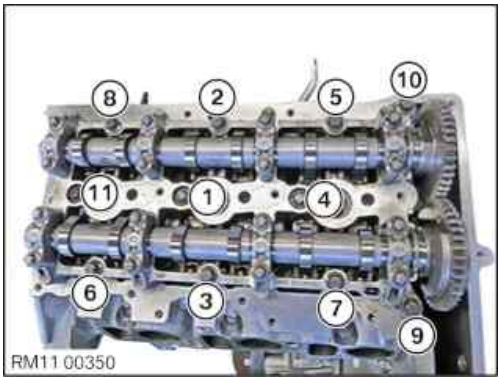


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

36 – Adjusting the timing of the camshafts

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.

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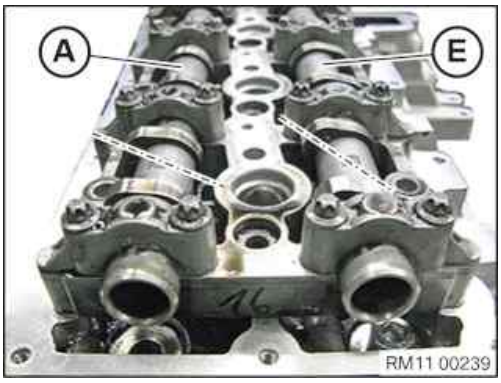


- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

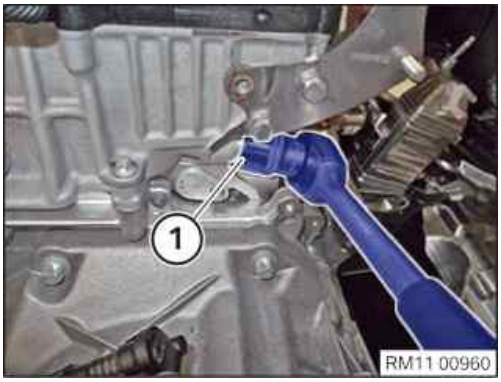
▶ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

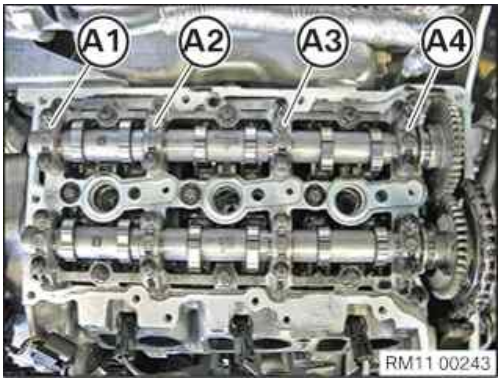
▶ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

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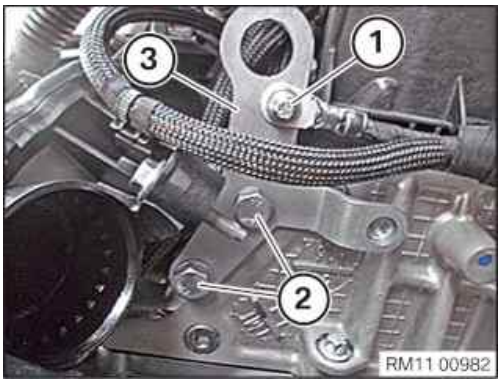
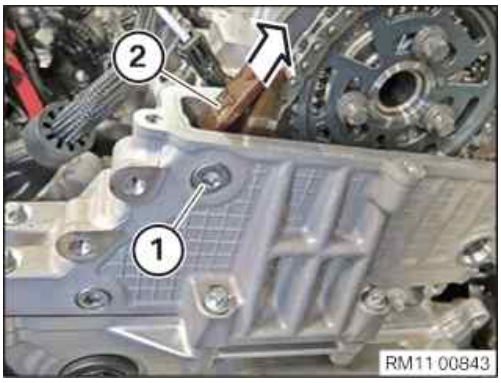
▶ **Remove the timing chain guide rail**

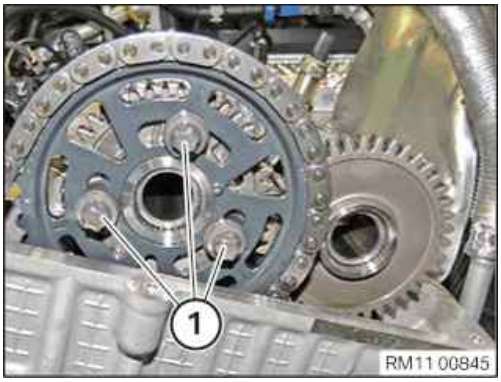


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▶ **Installing exhaust camshaft**

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

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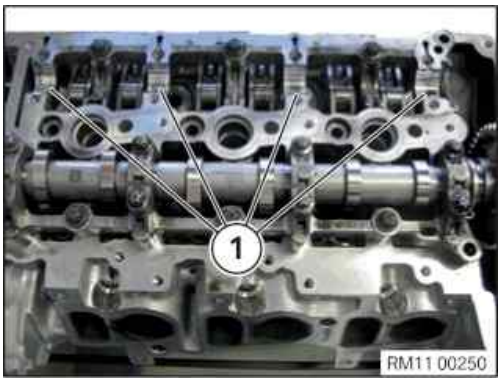
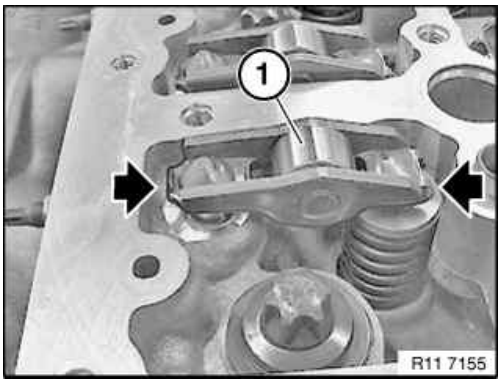
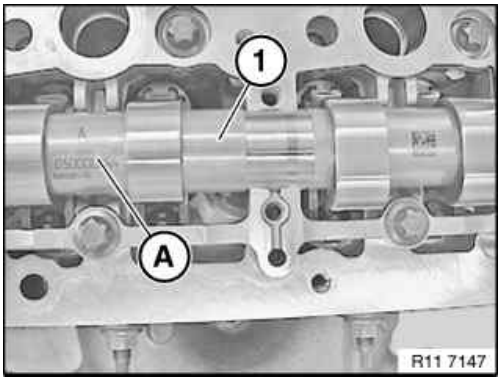


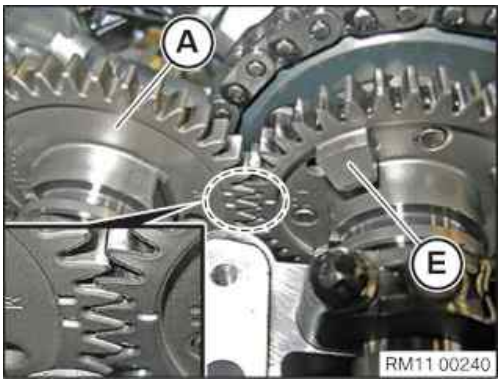
- Oil all bearing positions (1).



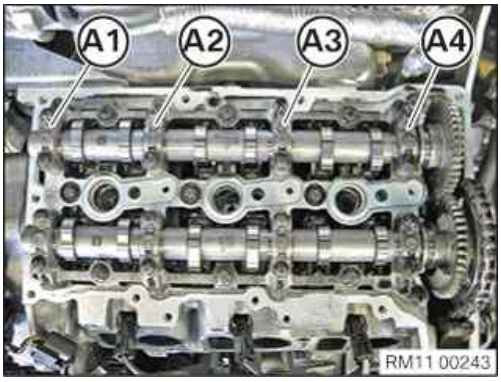
- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

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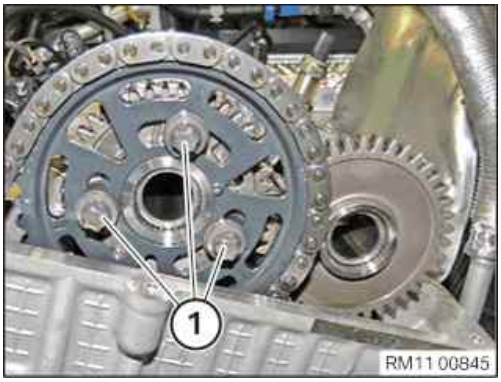
- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

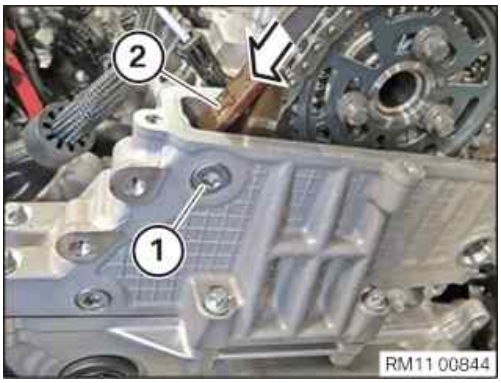
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



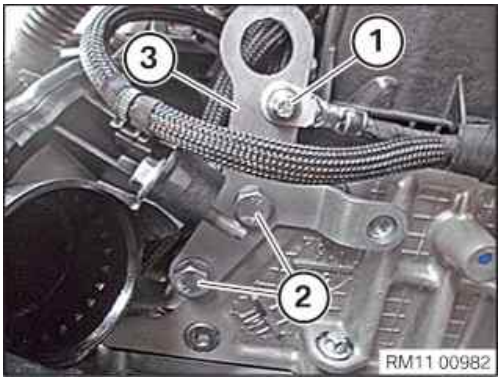
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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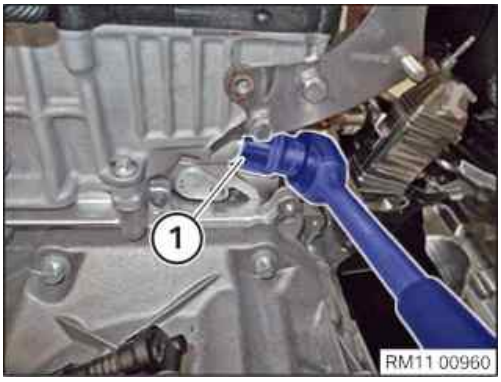
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

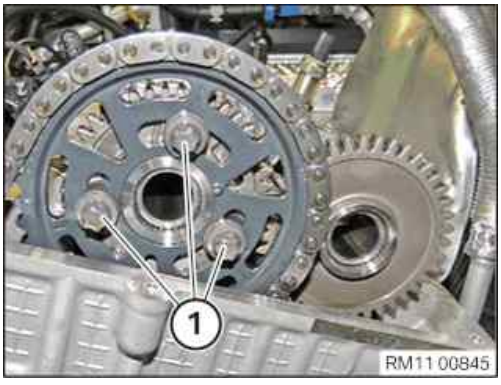


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

37 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

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38 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

39 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

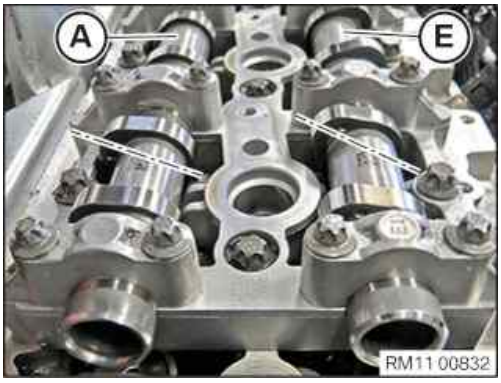
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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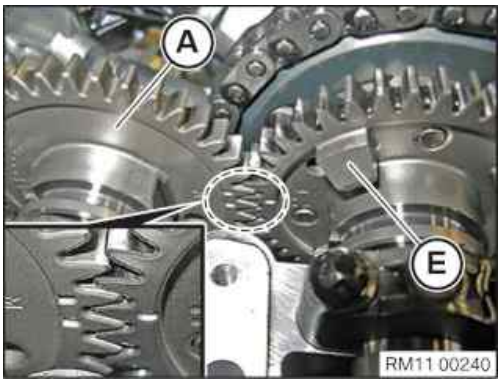
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

40 – Installing cylinder head cover

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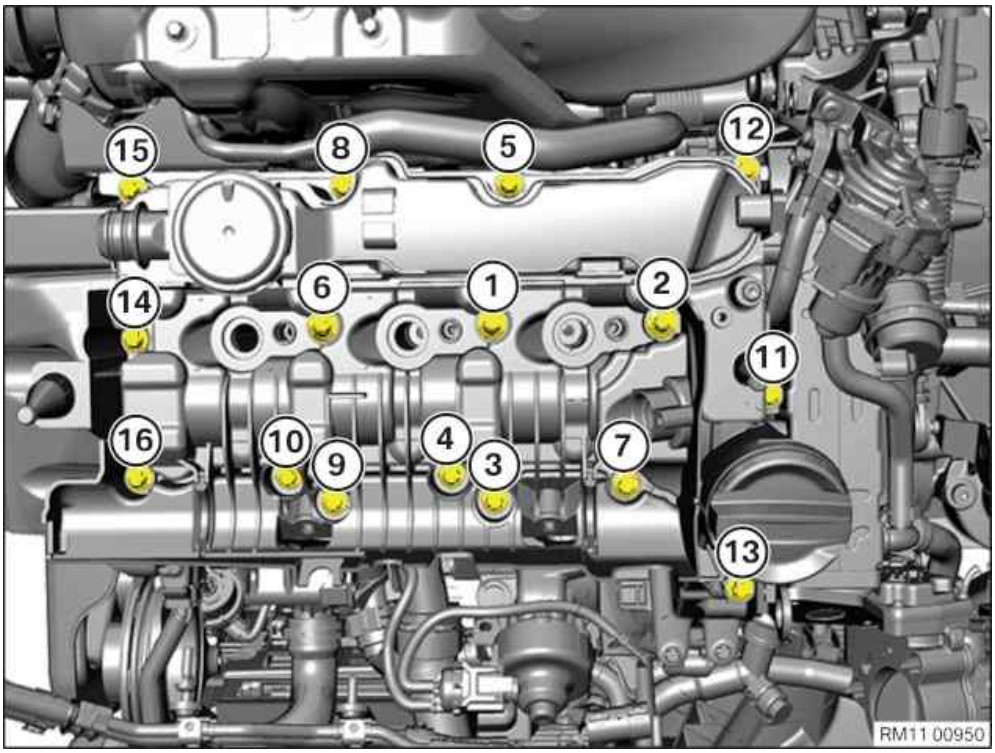
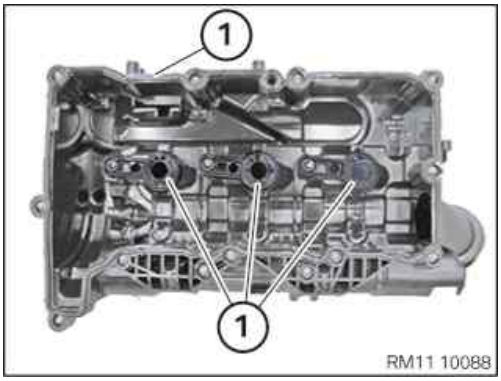
Overview: Screw connection of the cylinder head cover

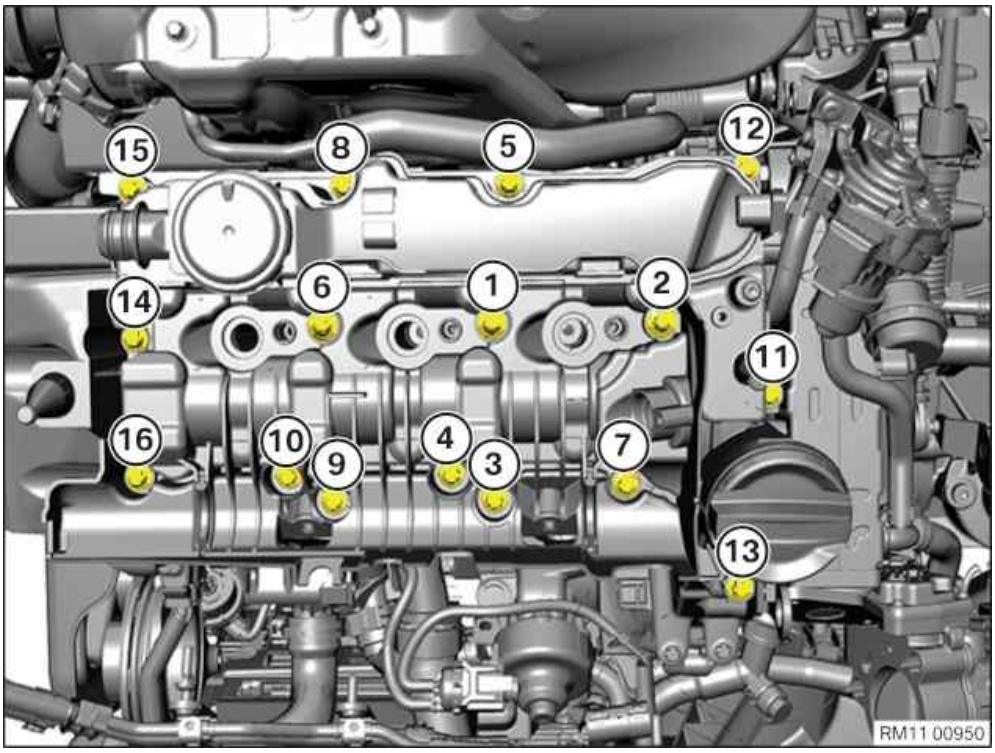


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nm

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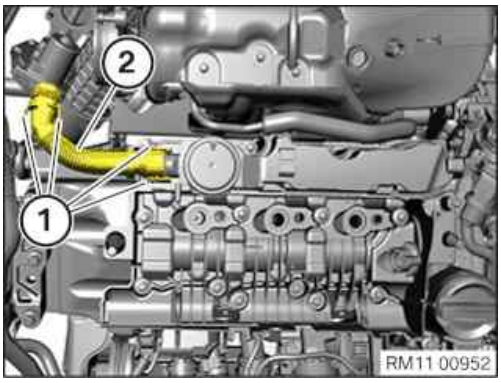


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

41 – Installing injectors of injection system

▶ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

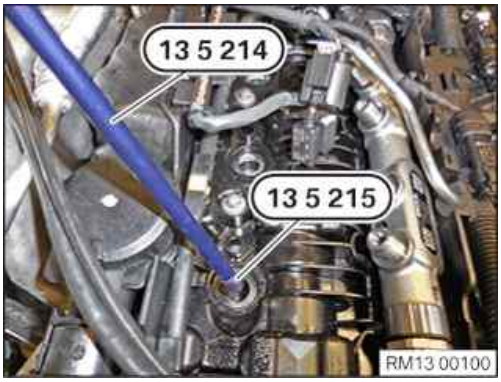
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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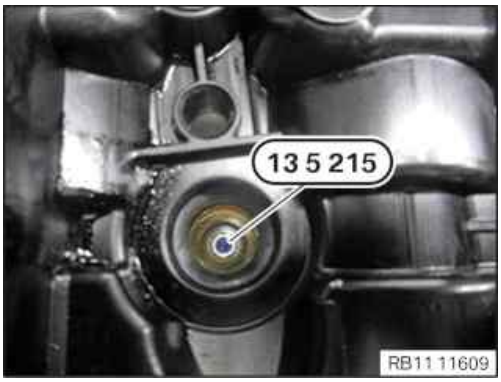
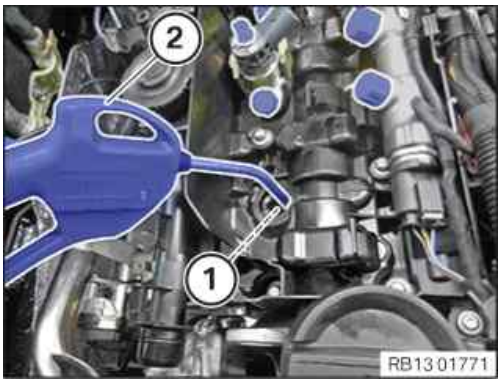


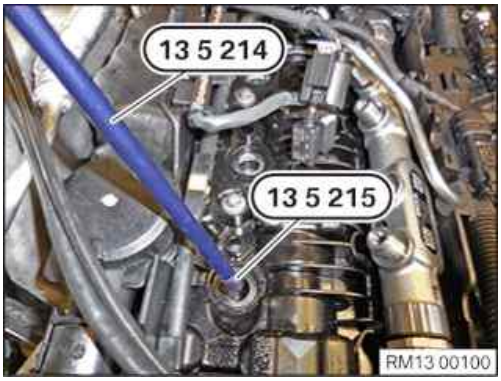
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

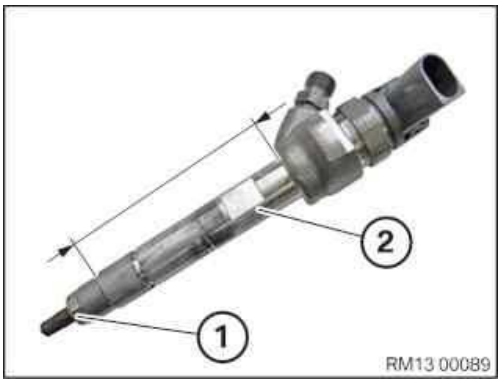
▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

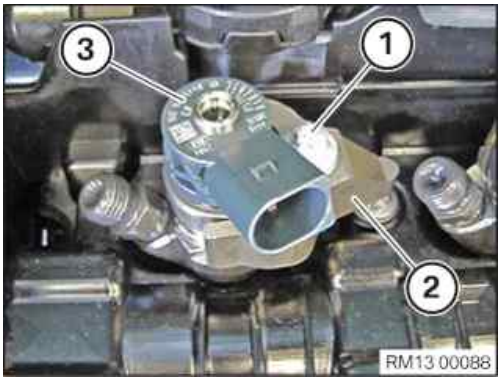


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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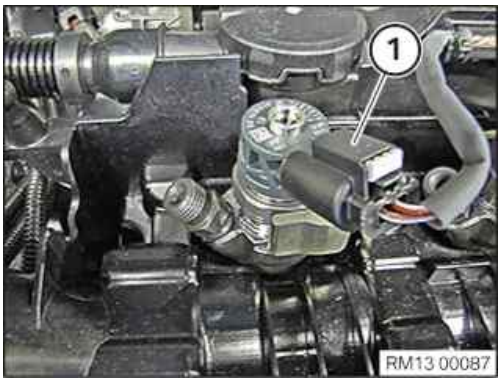


- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

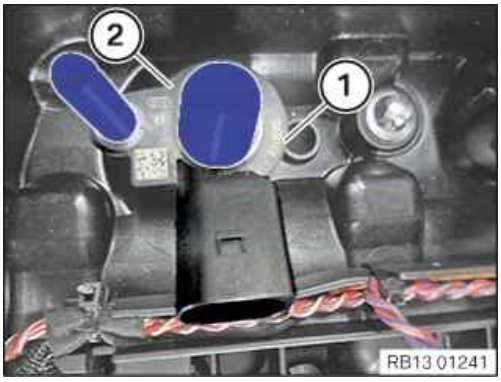
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

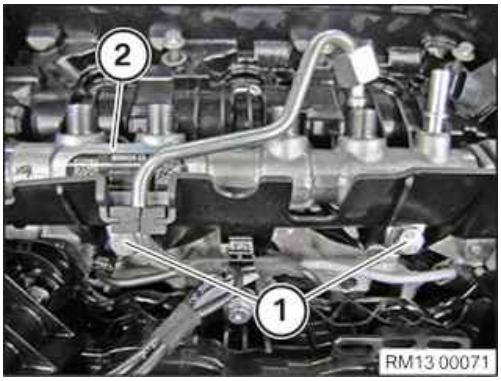
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

42 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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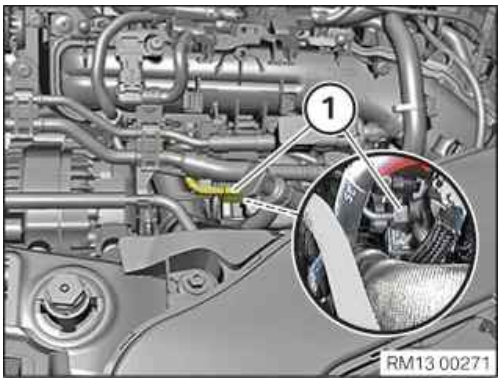


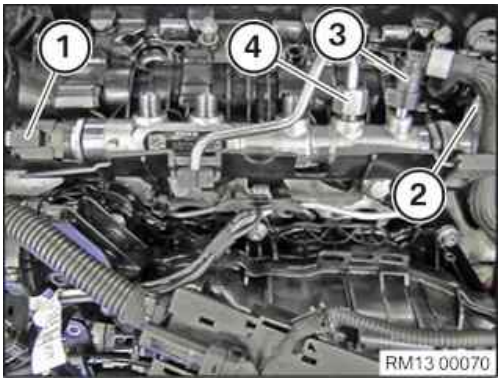
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

43 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

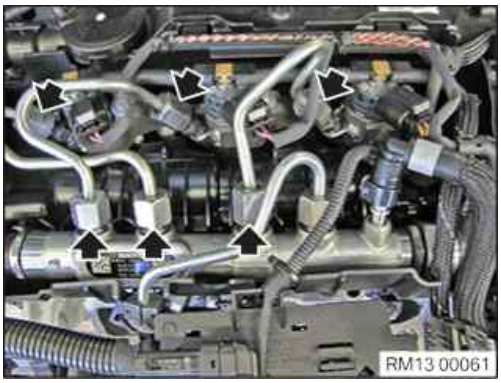
44 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

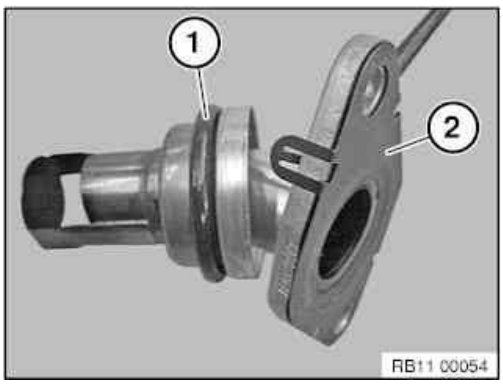
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

45 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

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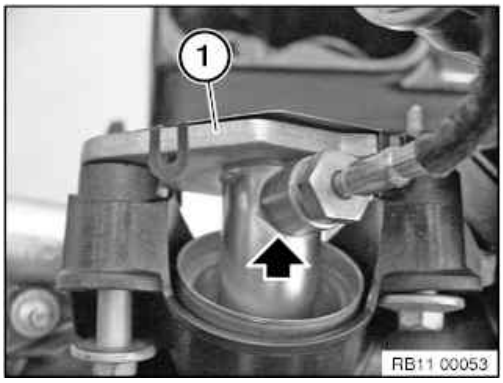
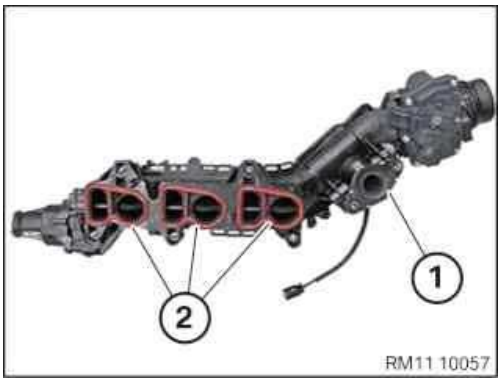
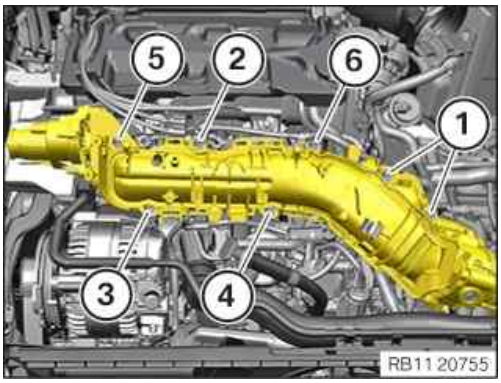


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

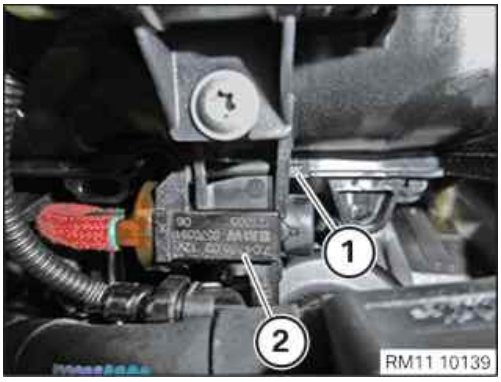
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



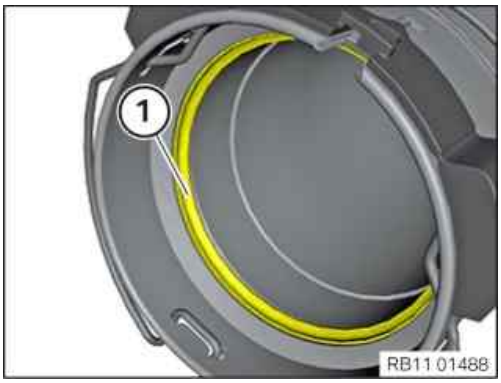
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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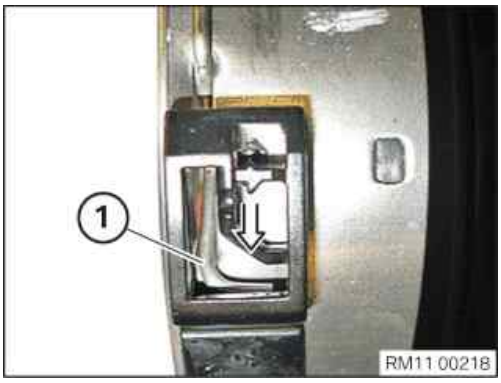
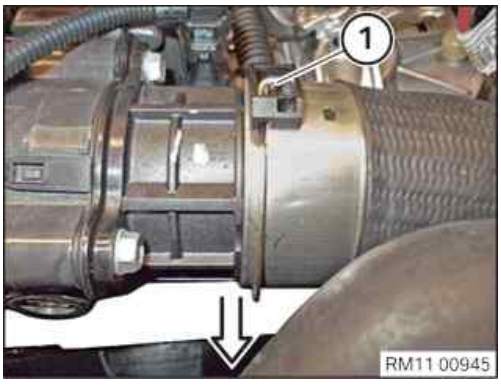


- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

46 – Remove the engine from the assembly stand

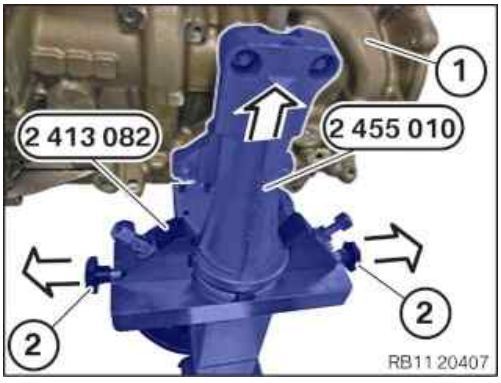
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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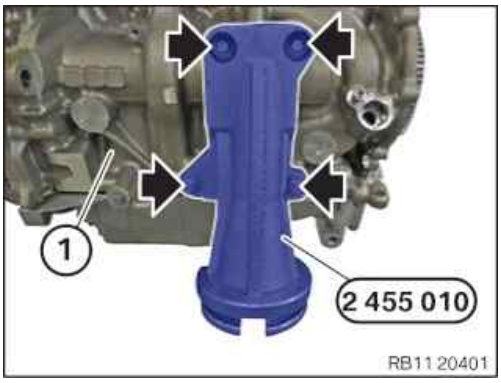
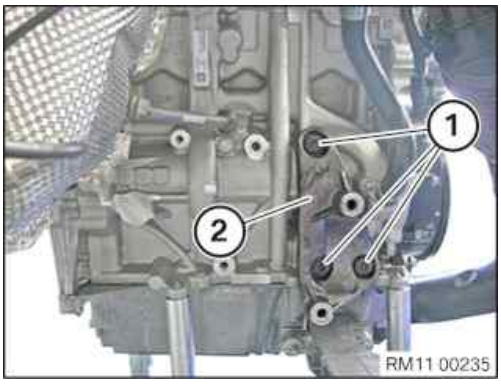


- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

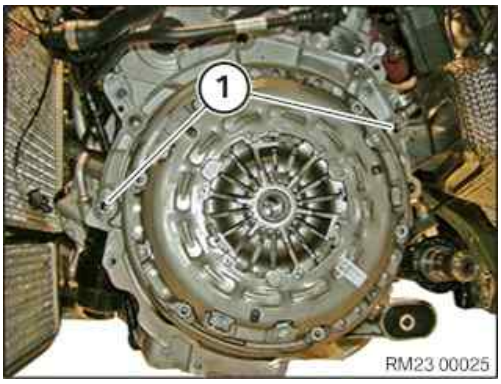
Holder to crankcase

M10		Tightening torque	38 Nm

47 – Mounting engine on manual gearbox

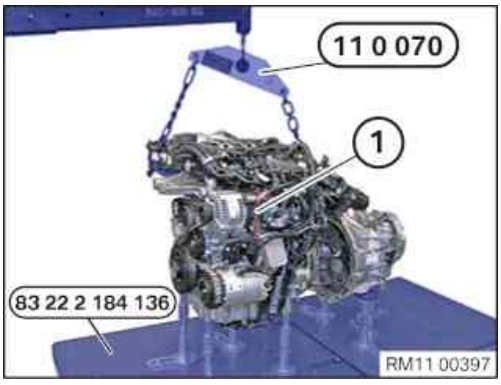
Prerequisite

Engine has been removed.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.



- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.

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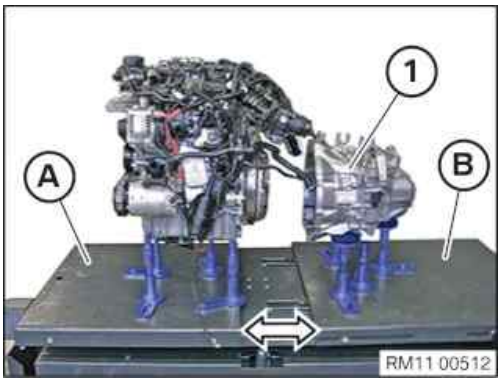
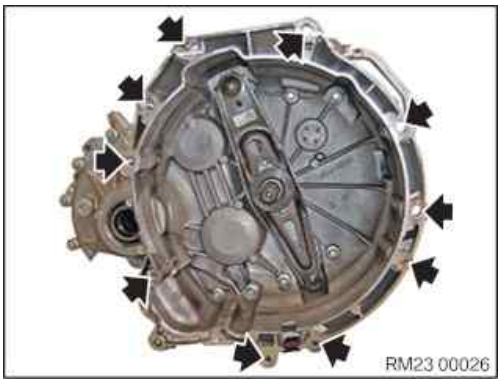


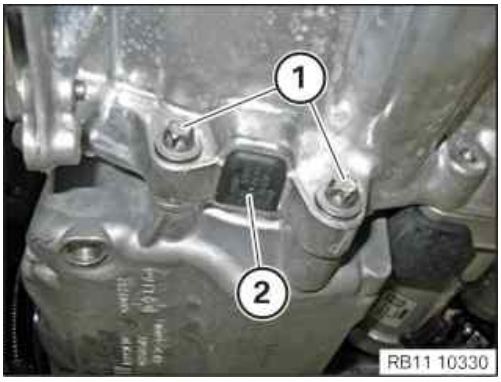
- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Tighten the screws (1).

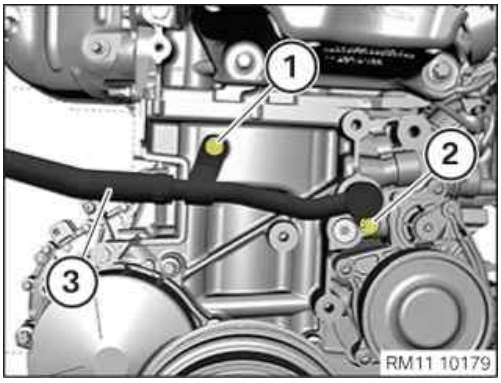
Transmission to oil sump

M8		Tightening torque	19 Nm

- Install the protective cap (2).

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

48 – Attaching assemblies (on lifting table)



- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm

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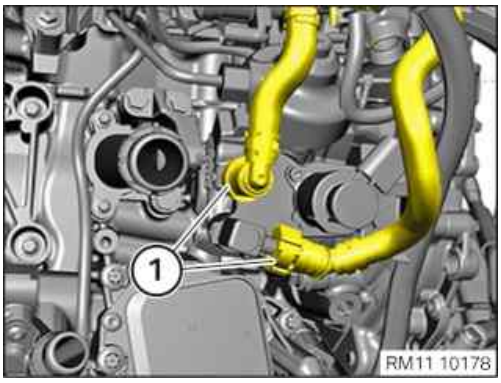


- Connect and lock fuel lines (1).

  The locks must engage audibly.

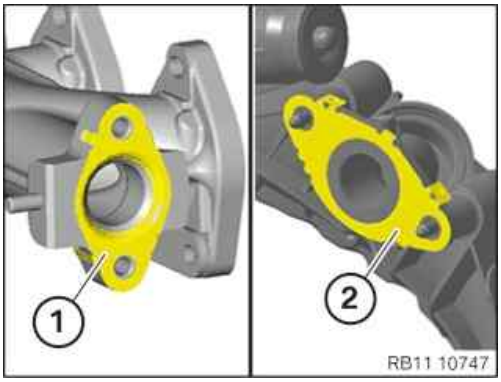
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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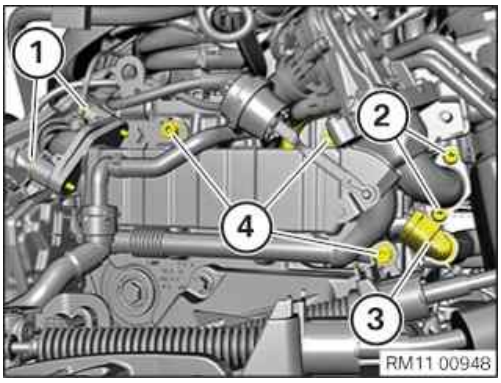


- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

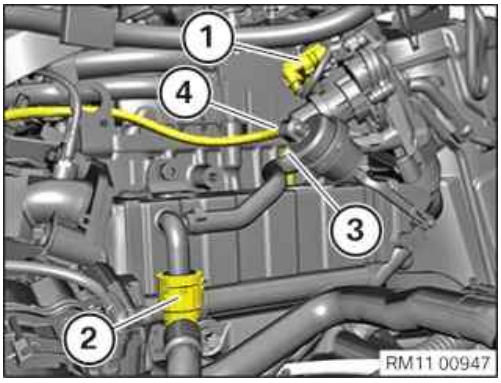
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

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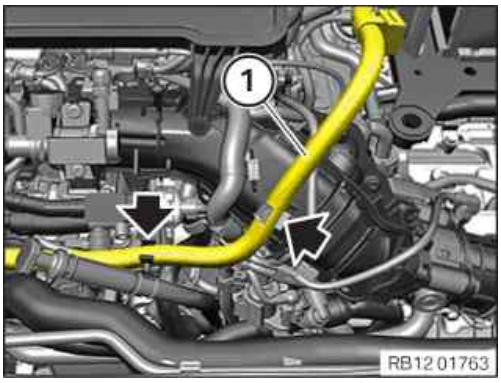


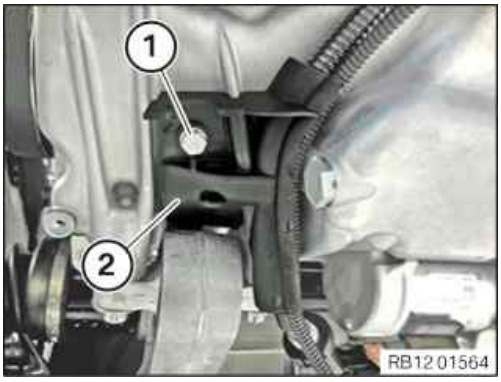
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

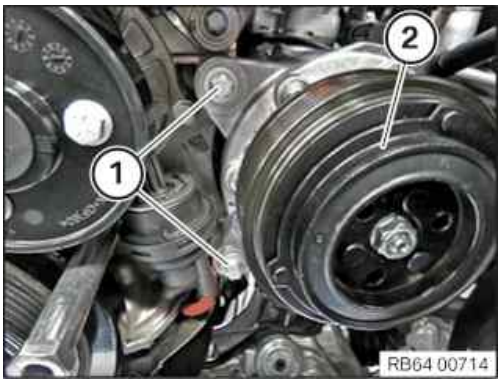
- Insert the positive battery cable (1) into the clamps (arrows).
- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

- Tighten the screws (1).

- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

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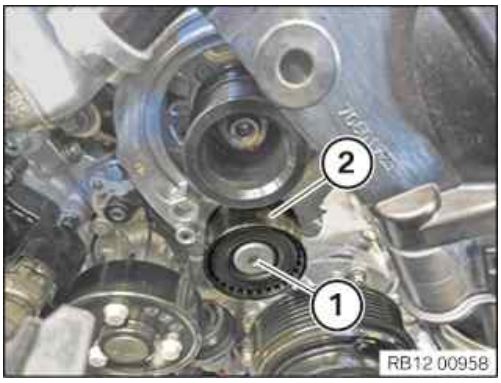
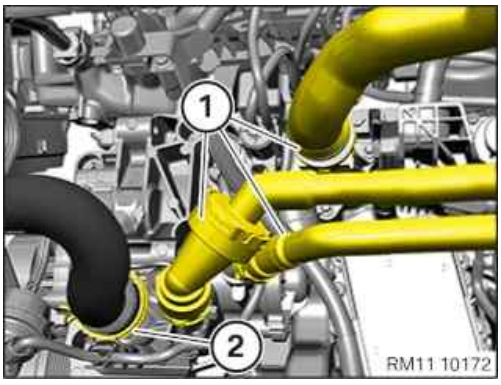


- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

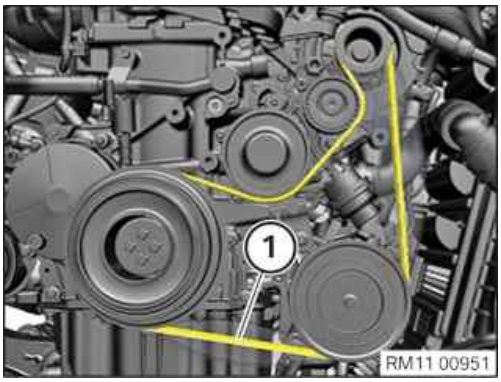
▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ Install the acoustic cover for the engine at the front

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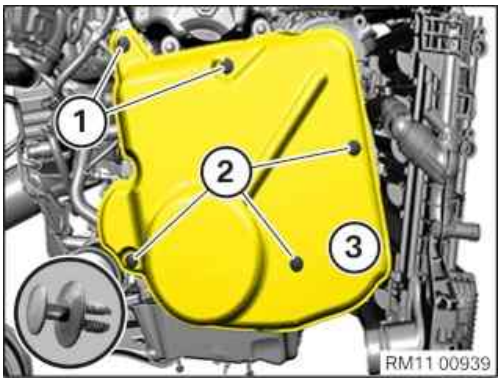
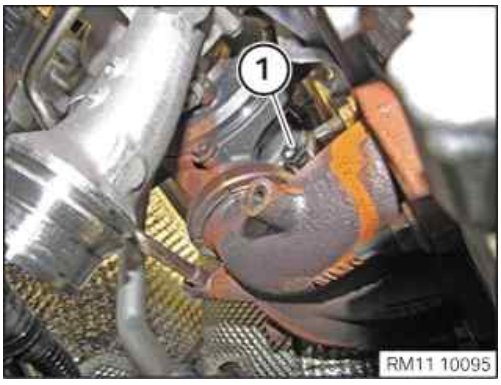


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

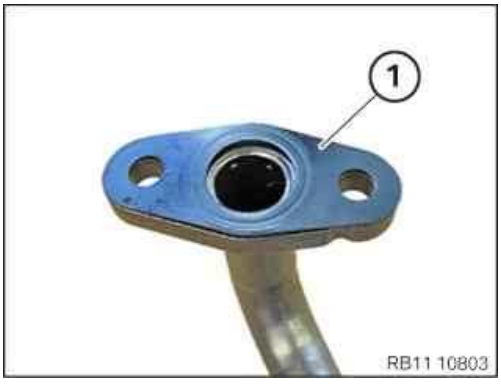
▸ **Installing the oil return line for the exhaust turbocharger**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

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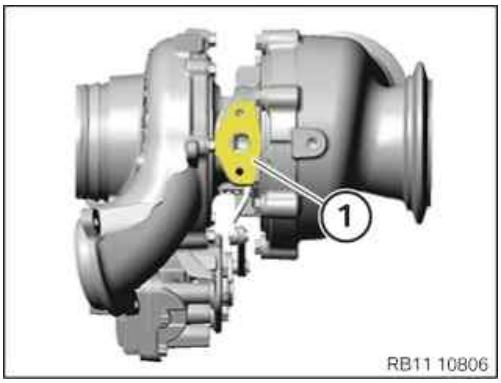
- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

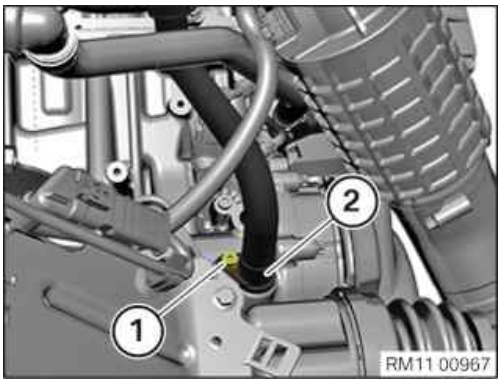
- Do not use any metal-cutting tools.

- Clean sealing surface.

- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm



- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

▸ **Install the oil feed line for the exhaust turbocharger**

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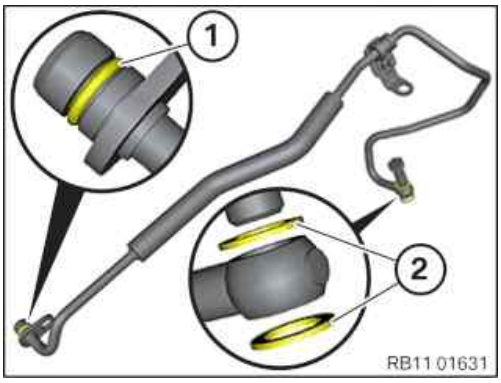
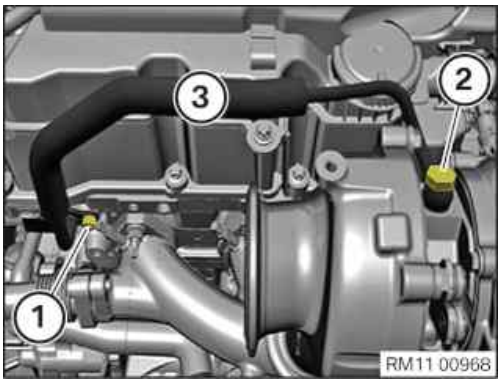


- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

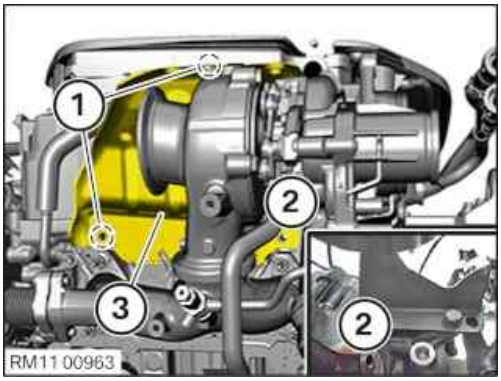
▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

▸ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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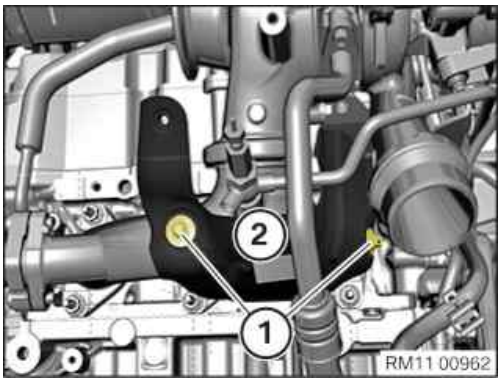


- Feed in and install the heat shield (2).
- Tighten the screws (1).

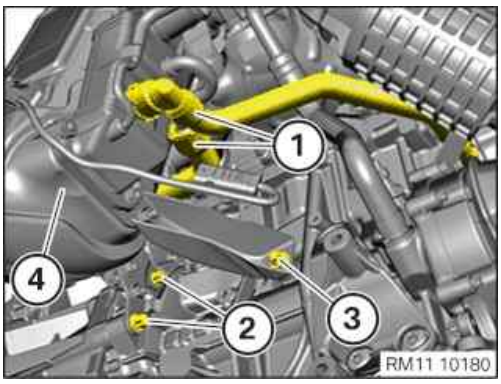
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

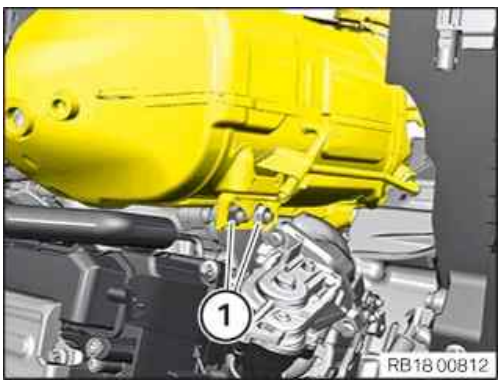
M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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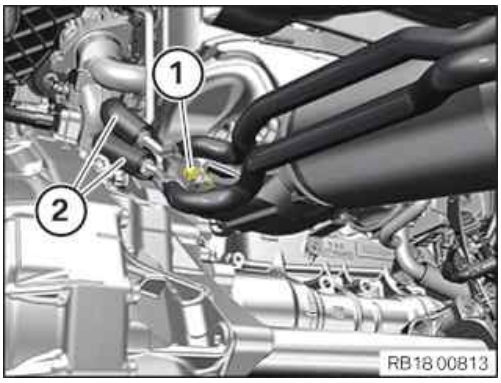


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

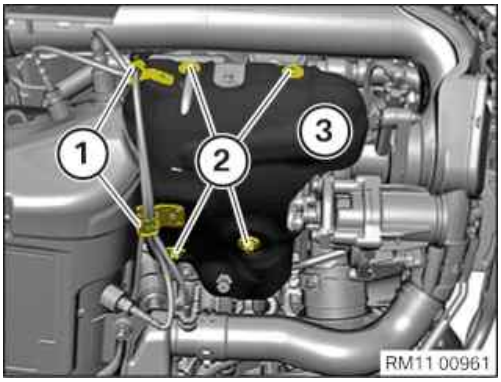
▶ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



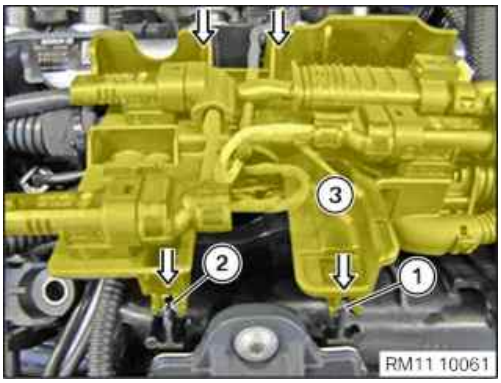
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

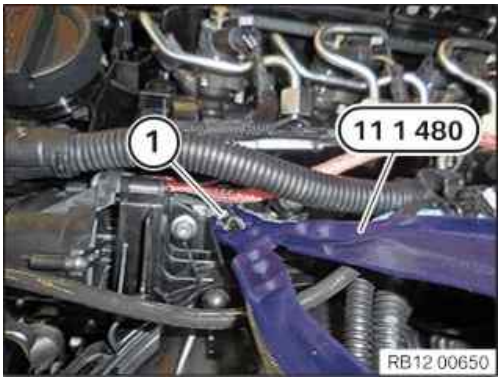
Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▶ **Installing the cable clip for the intake plenum**



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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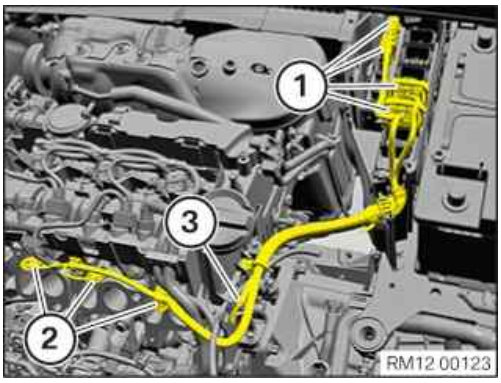
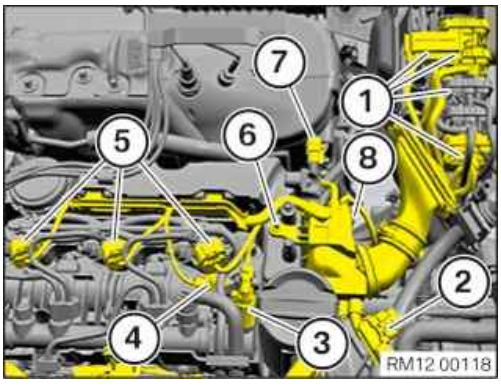


- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

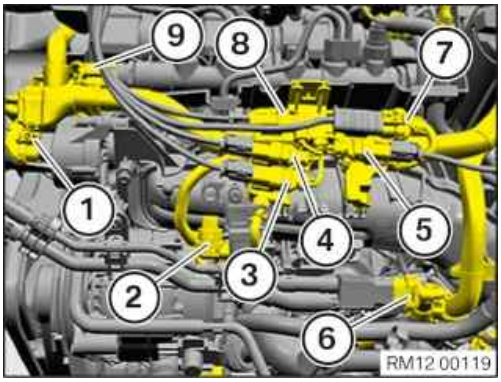


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

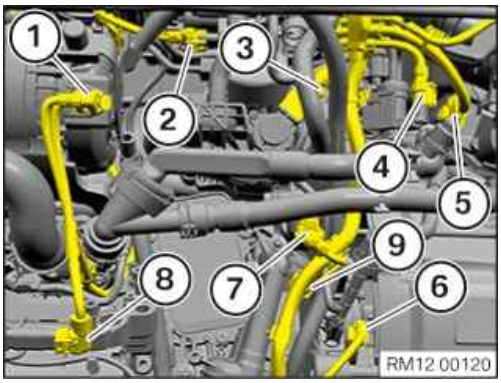
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.

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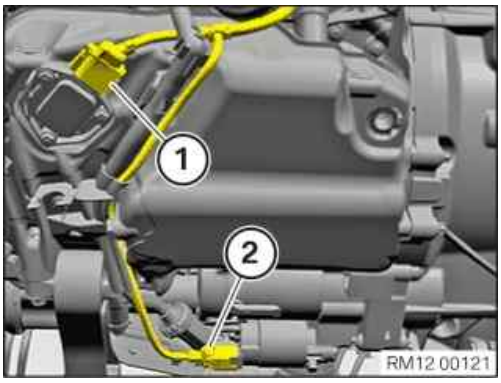
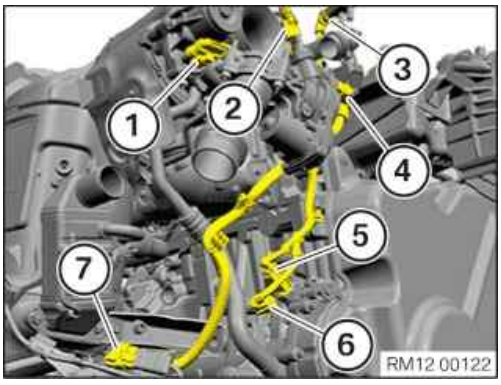
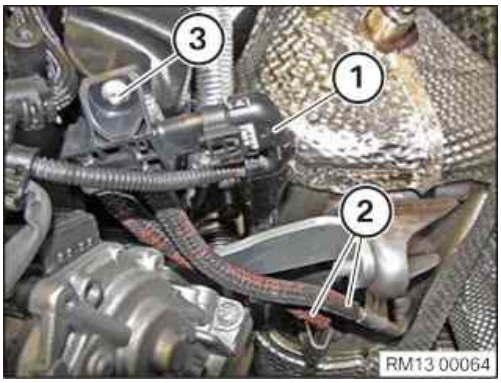


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

49 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

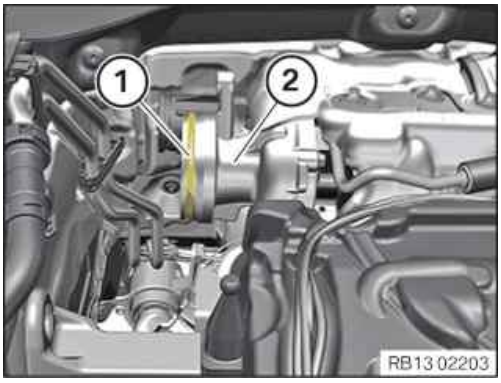
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

50 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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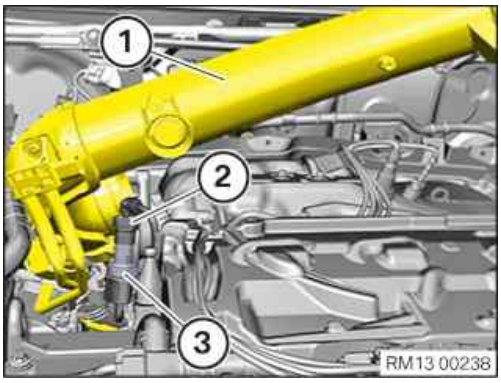


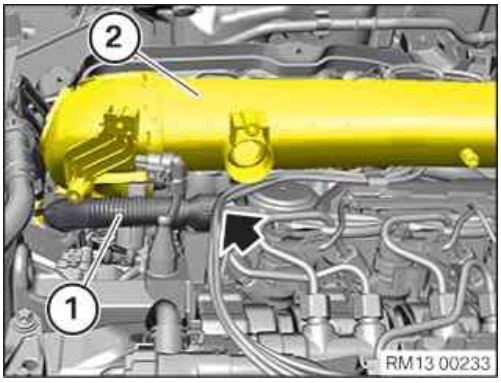
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

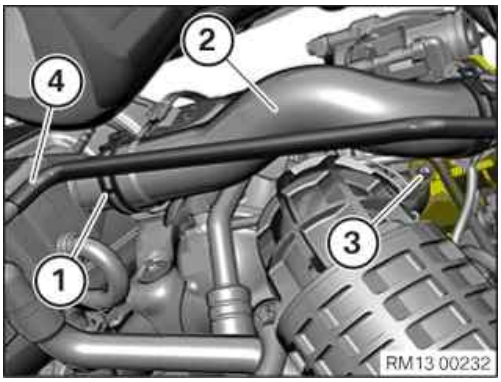
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

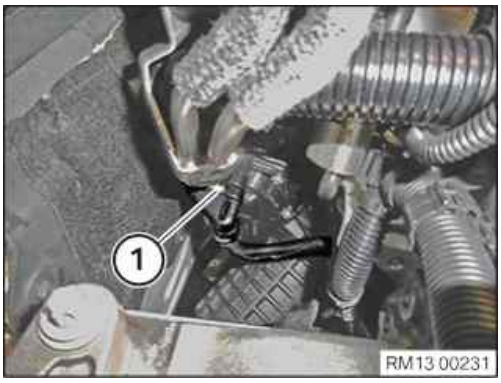
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.

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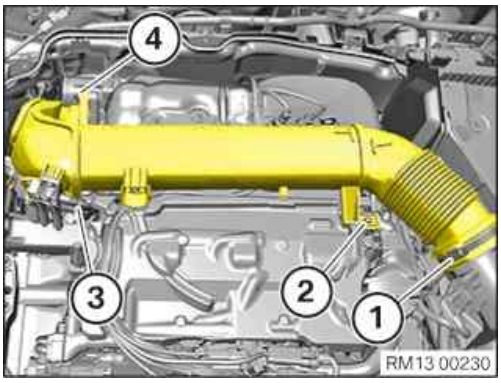


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

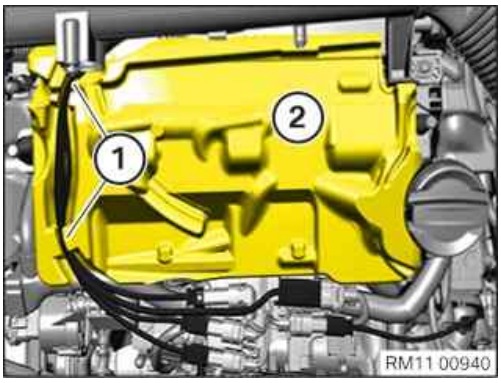
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

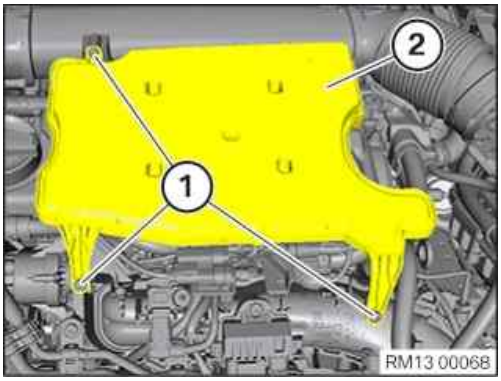
Clamp		Tightening torque	3 Nm

51 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

52 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

53 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

54 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head Used in step 8

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase Used in step 9

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 9

M14x35		Tightening torque	160 Nm

Hydraulic chain tensioner to crankcase

Used in step 28

M6x22		Tightening torque	9 Nm

Rear timing case cover to crankcase

Used in step 29

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover

Used in step 29

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 29

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 29

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 29

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 29 47

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 29

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 30

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel

Used in step 31

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Glow elements to cylinder head

Used in step 34

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 35

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 36

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 36

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 36

M8		Tightening torque	19 Nm

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Standard screw connection M6

Used in step 36 48

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 36

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 36

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 40

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 41

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 41

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 42

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 42

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 44

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 45

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 46 48

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 47 48

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 48

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 48

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 48

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 48

M8x20		Tightening torque	19 Nm

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Bracket to oil sump — Used in step 48

M6		Tightening torque	8 Nm

Air conditioning compressor in component carrier — Used in step 48

M10		Tightening torque	38 Nm

Alternator to component carrier — Used in step 48

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner — Used in step 48

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold — Used in step 48

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase — Used in step 48

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger — Used in step 48

M6x12		Tightening torque	8 Nm

Oil return line to crankcase — Used in step 48

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head — Used in step 48

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger — Used in step 48

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger — Used in step 48

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 48

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder — Used in step 48

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 48

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter — Used in step 48

Torx bolt BM6x16		Tightening torque	8 Nm

Ground cable to cylinder head — Used in step 48

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 48

TS5x20		Tightening torque	3,5 Nm

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Differential pressure sensor to holder — Used in step 49

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 49 50

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor — Used in step 50

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 50

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 50

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 50

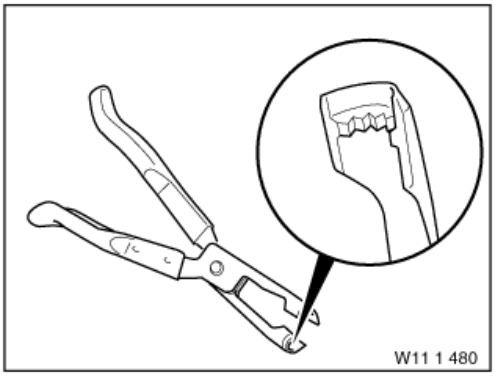
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 52

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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2 459 012 Holder

Common

Used in step 8 47

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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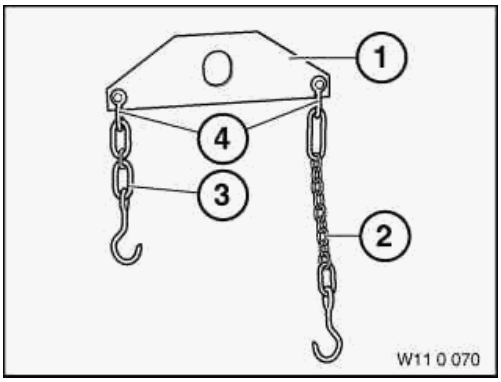
0 490 579 (11 0 070) Lifting gear



Common

Used in step 8 9 46 47

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

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2 455 010 Engine support

Common Used in step 9 46

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 9

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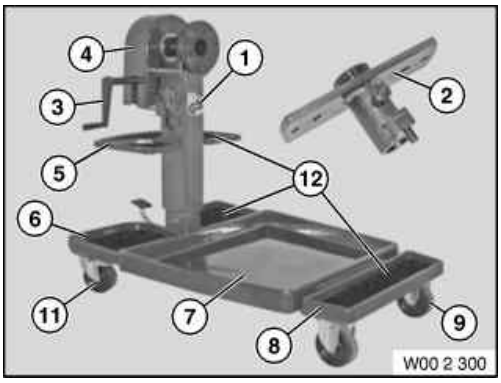

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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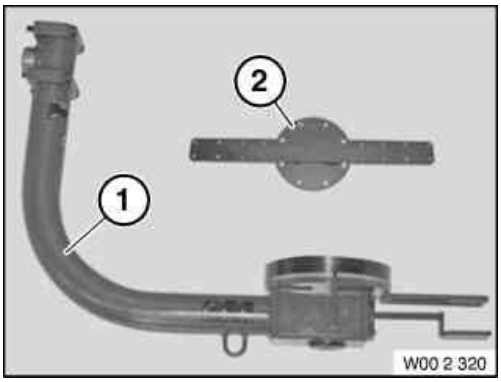
0 495 196 (00 2 320) Support arm



Common

Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common

Used in step 11 14 42 44

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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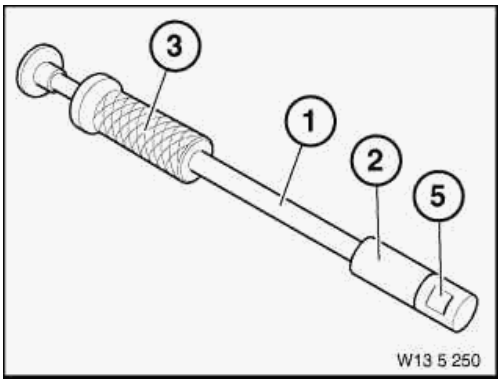
2 413 106 Fastener

Common

Used in step 11 44

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common

Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush

Common Used in step 13

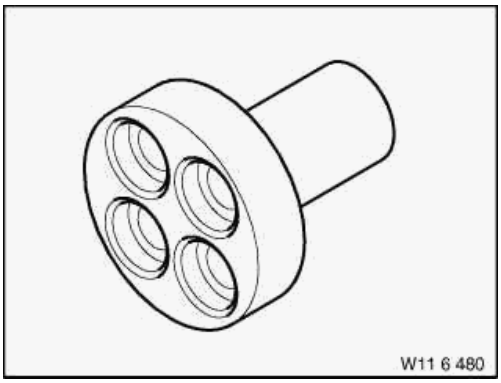
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 13

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 16 36 39

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 288 380 Locating stud

Common Used in step 16 36 37 39

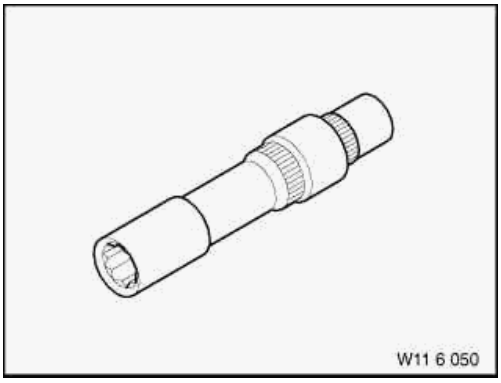
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common Used in step 16 36 38 39

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 21 34

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

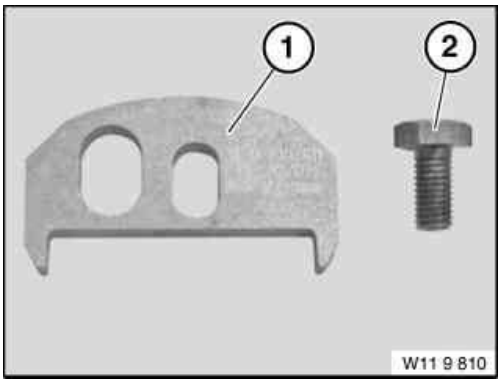
Common Used in step 22 23 36

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 171 (11 9 811) Holder



Common Used in step 24 25 30

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush

Common Used in step 24 25 30

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

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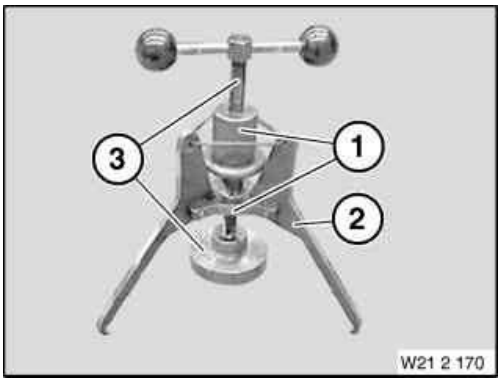
0 493 839 (21 2 170) Device



Common Used in step 24 31

Usage	(tensioning device) For resetting adjusting ring and installing self-adjusting clutch on flywheel without tension.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 00 (622)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 558 (21 2 171)		**Basic body** (Basic body) Basic body with adjusting spindle Deletion, only available via tool set	
2	0 494 559 (21 2 172)		**Claw** (Clamping claw (1 piece)) Available as part of complete tool set 0493839 only.	
3	0 494 560 (21 2 173)		**Spindle** (Pressure spindle with washer) Available as part of complete tool set 0493839 only.	

2 288 165 Synchronising key

Common Used in step 24 31

Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

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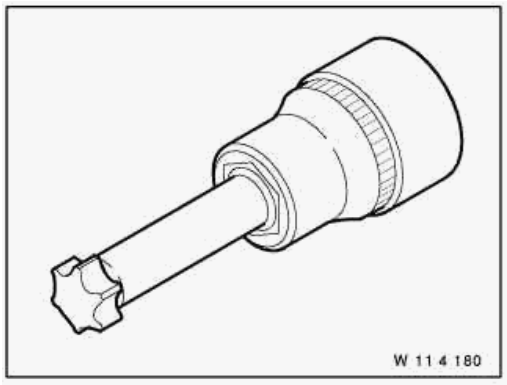
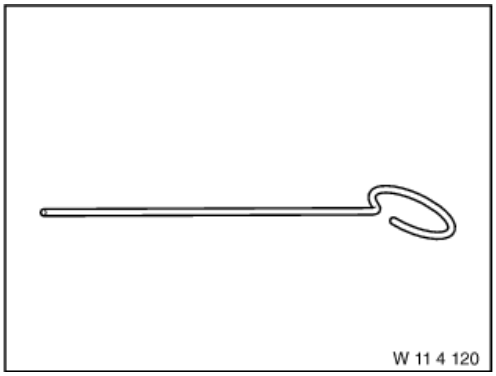
0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 25 30
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

0 491 012 (11 4 120) Pin



Common	Used in step 27 28
Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

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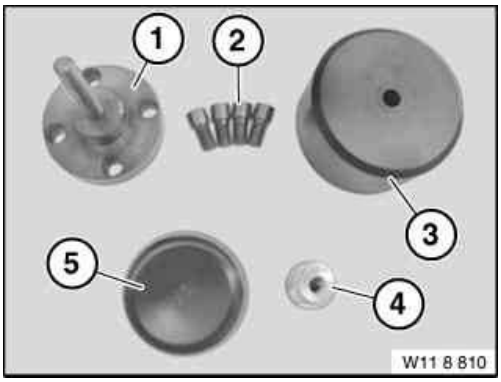
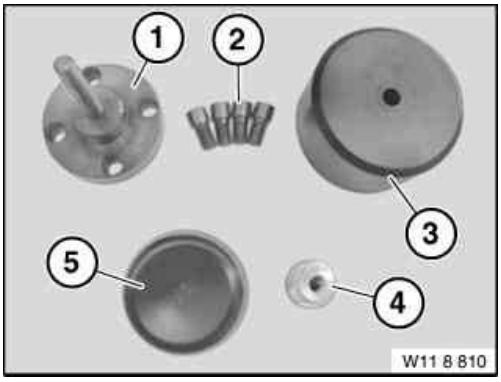
0 496 137 (11 8 815) Holding sleeve



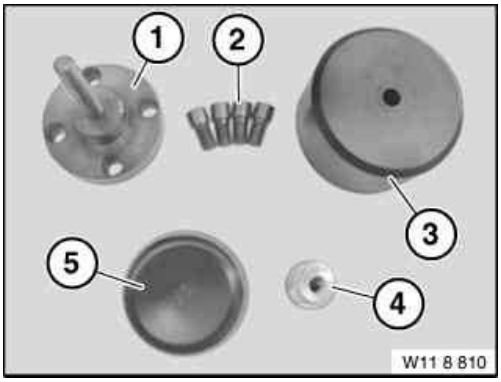
Common	Used in step 29
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body



Common	Used in step 29
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 29
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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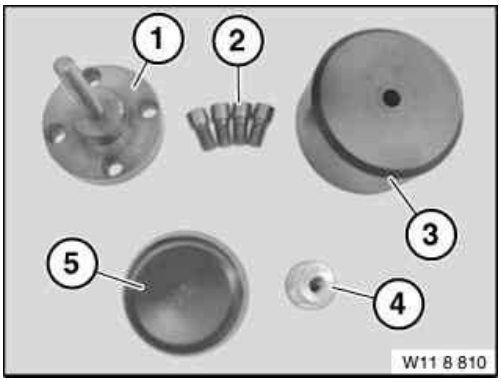
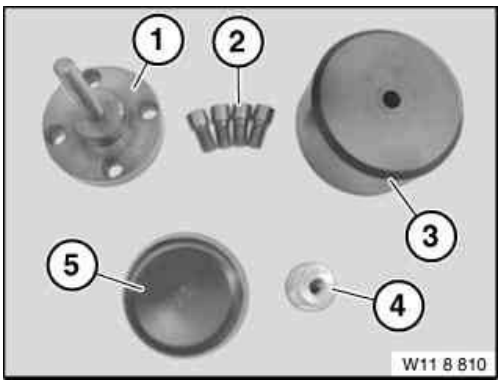
0 496 135 (11 8 813) Holding sleeve



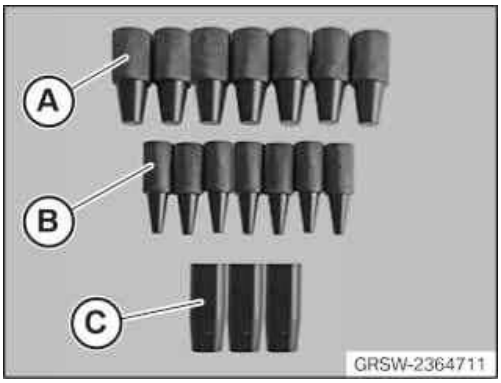
Common	Used in step 29
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut



Common	Used in step 29
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common	Used in step 29
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

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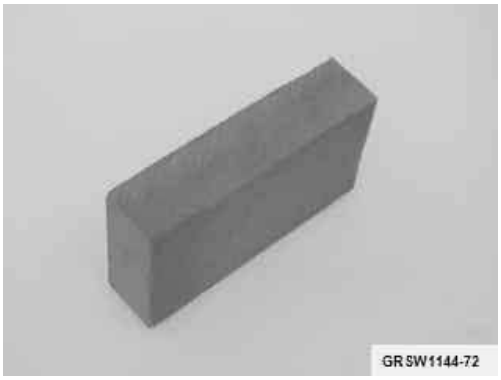
0 495 103 (11 4 471) Scraper

Common	Used in step 29
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 29
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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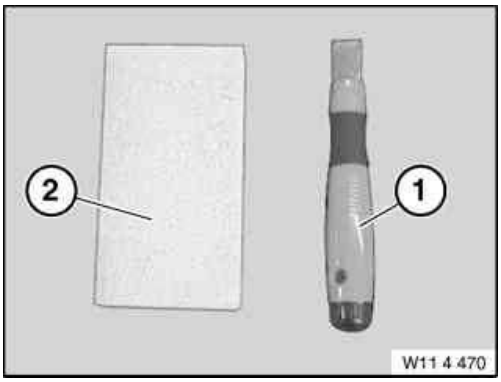
0 495 102 (11 4 470) Tool



Common

Used in step 29

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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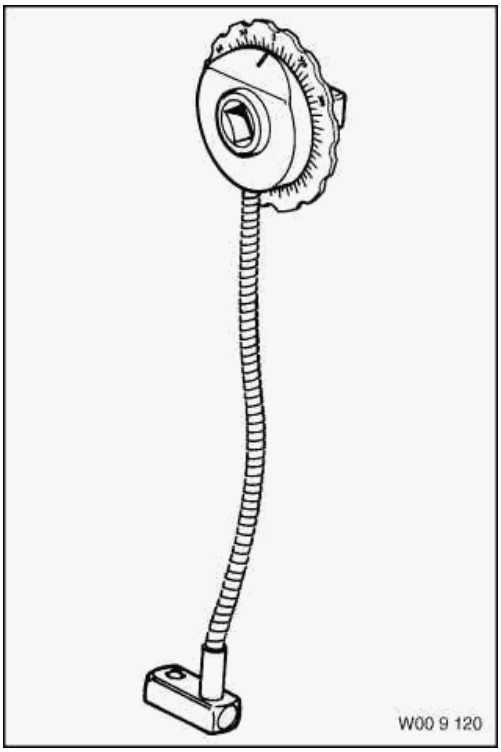
0 490 504 (00 9 120) Torque angle measuring dial

Used in step 29



Common

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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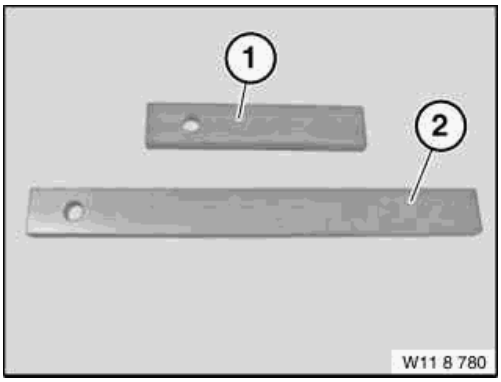
0 496 120 (11 8 780) Plate



Common

Used in step 29

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

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2 285 058 Tool set

Common

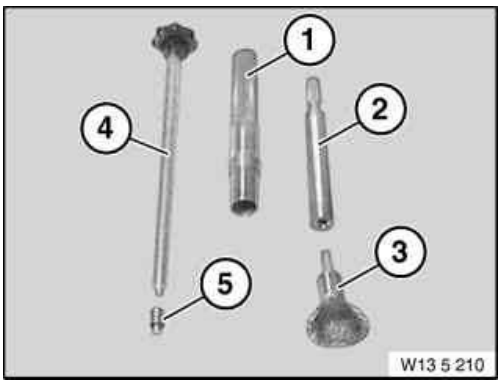
Used in step 30

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

2 358 471 Clutch tool

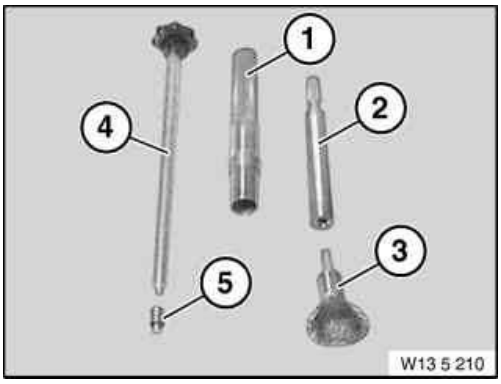
Common	Used in step 31
Usage	For installation of coupling drive plate.. (Getrag transmission) . Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A55
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

0 493 763 (13 5 215) Plug



Common	Used in step 41
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 41
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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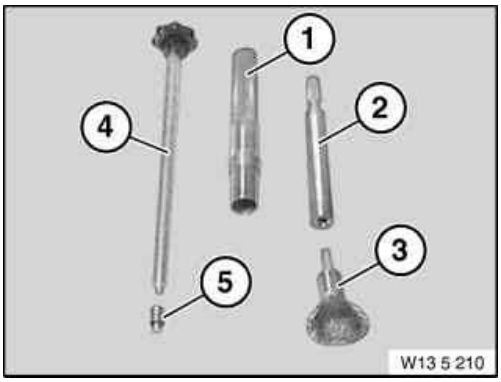
0 493 758 (13 5 210) Tool



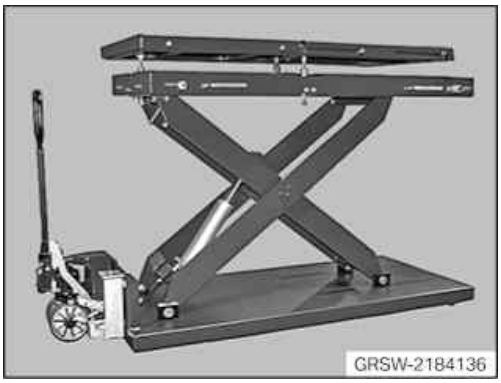
Common Used in step 41

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 47

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

Replacement tools:

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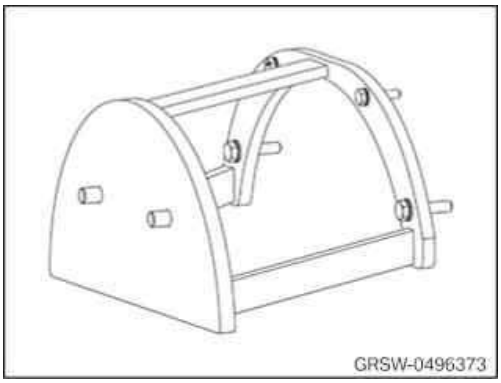
2 299 563 Adapter

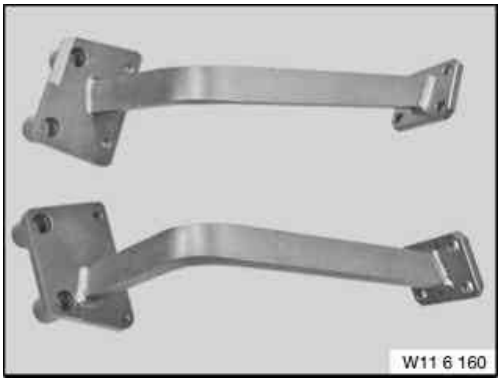
Common	Used in step 9
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 373 (11 5 420) Plate



Common	Used in step 9
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 9
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 30
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 48
EGR controller	7 48

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	29

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 54

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11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
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11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
31 10 001 Completely removing and installing front axle with engine and transmission	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
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11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Removing and installing the engine (manual gearbox)	1 54
11 00 050 Remove and install engine (Automatic)	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
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11 00 050 Removing and installing engine	1 54

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11 00 050 Removing and installing engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine \PREMIUM	1 54
11 00 050 Removing and installing/replacing engine (N63)	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine (Automatic)	1 54
11 00 050 Remove and install engine (Automatic)	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine (Automatic)	1 54
11 00 050 Remove and install engine (Automatic)	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 54
11 00 050 Remove and install engine	1 54
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21 29
61 35 ... Notes on ESD protection (Electro Static Discharge)	29

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	36
Exhaust-gas recirculation cooler seal on exhaust manifold	48
Exhaust-gas recirculation cooler seal on intake plenum	48

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This documentation refers to special tools that were not yet available when going to press.

11 31 091 Removing and installing/replacing the hydraulic chain tensioner

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

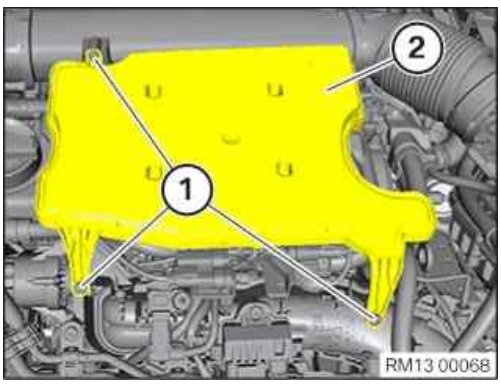
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

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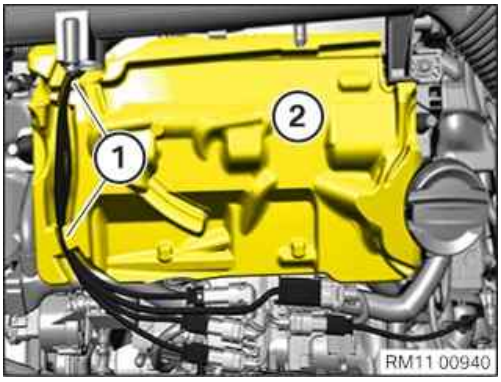
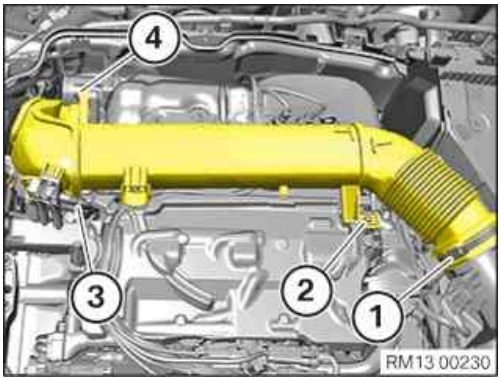
4 – Remove the acoustic cover for the injectors

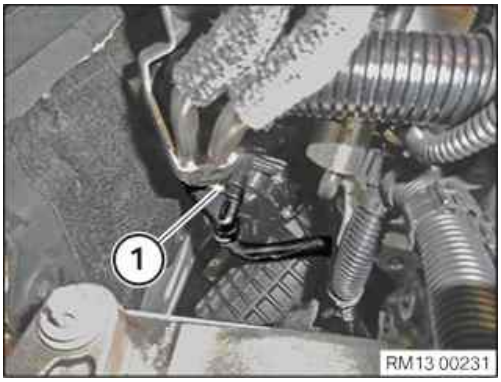


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

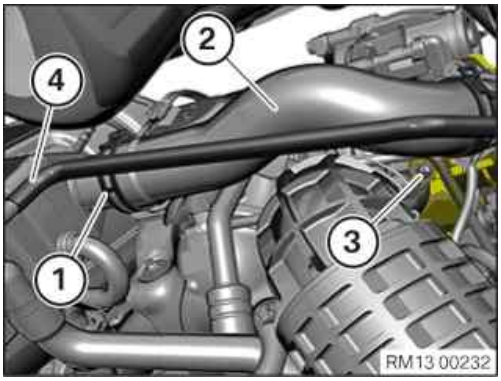
5 – Removing clean air pipe



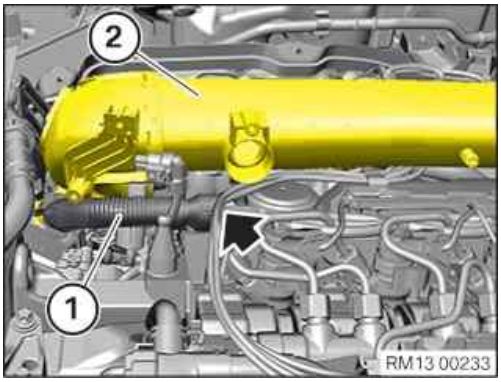
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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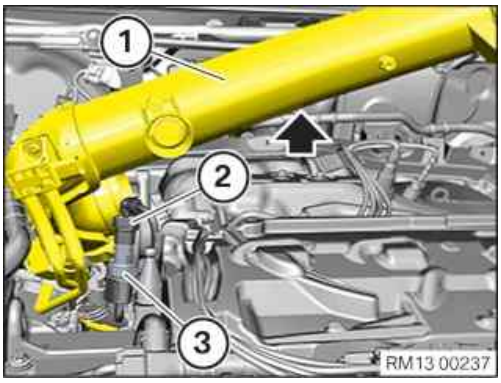


- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

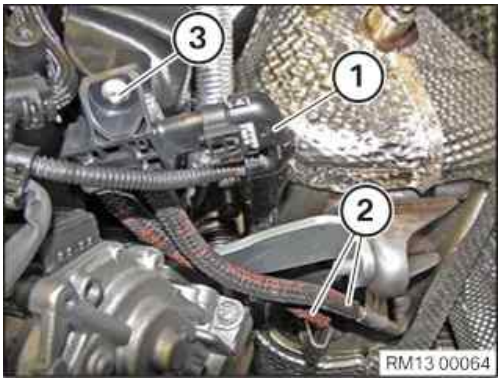
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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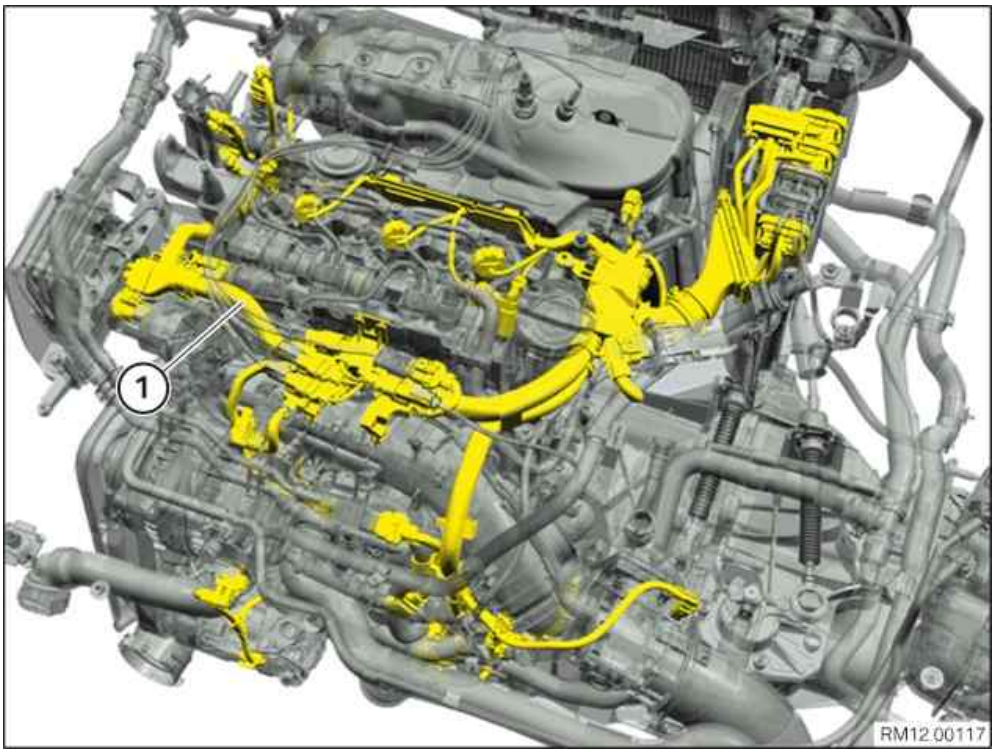
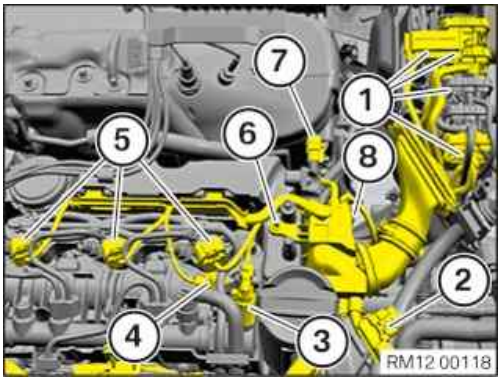
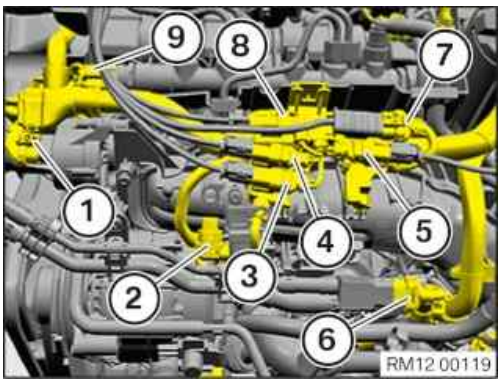
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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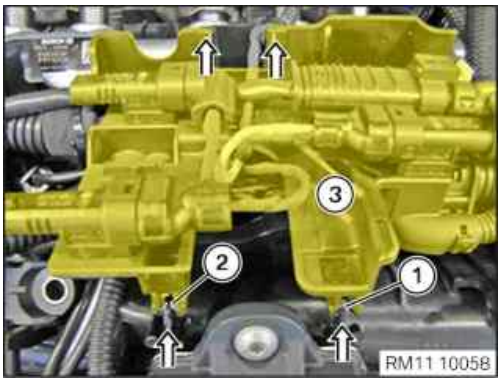
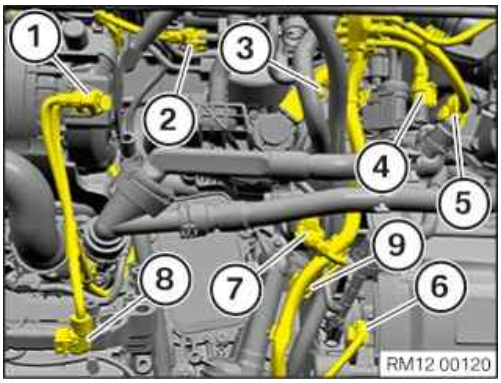
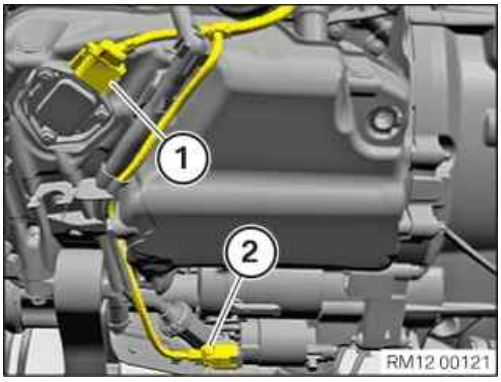


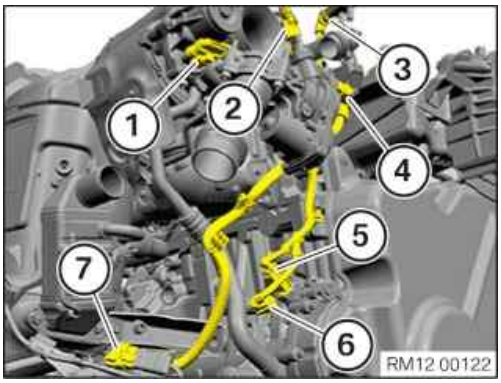
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



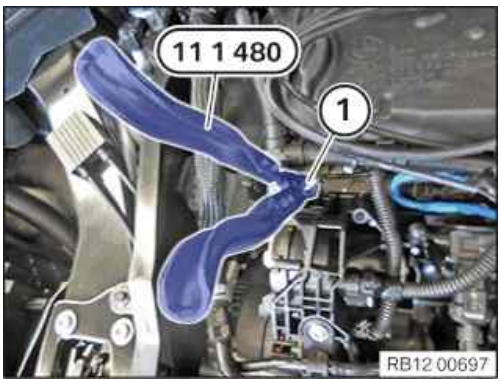
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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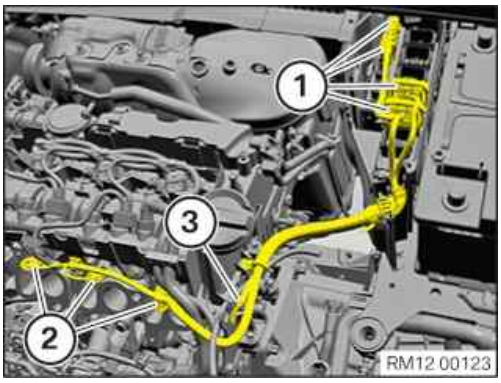


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

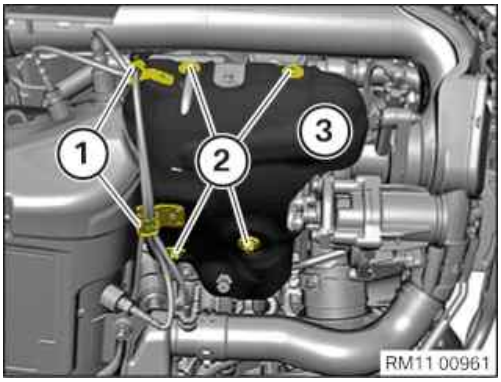
▶ Removing heat shield from top exhaust turbocharger

WARNING

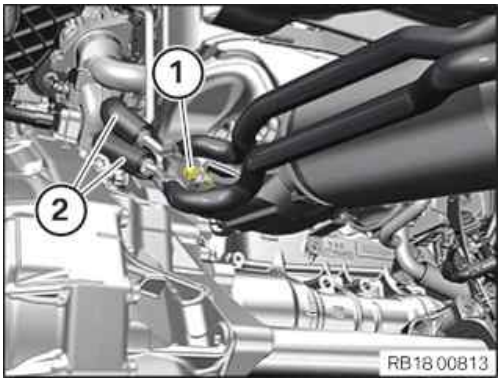
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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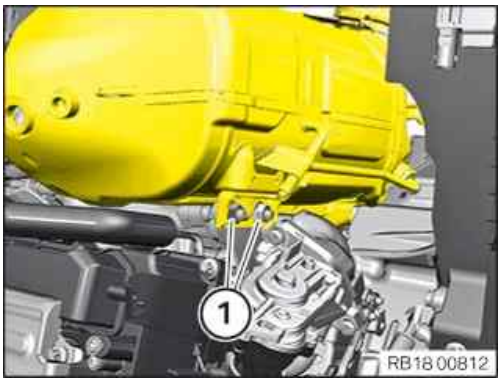
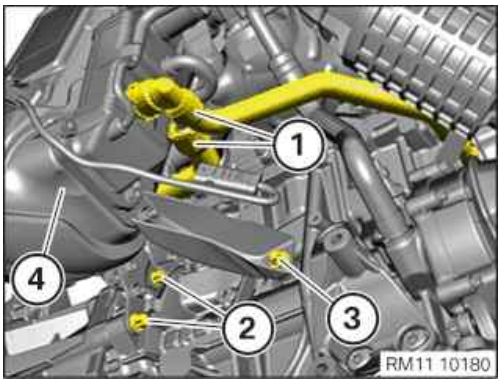


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

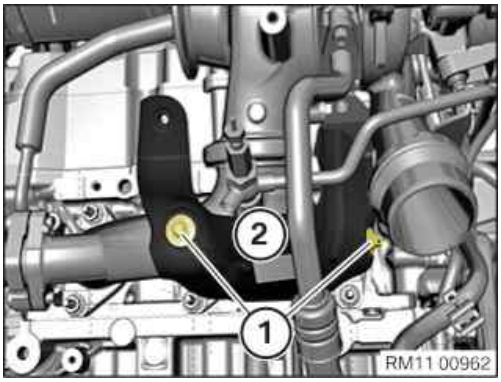
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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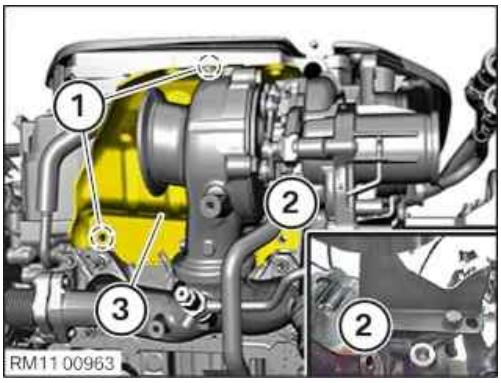


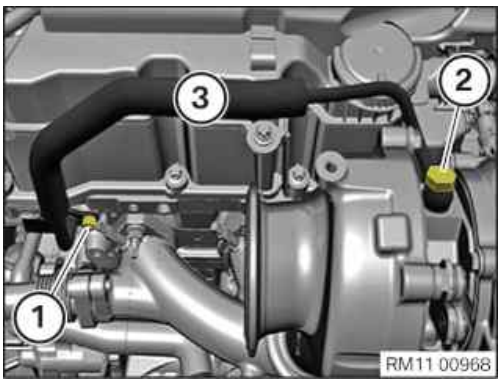
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

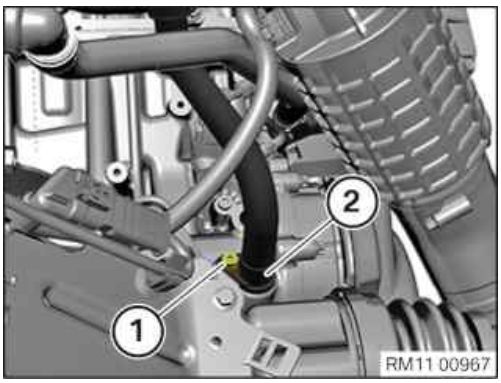
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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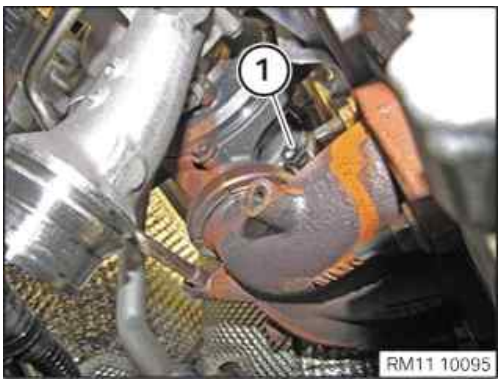
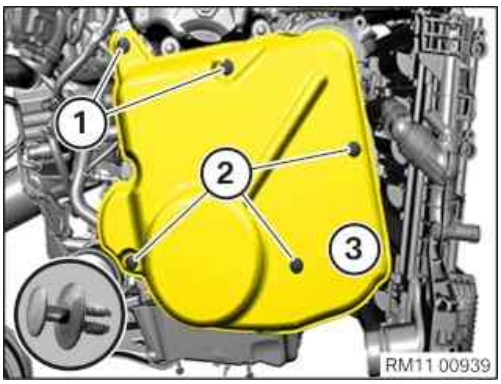
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

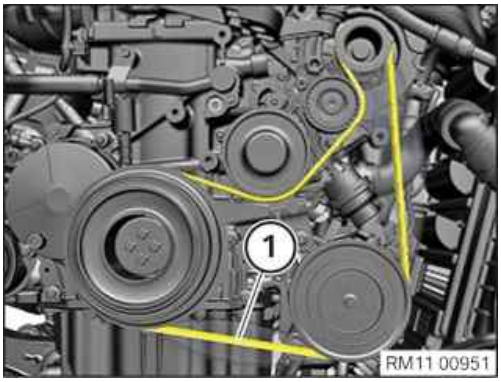
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

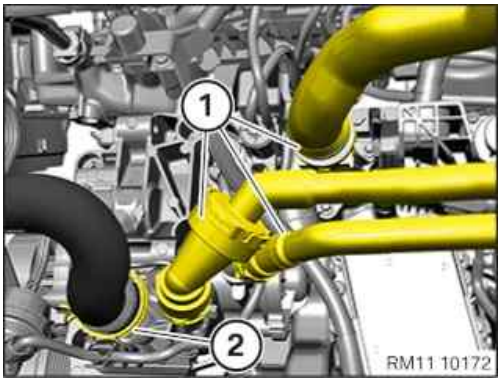
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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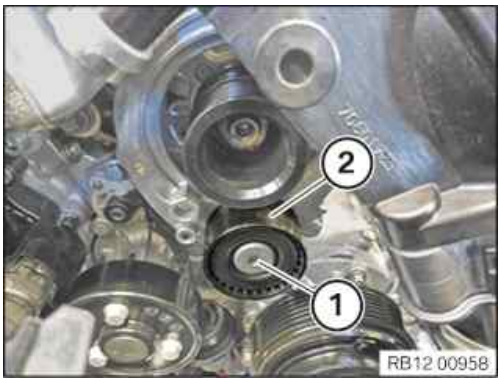
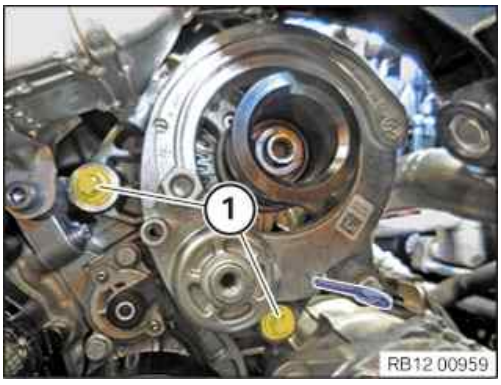
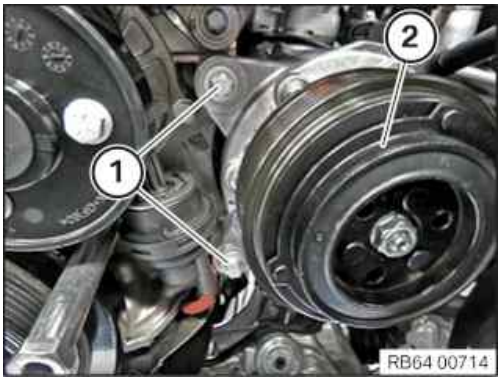


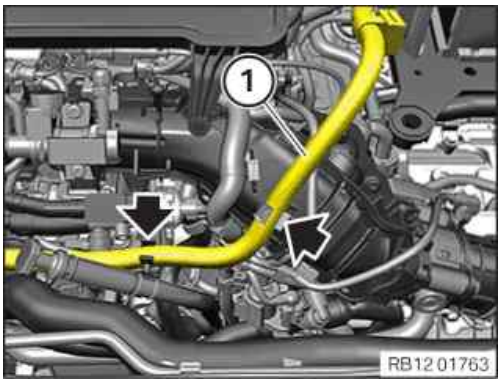
- Loosen screw (1).
- Remove the deflecting element (2).



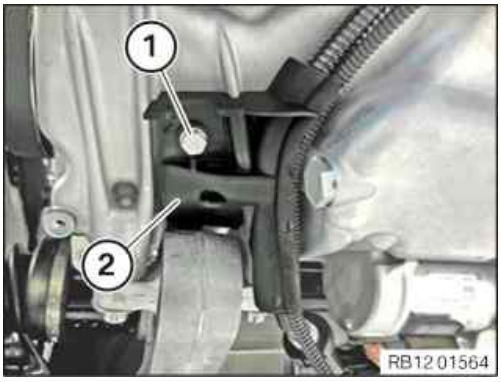
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

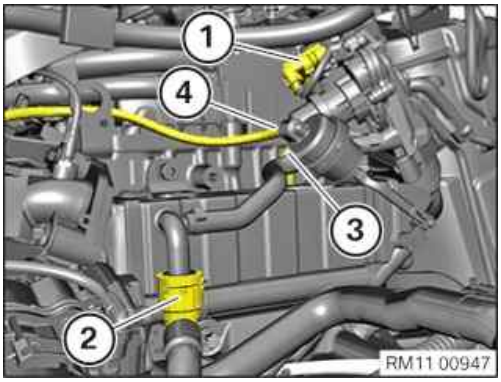
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

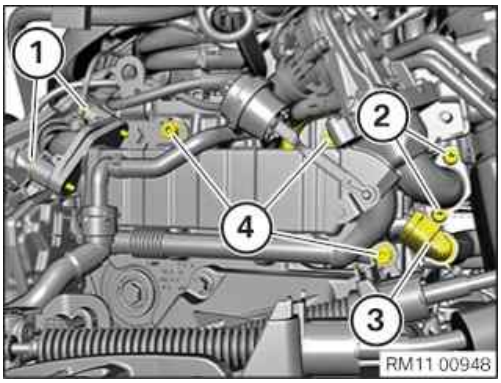
- Perform all work only on components that have cooled down.



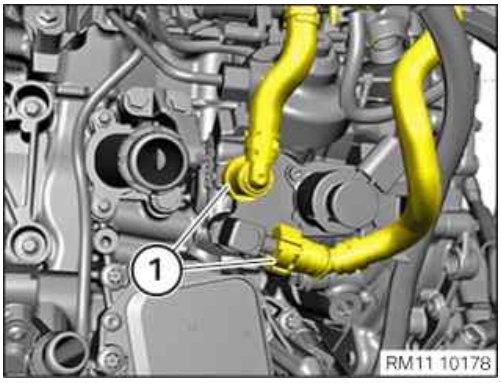
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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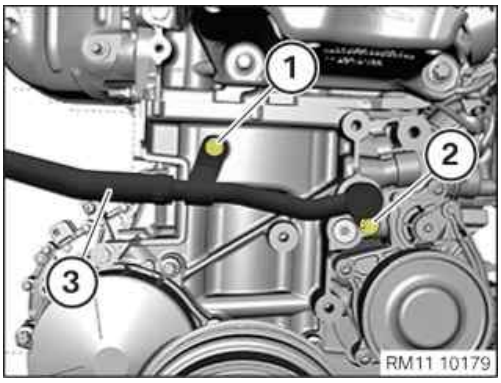


- Loosen screws (1) and (2).
- Remove coolant line (3).

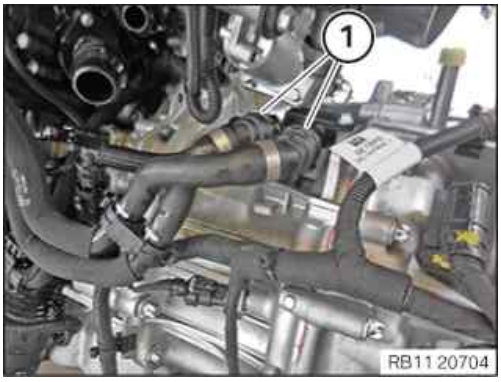
8 – Disconnect the engine from the double-clutch transmission (DKG)

RISK OF DAMAGE

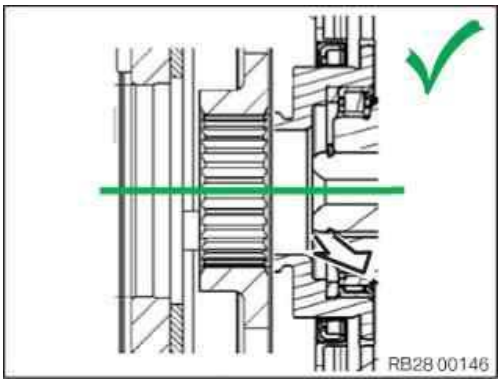
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

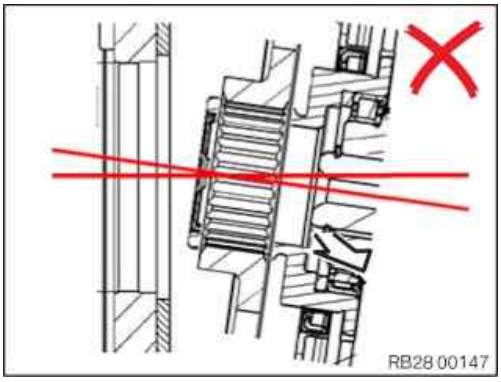
- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.



- Unlock and release coolant line (1).
- Catch and dispose of escaping coolant.



- **Correct:** Pull the double-clutch transmission (DKG) horizontally off the flywheel.



- **Wrong:** Do not pull the double-clutch transmission (DKG) off the flywheel if it is tilted.

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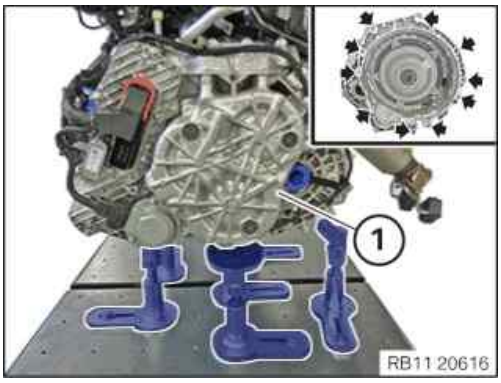
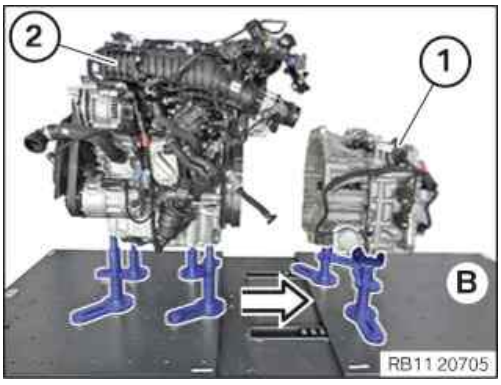


- Remove screws (arrows).
- Pull the double-clutch transmission (DKG) (1) off the flywheel when it is **absolutely** horizontal.



NOTICE

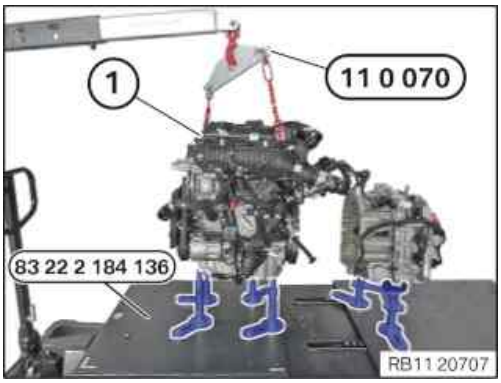
Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table top (B) in the direction of arrow and disconnect double-clutch transmission (DKG) (1) from the engine (2).

- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach the engine lifter with the special tool **0 490 579 (11 0 070)** and lift the engine (1) off the lifting table.

9 – Mount engine on assembly stand

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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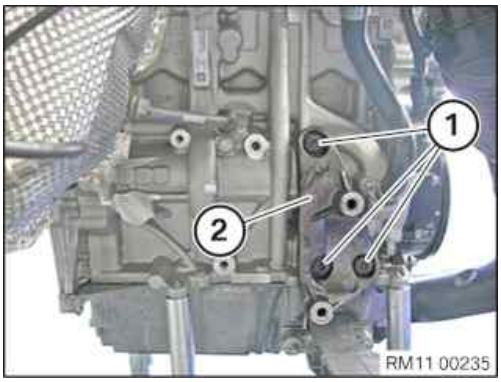
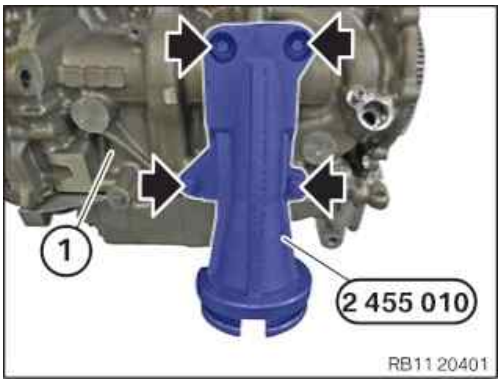


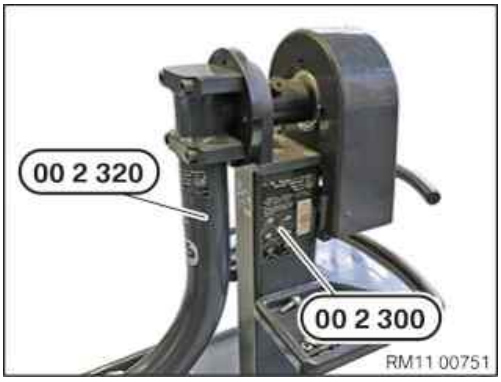
- Loosen screws (1).
- Guide out and remove holder (2).



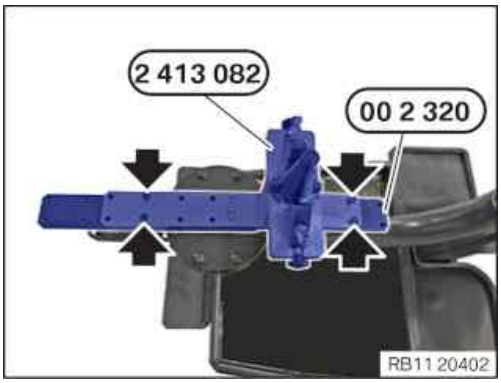
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.

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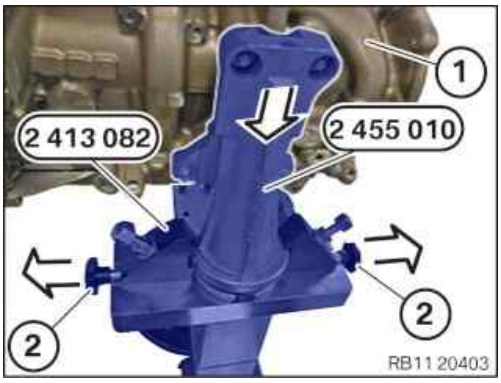
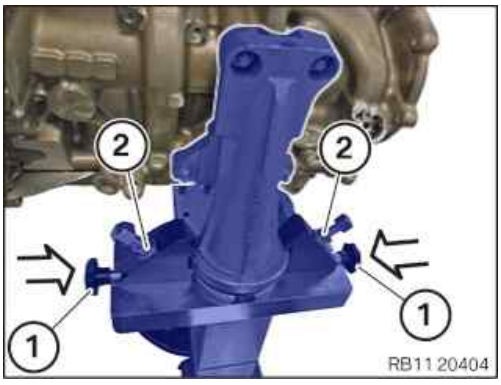


- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



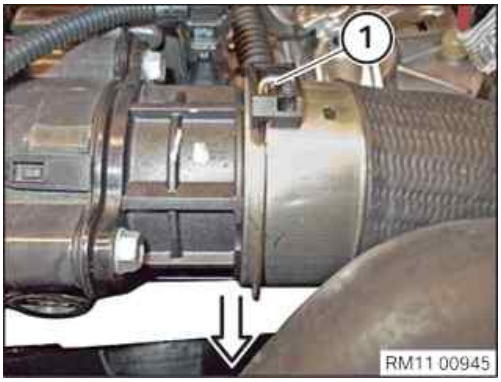
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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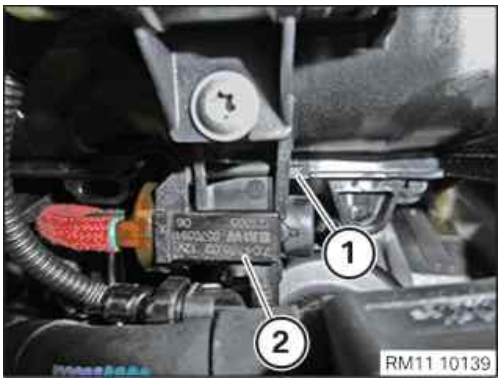
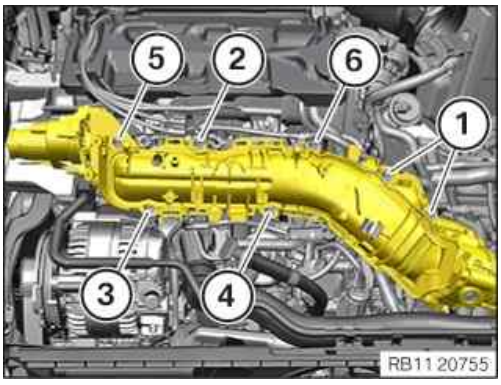
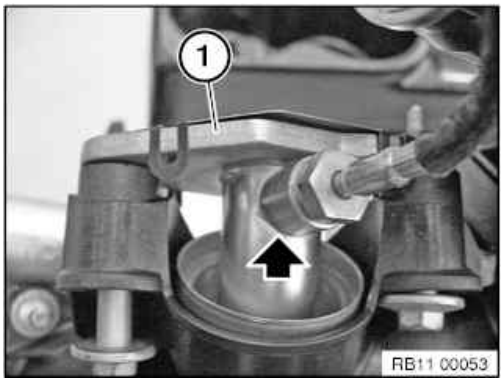


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

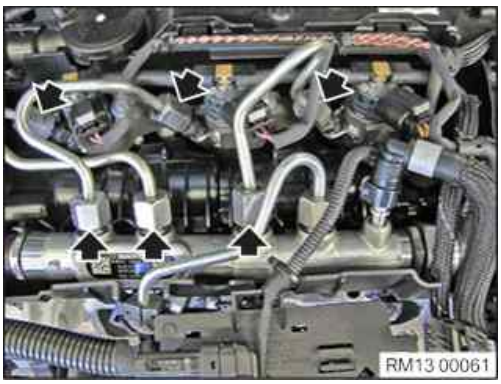
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

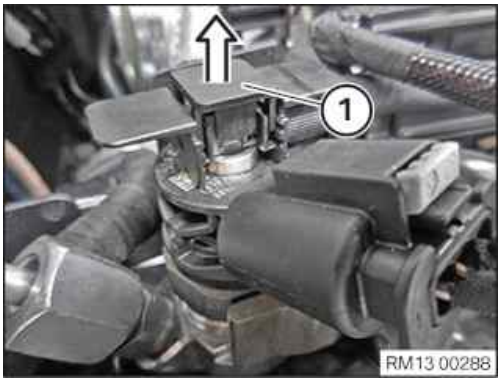
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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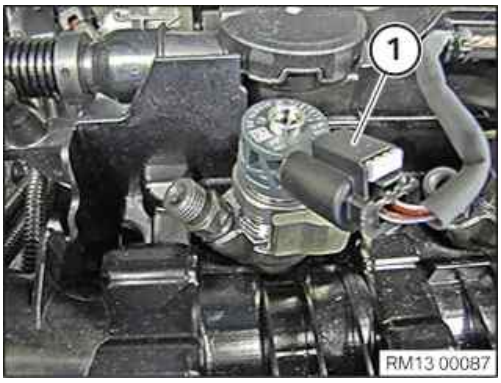
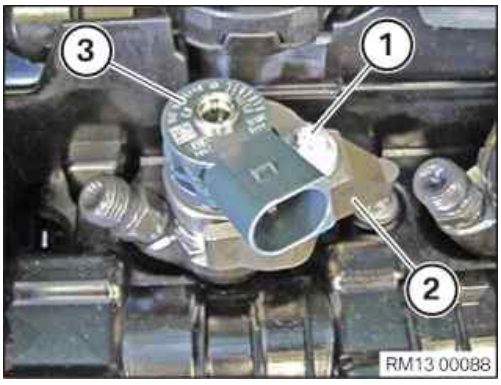


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

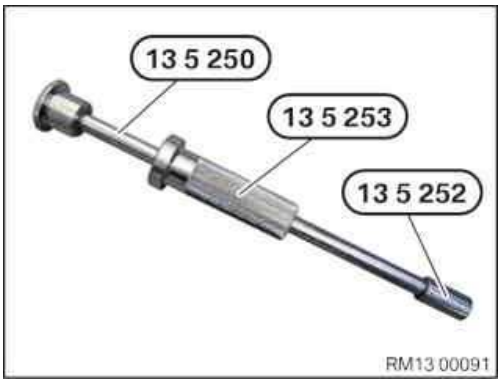
▶ **Loosen stuck injectors**

RISK OF DAMAGE

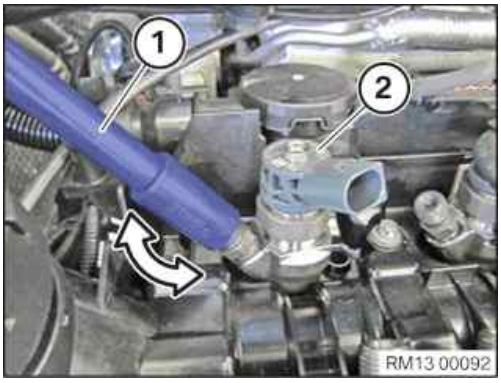
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

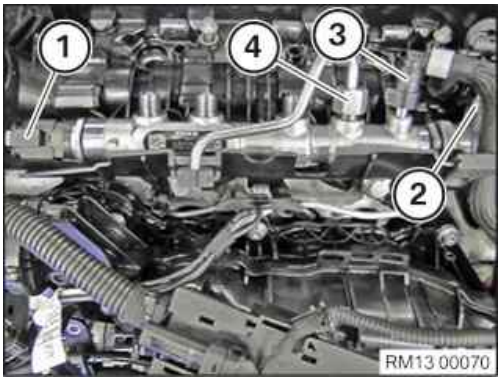
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

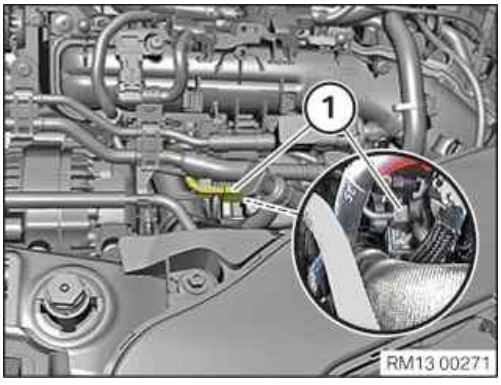
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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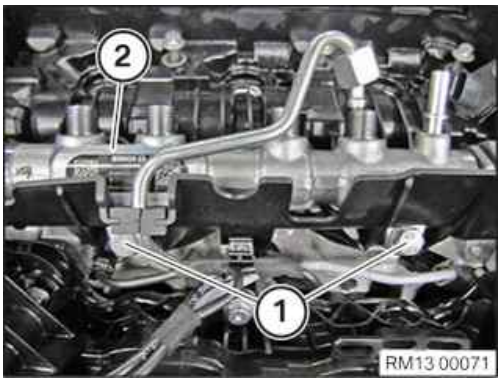
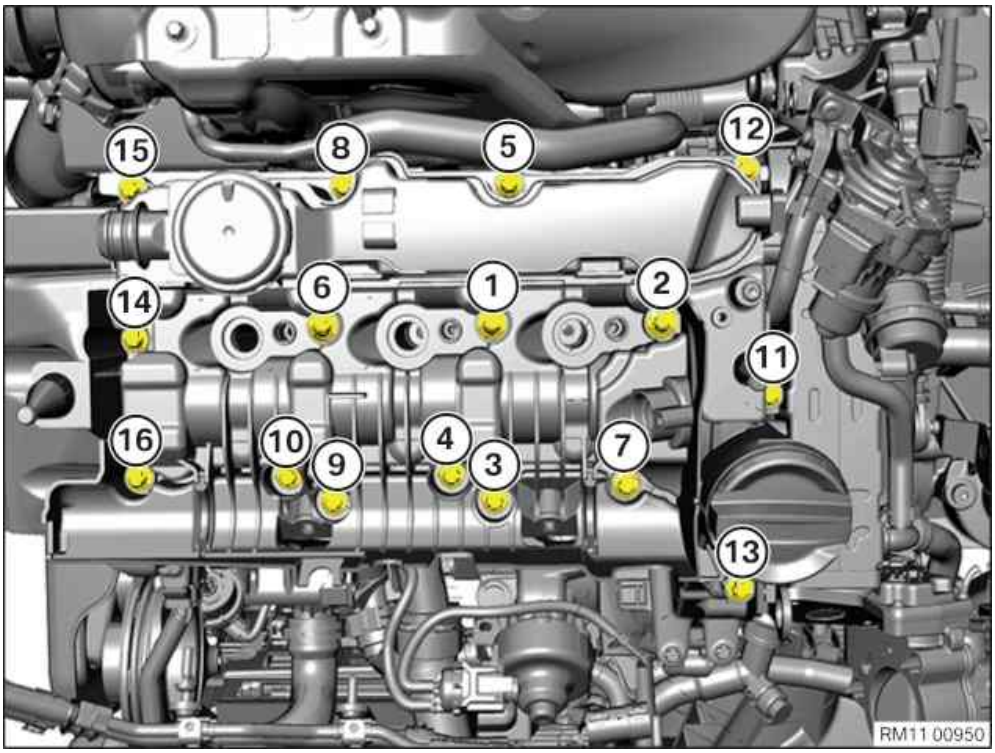


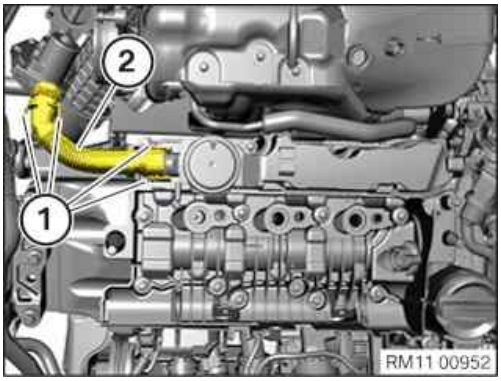
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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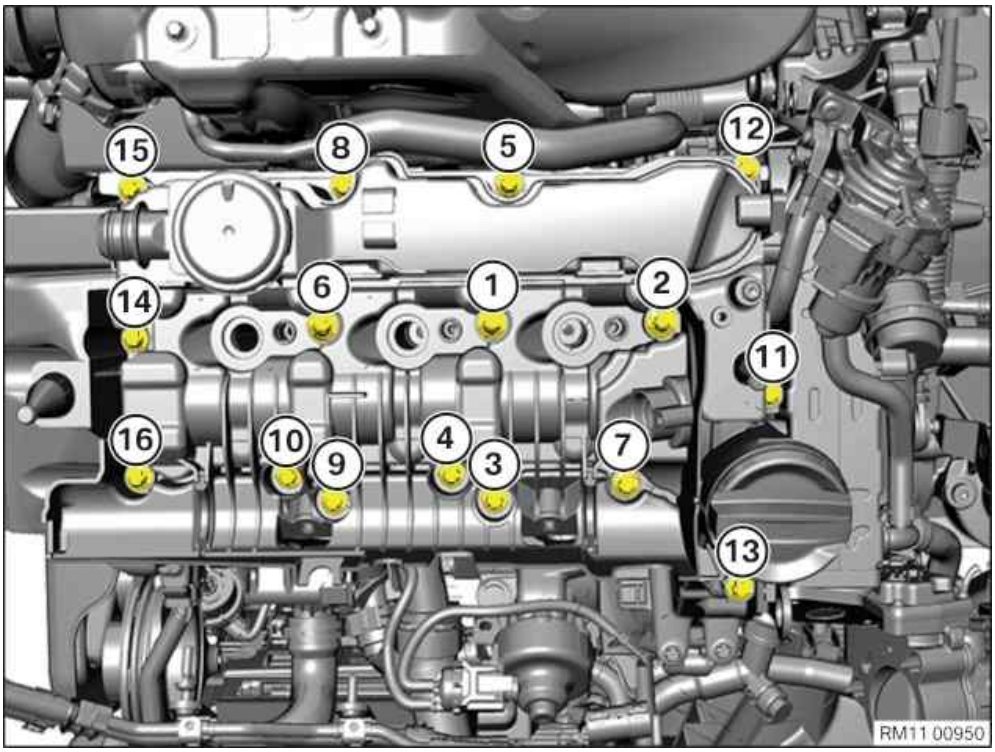

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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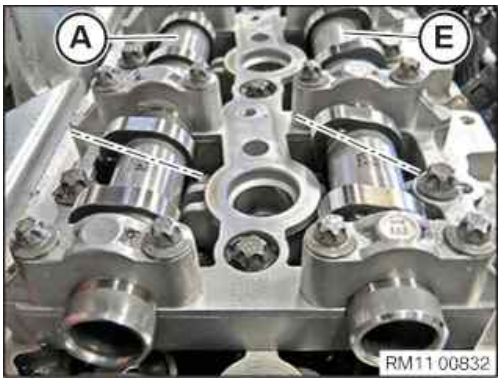
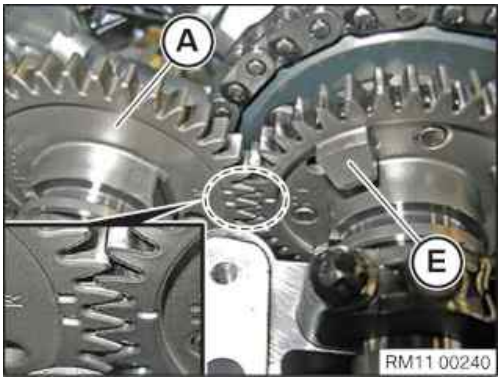


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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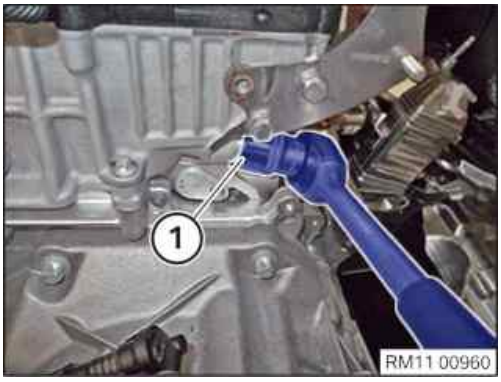
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

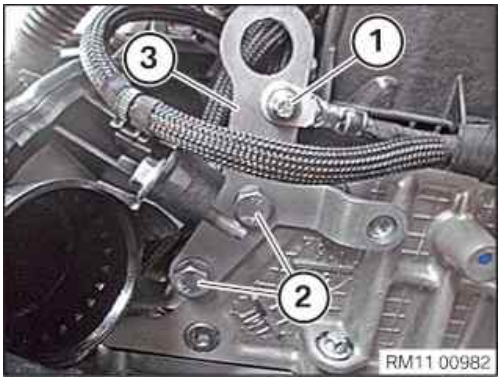


TECHNICAL INFORMATION

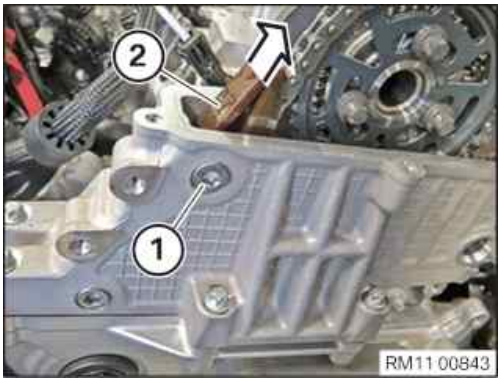
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

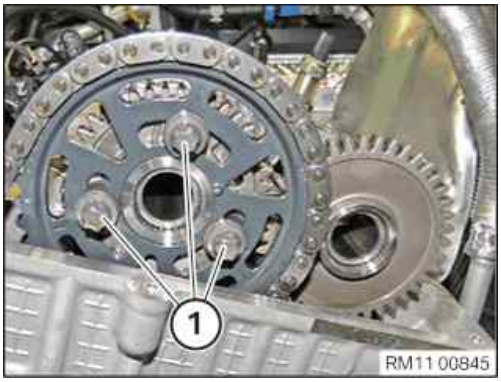


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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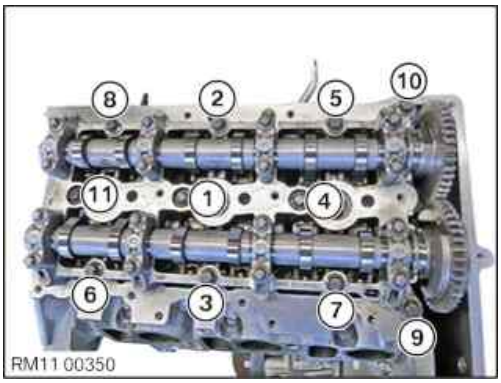
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

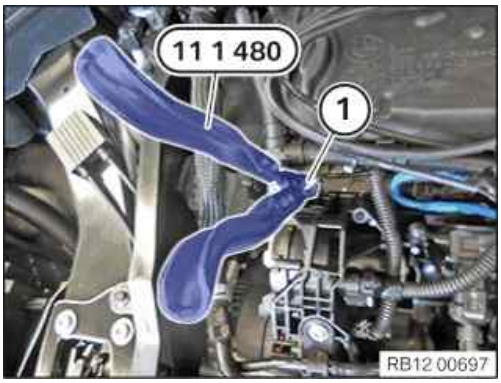
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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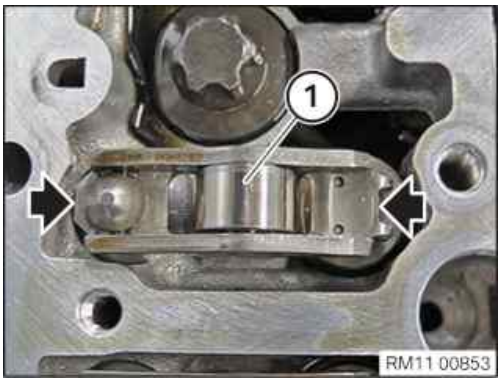


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

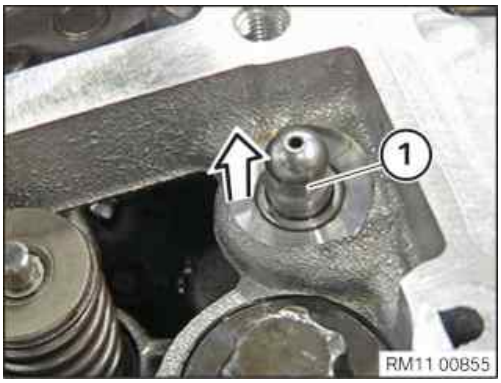
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

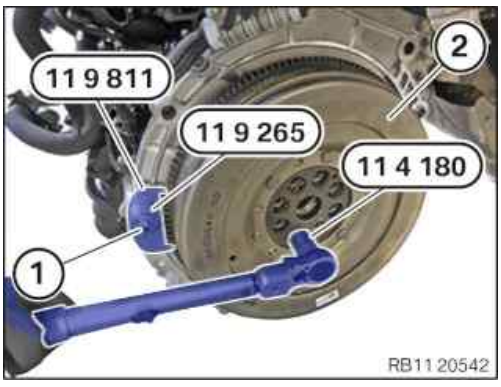
24 – Remove flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Position special tool **0 496 171 (11 9 811)** with a **standard** 5 mm thick washer between the crankcase and the flywheel.

  The 5 mm thick washer must be mounted between the crankcase and special tool **0 496 171 (11 9 811)** .
- Secure the special tool **0 494 793 (11 9 265)** with the transmission bolt (1).
- Protect the flywheel (2) from falling.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Guide out the flywheel (2) and remove.

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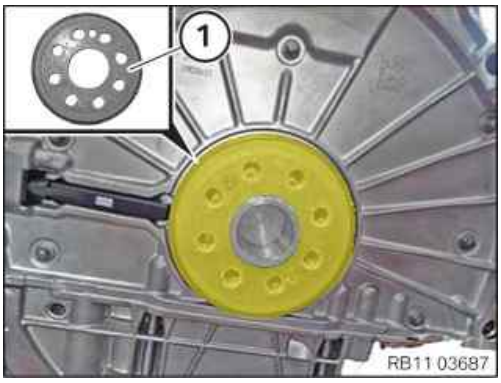


RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

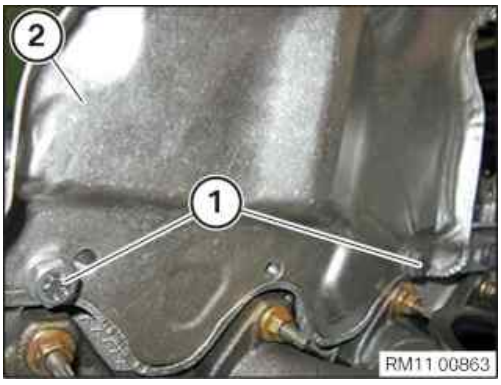
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove increment wheel (1) from the crankshaft and set it aside properly.

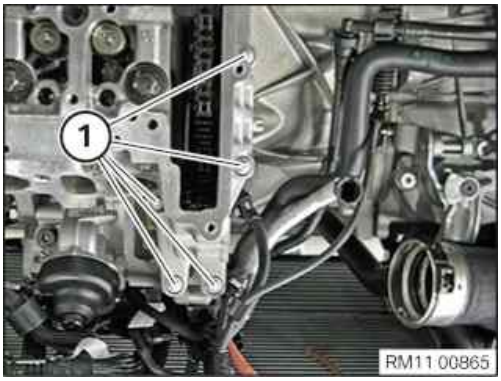
25 – Remove rear timing case cover

Prerequisite

Transmission is removed.



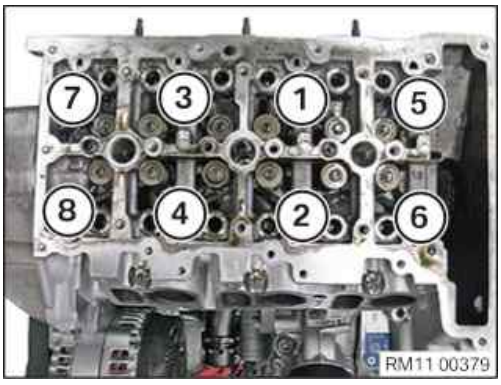
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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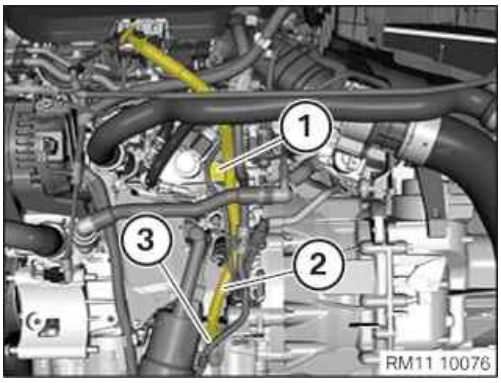
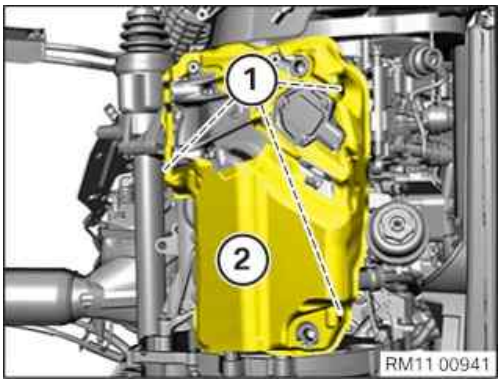
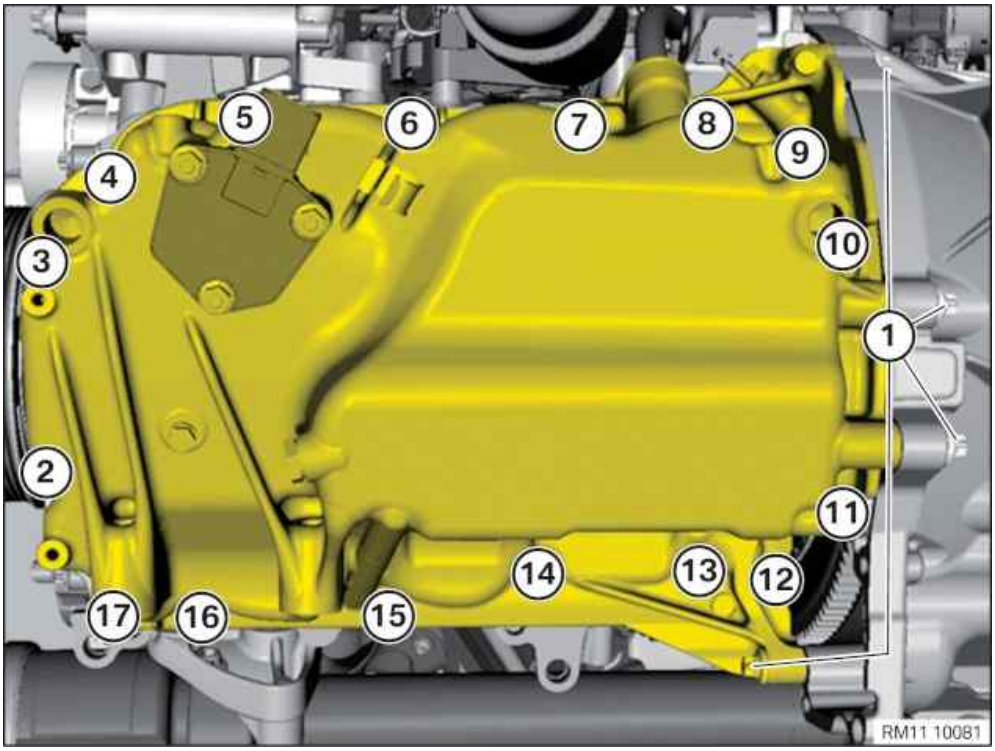


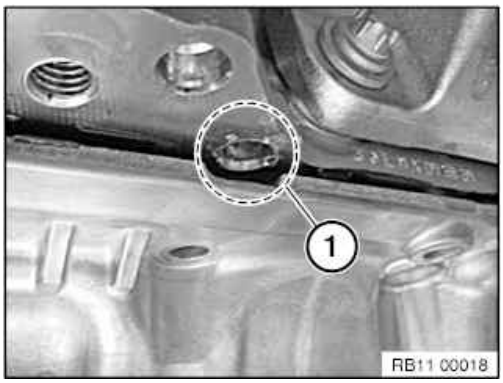
- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- If required, remove sealing ring (3) from oil sump.



- Remove the expanding rivet (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).



- Tighten the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release oil sump only in area (1).

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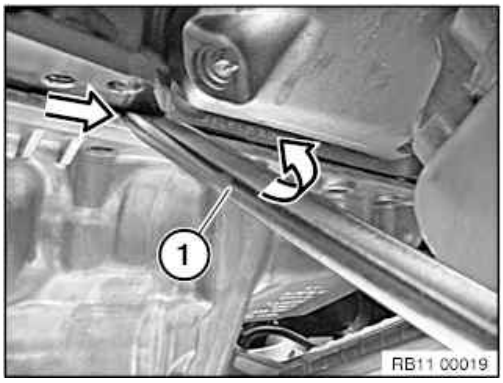
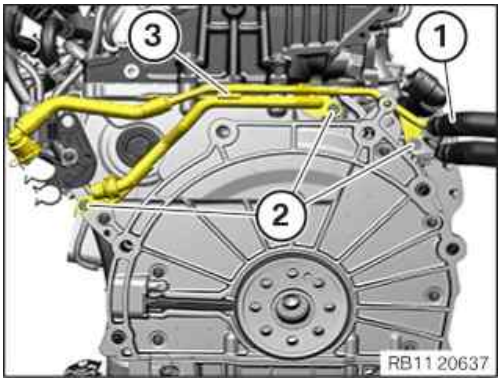
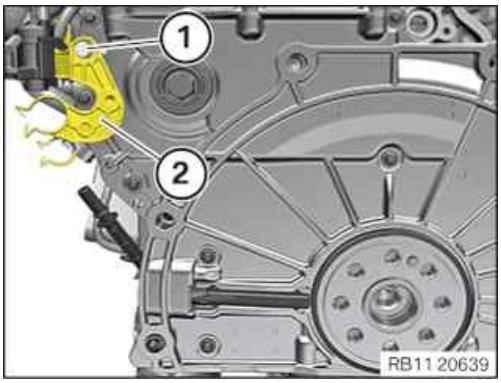


- Release the oil sump using a suitable mounting lever (1) carefully at the position intended for that.
- If required, secure the oil sump against falling.

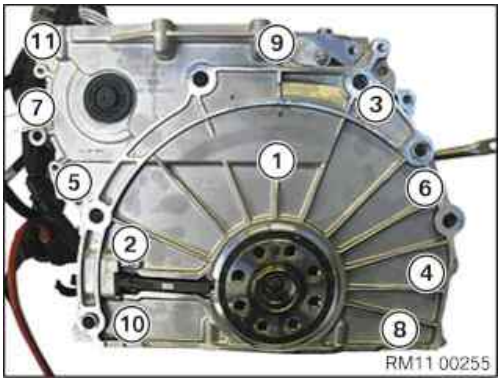
► **If installed: Remove coolant line of the SCR metering module**



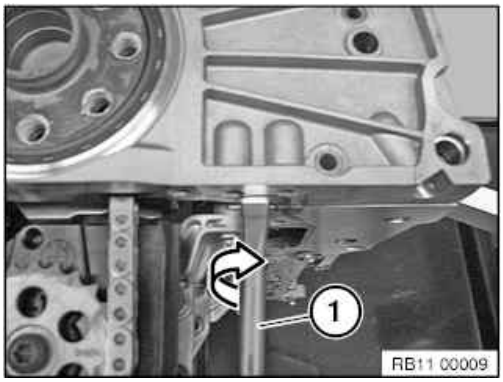
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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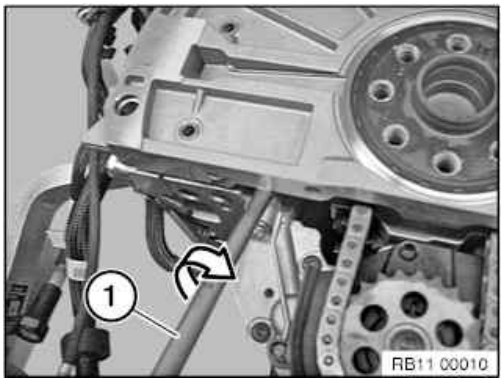


- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

MAIN WORK

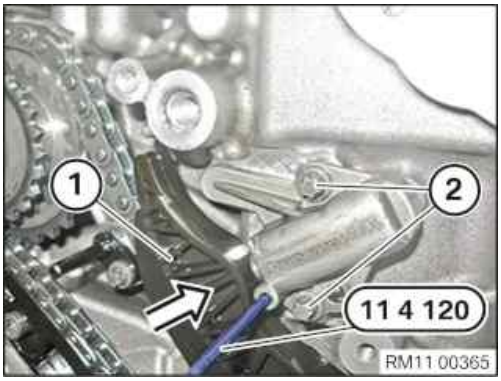
26 – Removing the hydraulic chain tensioner for the bottom timing chain

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.



- Press the hydraulic chain tensioner with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove hydraulic chain tensioner.

27 – Installing the hydraulic chain tensioner for the bottom timing chain

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

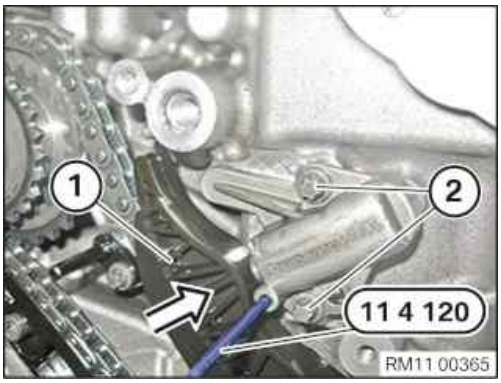
Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

- Clean sealing surfaces (1) with compressed air.



- Install the hydraulic chain tensioner.
- Tighten down screws (2).

Hydraulic chain tensioner to crankcase

M6x22		Tightening torque	9 Nm

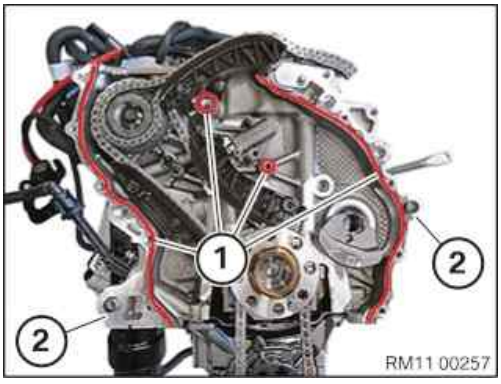
- Press the hydraulic chain tensioner with tensioning rail (1) in the direction of the arrow and remove the special tool **0 491 012 (11 4 120)**.

POSTPROCESSES

28 – Install the rear timing case cover

Prerequisite

Transmission is removed.



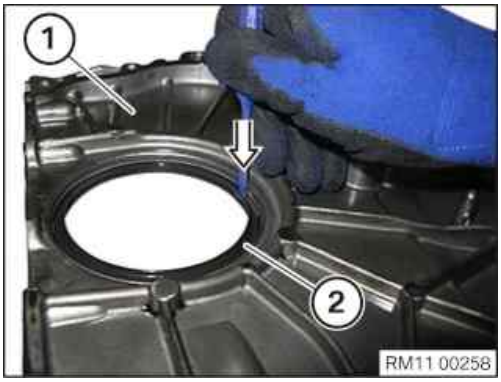
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.

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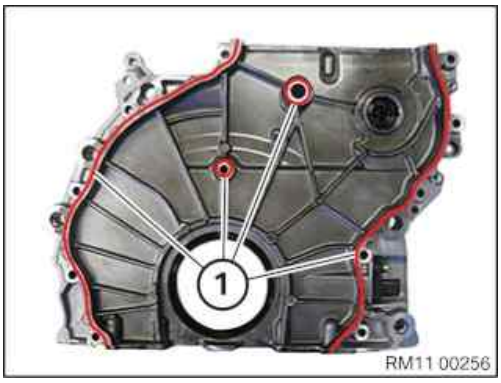
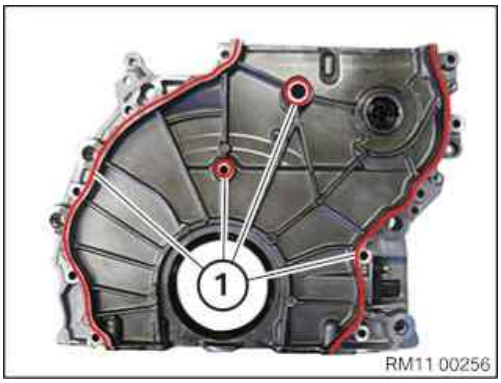


- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

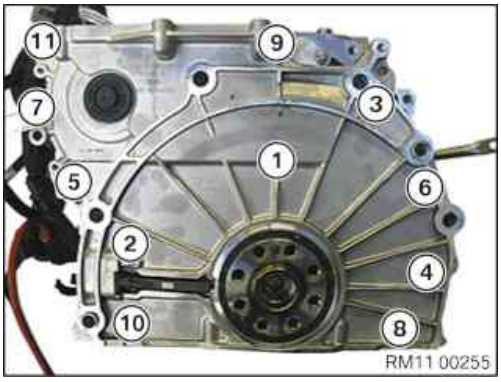


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

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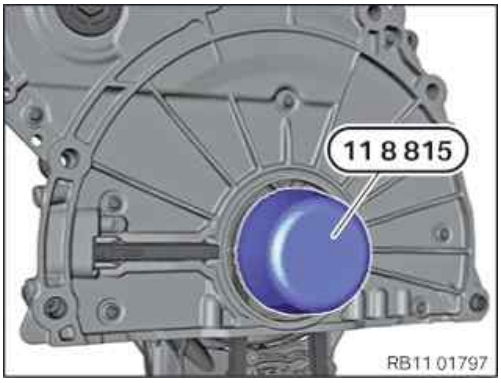
RISK OF DAMAGE

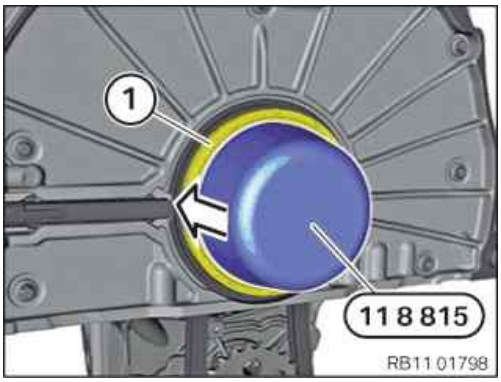
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

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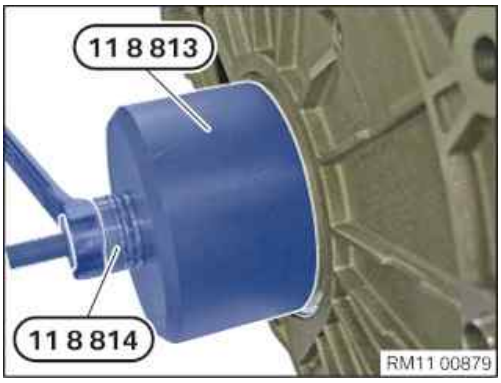
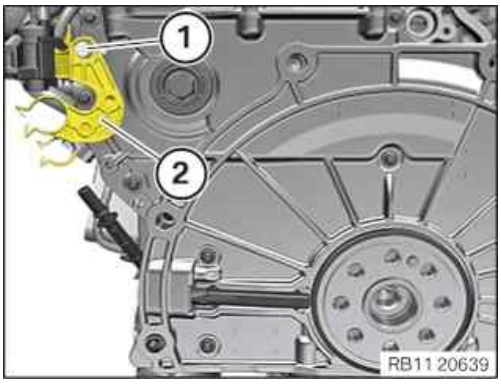
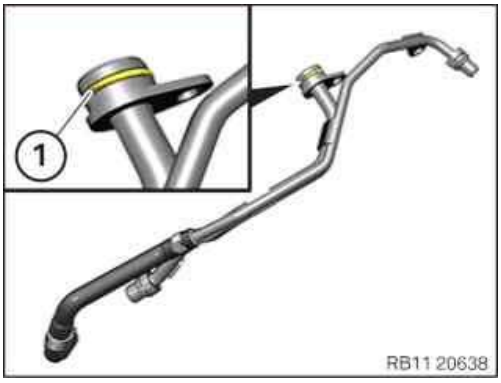


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



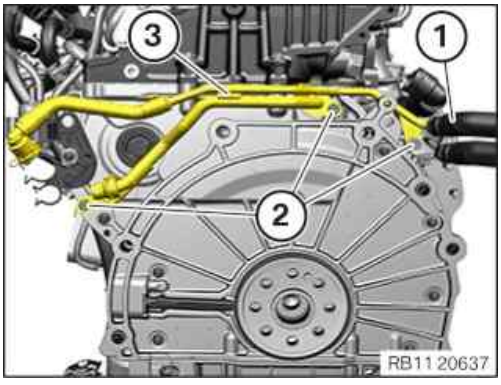
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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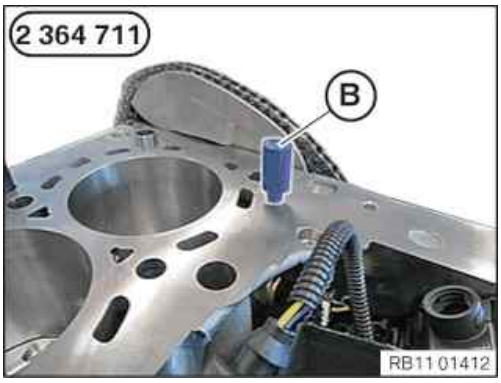


- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

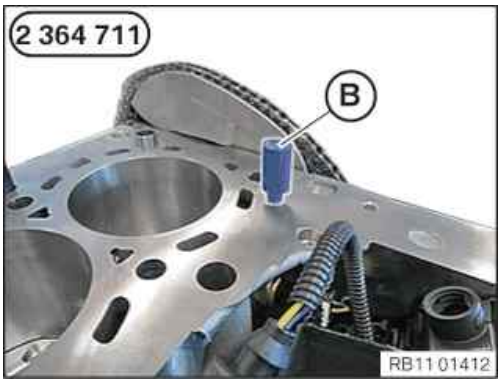
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

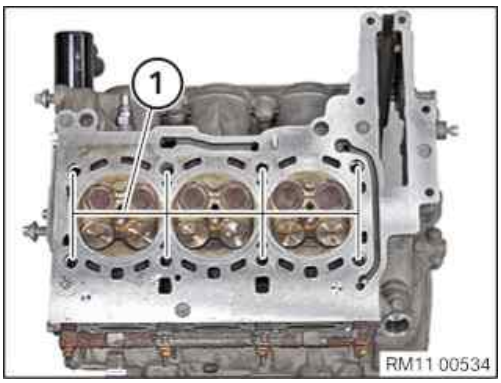
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ Renewing the cylinder head gasket



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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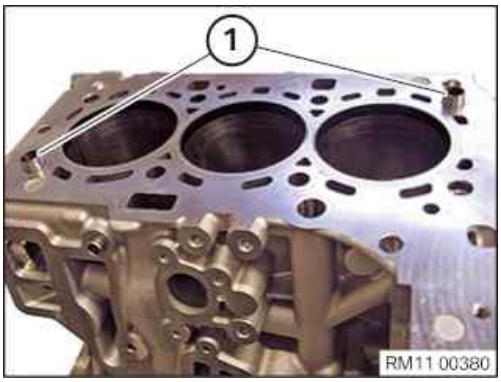
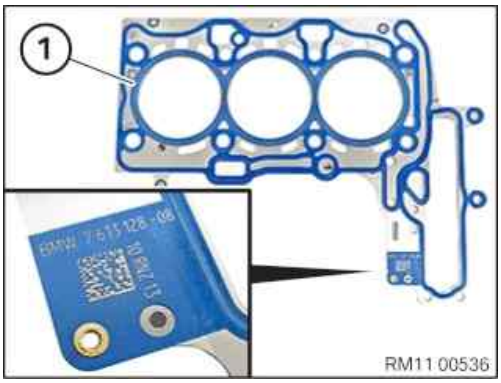
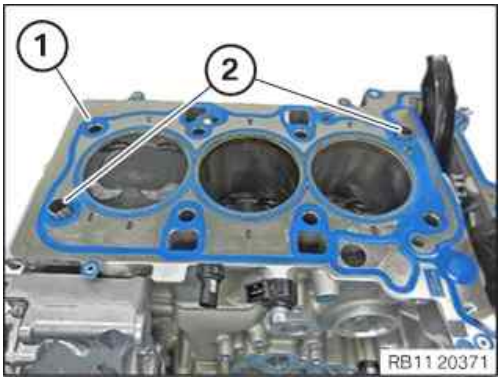


- Check the fitting sleeves (1) for secure fit and damage.

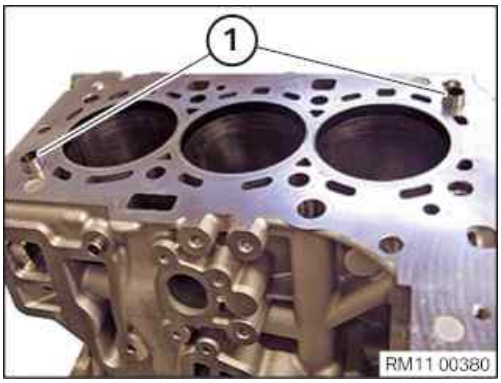


- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.

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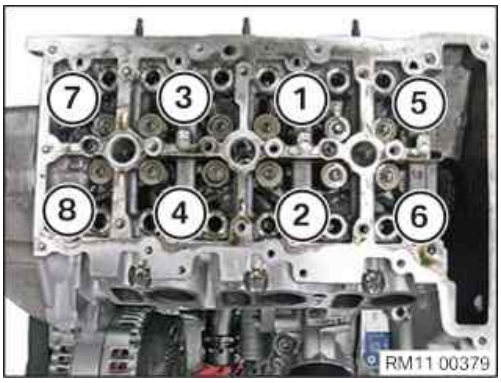


- Fit new cylinder head screws.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

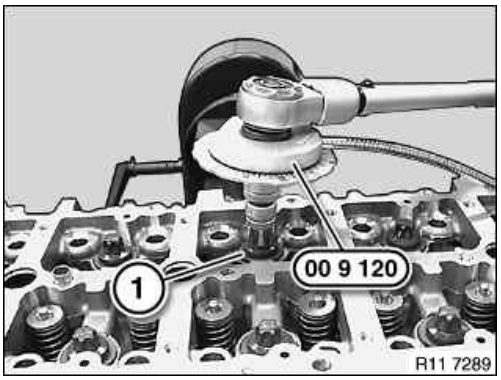
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

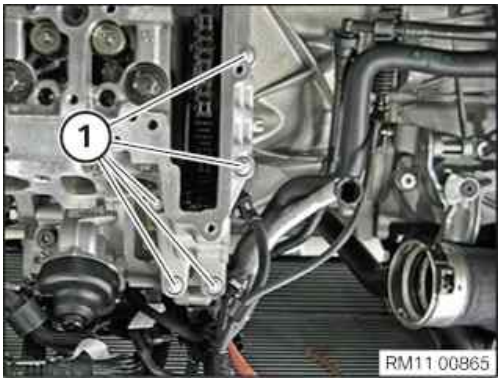
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolts in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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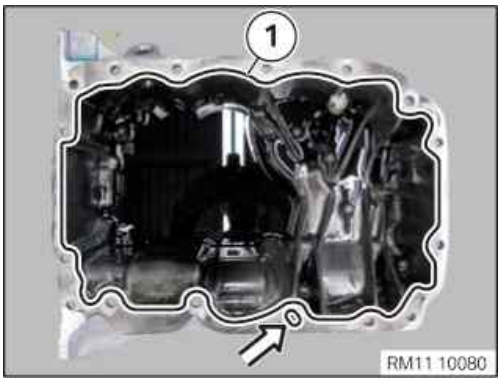


TECHNICAL INFORMATION

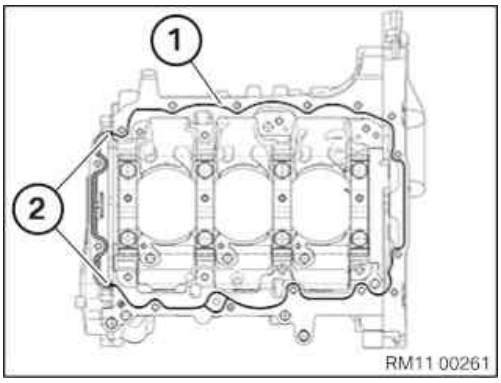
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

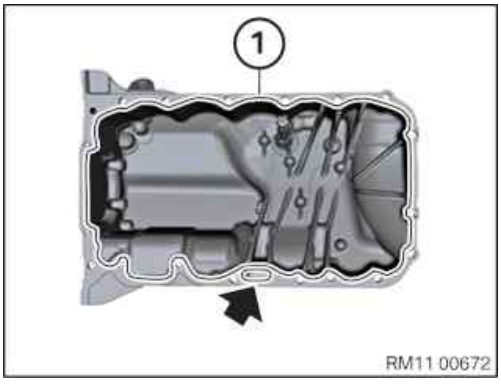
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

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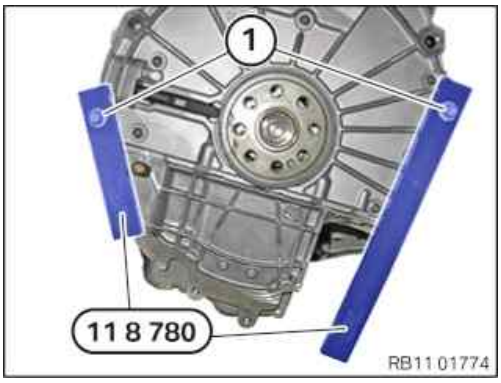
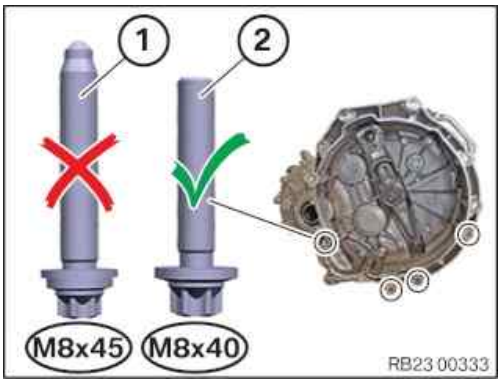


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

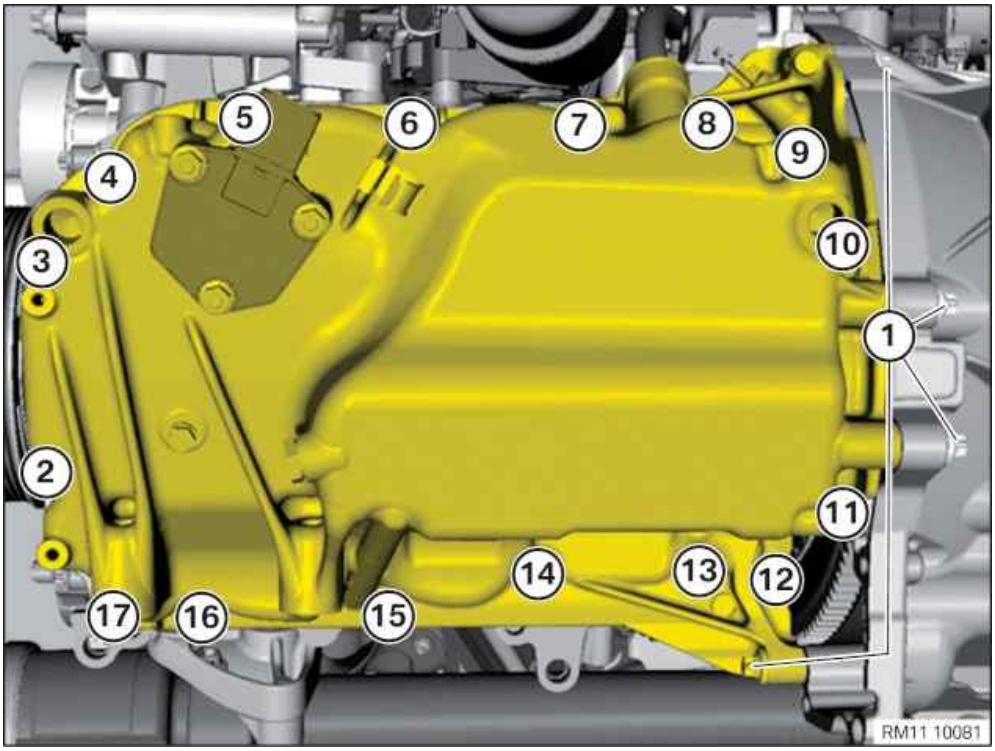
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Hand tighten the screws of oil sump (2) to (17) , but do **not** tighten completely yet.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

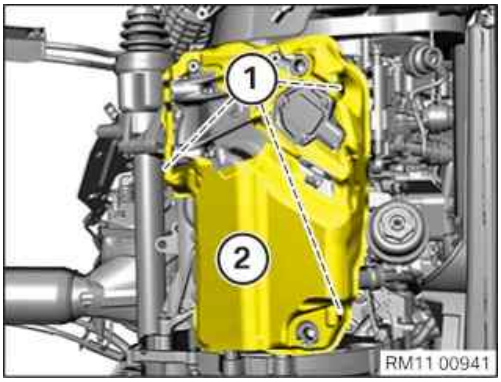
Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

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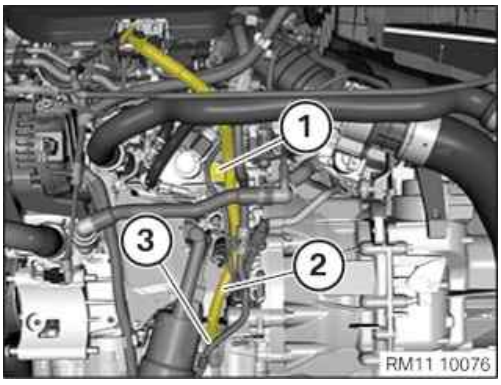
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

29 – Installing the flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all the screw threads (1).

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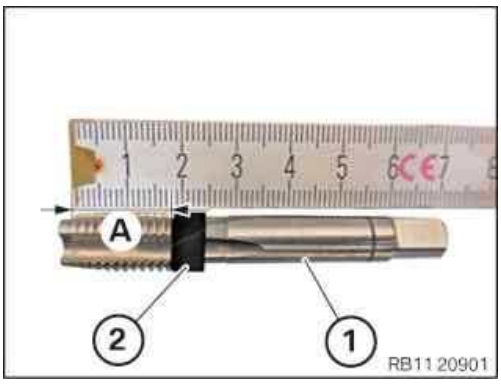
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

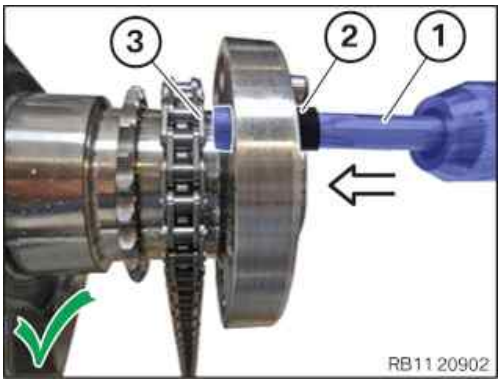
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the depth of insertion (A) on the thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

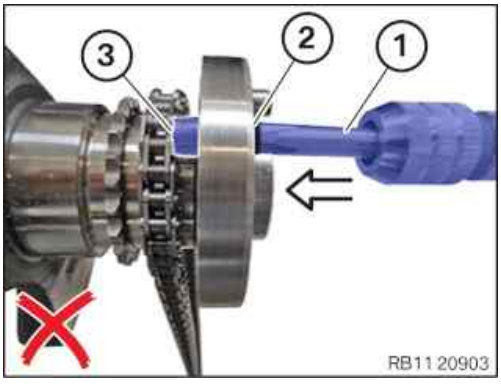
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).



TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the depth of insertion (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).

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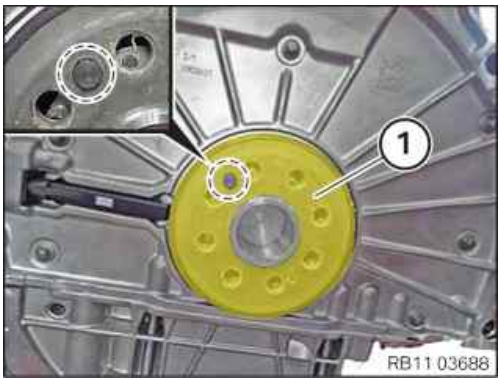
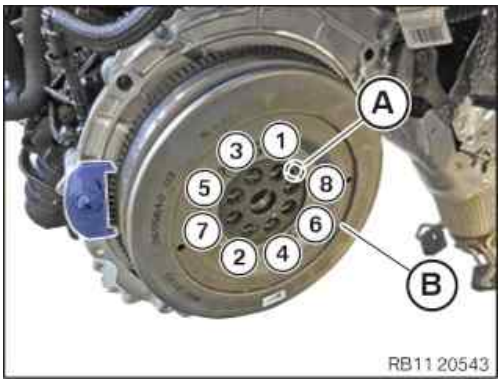


- It is essential to observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

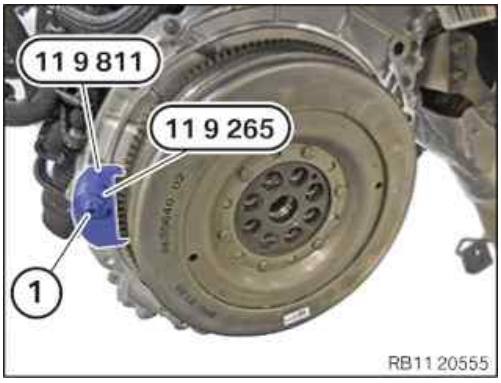


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Thread out special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)** remove.
- Ensure that the washer (5 mm) is removed.

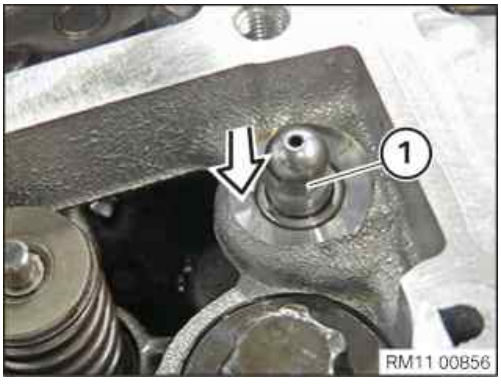
30 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

31 – Install the roller cam followers

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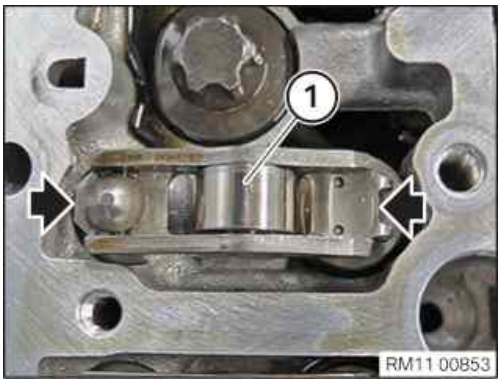
TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

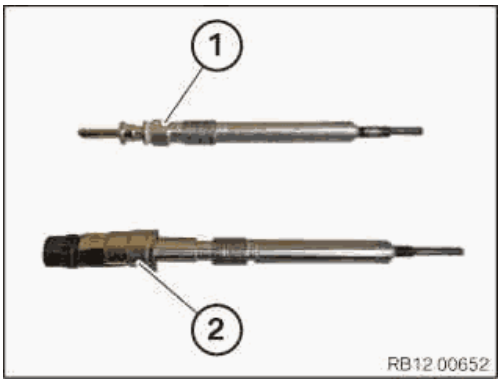


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

32 – Install glow elements

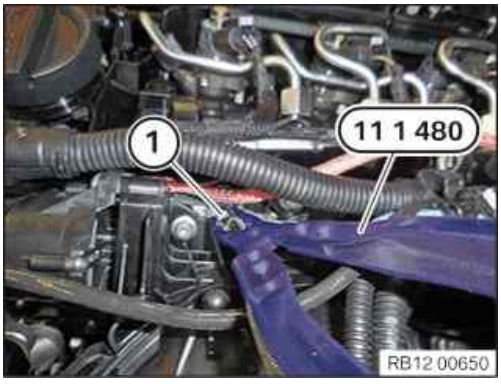


- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

33 – Installing the camshaft support

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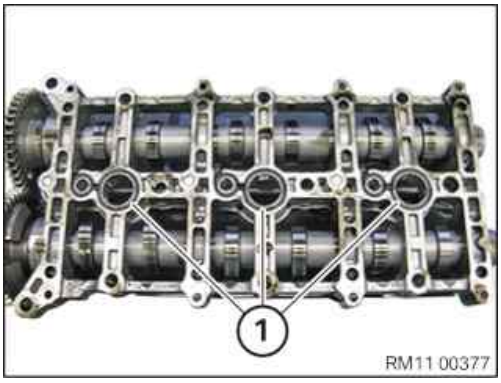
RISK OF DAMAGE

Damage of the engine and mounted parts.

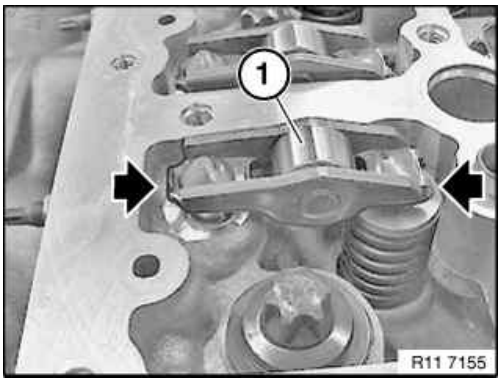
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

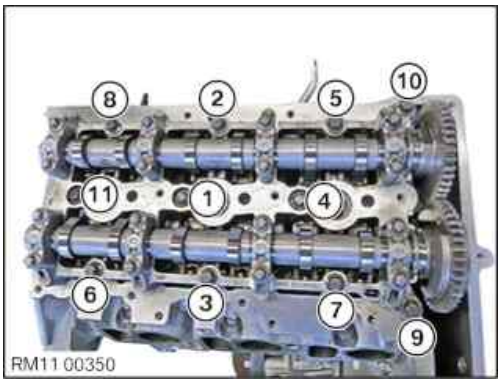


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

34 – Adjusting the timing of the camshafts

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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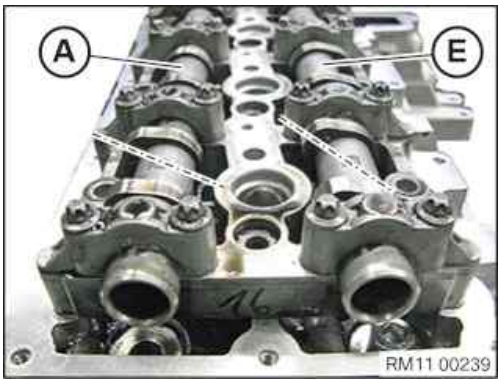
- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

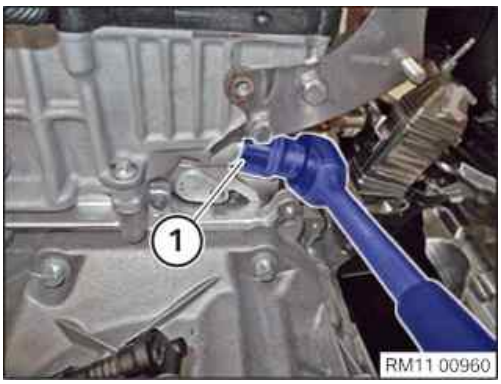
▸ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▸ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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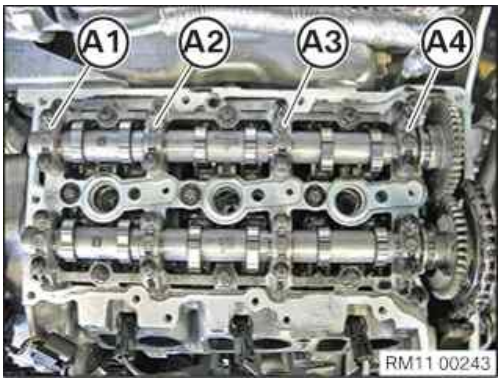
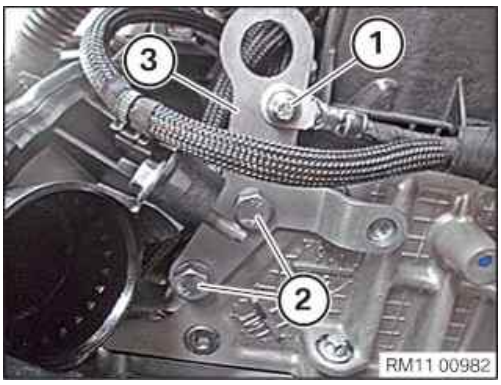


TECHNICAL INFORMATION

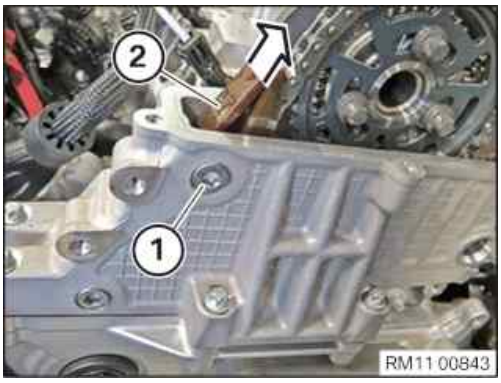
The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▸ **Remove the timing chain guide rail**

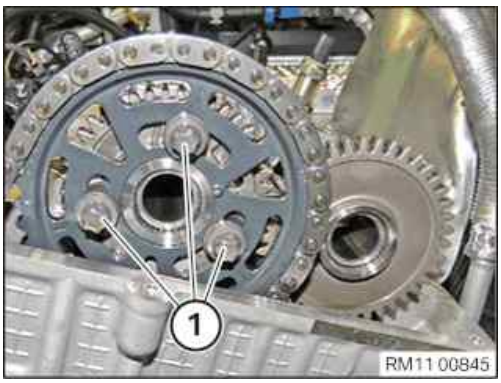


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▸ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▸ **Installing exhaust camshaft**

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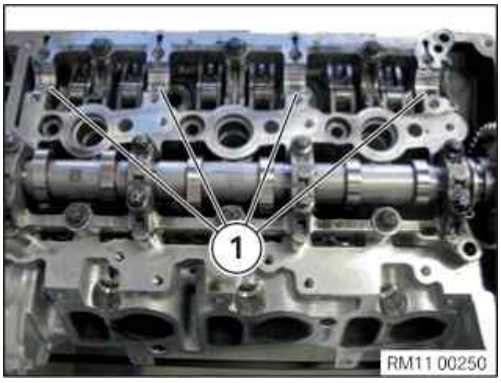
RISK OF DAMAGE

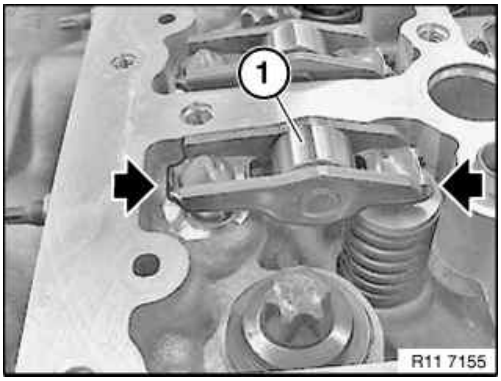
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

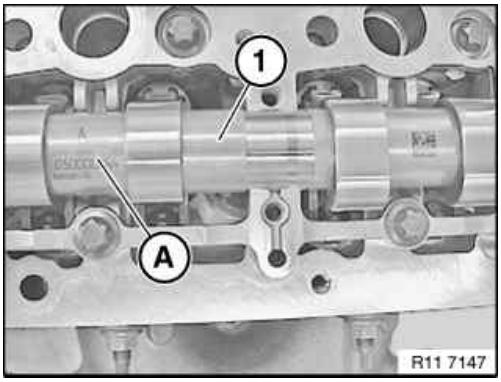
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



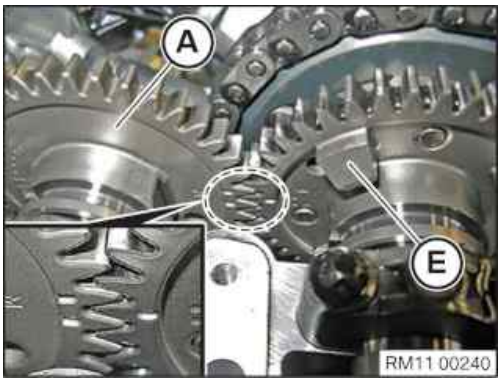
- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.

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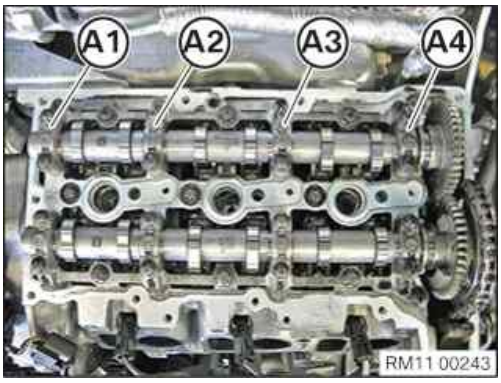


- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

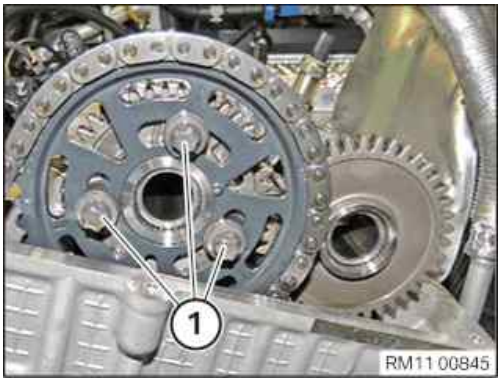
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

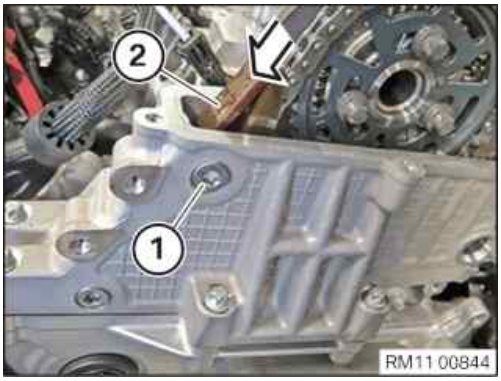
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



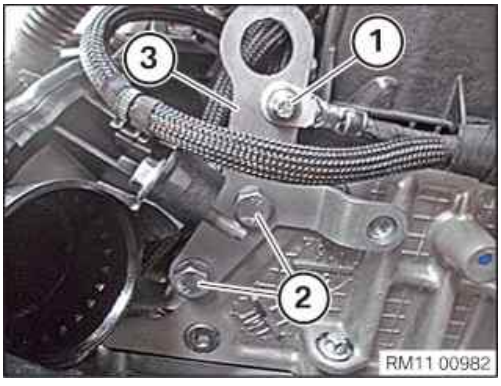
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6			8 Nm

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▸ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

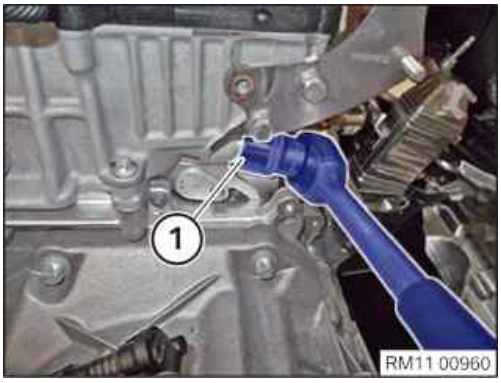
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

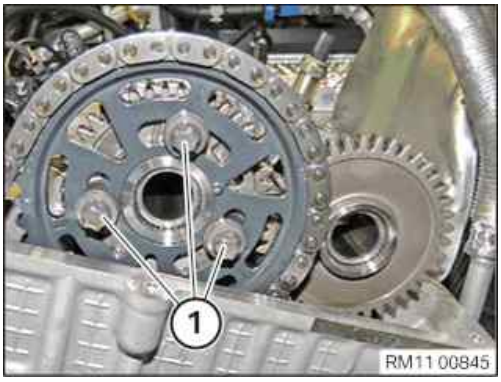


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▸ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

35 – Remove special tool to disconnect the crank shaft

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- Remove special tool **2 288 380**.

36 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

37 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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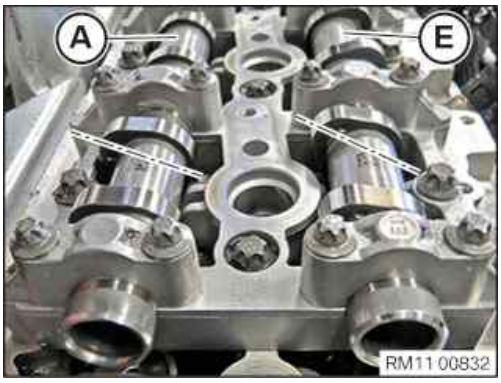
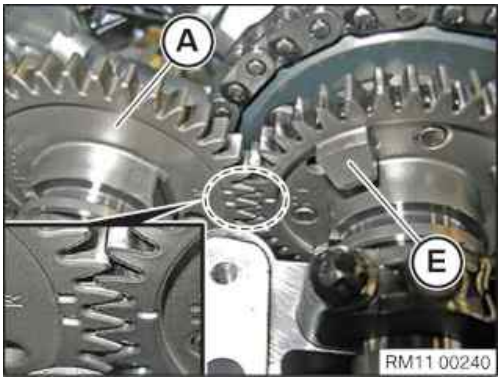


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

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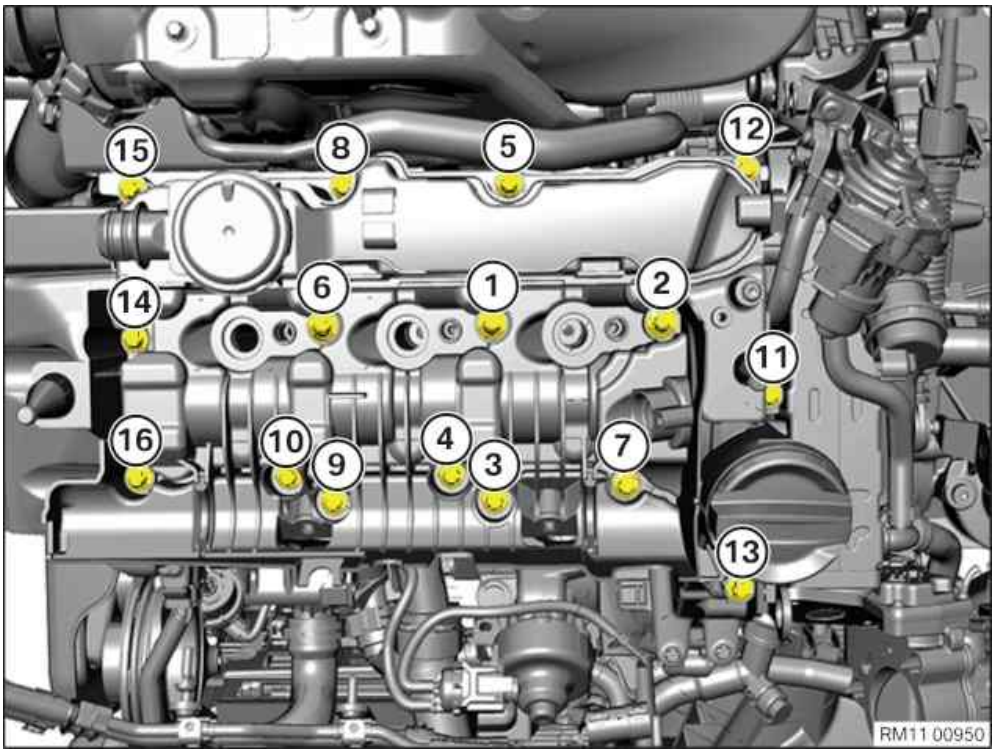
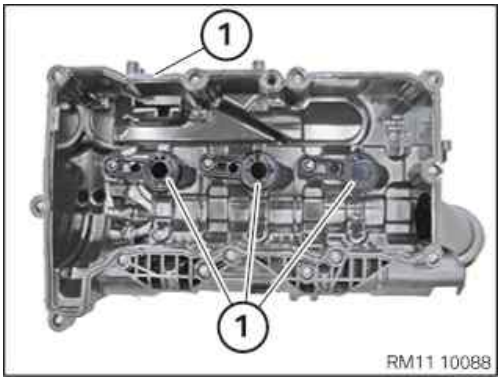
Overview: Screw connection of the cylinder head cover

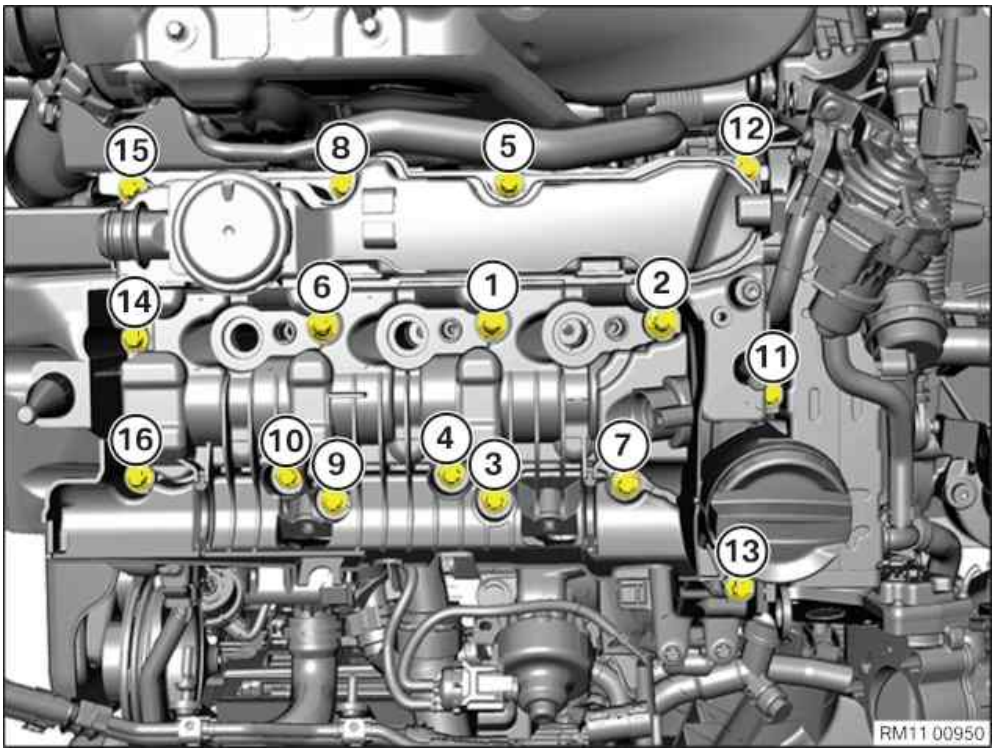


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm

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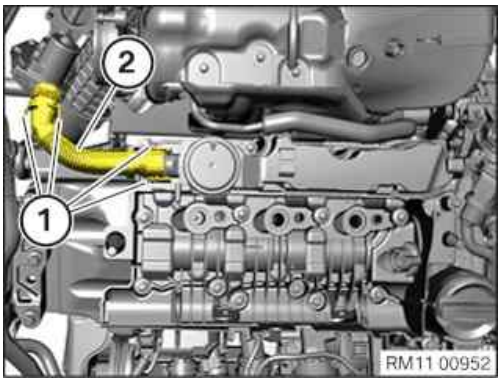


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

39 – Installing injectors of injection system

▶ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

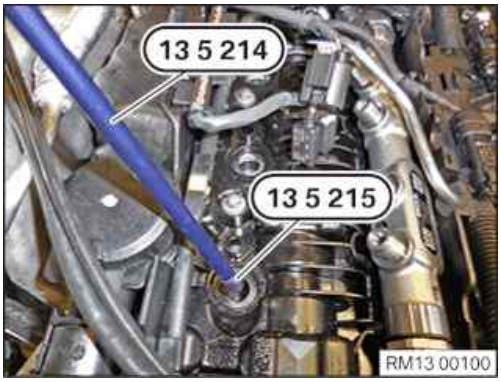
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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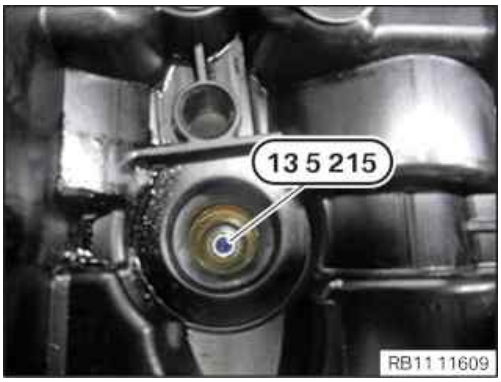
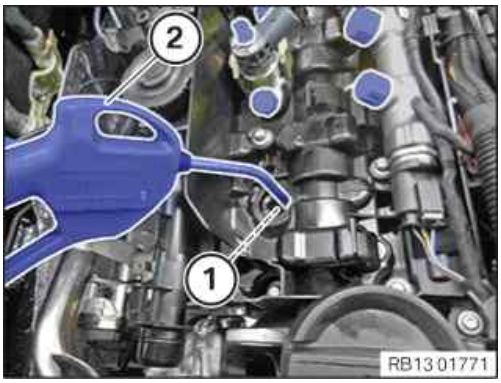


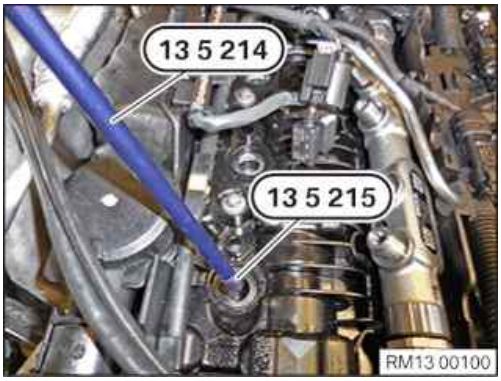
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

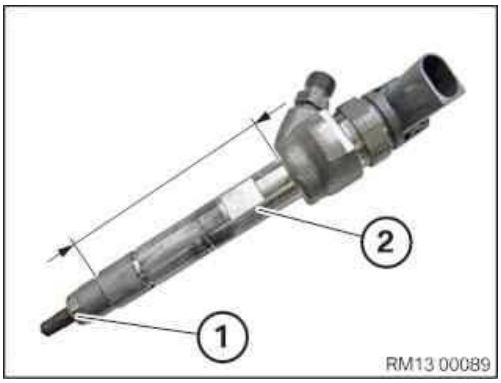
▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

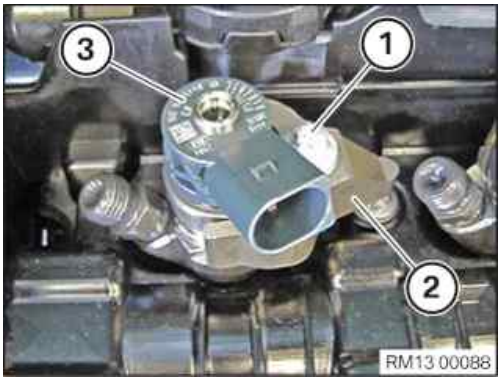


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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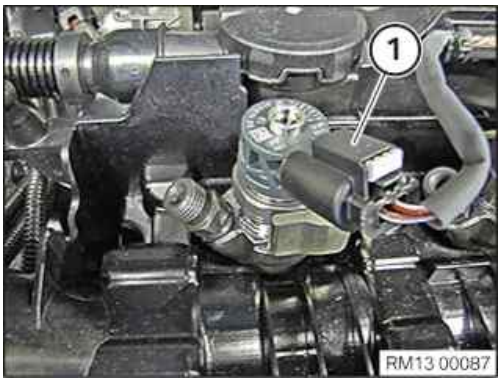


- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

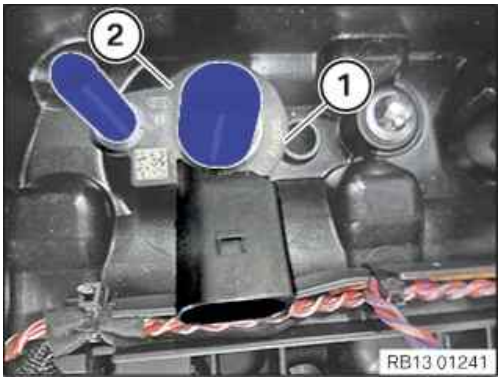
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

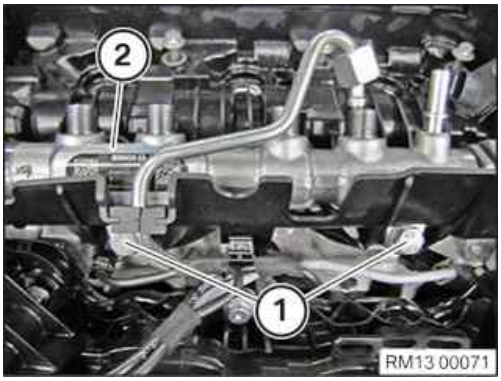
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

40 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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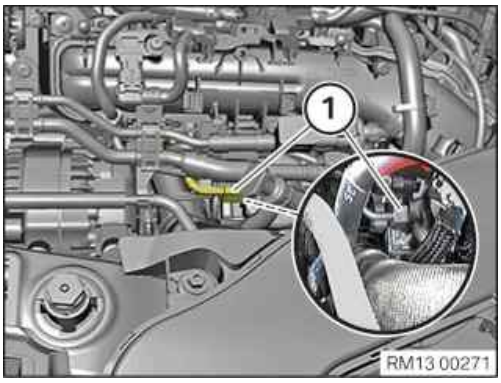


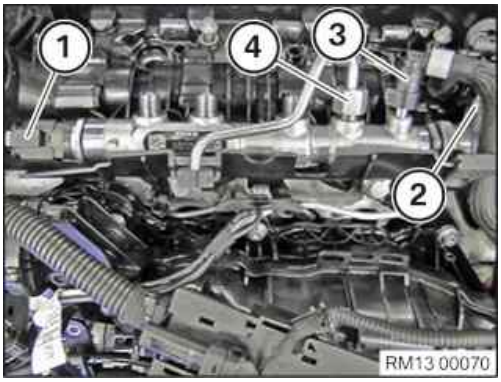
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

41 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

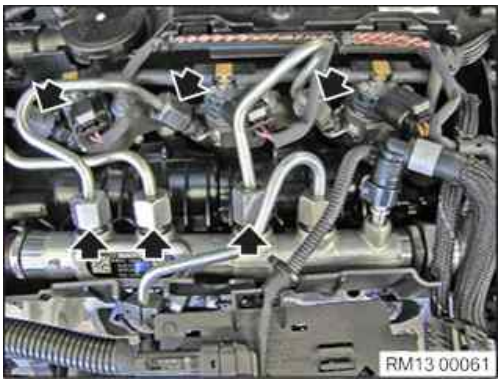
42 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

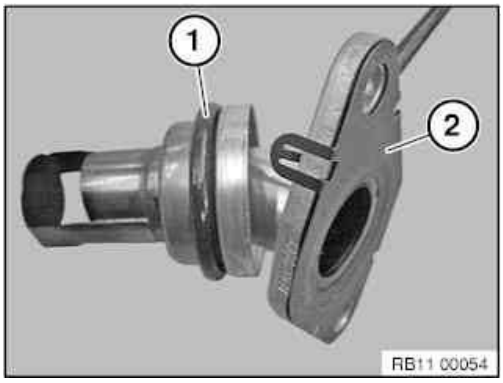
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

43 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

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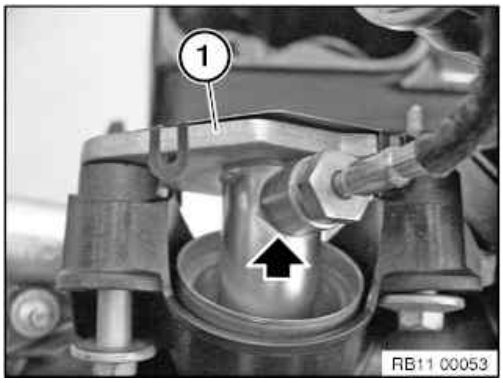
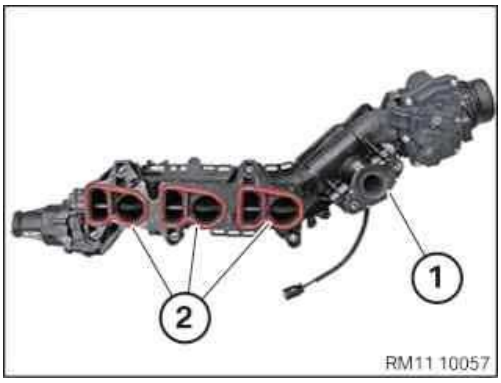
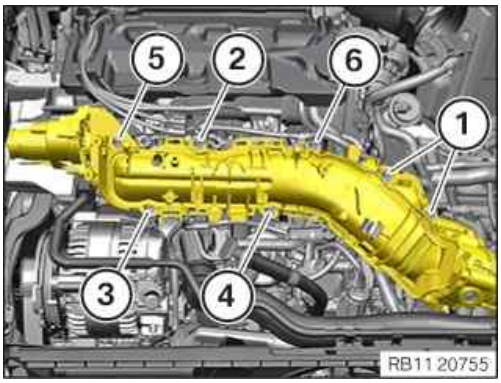


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

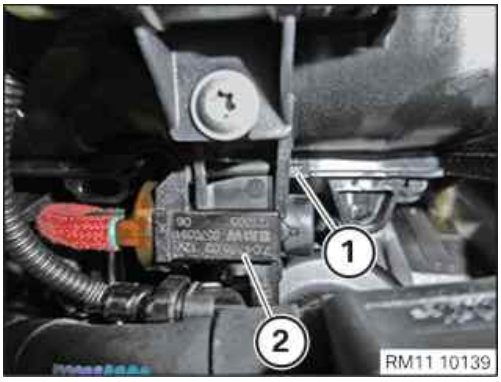
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



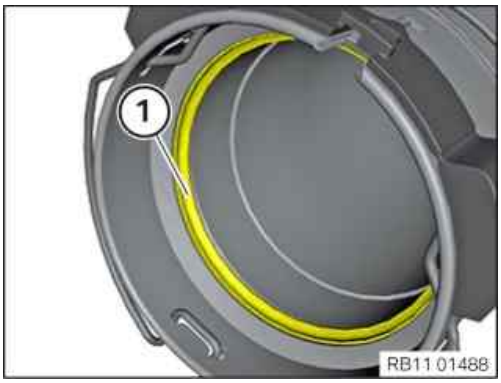
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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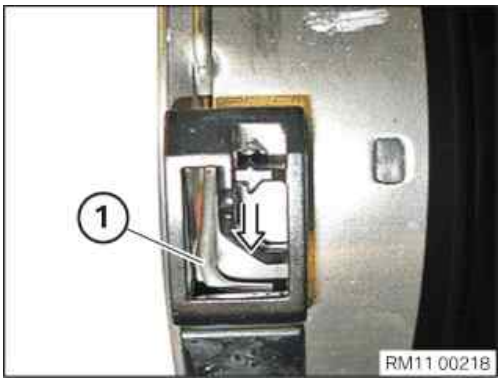
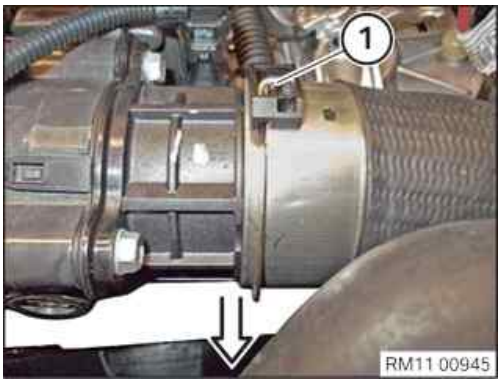


- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

44 – Remove the engine from the assembly stand

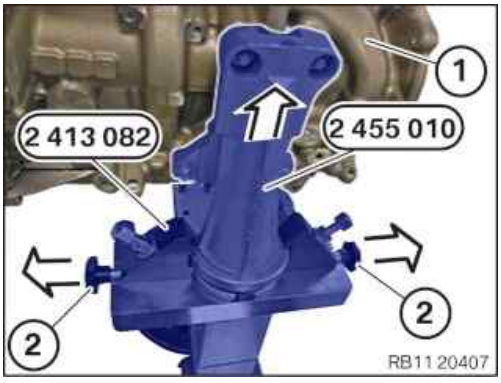
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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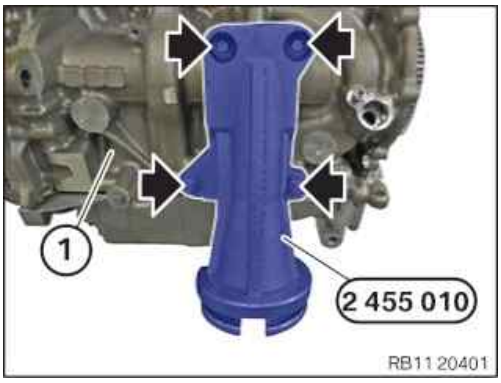
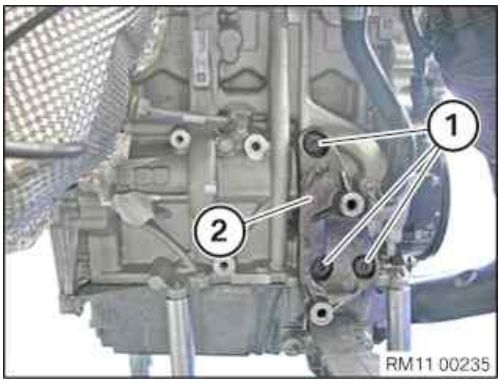


- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

M10		Tightening torque	38 Nm

45 – Install the engine on the double-clutch transmission (DKG)

RISK OF DAMAGE

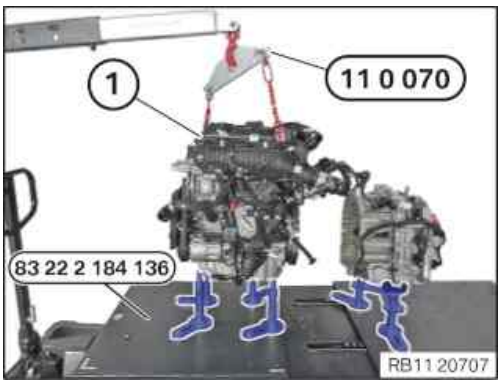
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.

TECHNICAL INFORMATION

Transmission oil temperature 20 °C up to a maximum 40 °C!
Carry out the "Transmission oil adjustment" service function with the diagnosis system.
The double clutch also needs to be replaced if you exceed the oil change interval by more than 3000 km!
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox (DKG).



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.

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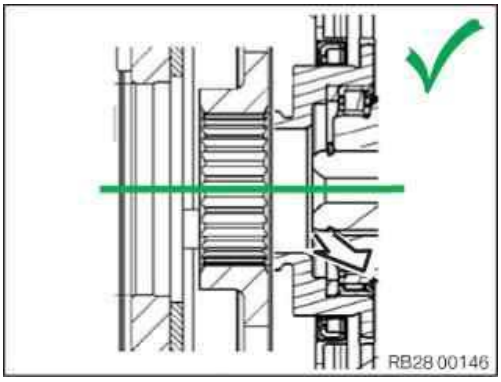
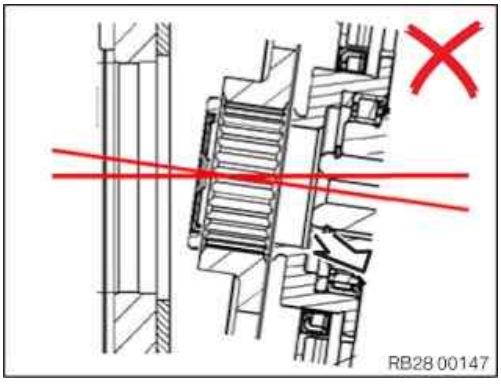
- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Clean the gearing (1) of the drive shaft.
- Coat the gearing (1) with MI-Setral-43N grease (BMW part number 83 23 2 152 082).

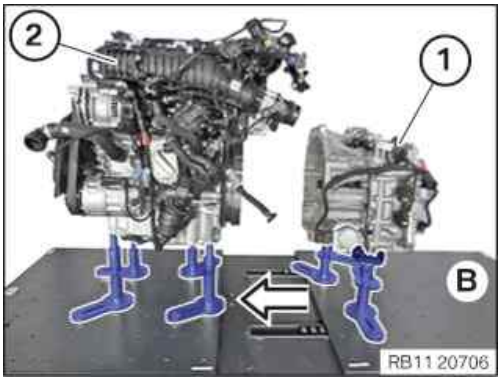
  Tooth gaps must be filled with grease up to tooth height!



- **Correct:** Insert the double-clutch transmission (DKG) horizontally into the flywheel.



- **Wrong:** Do not tilt the double-clutch transmission (DKG) when inserting it into the flywheel.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table plate (B) in the direction of the arrow and position double-clutch transmission (DKG) (1) **carefully** on the engine (2).

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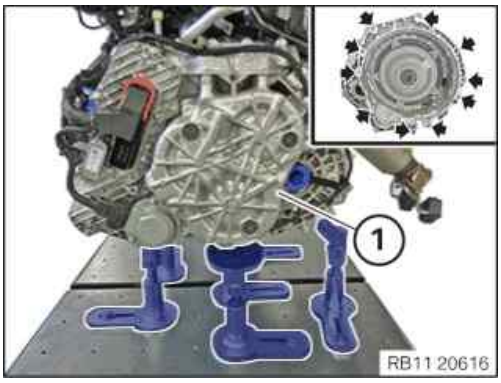
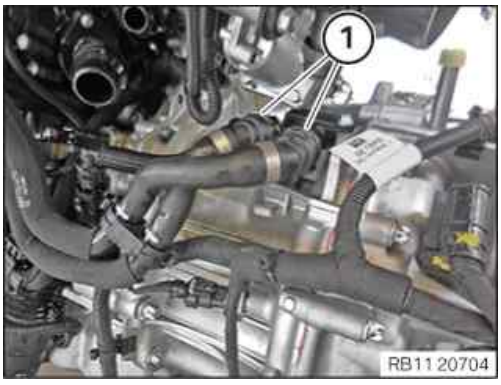


- Flange-mount the double-clutch transmission (DKG) to the engine so that it is **absolutely** horizontal.
- Tighten screws (arrows).

Transmission to engine

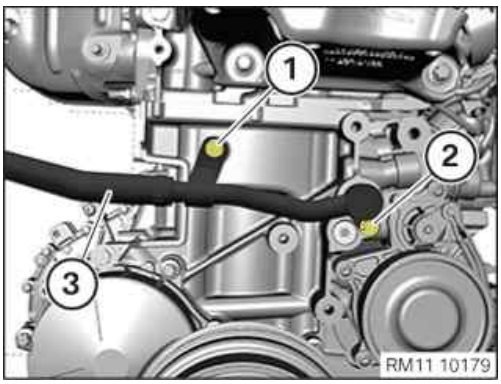
M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Connect and lock the coolant lines (1).
- Make sure that you can hear the coolant lines (1) engage.

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

46 – Attaching assemblies (on lifting table)

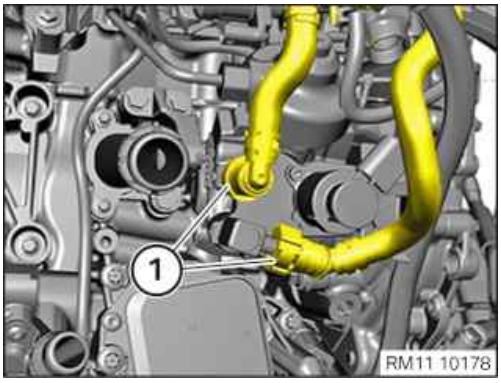


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The locks must engage audibly.

► **Installing the exhaust-gas recirculation cooler**

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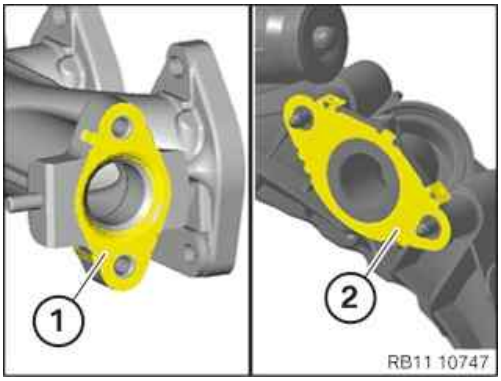
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

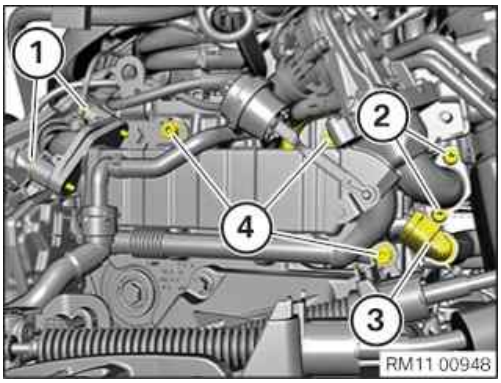


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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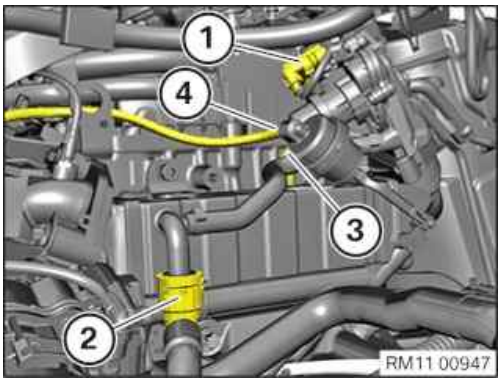
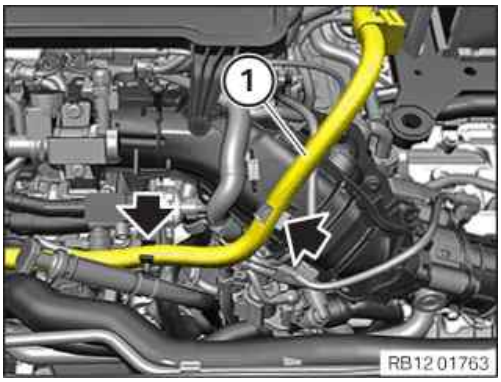


TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.



CAUTION

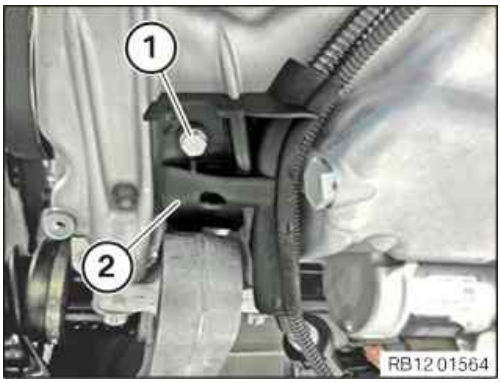
Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert the positive battery cable (1) into the clamps (arrows).

- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

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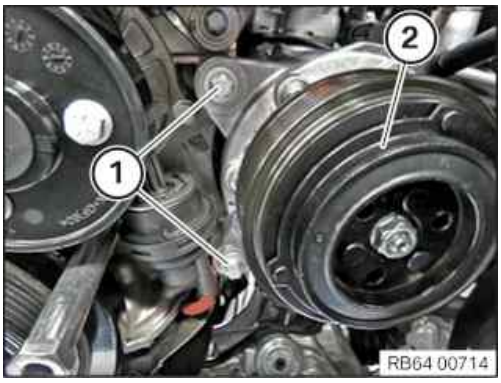
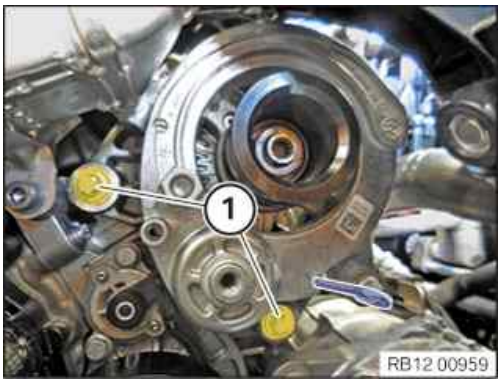


- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

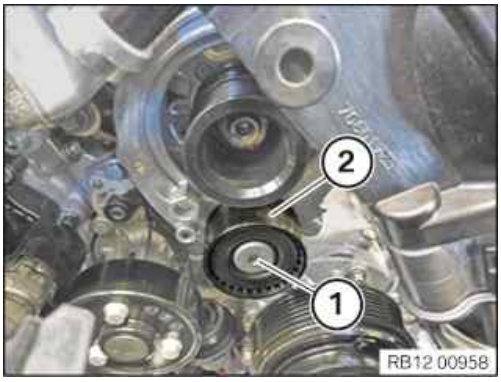
- Tighten the screws (1).



- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

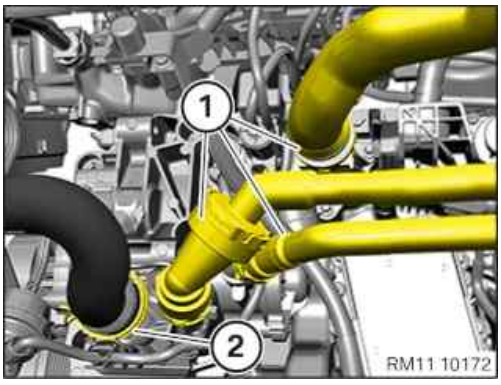
M10x75 / M10x125		Tightening torque	38 Nm



- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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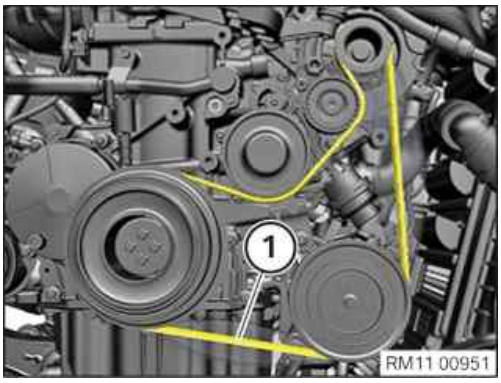
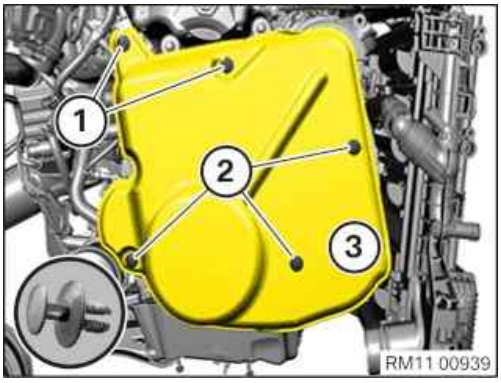


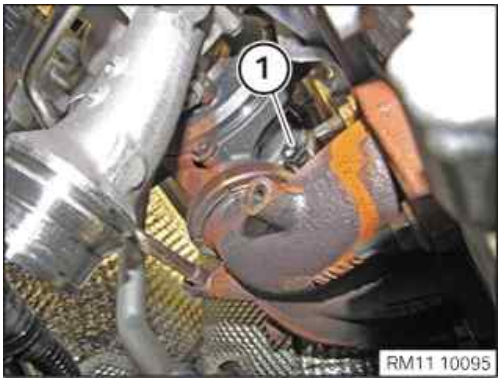
- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ **Install the acoustic cover for the engine at the front**



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

▸ **Installing the oil return line for the exhaust turbocharger**

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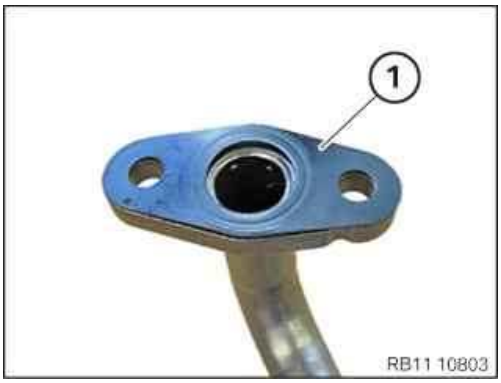
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

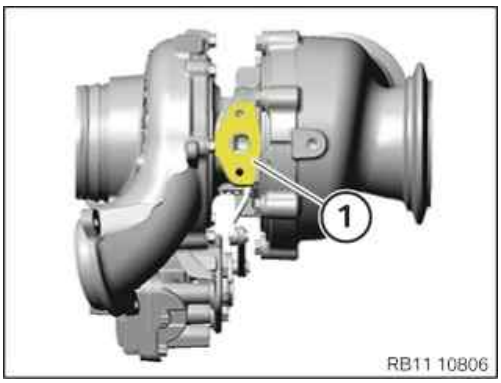
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface.

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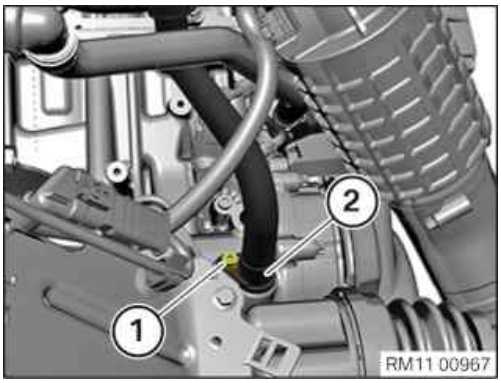
- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

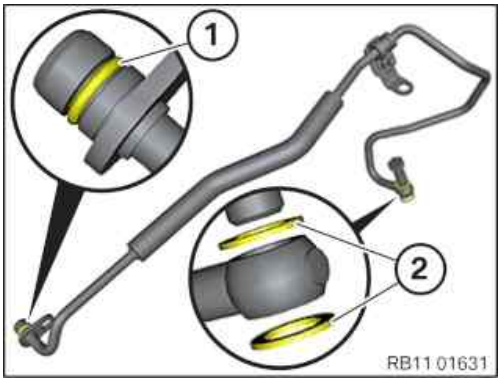


- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

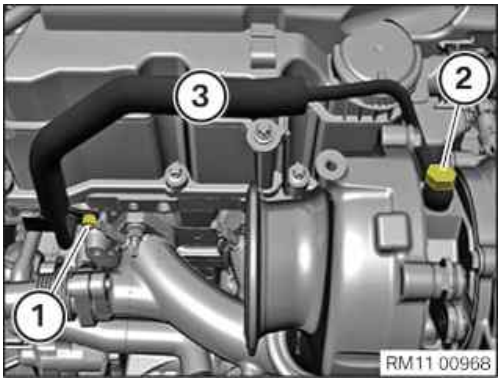
▸ **Install the oil feed line for the exhaust turbocharger**



- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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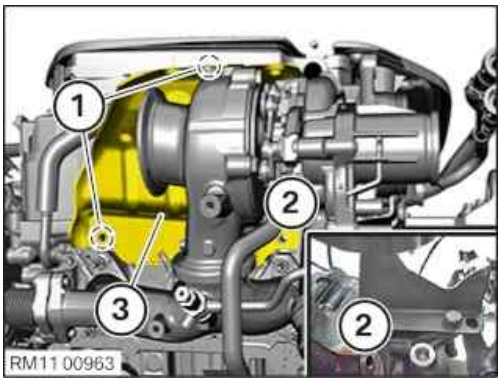


- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

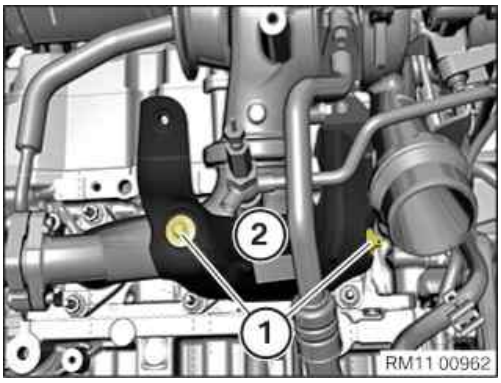
▶ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

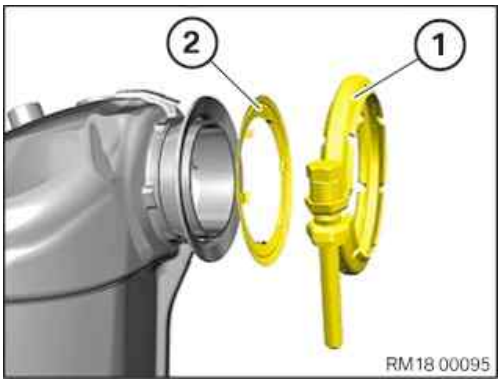
- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

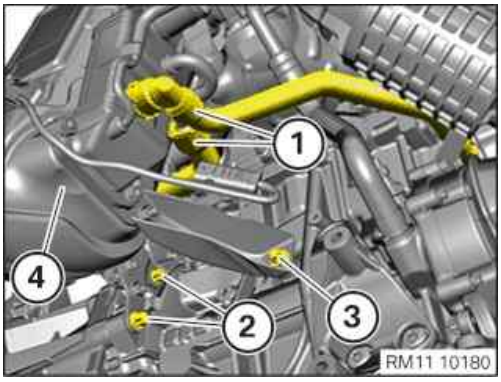
Torx screw BM 6x12		Tightening torque	10 Nm



- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).

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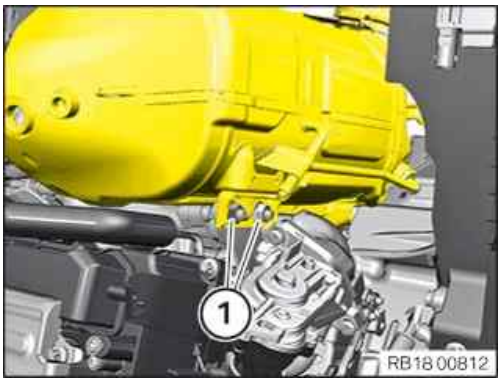


- Tighten nuts (1).

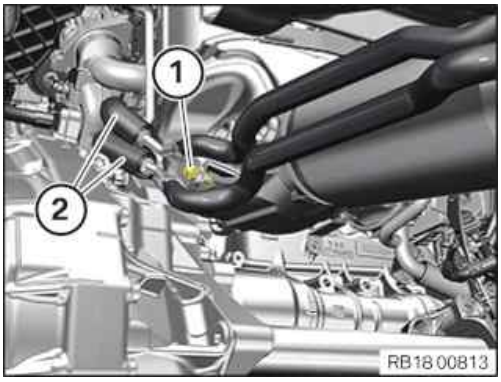
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

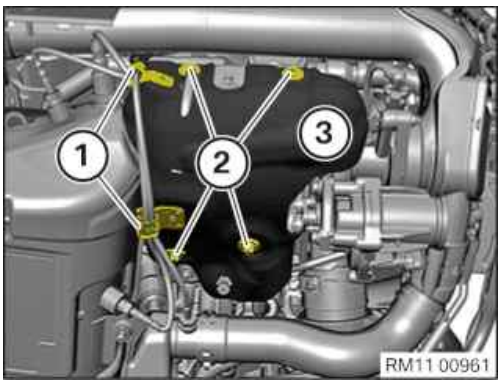
▶ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▶ **Installing the cable clip for the intake plenum**

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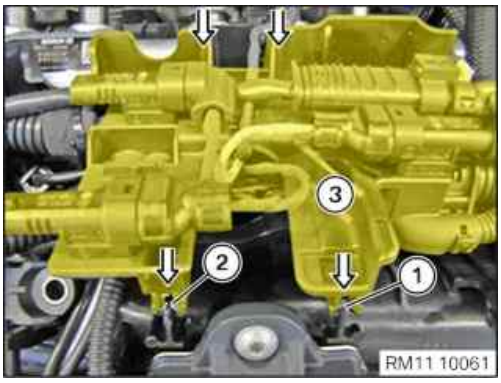
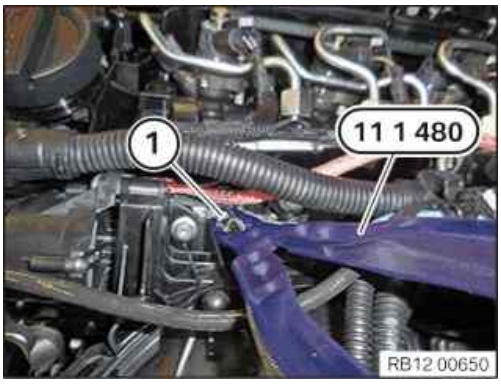
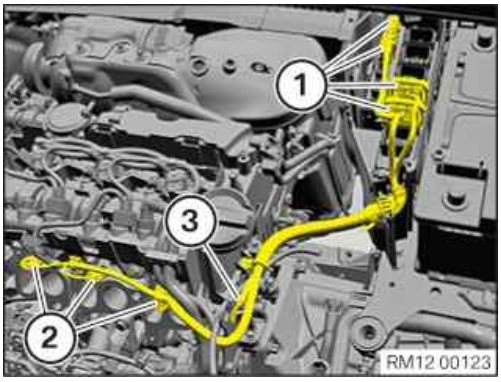


- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

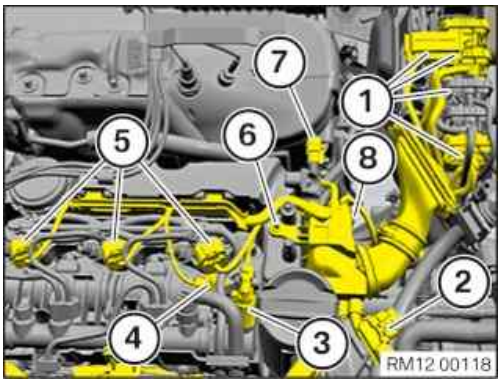
  The connector (1) must engage audibly.



- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm



- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.

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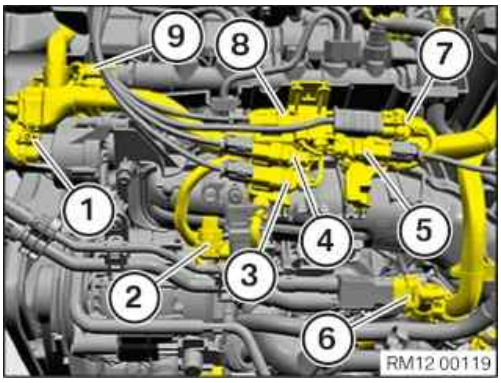
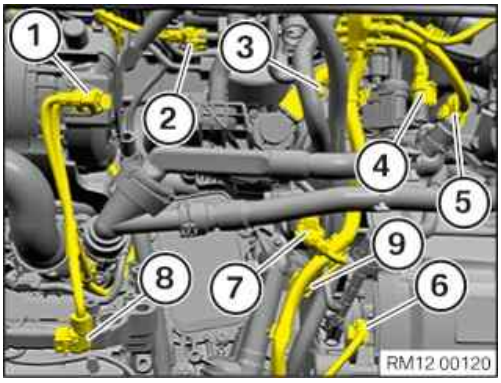
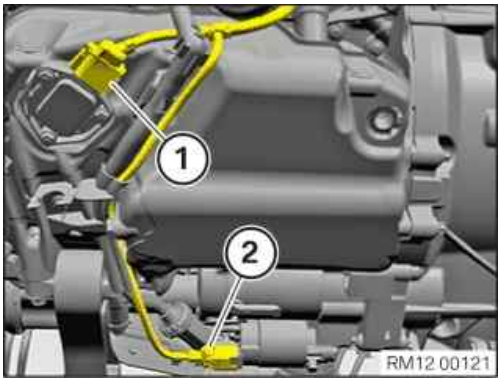


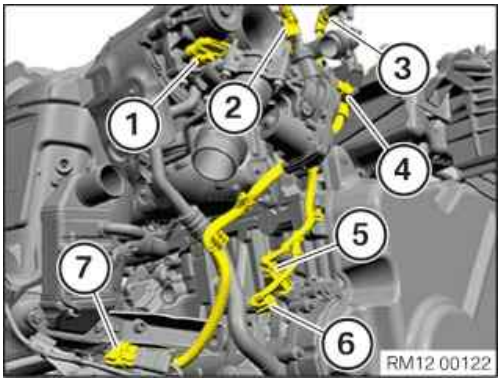
- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.



- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

47 – Installing differential pressure sensor

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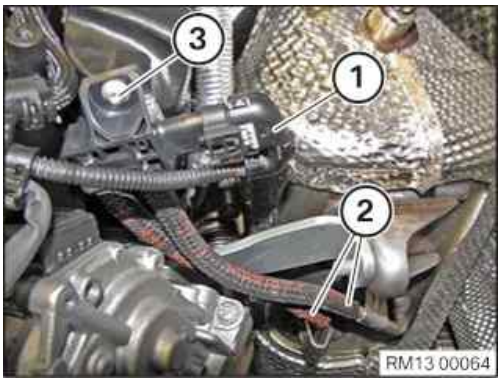


- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

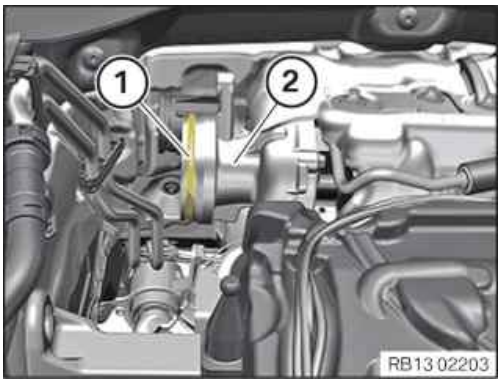
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

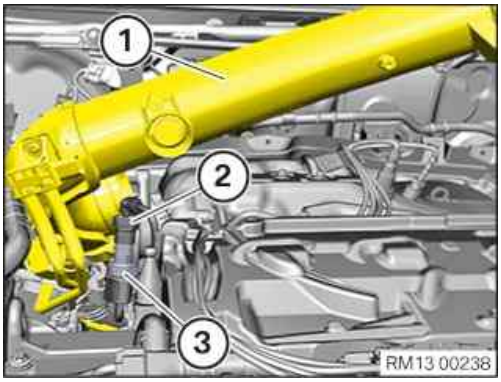
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

48 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



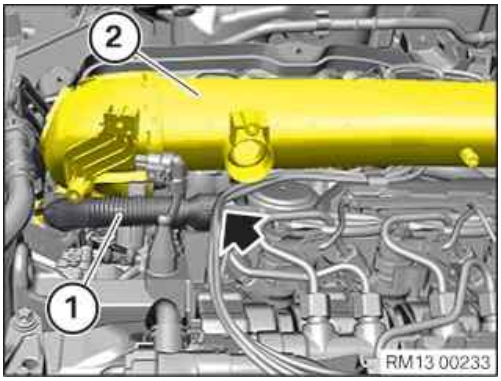
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.

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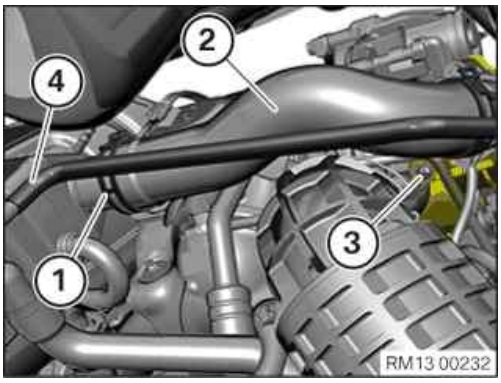


- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

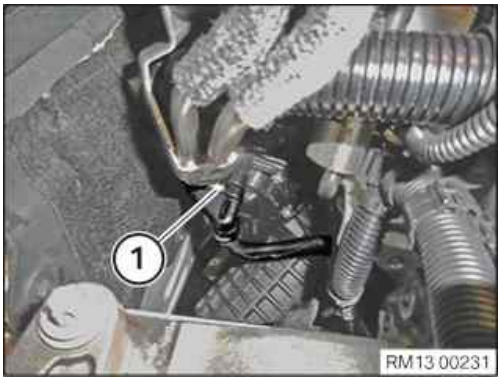
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

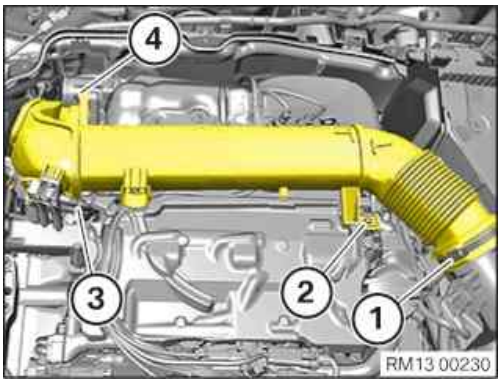
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

49 – Install the acoustic cover for the injectors

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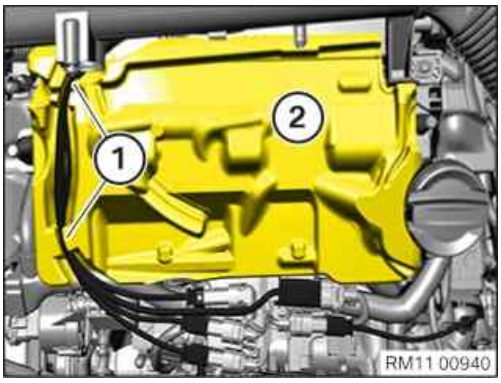
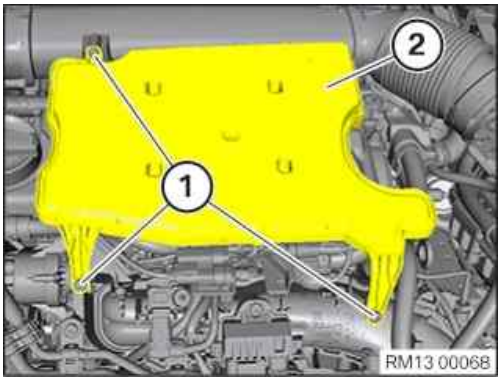


- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

50 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

51 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

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- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

52 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head			Used in step 8
M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase			Used in step 9
M10x30		Tightening torque	38 Nm

Special tool 11 8 930 to special tool 00 2 320			Used in step 9
M14x35		Tightening torque	160 Nm

Hydraulic chain tensioner to crankcase			Used in step 27
M6x22		Tightening torque	9 Nm

Rear timing case cover to crankcase			Used in step 28
M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover			Used in step 28
Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase			Used in step 28
M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover			Used in step 28
M8x40		Tightening torque	19 Nm

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Oil sump to crankcase

Used in step 28

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 28

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 28

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 29

M12x1.5	Renew screws.	Tightening torque	120 Nm

Glow elements to cylinder head

Used in step 32

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 33

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 34

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 34

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 34

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 34 46

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 34

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 34

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 38

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 39

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 39

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 40

Torx screw M8x25		Tightening torque	19 Nm

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High pressure line between high pressure pump and rail

Used in step 40

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 42

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 43

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 44 46

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 45 46

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 46

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 46

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 46

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 46

M8x20		Tightening torque	19 Nm

Bracket to oil sump

Used in step 46

M6		Tightening torque	8 Nm

Air conditioning compressor in component carrier

Used in step 46

M10		Tightening torque	38 Nm

Alternator to component carrier

Used in step 46

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner

Used in step 46

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold

Used in step 46

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase

Used in step 46

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger

Used in step 46

M6x12		Tightening torque	8 Nm

Oil return line to crankcase

Used in step 46

M6x12		Tightening torque	8 Nm

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Oil feed line on cylinder head — Used in step 46

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger — Used in step 46

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger — Used in step 46

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 46

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder — Used in step 46

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 46

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter — Used in step 46

Torx bolt BM6x16		Tightening torque	8 Nm

Ground cable to cylinder head — Used in step 46

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 46

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 47

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 47 48

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor — Used in step 48

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 48

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 48

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 48

Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 50

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

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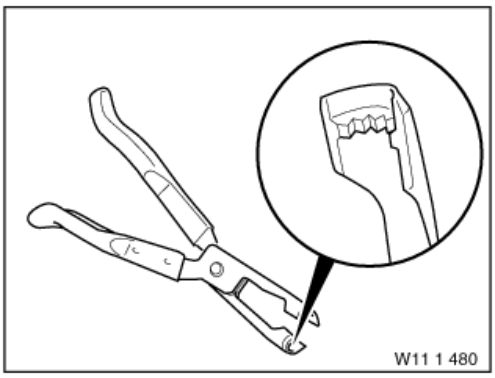
0 490 796 (11 1 480) Pliers



Common Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder

Common Used in step 8 45

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 490 579 (11 0 070) Lifting gear

Used in step 8 9 44 45

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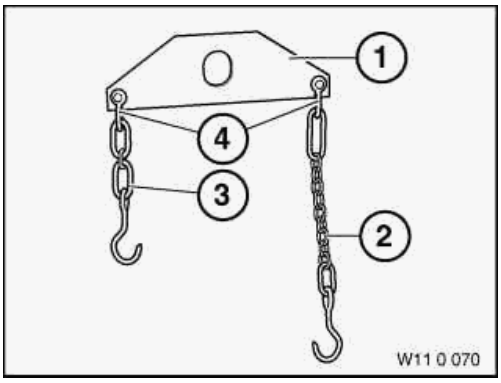

Common

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

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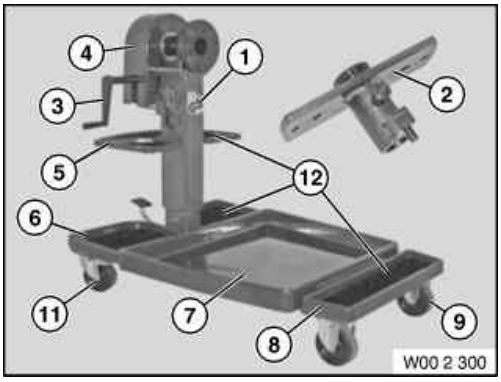
2 455 010 Engine support

Common

Used in step 9 44

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand



Common

Used in step 9

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	

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2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

0 495 196 (00 2 320) Support arm

Used in step 9

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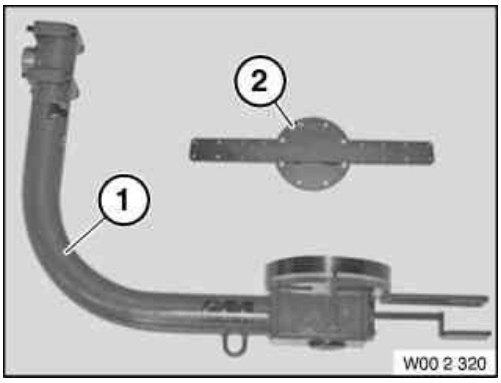

Common

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common

Used in step 11 14 40 42

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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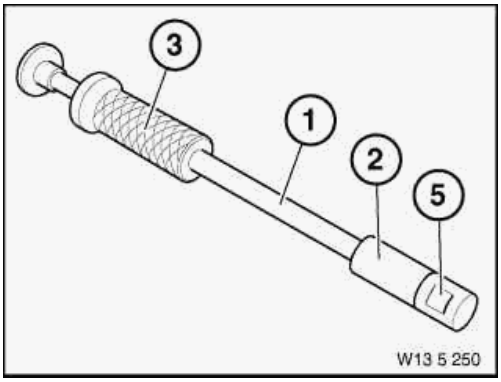
2 413 106 Fastener

Common

Used in step 11 42

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common

Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush

Common Used in step 13

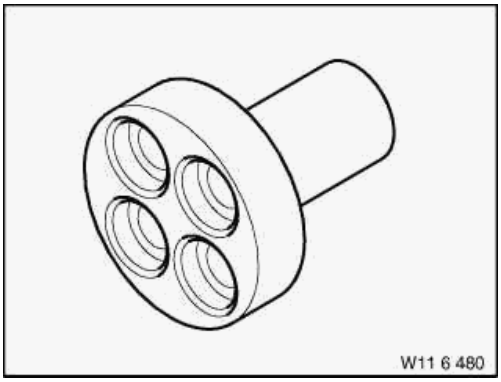
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 13

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 16 34 37

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 288 380 Locating stud

Common Used in step 16 34 35 37

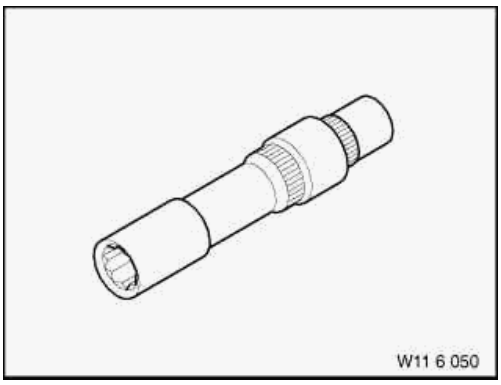
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common Used in step 16 34 36 37

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 21 32

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

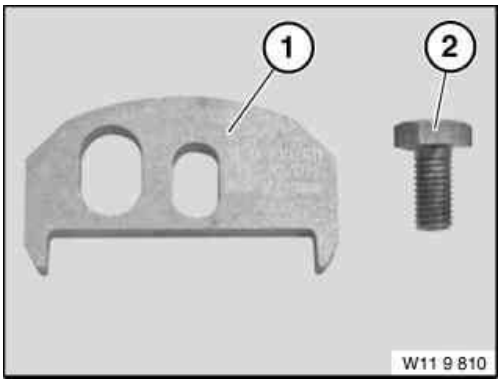
Common Used in step 22 23 34

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 171 (11 9 811) Holder



Common Used in step 24 29

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

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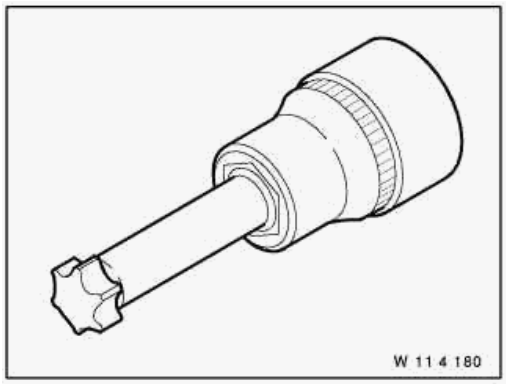
0 494 793 (11 9 265) Bush

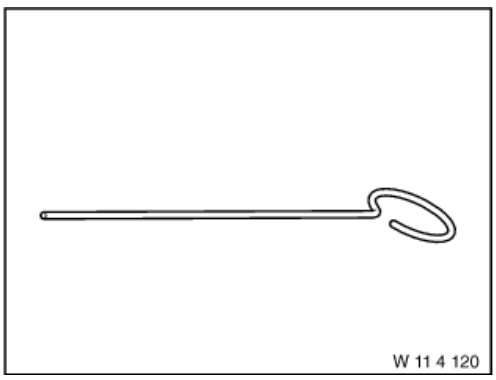
Common	Used in step 24 29
Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 24 29
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

0 491 012 (11 4 120) Pin



Common	Used in step 26 27
Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

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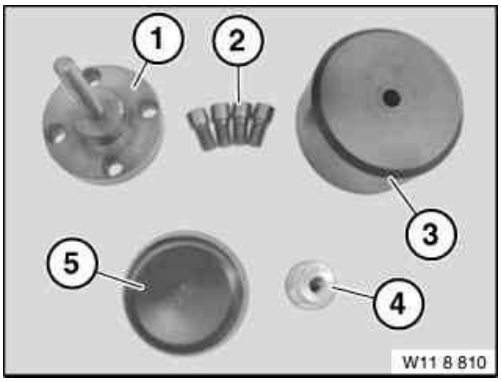
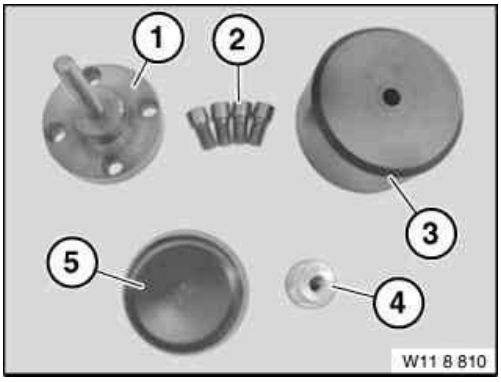
0 496 137 (11 8 815) Holding sleeve



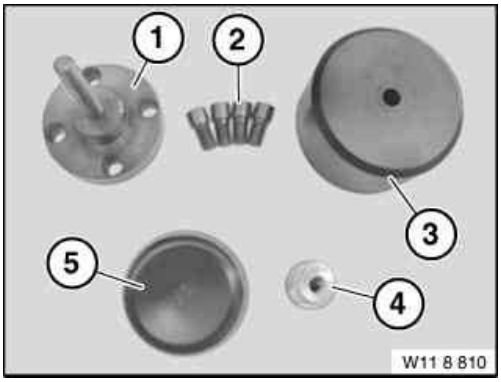
Common	Used in step 28
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body



Common	Used in step 28
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 28
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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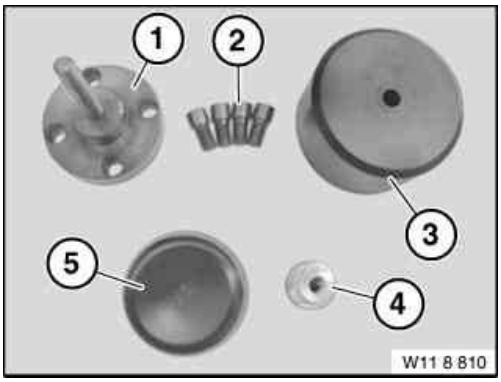
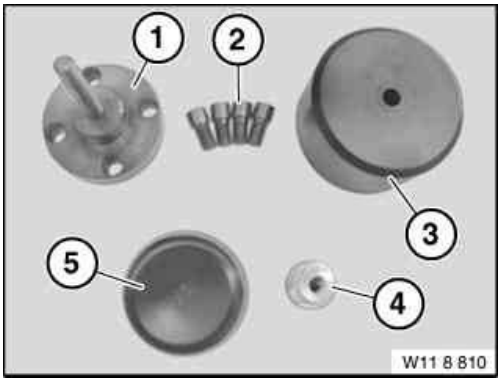
0 496 135 (11 8 813) Holding sleeve



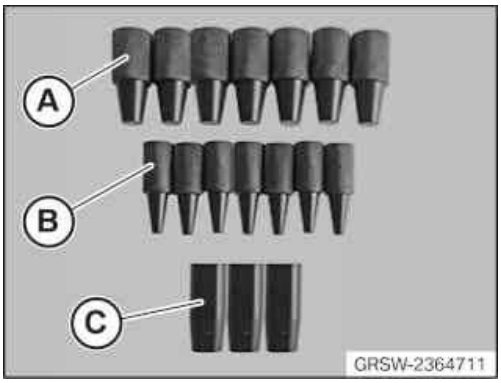
Common	Used in step 28
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 136 (11 8 814) Nut



Common	Used in step 28
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug



Common	Used in step 28
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

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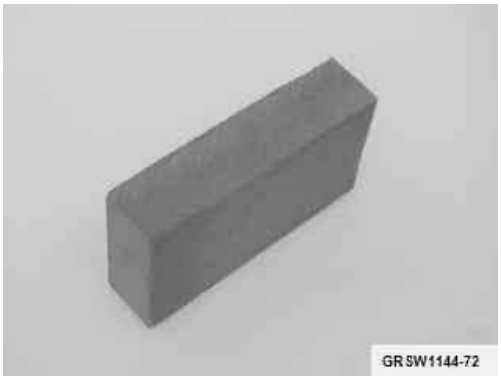
0 495 103 (11 4 471) Scraper

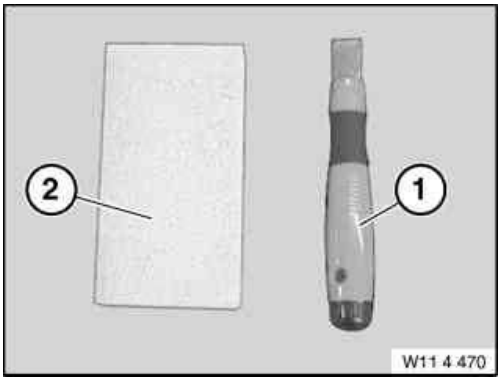
Common	Used in step 28
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 28
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 102 (11 4 470) Tool



Common	Used in step 28
Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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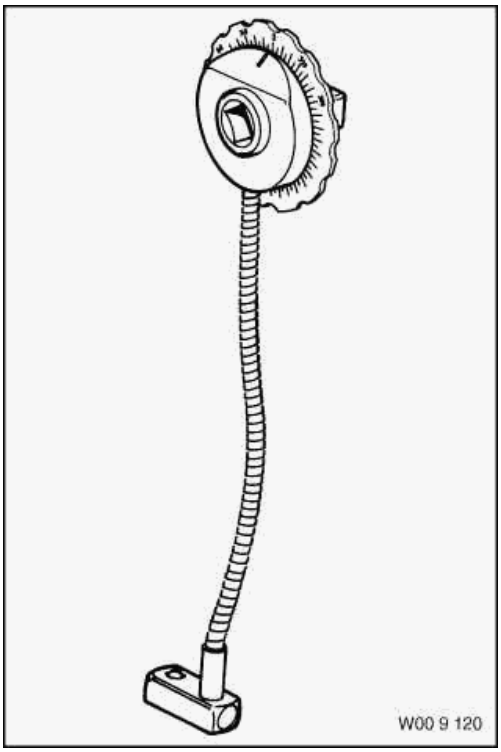
0 490 504 (00 9 120) Torque angle measuring dial



Common

Used in step 28

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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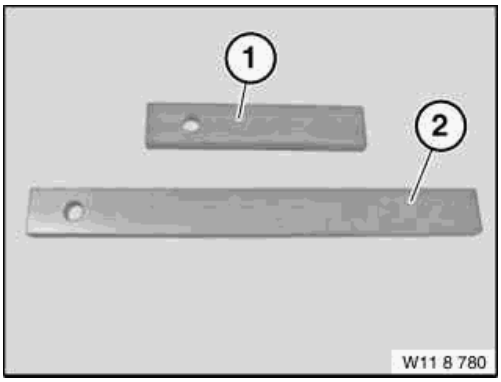
0 496 120 (11 8 780) Plate



Common

Used in step 28

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

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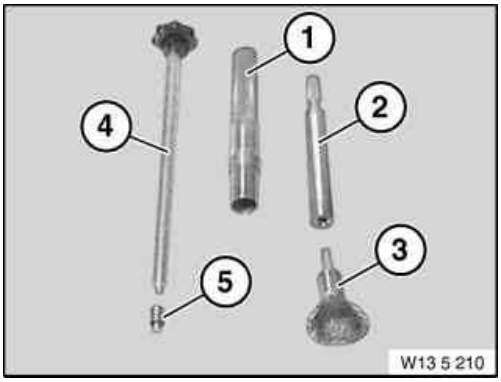
2 285 058 Tool set

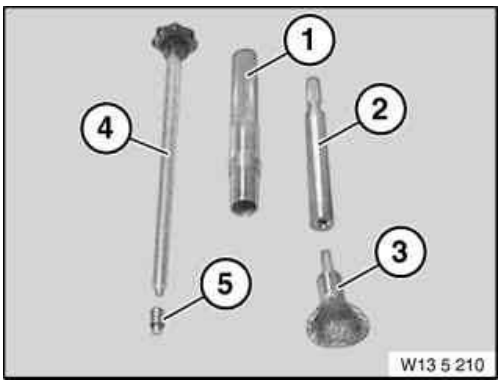
Common	Used in step 29
Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

0 493 763 (13 5 215) Plug



Common	Used in step 39
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 39
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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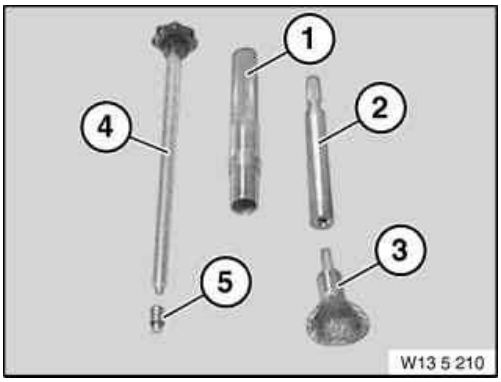
0 493 758 (13 5 210) Tool



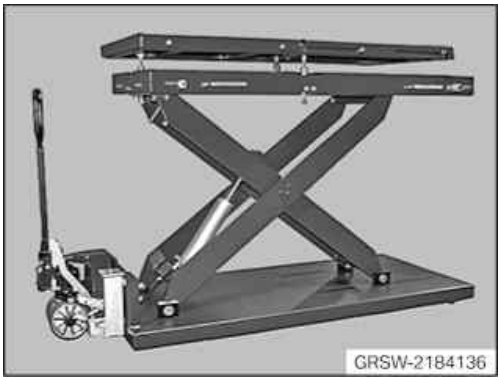
Common Used in step 39

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 45

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

Replacement tools:

2 299 563 Adapter

Common Used in step 9

Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

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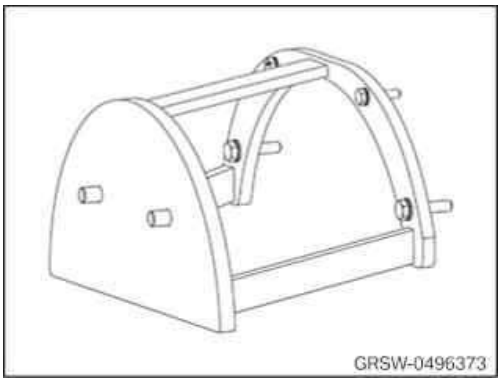
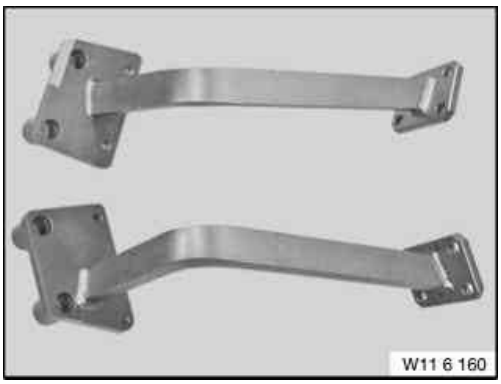
0 496 373 (11 5 420) Plate



Common	Used in step 9
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 9
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 29
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 46
EGR controller	7 46

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	28

Repair instructions	Used in step
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52

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11 00 050 Removing and installing engine	1	52
31 10 001 Completely removing and installing front axle with engine and transmission	1	52
11 00 050 Removing and installing engine	1	52
11 00 050 Removing and installing engine	1	52
11 00 050 Removing and installing engine	1	52
11 00 050 Removing and installing engine	1	52
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11 00 050 Remove and install engine	1	52
11 00 050 Remove and install engine	1	52
11 00 050 Remove and install engine	1	52
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1	52
11 00 050 Remove and install engine	1	52
11 00 050 Remove and install engine	1	52
11 00 050 Remove and install engine	1	52
11 00 050 Remove and install engine	1	52
11 00 050 Removing and installing the engine (manual gearbox)	1	52
11 00 050 Remove and install engine (Automatic)	1	52
11 00 050 Remove and install engine	1	52
11 00 050 Remove and install engine	1	52
11 00 050 Remove and install engine	1	52
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11 00 050 Remove and install engine	1	52
11 00 050 Removing and installing engine	1	52
11 00 050 Removing and installing engine \PREMIUM	1	52
11 00 050 Removing and installing/replacing engine (N63)	1	52
11 00 050 Removing and installing engine	1	52
11 00 050 Removing and installing engine	1	52
11 00 050 Removing and installing engine	1	52

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11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 52
11 00 050 Remove and install engine	1 52
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21 28
61 35 ... Notes on ESD protection (Electro Static Discharge)	28

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	34
Exhaust-gas recirculation cooler seal on exhaust manifold	46
Exhaust-gas recirculation cooler seal on intake plenum	46

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This documentation refers to special tools that were not yet available when going to press.

11 31 052 Replacing both timing chains

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

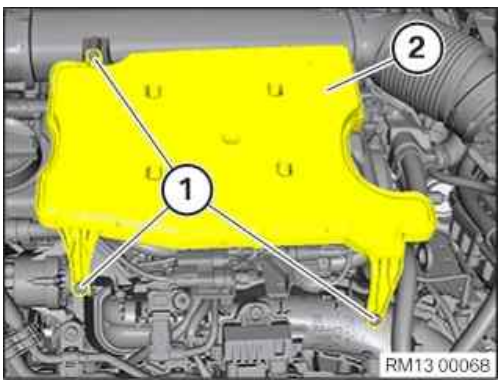
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

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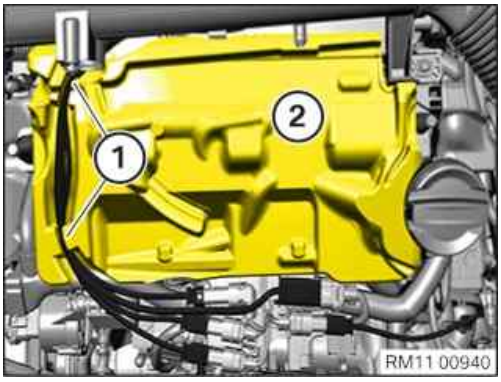
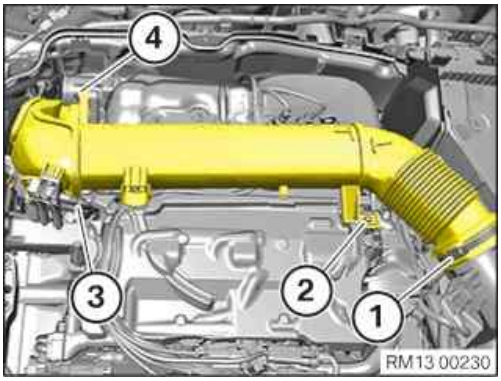
4 – Remove the acoustic cover for the injectors

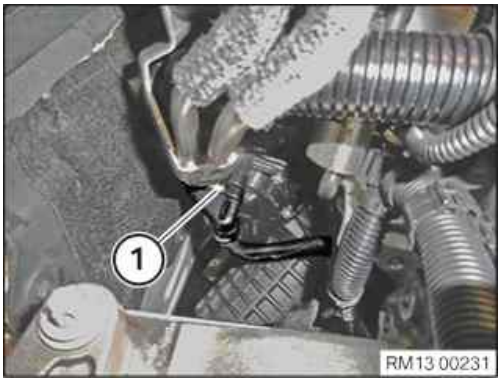


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

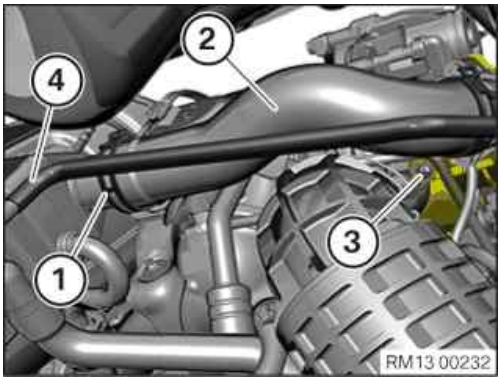
5 – Removing clean air pipe



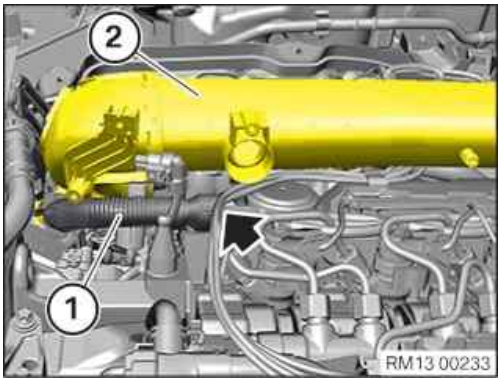
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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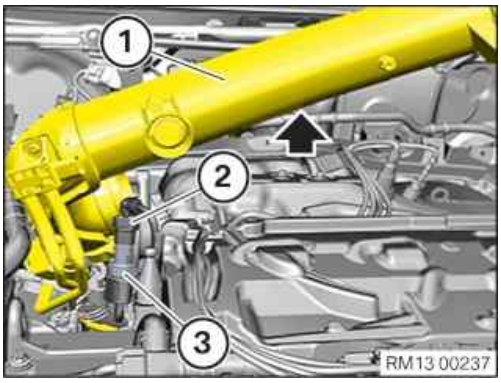


- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

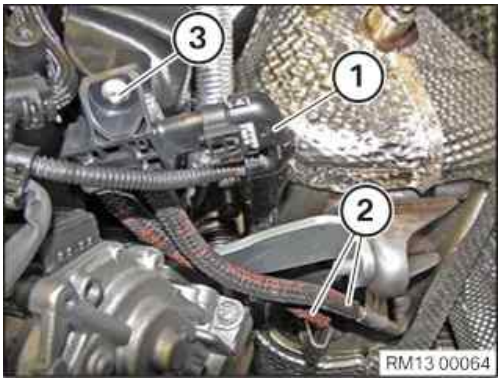
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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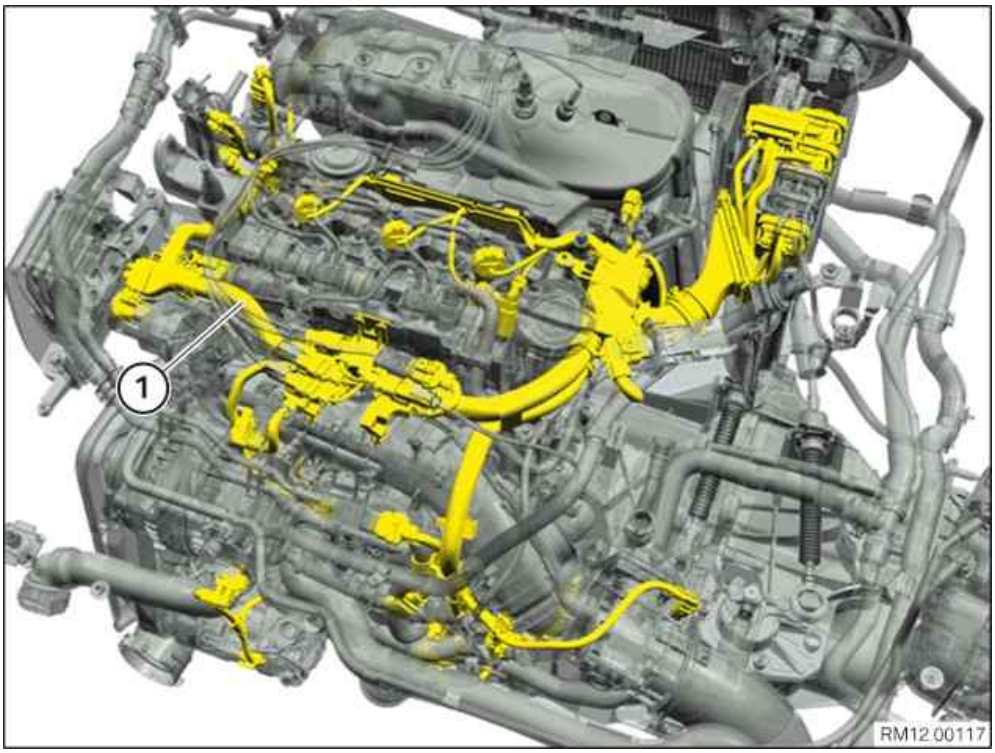
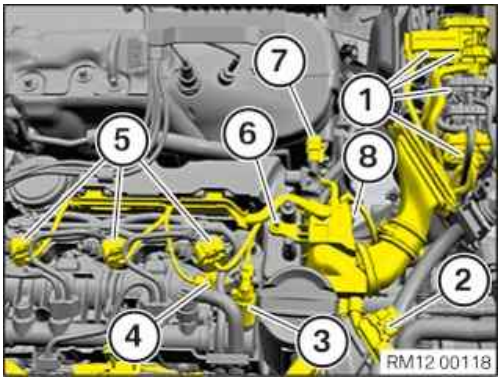
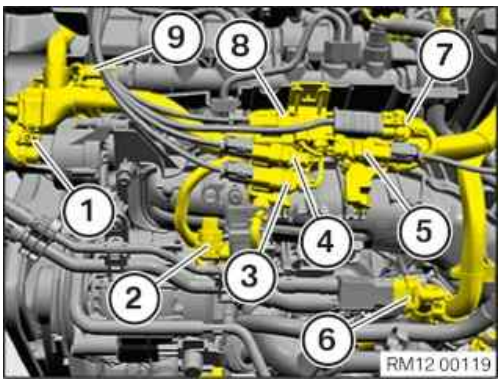
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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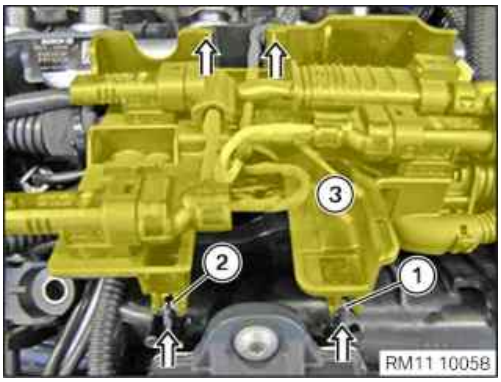
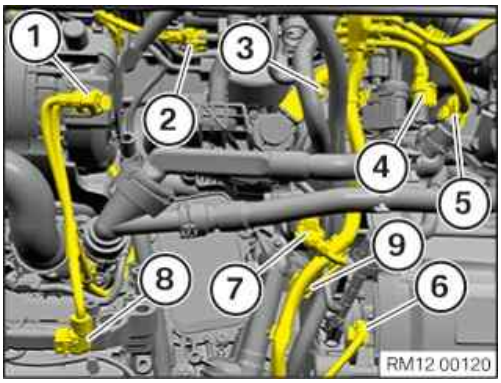
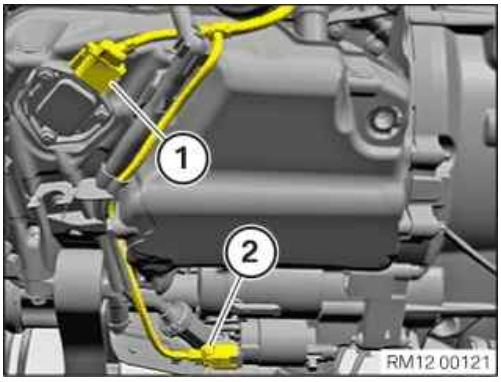


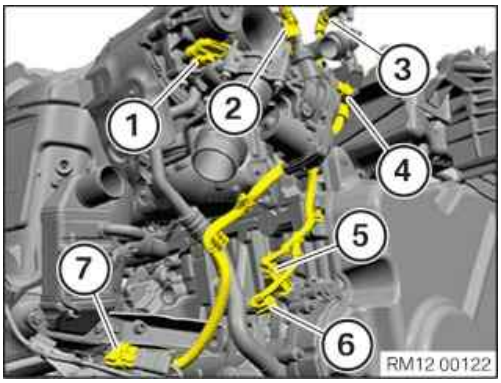
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



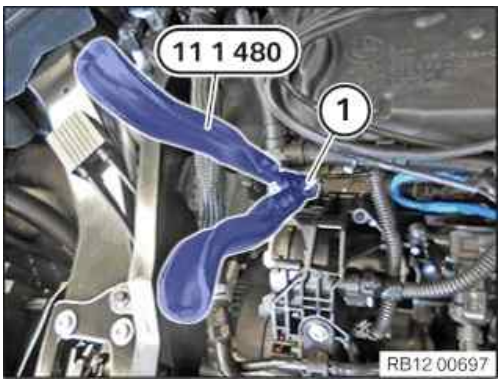
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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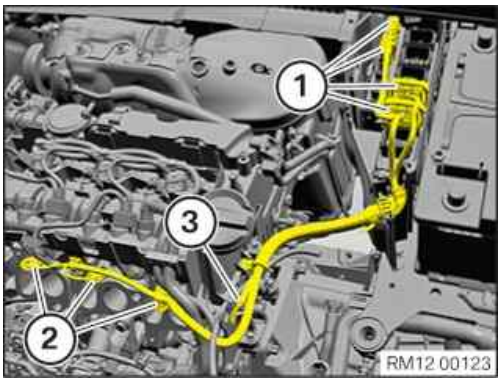


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

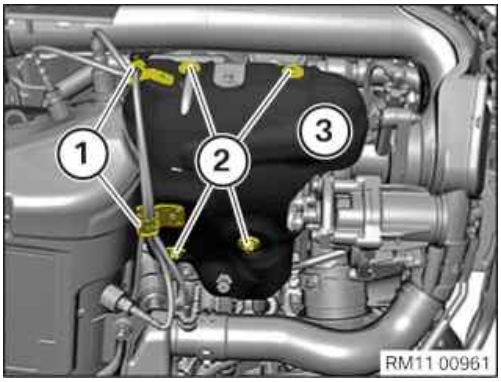
▶ Removing heat shield from top exhaust turbocharger

WARNING

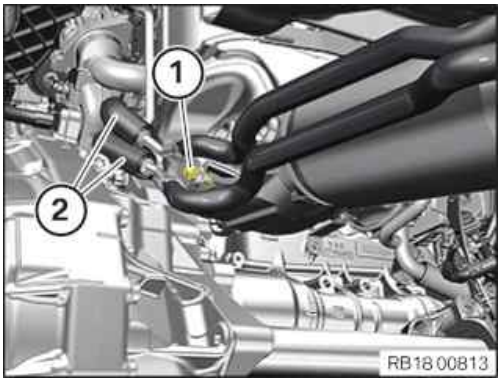
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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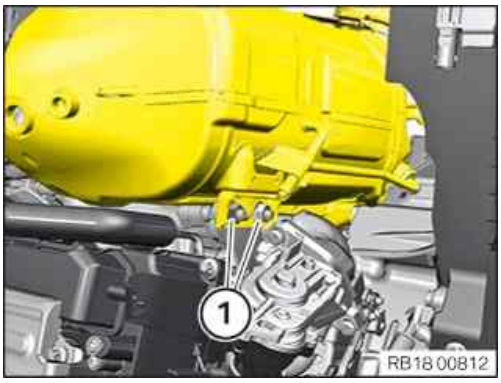
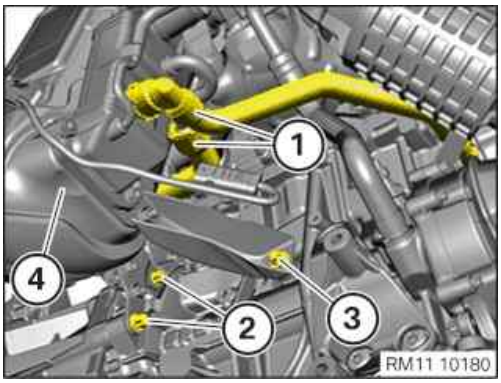


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

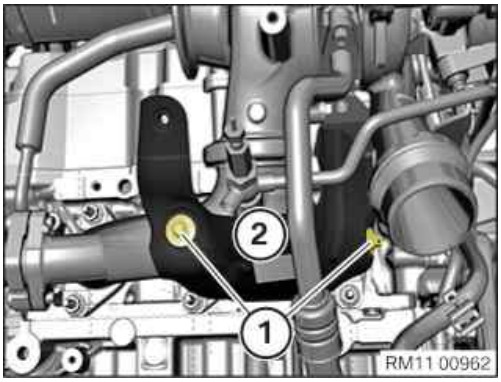
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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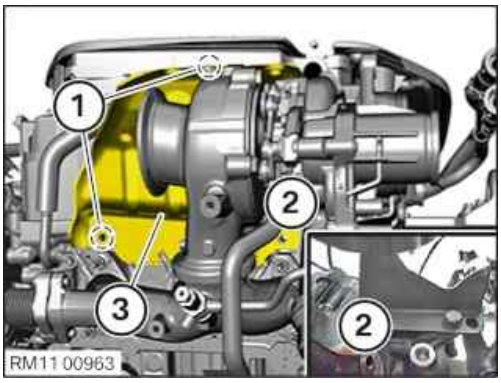


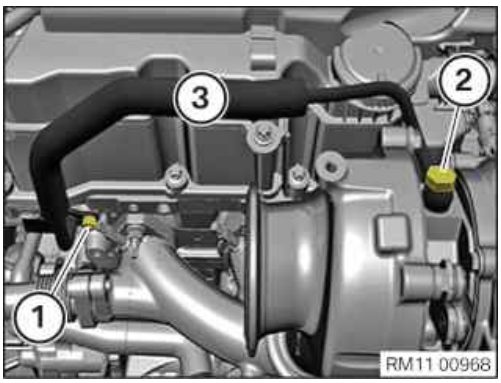
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

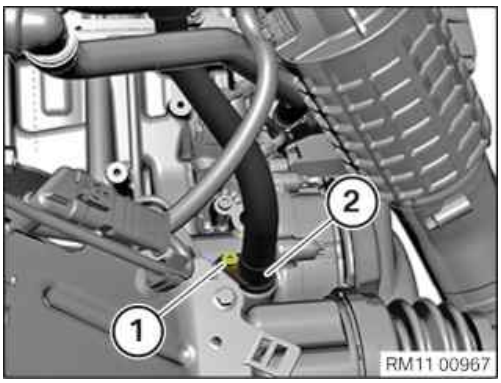
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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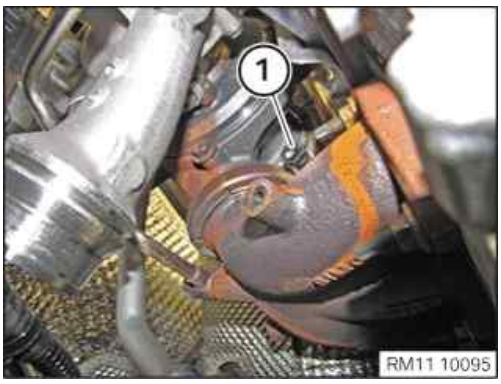
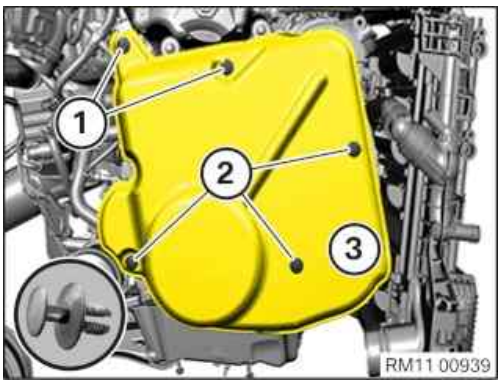
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

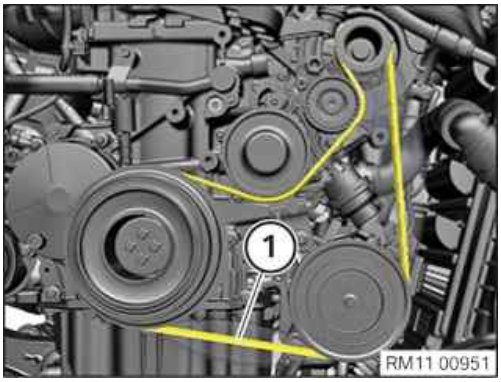
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

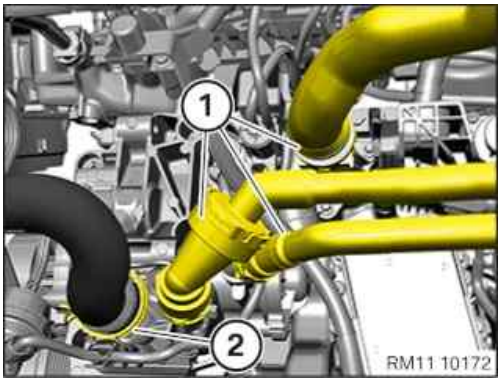
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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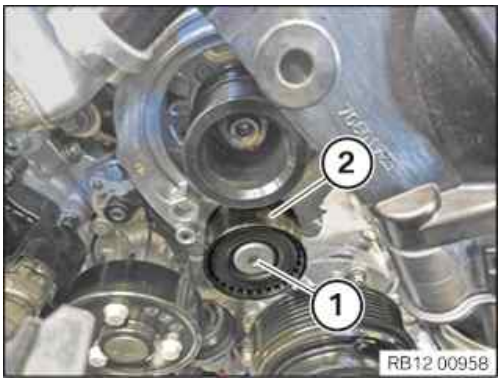
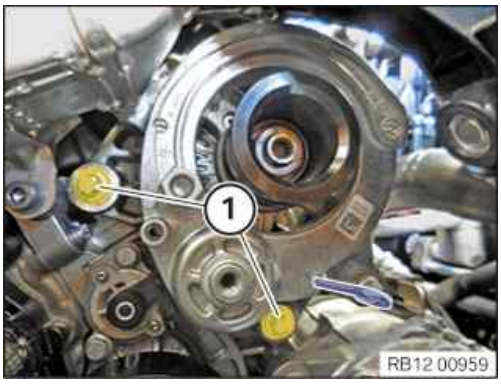
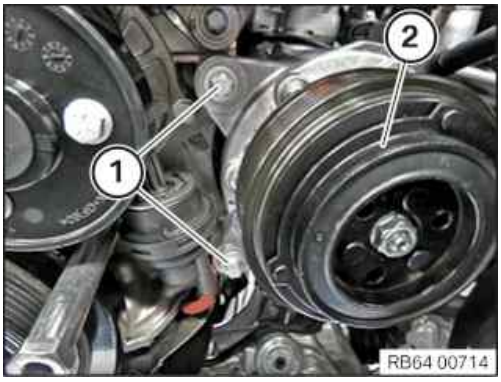


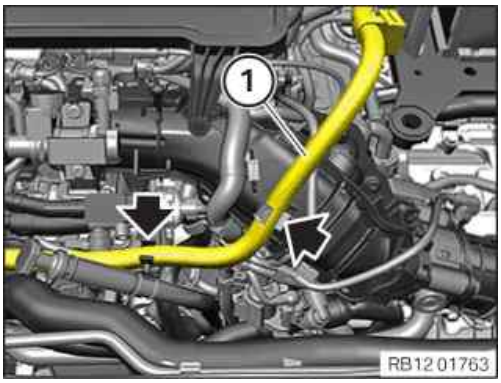
- Loosen screw (1).
- Remove the deflecting element (2).



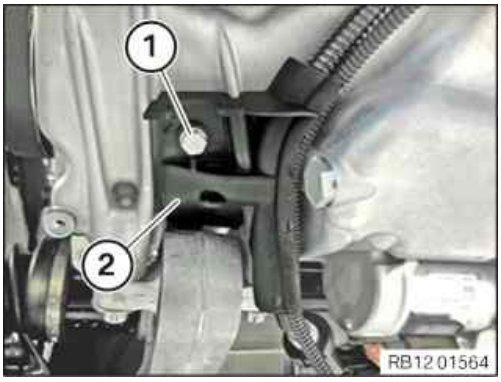
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

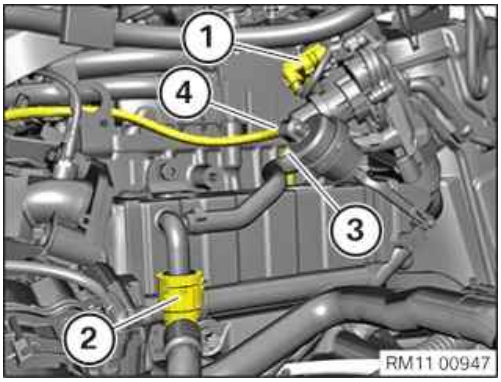
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

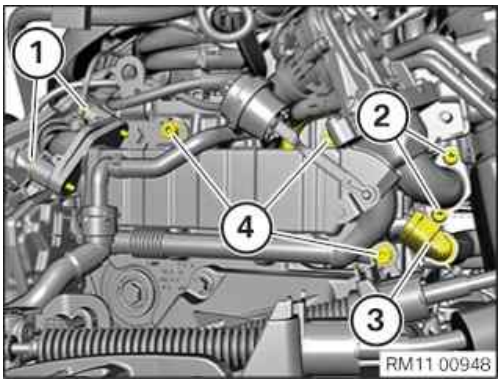
- Perform all work only on components that have cooled down.



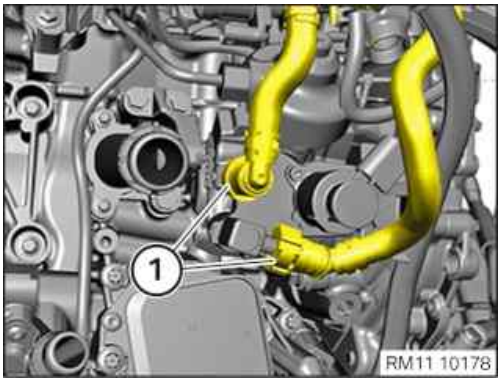
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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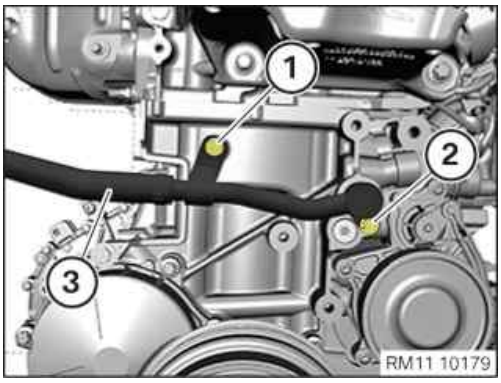


- Loosen screws (1) and (2).
- Remove coolant line (3).

8 – Detach the engine from the manual gearbox

Prerequisite

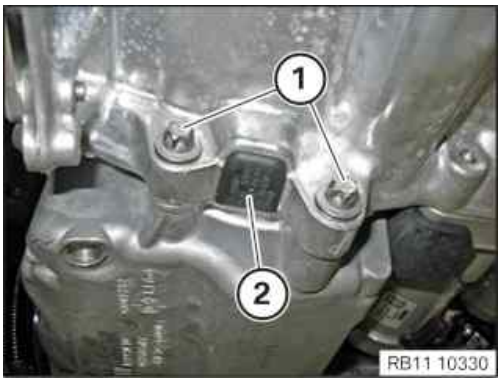
Engine has been removed.

CAUTION

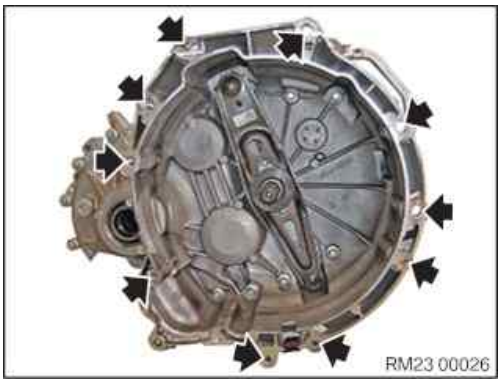
Heavy component.

Heavy components can lead to injury or damage.

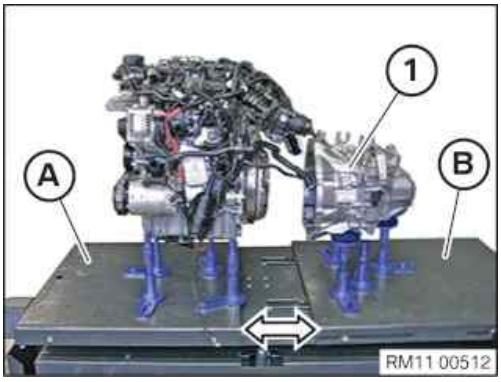
- Remove and install heavy components with the aid of another person/other persons.



- Loosen screws (1).
- Remove protective cap (2).



- Remove screws (arrows).



- Slide the table top (B) in the direction of the arrow and slide the manual gearbox (1) to the side.

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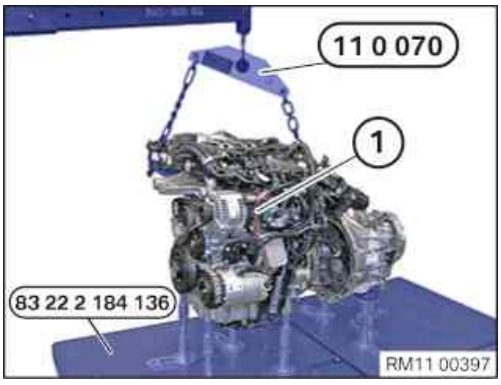
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Attach engine lifter to special tool **0 490 579 (11 0 070)** and lift engine (1) off lifting table.

9 – Mount engine on assembly stand

CAUTION

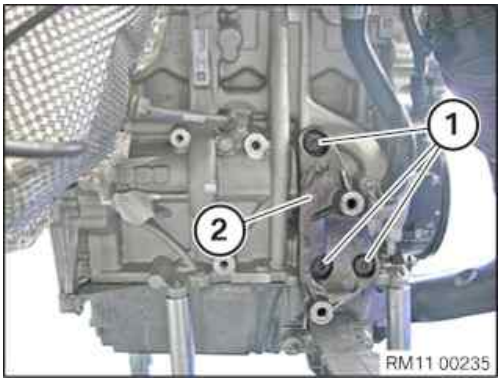
Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Loosen screws (1).
- Guide out and remove holder (2).

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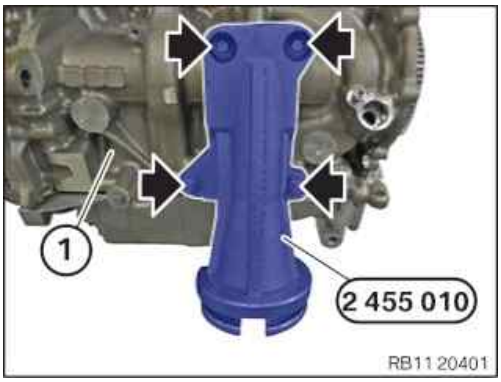
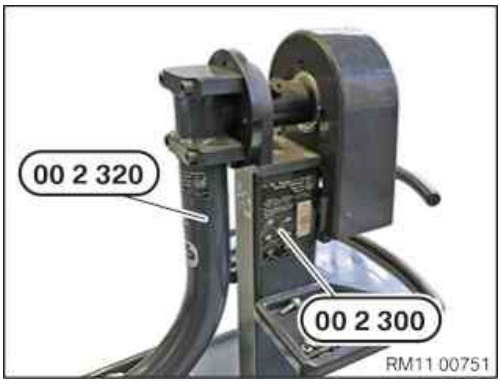


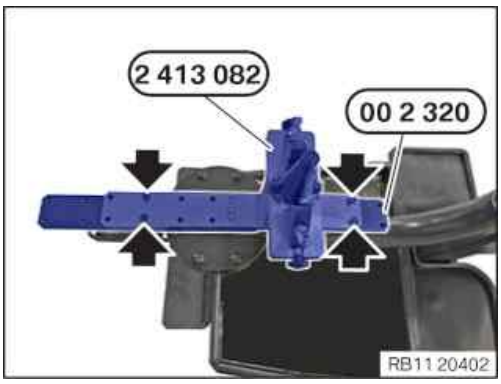
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.

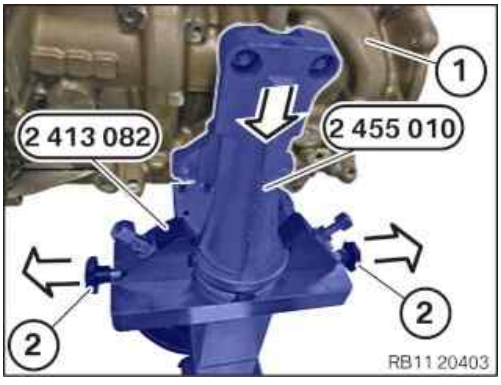


- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.



- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .

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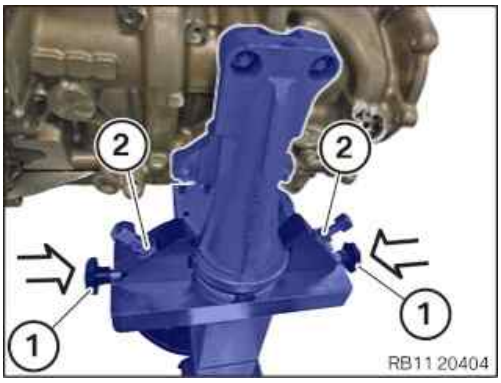


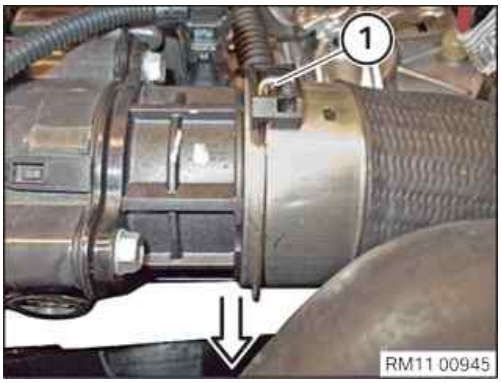
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

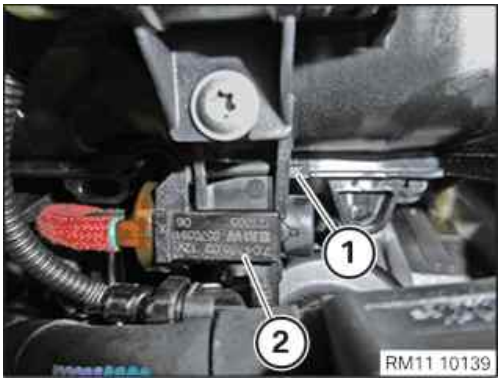
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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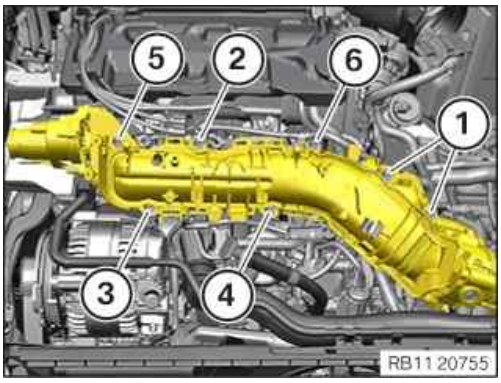
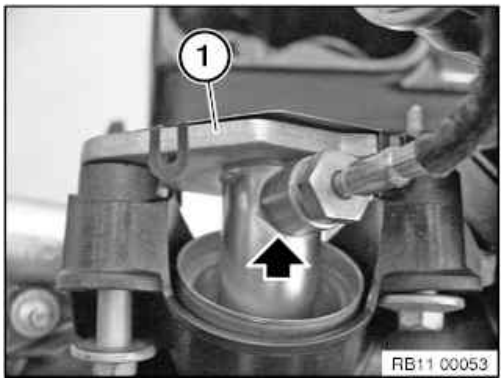


- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

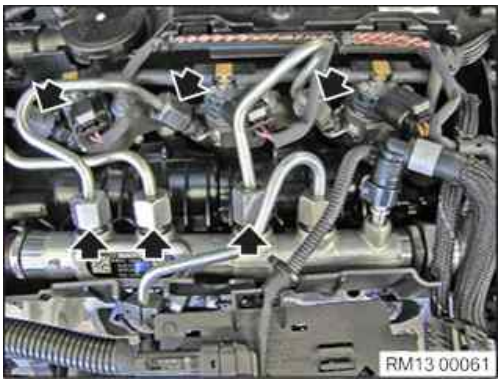
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

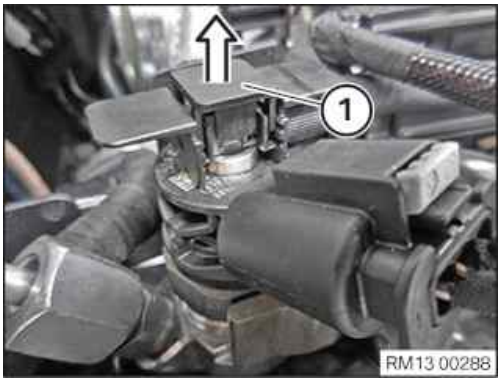
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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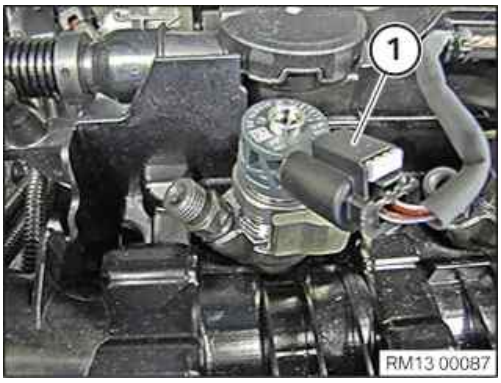
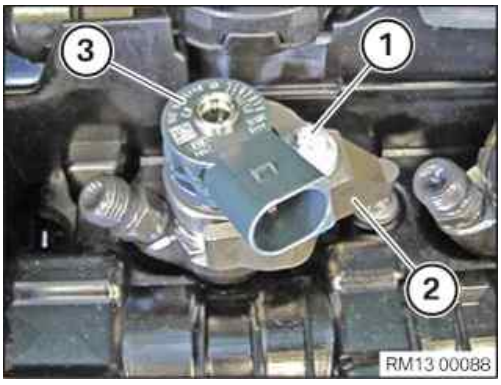


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

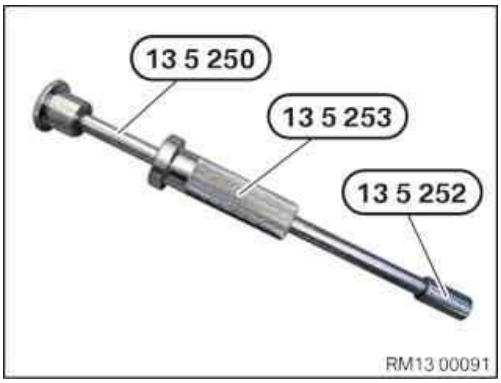
▶ **Loosen stuck injectors**

RISK OF DAMAGE

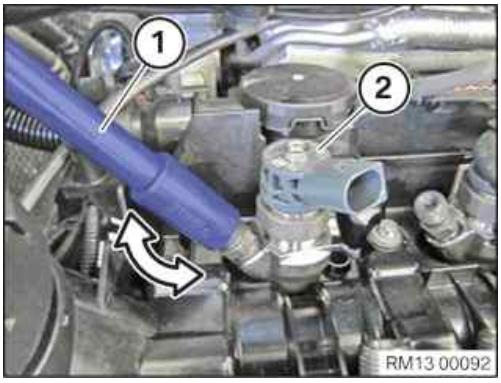
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

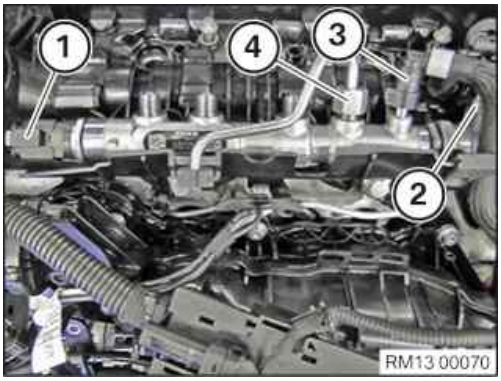
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

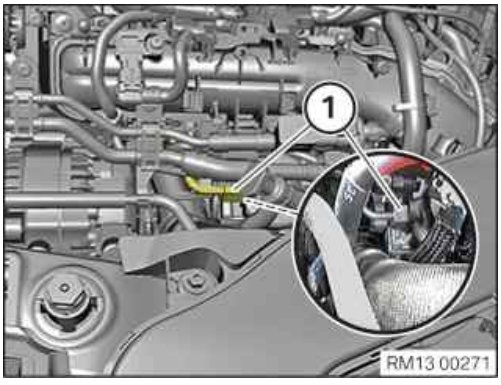
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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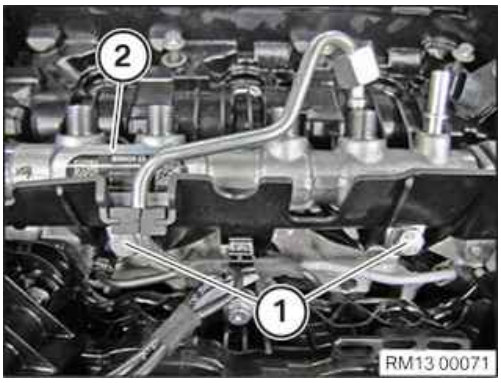
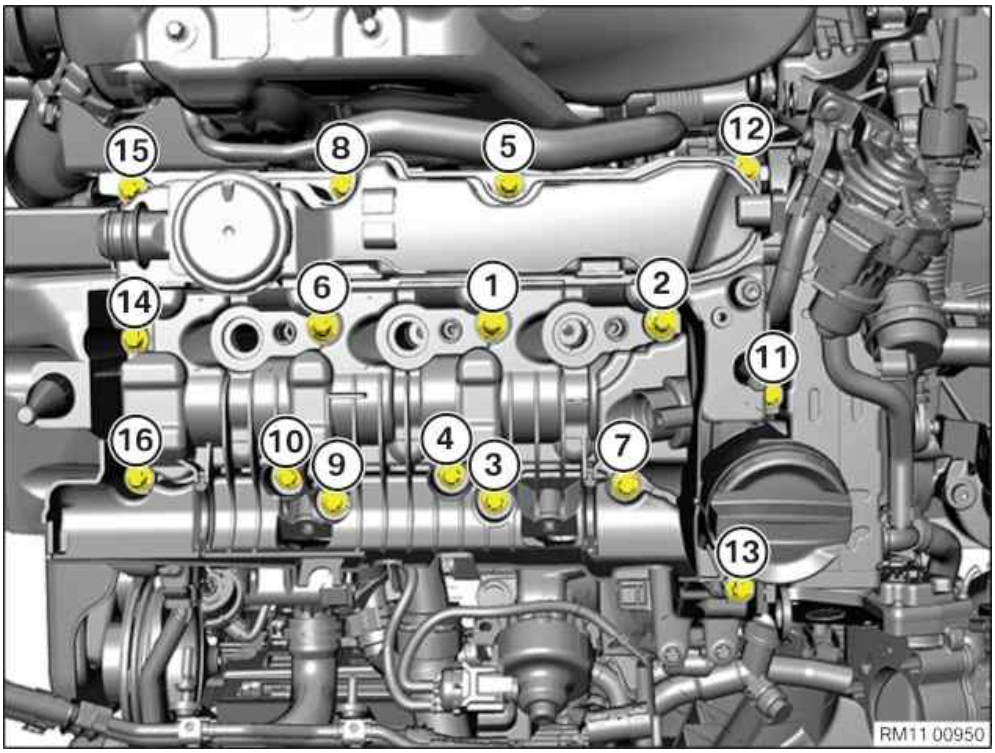


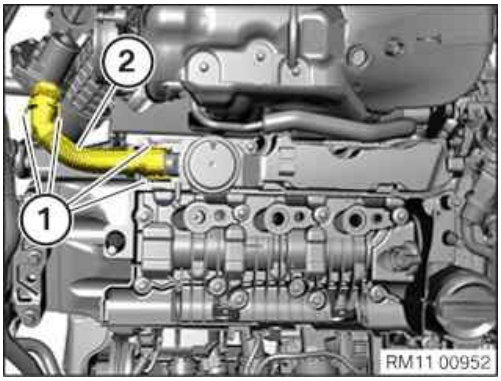
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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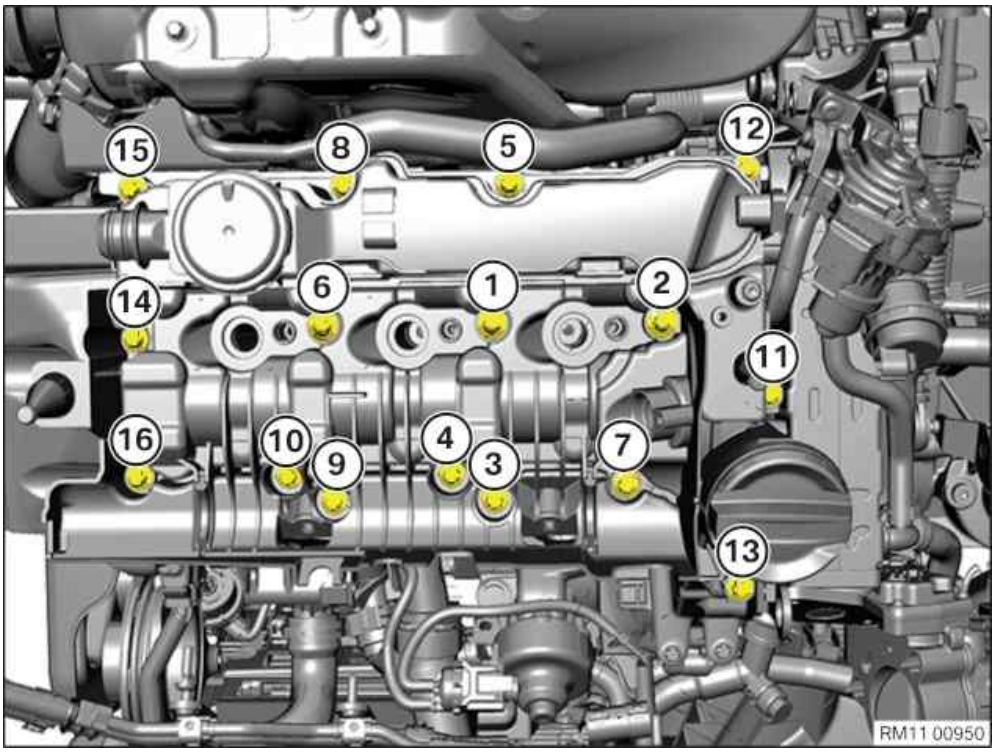

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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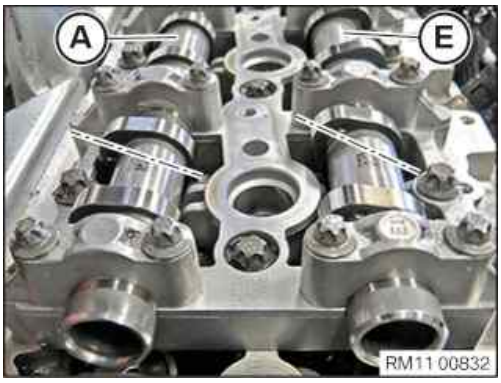
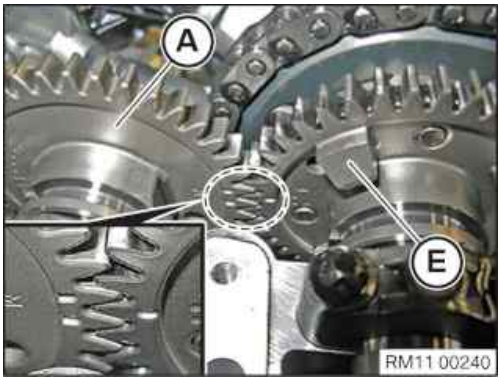


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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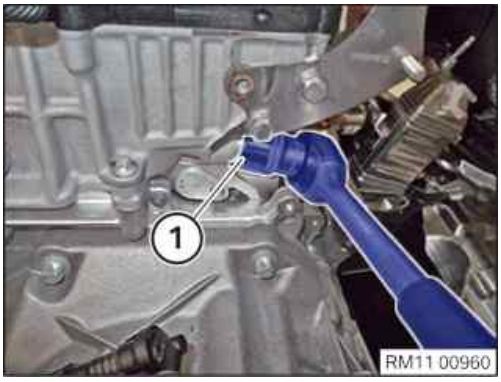
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

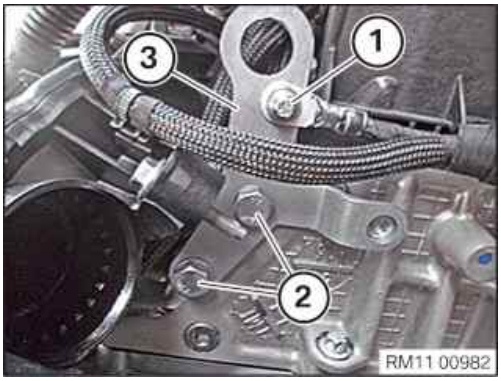


TECHNICAL INFORMATION

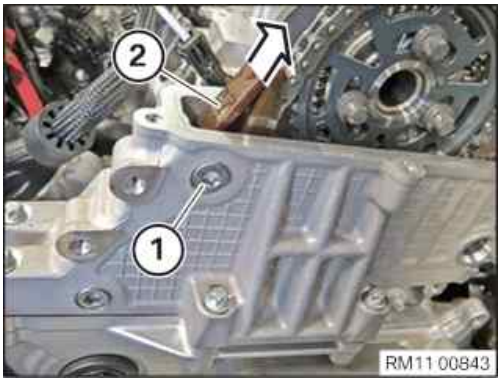
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

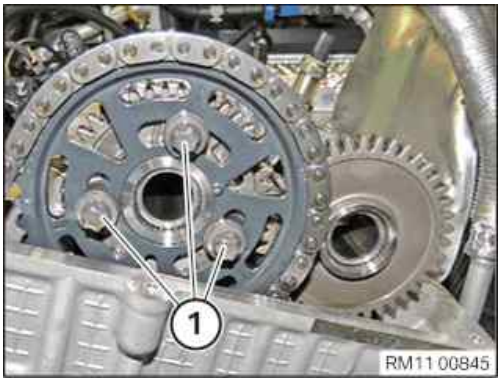


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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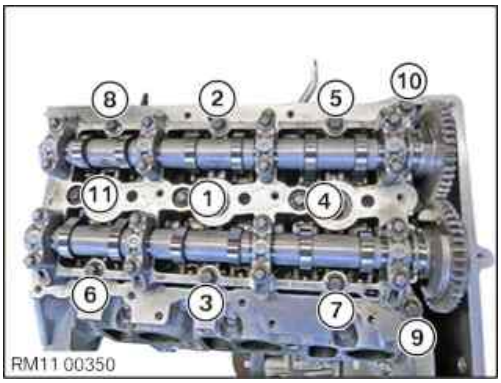
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

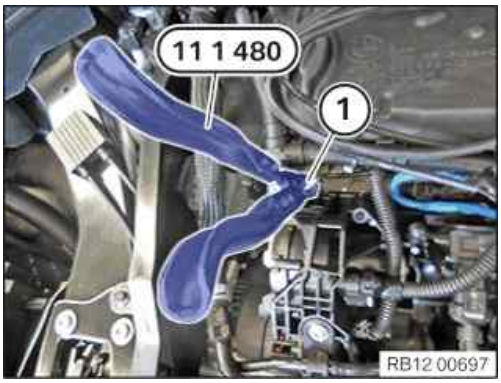
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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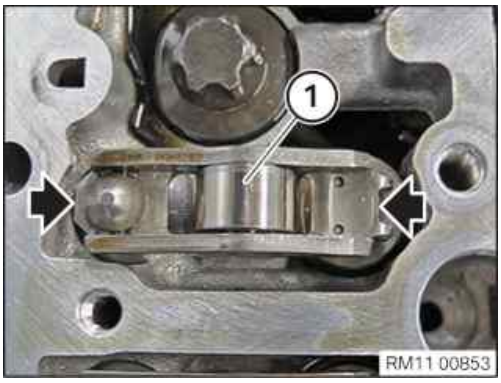


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

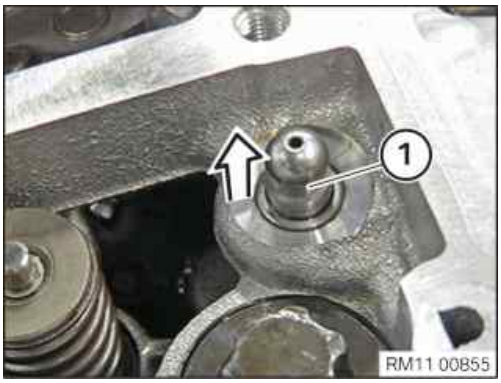
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

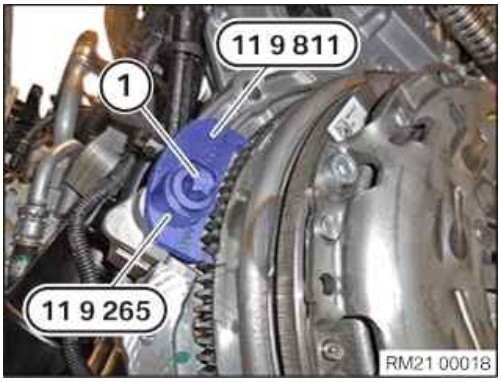
24 – Remove clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.



- Block flywheel with transmission bolt (1) and special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.

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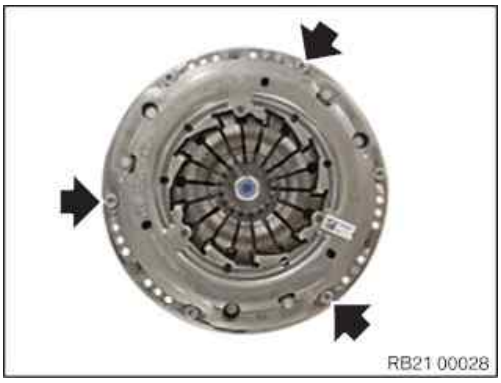
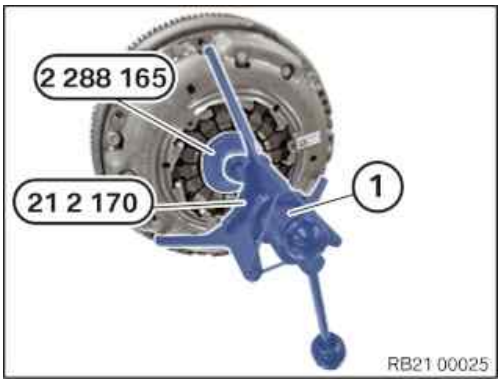
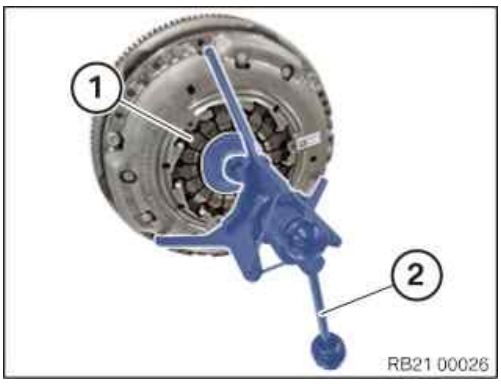


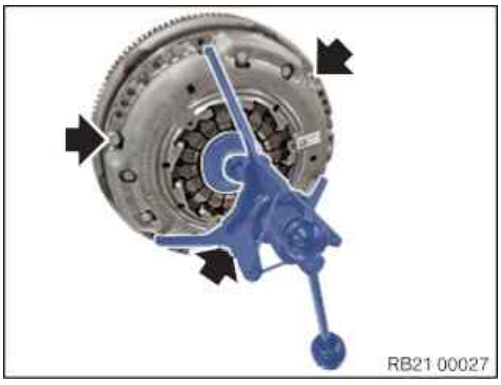
- Detach 3 screws to attach special tool **0 493 839 (21 2 170)** and **2 288 165**.



- Position special tool **0 493 839 (21 2 170)** and **2 288 165** and tighten on the knurled screw (1).



- Screw in the spindle (2) until the diaphragm spring (1) is preloaded and the clutch disc is free of tension.



- Loosen the remaining 3 screws and remove the clutch with clutch disc from the flywheel.

25 – Removing flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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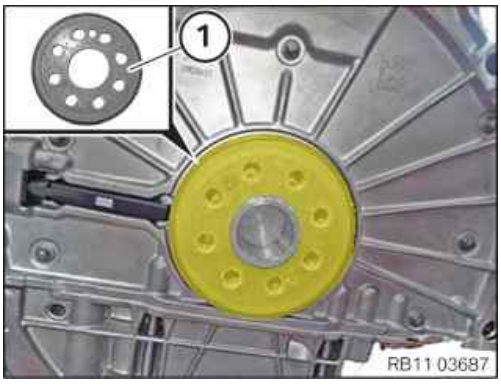
- Secure the flywheel with a transmission bolt (1) and with special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)**.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Remove flywheel.



RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

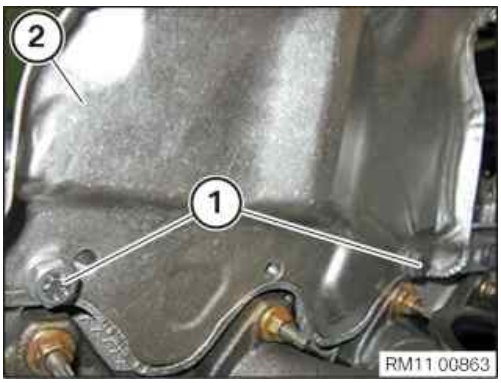
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove the increment wheel (1) from the crankshaft and lay it down correctly.

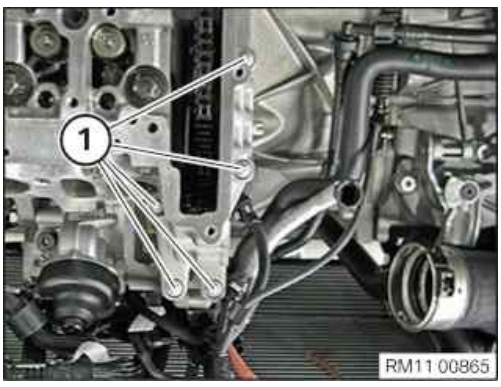
26 – Remove rear timing case cover

Prerequisite

Transmission is removed.



- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).

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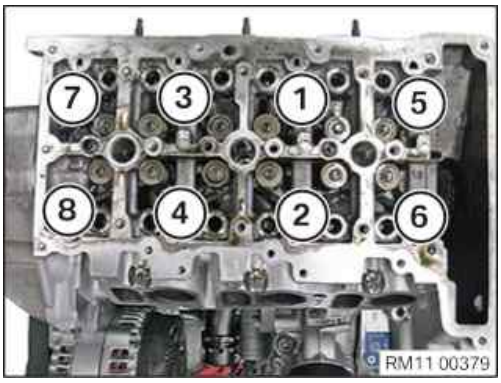
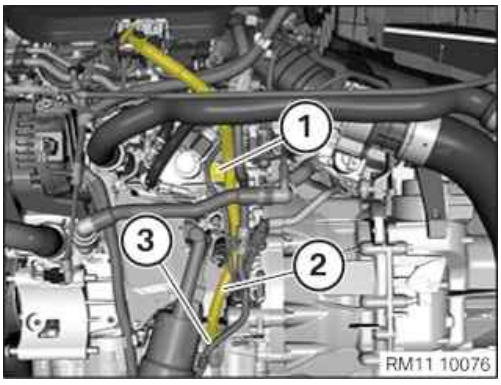
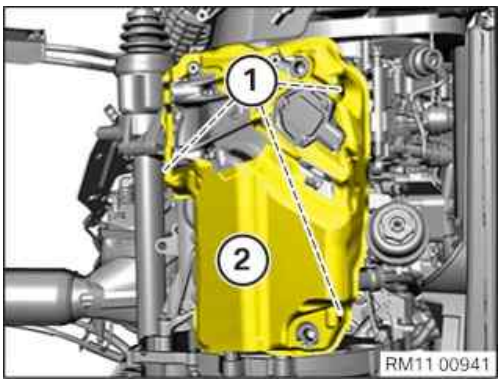


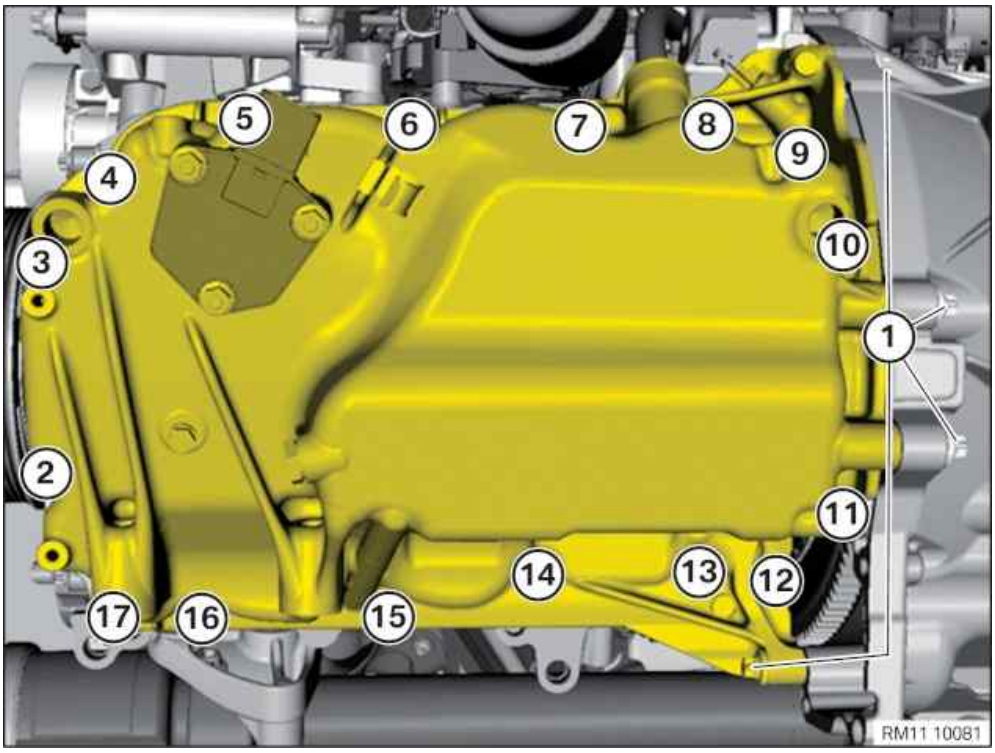
- Loosen the cylinder head bolts in the sequence from (8) to (1).



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- If required, remove sealing ring (3) from oil sump.



- Remove the expanding rivet (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).



- Tighten the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).

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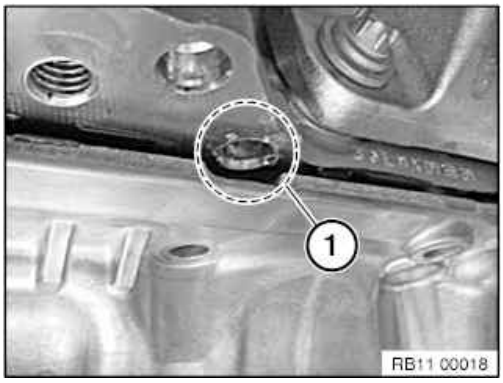
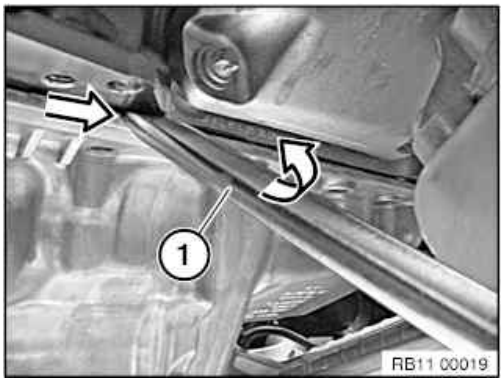
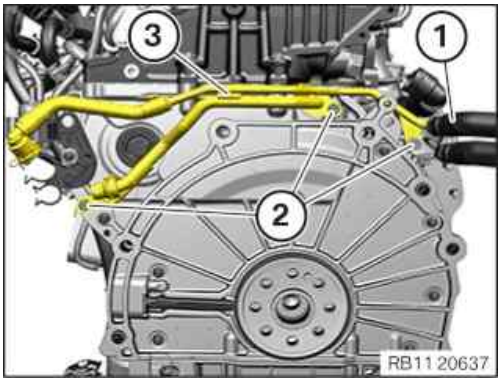


- Release oil sump only in area (1).

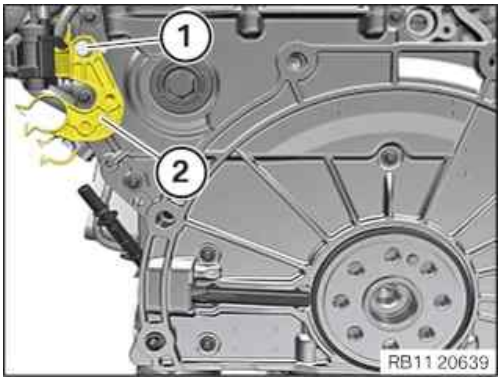


- Release the oil sump using a suitable mounting lever (1) carefully at the position intended for that.
- If required, secure the oil sump against falling.

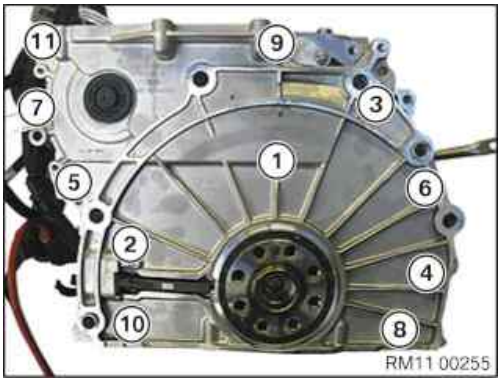
► **If installed: Remove coolant line of the SCR metering module**



- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).

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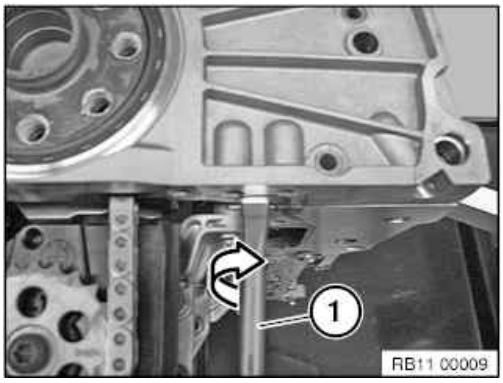
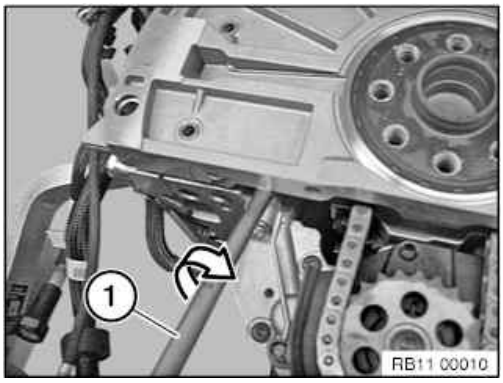


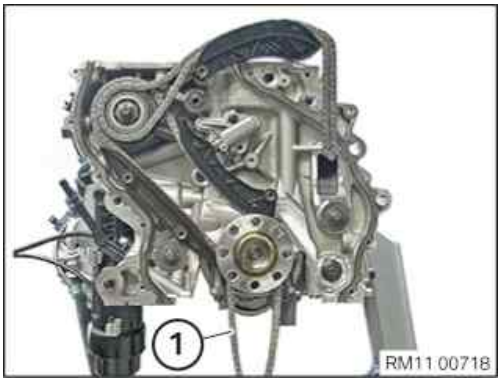
- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.



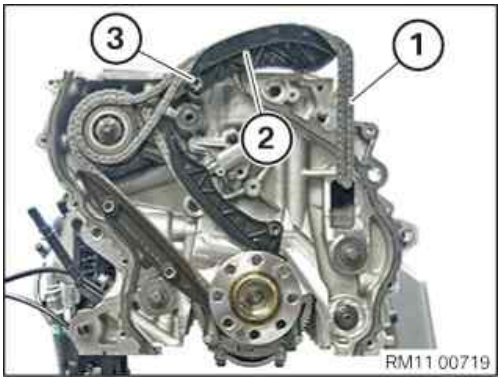
- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

MAIN WORK

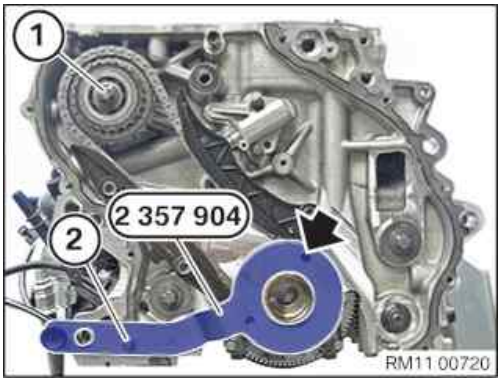
27 – Remove both timing chains



- Remove drive chain (1) for oil pump.



- Remove the timing chain (1) for the camshafts.
- Remove the tensioning rail (2) from the bearing journal (3).
  Bearing journal (3) does not have to be disassembled.



- Secure crankshaft to release central bolt (1) of high pressure pump.
- Position crankshaft with guide pin (arrow).
- Secure special tool **2 357 904** with bolt (2) on crankcase.
- Release central bolt (1) of high pressure pump; do not remove.

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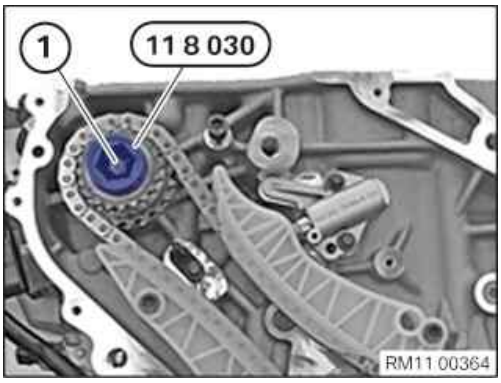
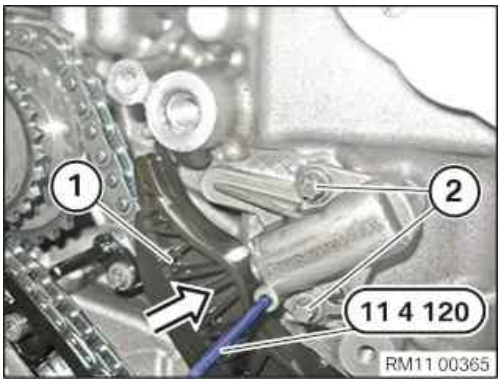
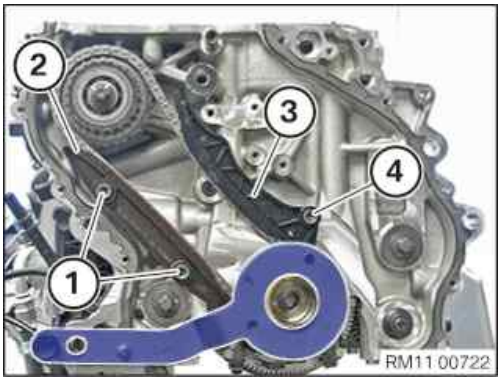


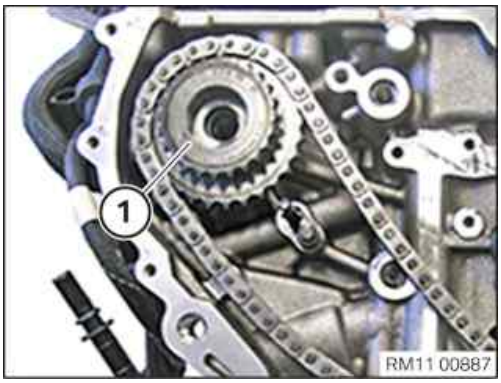
- Screw special tool **0 496 725 (11 8 030)** into sprocket of high pressure pump.
- Unscrew central bolt (1) of high pressure pump until central bolt can be supported on special tool **0 496 725 (11 8 030)**.
- Continue turning central bolt (1) until camshaft sprocket is released from high pressure pump shaft.



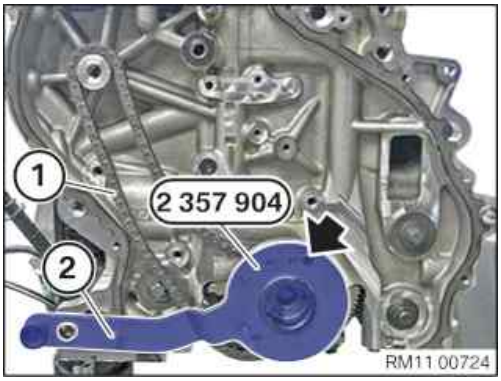
- Press chain tensioner in with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove chain tensioner.



- Loosen both bearing journals (1).
- Remove the guide rail (2).
- Loosen the bearing journals (4).
- Remove the tensioning rail (3).



- Remove bolt and camshaft sprocket (1) of high pressure pump.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Unscrew the bolt (2) and remove the special tool **2 357 904**.
- Remove the timing chain (1).

28 – Install both timing chains

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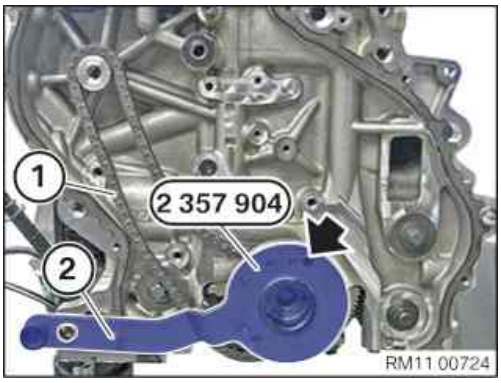
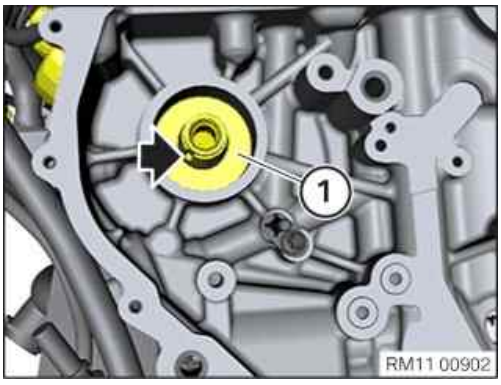


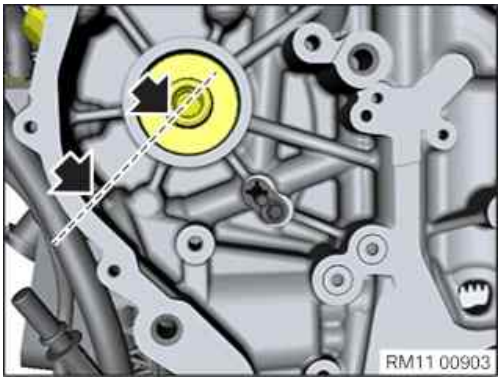
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

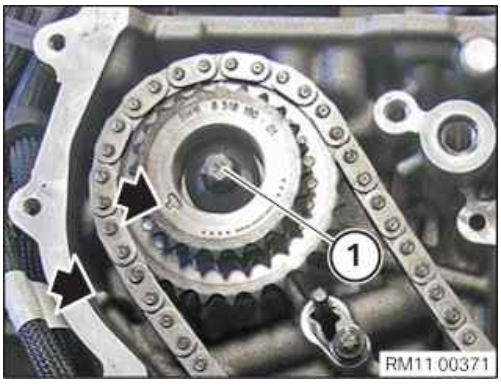
- Position the timing chain (1).
- Secure crankshaft with special tool **2 357 904**.
- Secure special tool **2 357 904** with bolt (2) on crankcase.



- Note spline groove on high pressure pump (1).



- Mark and groove (arrows) on high pressure pump and crankcase must align.



- Position the impeller with timing chain on the high pressure pump.
- Screw in and fasten central bolt (1) of high pressure pump.
- Mark and cast lug (arrows) must align.

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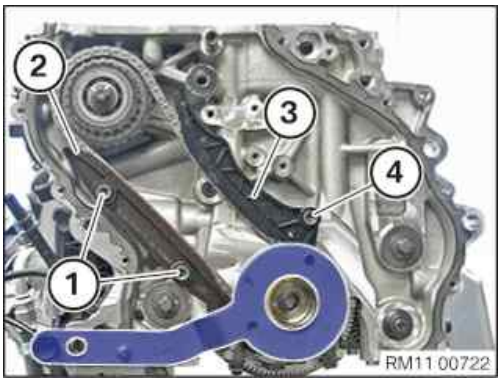


- Position tensioning rail (3).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten the bearing journals (4).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

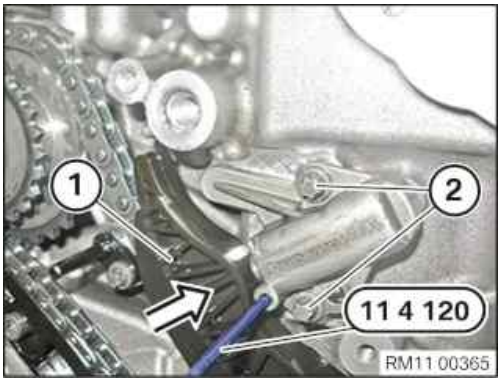
- Position the guide rail (2).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten both bearing journals (1).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

- Clean sealing surfaces (1) with compressed air.

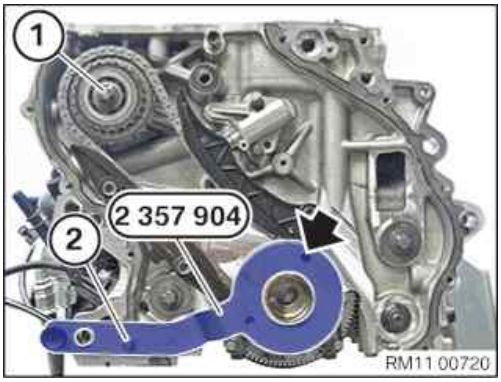


- Position hydraulic chain tensioner.
- Tighten down screws (2).

Chain tensioner to crankcase

M6x22		Tightening torque	10 Nm

- Press chain tensioner in by hand with tensioning rail (1) in direction of arrow until special tool **0 491 012 (11 4 120)** can be removed.



- To fasten central bolt (1) of high pressure pump, crankshaft must remain secured with special tool **2 357 904** and bolt (2).
- Renew central bolt (1).

  Parts: Central bolt
- Tighten central bolt (1).

Camshaft sprocket on high pressure pump

M12		Tightening torque	65 Nm

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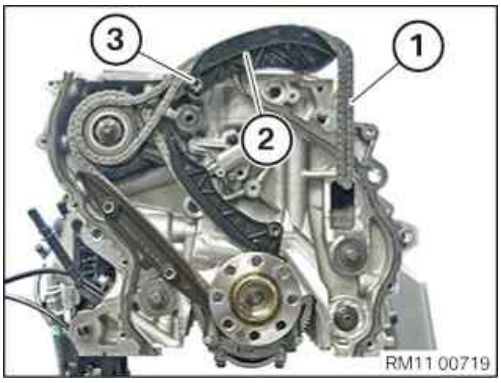
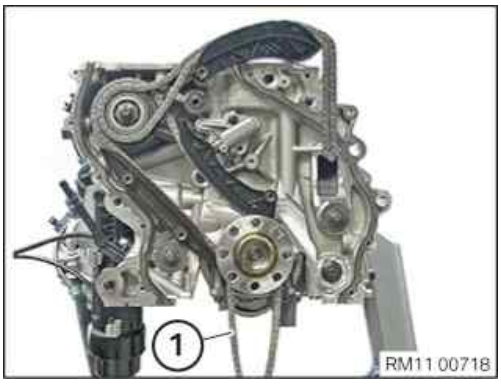


- Position tensioning rail (2) on bearing journal (3).
- Position camshaft timing chain (1).



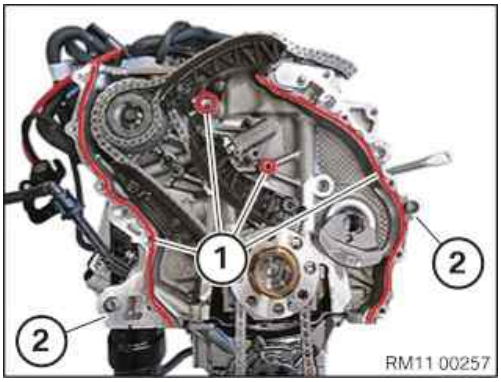
- Mount drive chain (1) for oil pump on crankshaft.

POSTPROCESSES

29 – Install the rear timing case cover

Prerequisite

Transmission is removed.



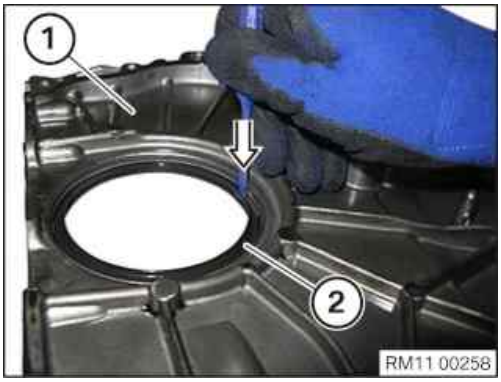
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.

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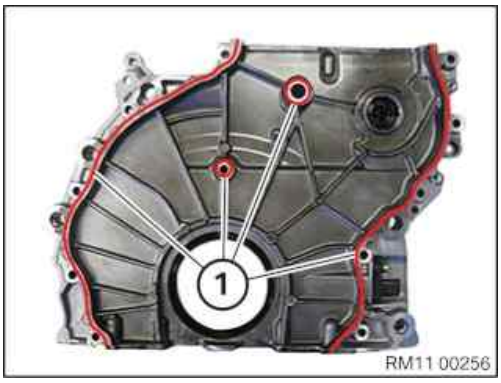
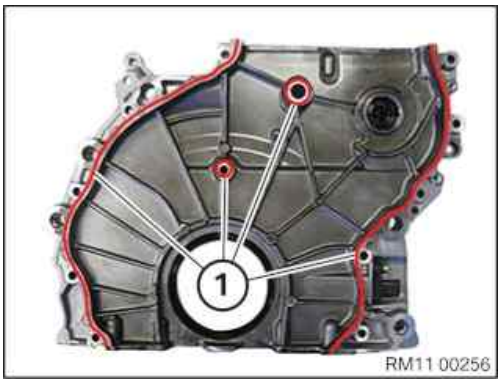


- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

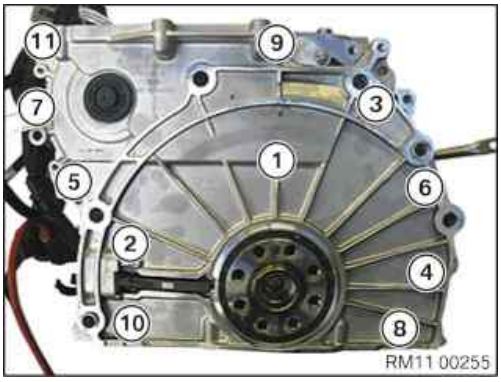


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

▸ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

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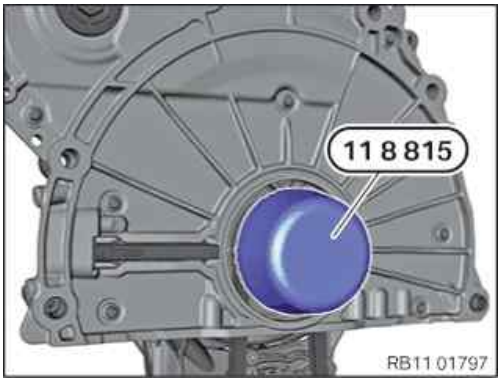
RISK OF DAMAGE

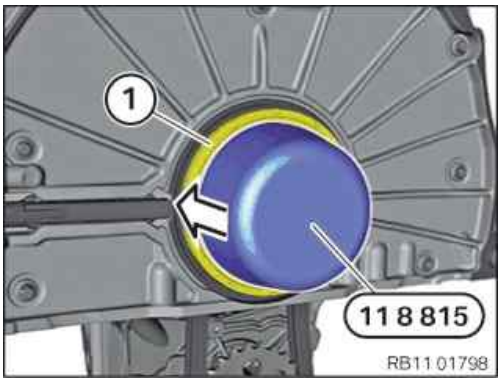
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.



- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.

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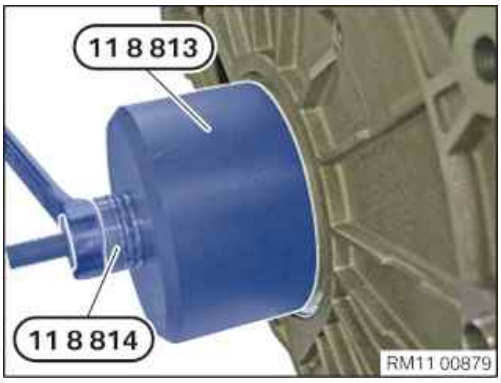
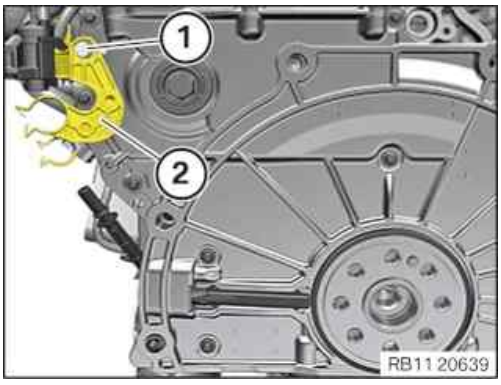
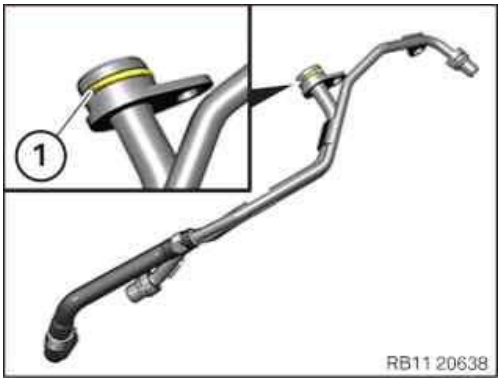


- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



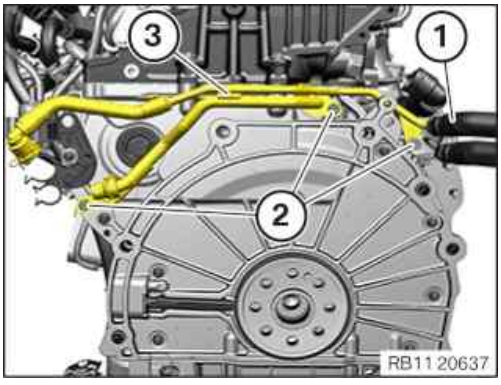
- Insert and install the holder (2).

▶ **If installed: Installing the coolant line of the SCR metering module**



- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

▶ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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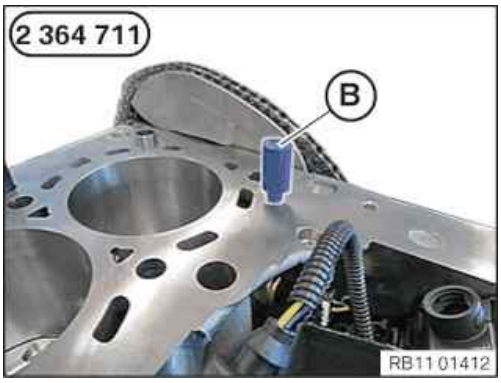


- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

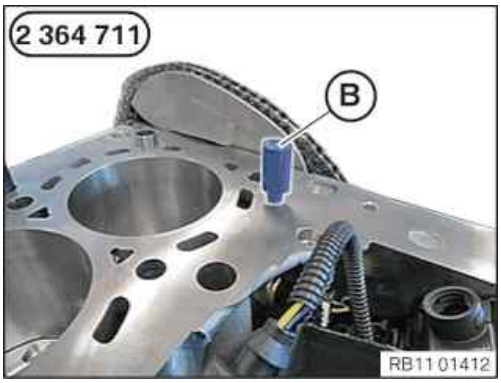
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

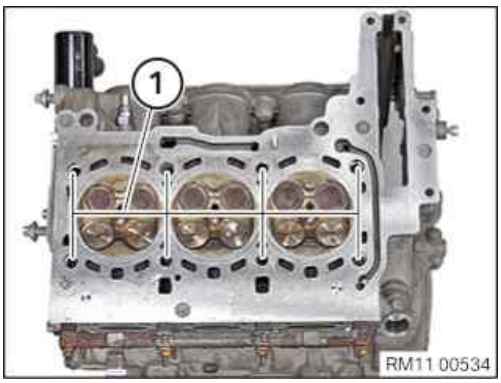
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ Renewing the cylinder head gasket



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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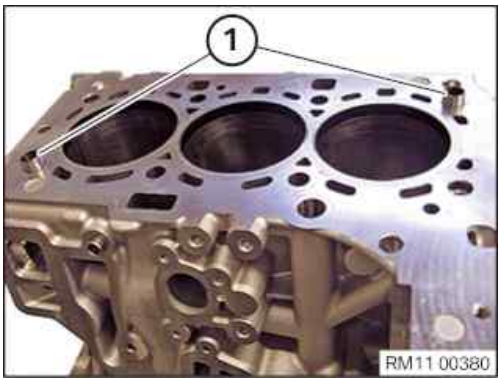
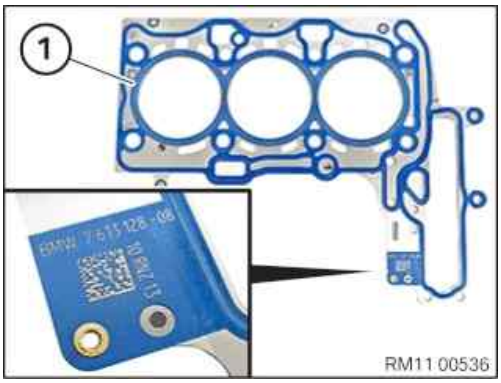
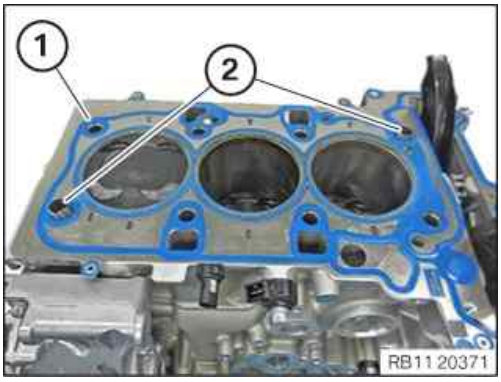


- Check the fitting sleeves (1) for secure fit and damage.

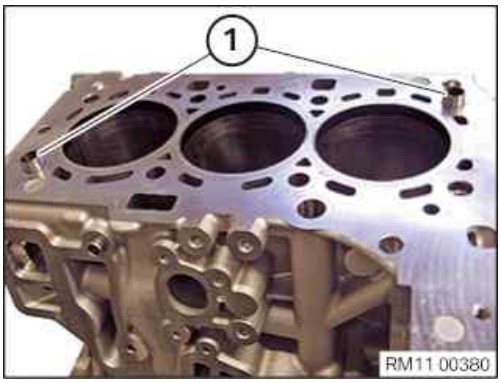


- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.

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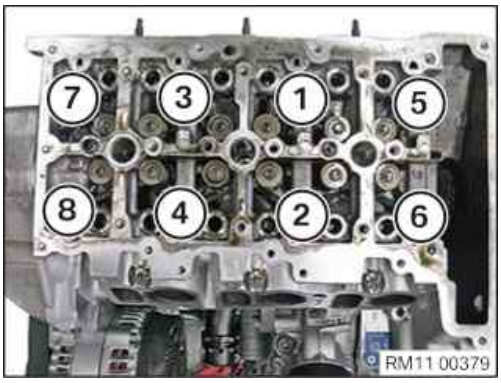


- Fit new cylinder head screws.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

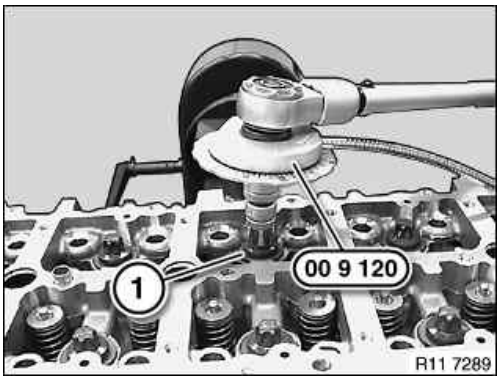
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

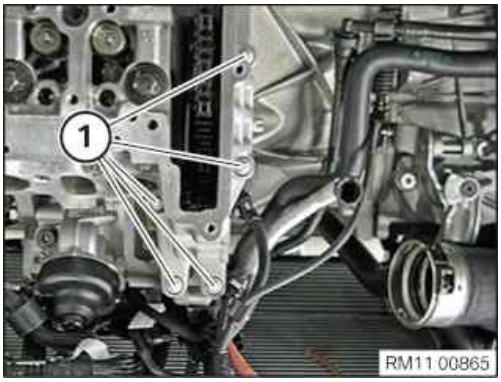
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolts in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

-

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.

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TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

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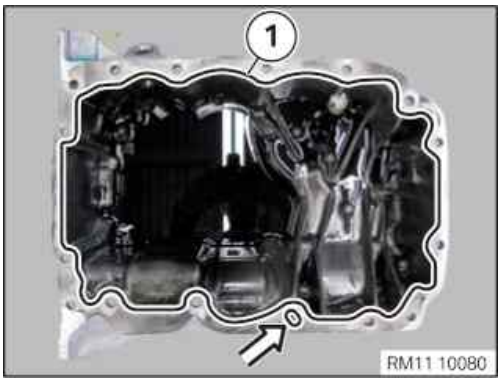


TECHNICAL INFORMATION

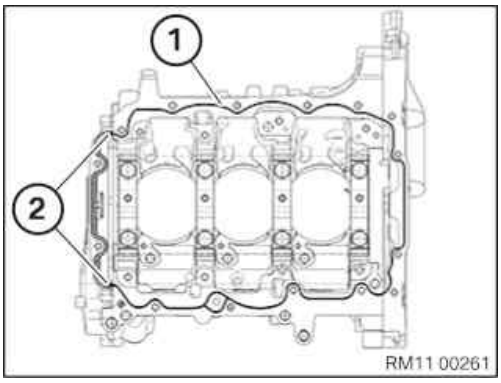
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

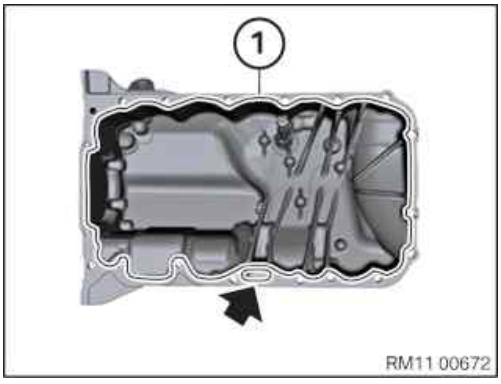
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.



TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.

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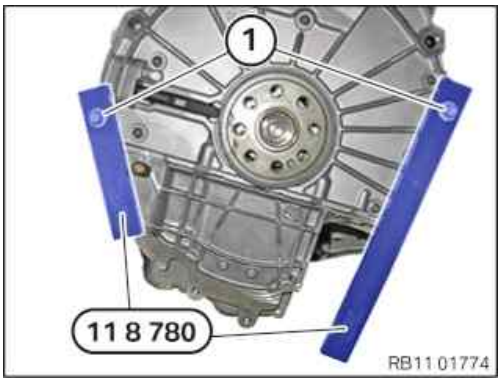
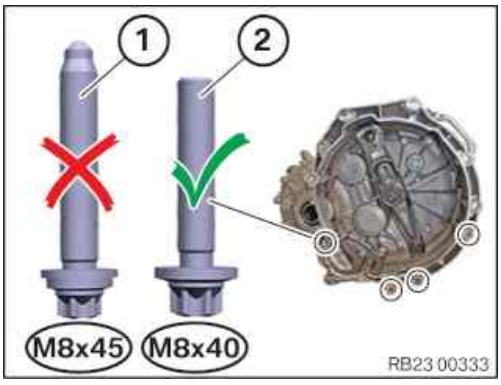


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

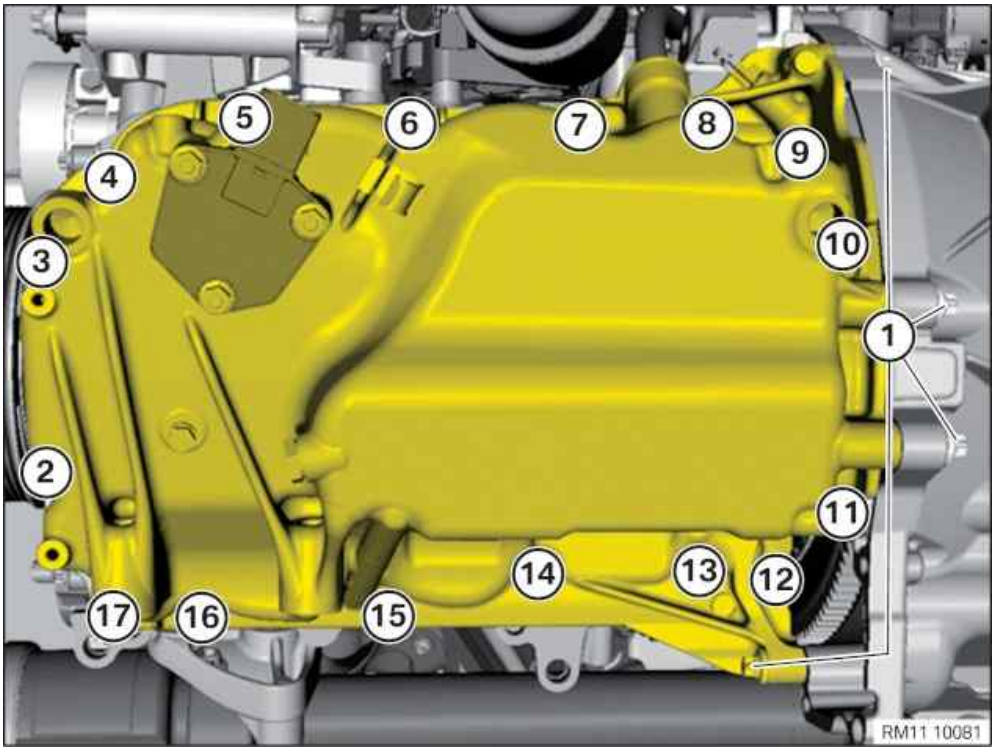
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Hand tighten the screws of oil sump (2) to (17) , but do **not** tighten completely yet.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

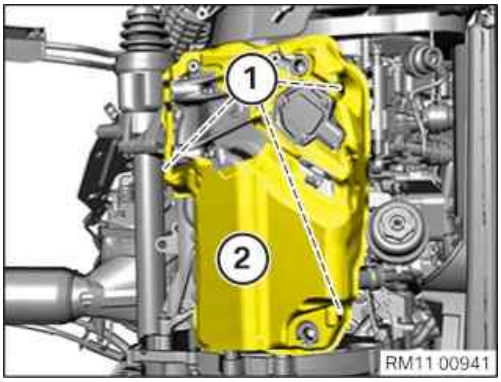
Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

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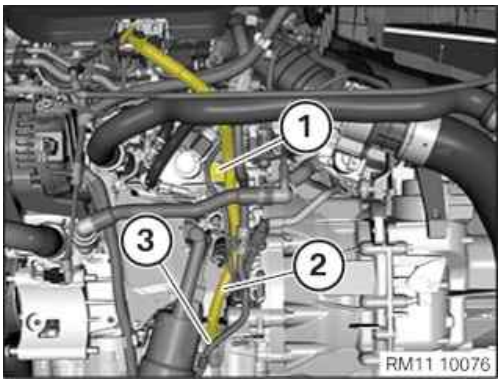
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

30 – Installing the flywheel

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Clean all threads with a screw tap.

- Clean all screw threads (1).

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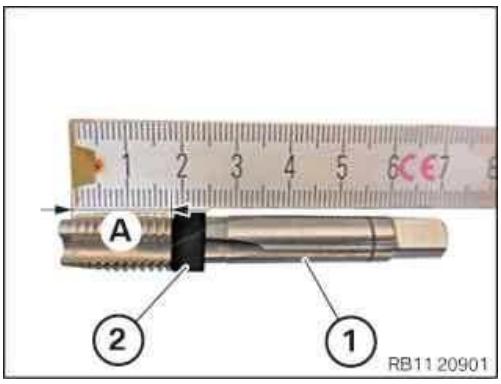
- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

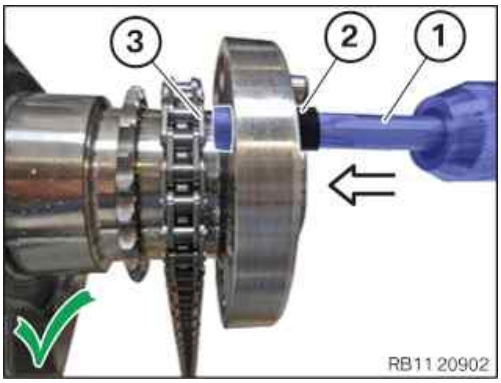
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the screw-in depth (A) on thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

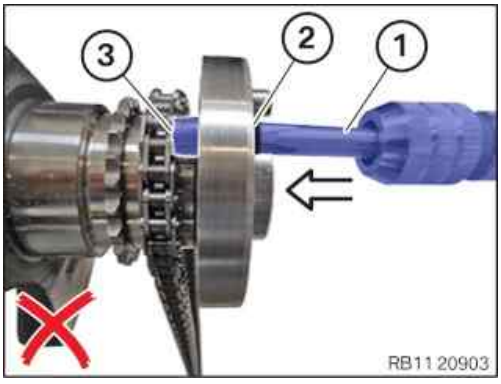
To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the screw-in depth (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).



TECHNICAL INFORMATION

- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the screw-in depth (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).

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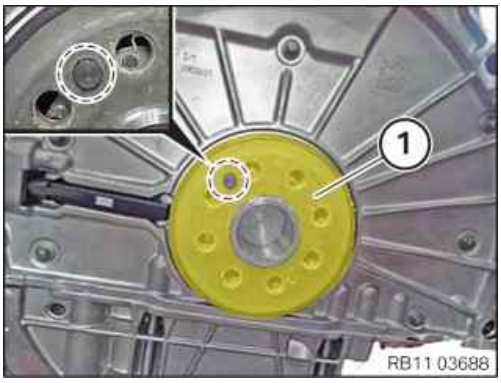
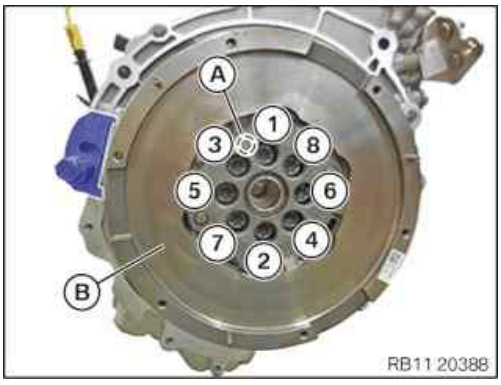


- During the installation, note the mark shown without fail.
- Install special tool (1) on the crankshaft as shown.

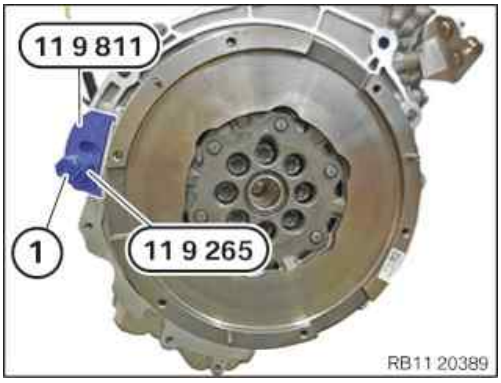


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Observe tightening sequence. While doing so, begin with dowel pin (A).
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Feed out and remove special tools **0 494 793 (11 9 265)** and **0 496 171 (11 9 811)** with the **standard** (5 mm) washer.

31 – Install clutch

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Handle the clutch disc carefully. Install the surfaces of the clutch disc in the correct mounting orientation.
Clean friction surfaces of the flywheel and the pressure plate with BMW-approved brake cleaner.
Note designation for ”engine side” / ”transmission side”.

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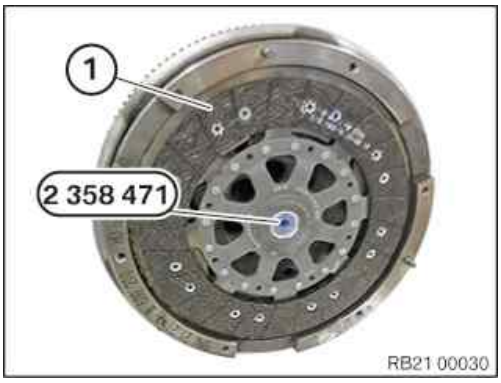
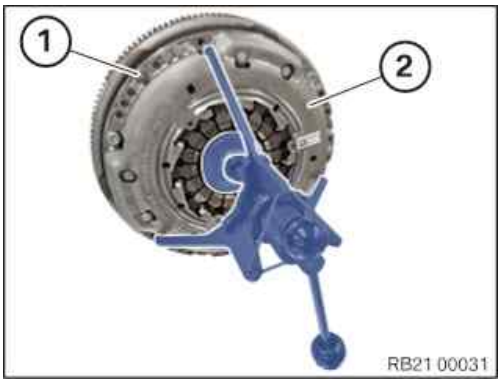
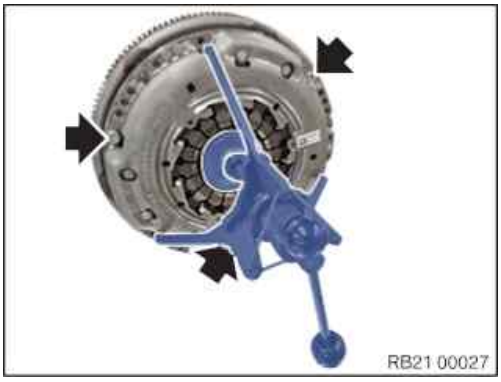


- Centre the clutch disc (1) using special tool **2 358 471**.



- Mount the clutch (2) together with the special tool to the flywheel.
- Observe the dowel pins (1).
- The clutch (2) must be secured via the dowel pins (1).

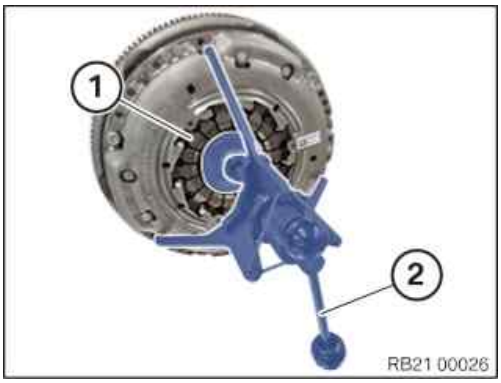


- Renew the bolts (arrows).

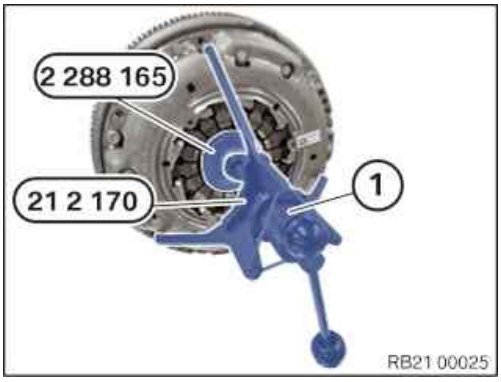
  Parts: Bolts
- Install and tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °



- Loosen the spindle (2) until the diaphragm spring (1) is fully relieved.



- Unscrew the knurled screw (1) and remove the special tool **0 493 839 (21 2 170)** with **2 288 165** from the clutch.

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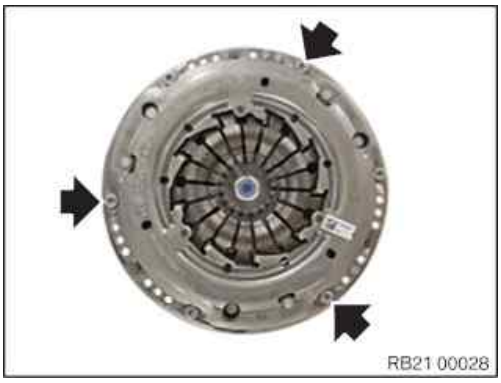


- Renew the bolts (arrows).

  Parts: Bolts
- Tighten screws (arrows).

Clutch to flywheel

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

- Withdraw special tool **2 358 471** from clutch disc with aid of accompanying screw.

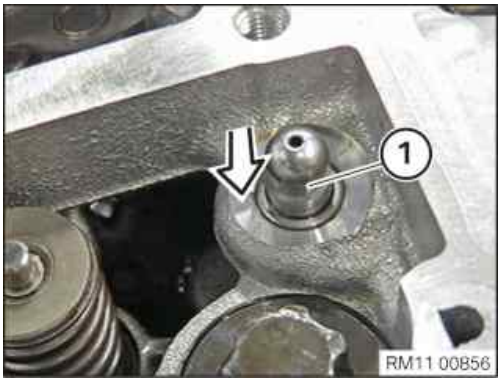
32 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

33 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

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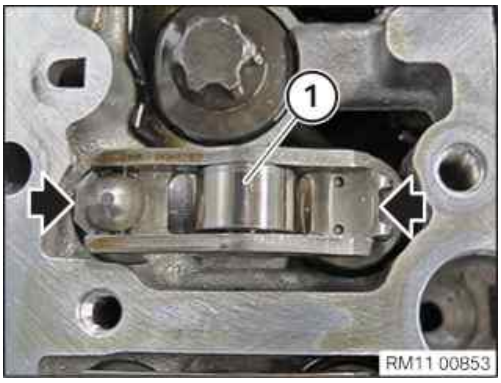
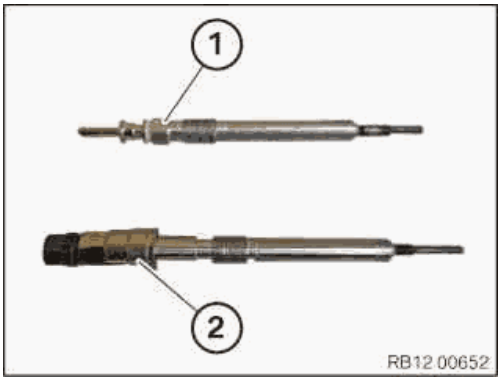


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

34 – Install glow elements

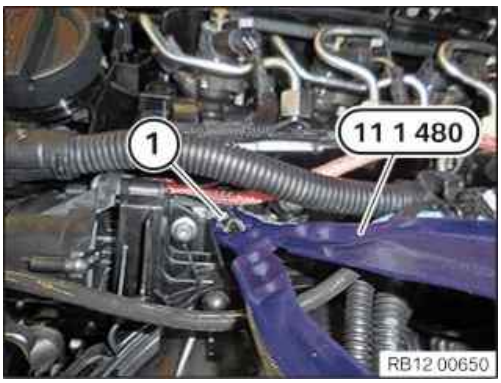


- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

35 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

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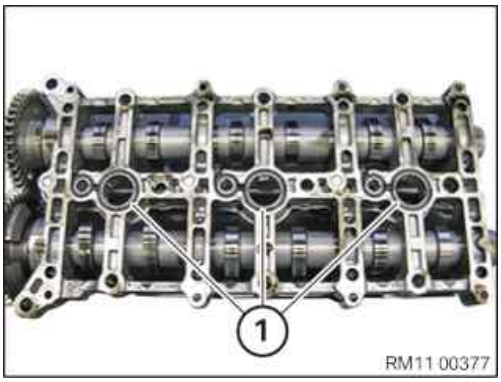
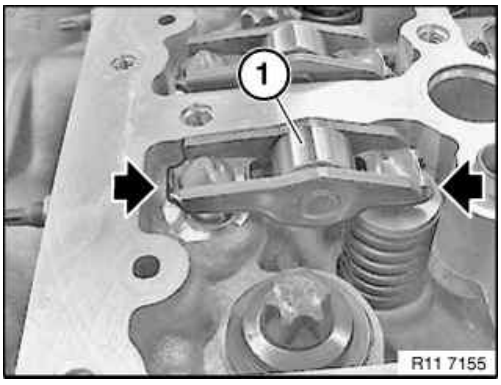
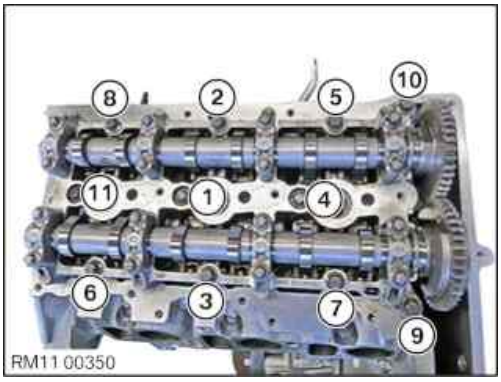


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

36 – Adjusting the timing of the camshafts

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.

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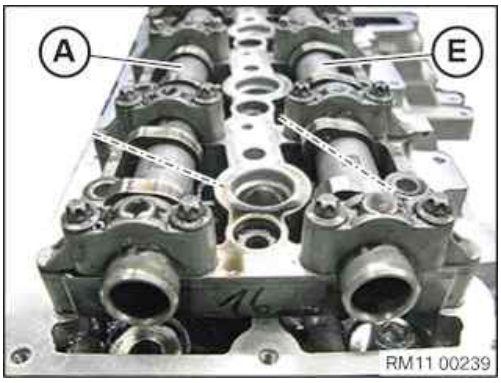


- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

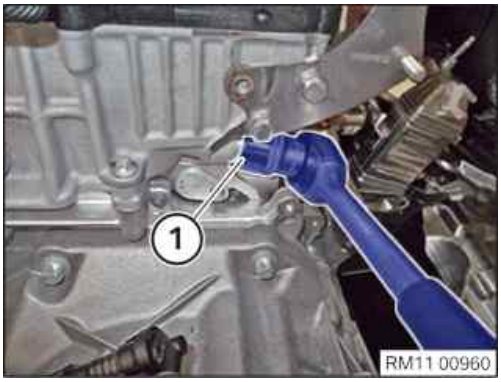
▶ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

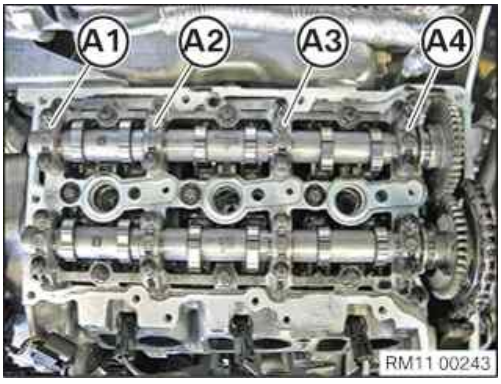
▶ **Remove exhaust camshaft.**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



TECHNICAL INFORMATION

The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

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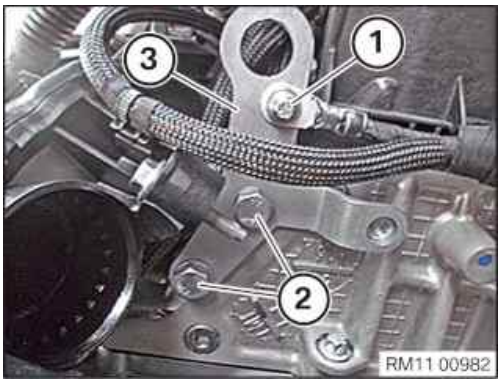
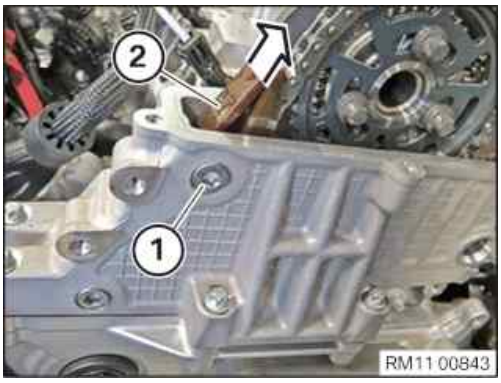
▶ **Remove the timing chain guide rail**

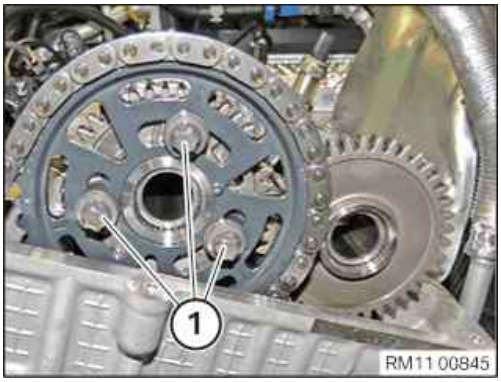


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

▶ **Installing exhaust camshaft**

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

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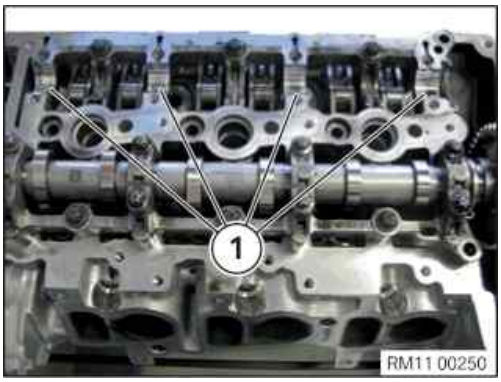
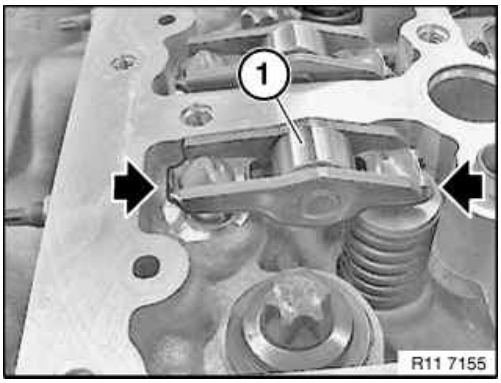
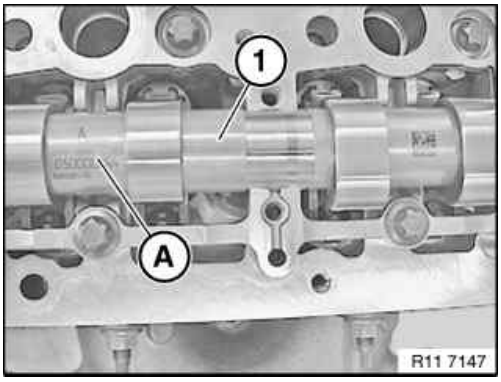


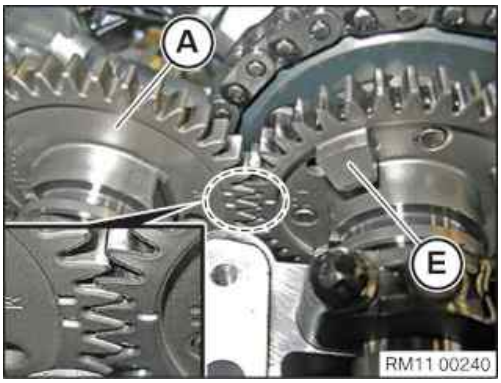
- Oil all bearing positions (1).



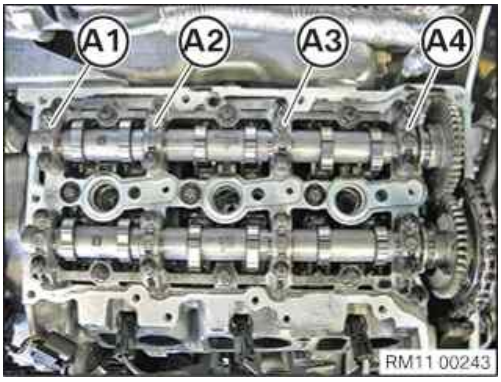
- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.



- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

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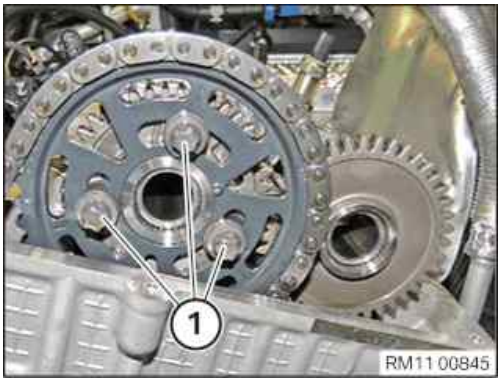
- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

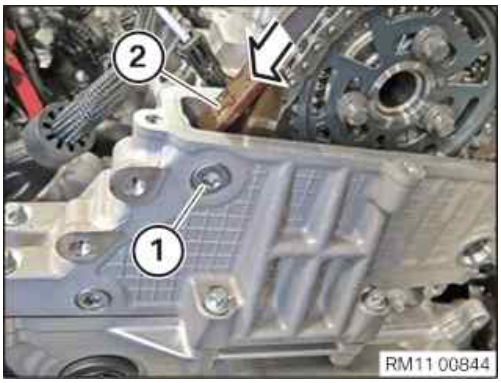
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



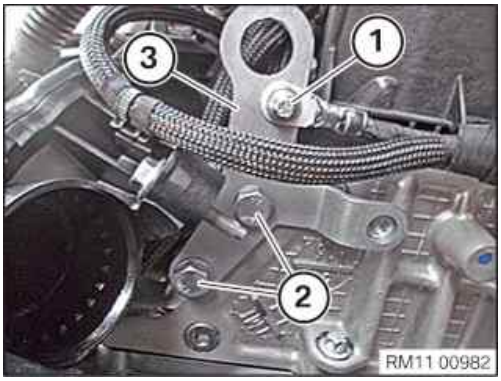
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▶ **Installing the chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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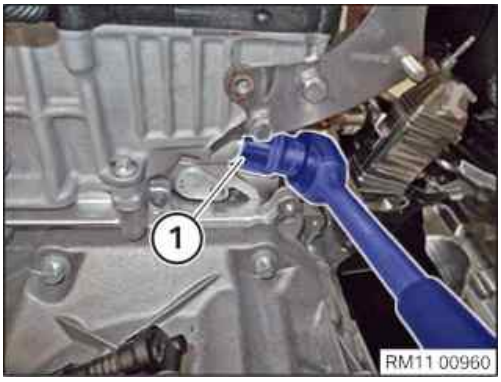
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

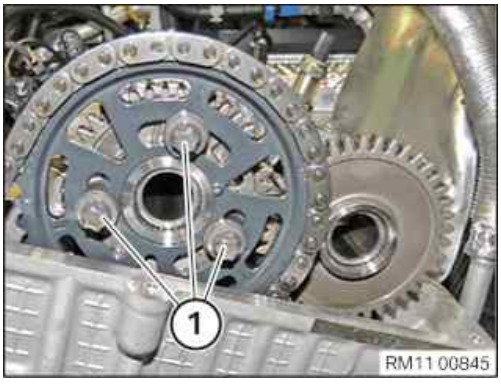


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▶ **Tightening the camshaft sprocket on the intake camshaft**



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

37 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

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38 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

39 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

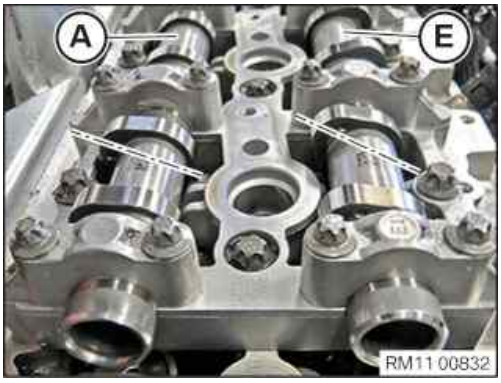
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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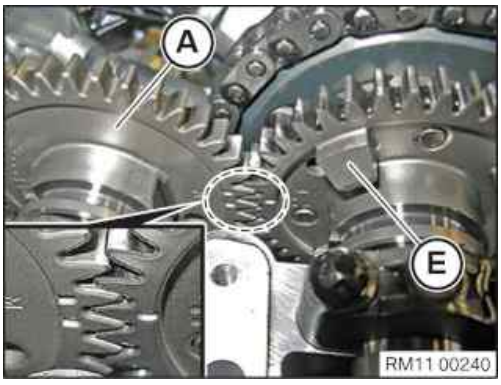
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

40 – Installing cylinder head cover

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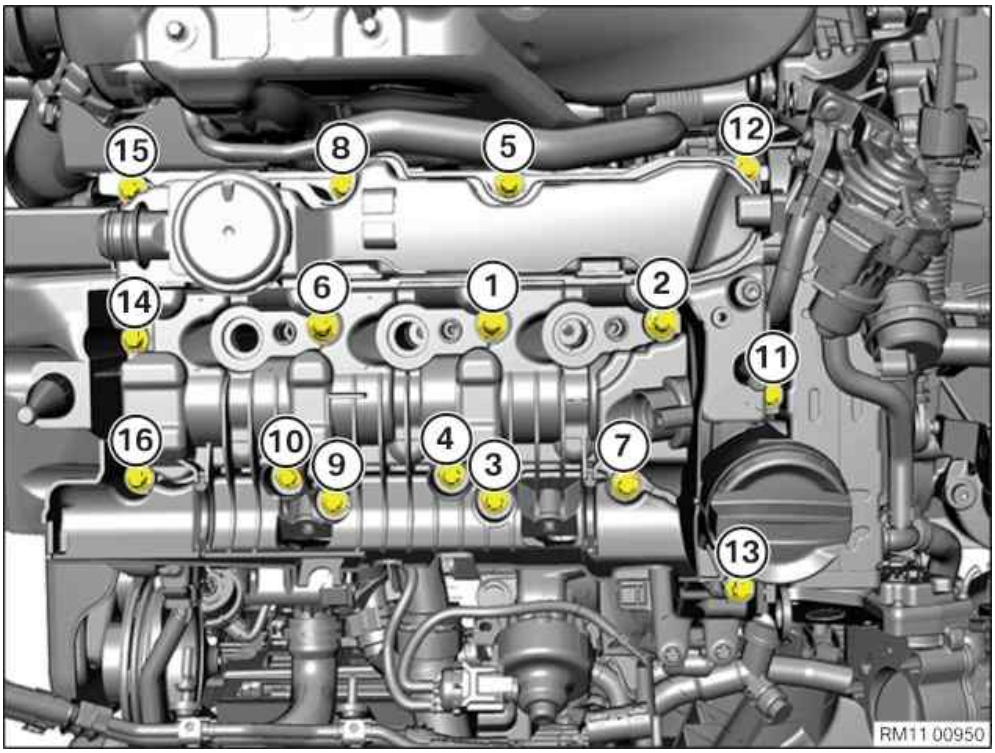
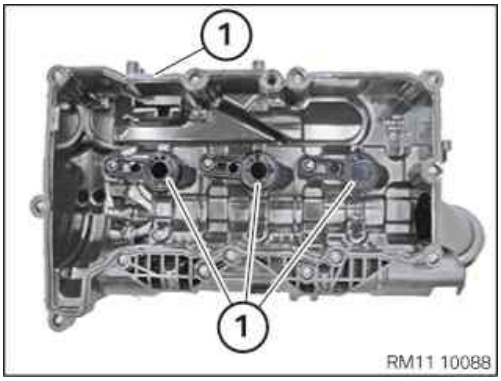
Overview: Screw connection of the cylinder head cover

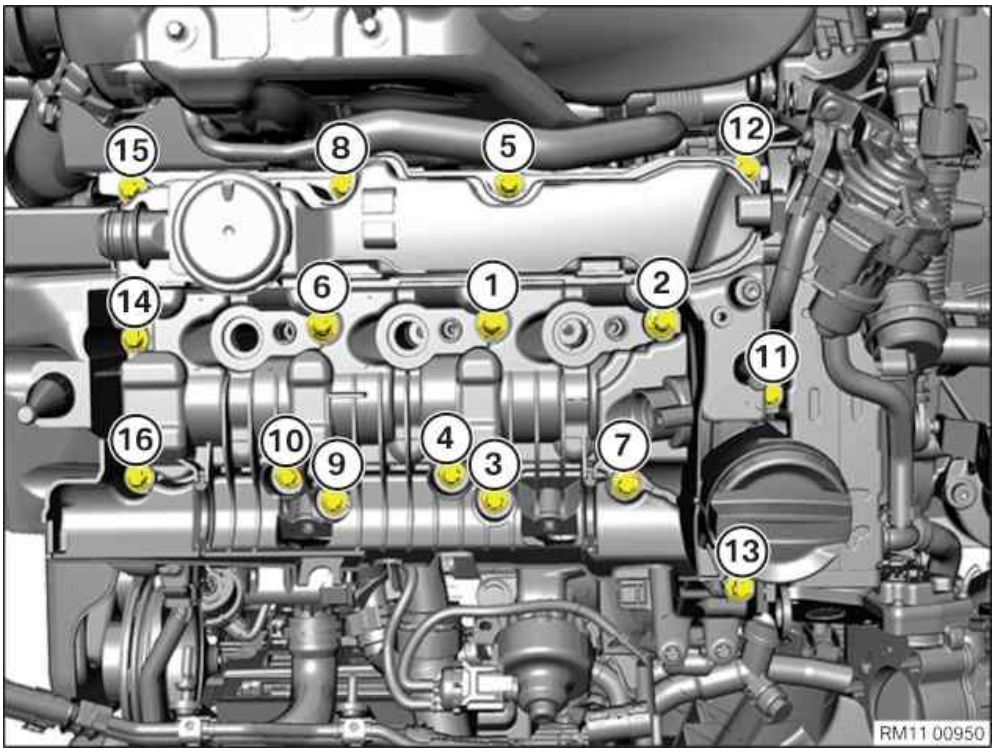


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm

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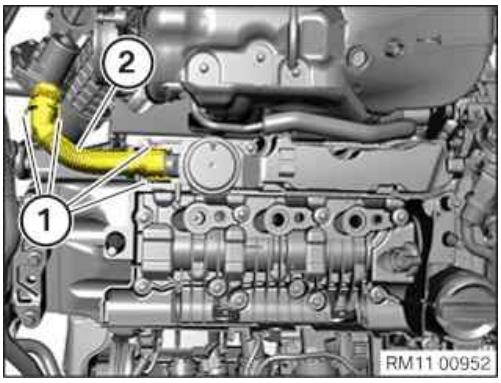


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

41 – Installing injectors of injection system

▶ Cleaning the injector shafts

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

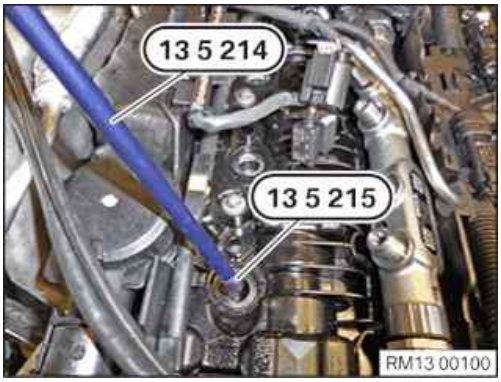
- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.

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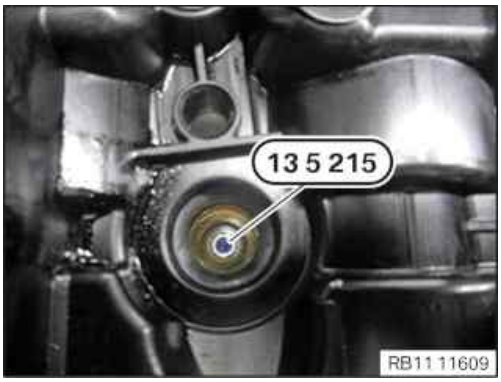
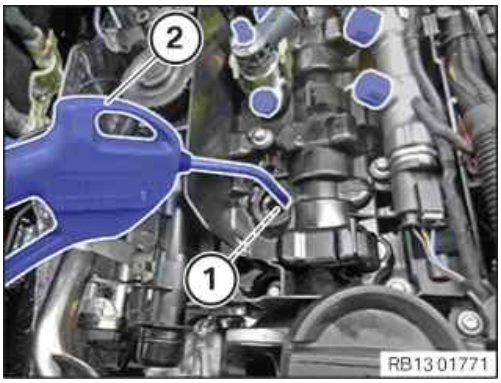


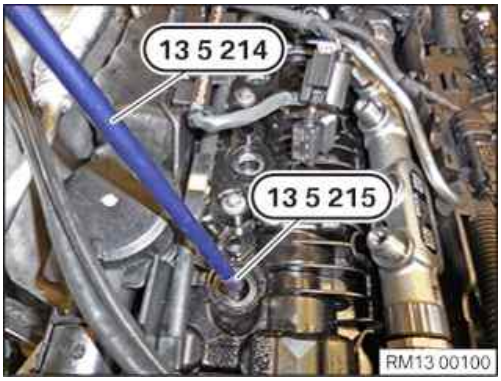
- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

► **Check the placement of the clamping claw**

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

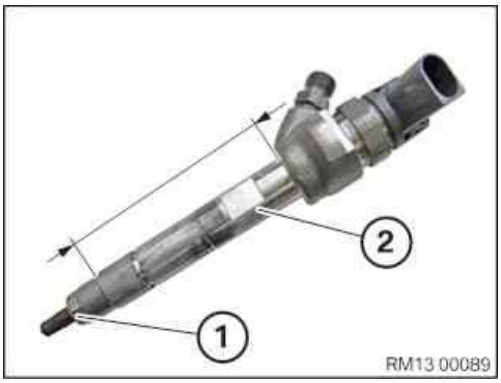
▸ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

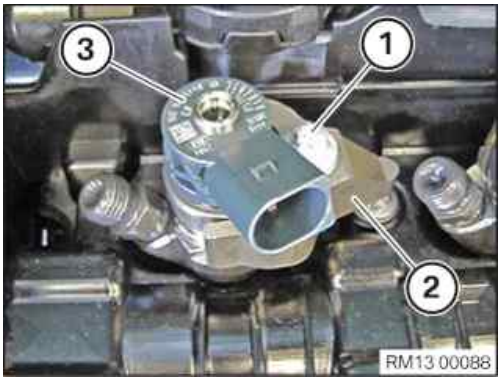


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

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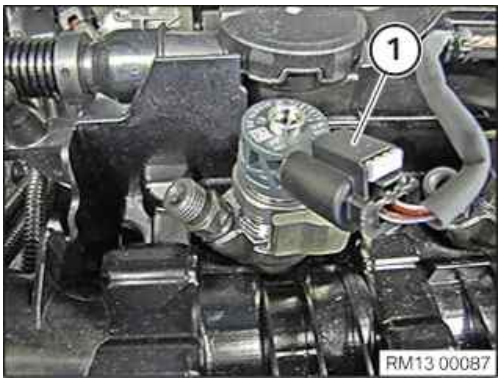


- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

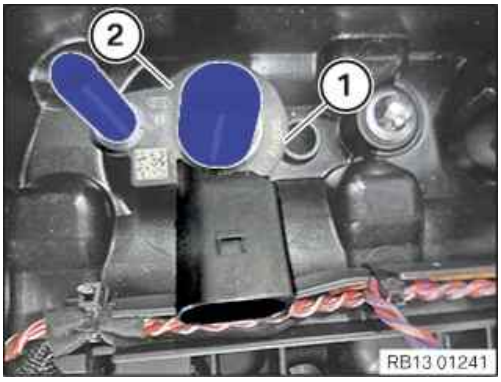
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

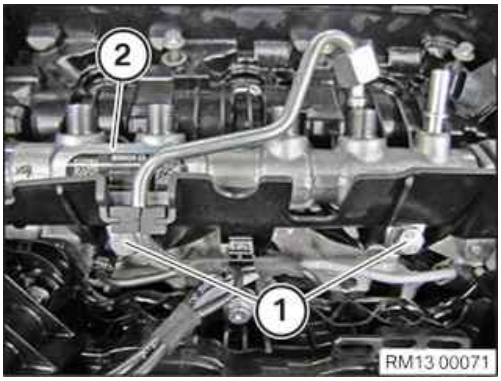
Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

42 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm

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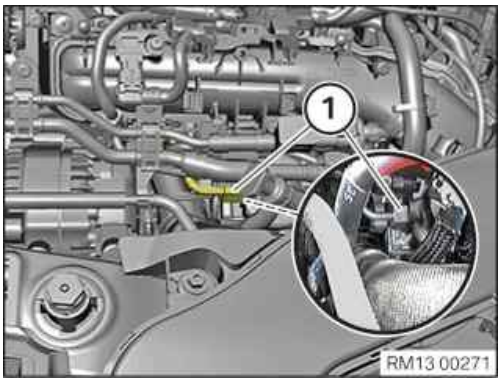


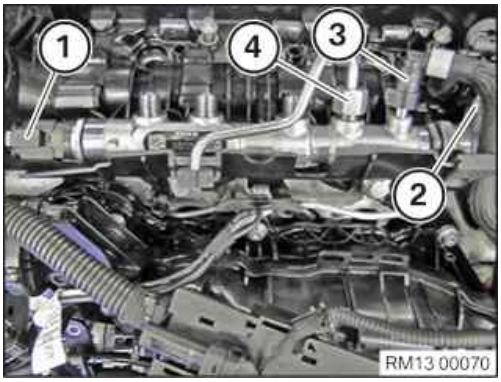
TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

43 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

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- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

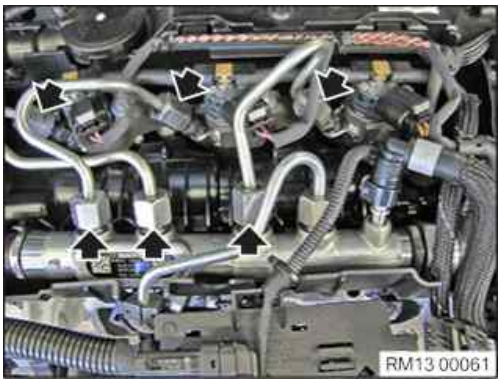
44 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

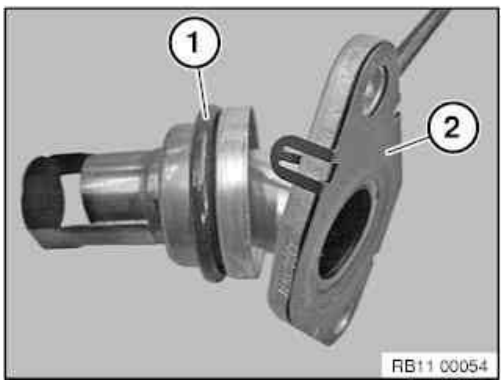
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

45 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

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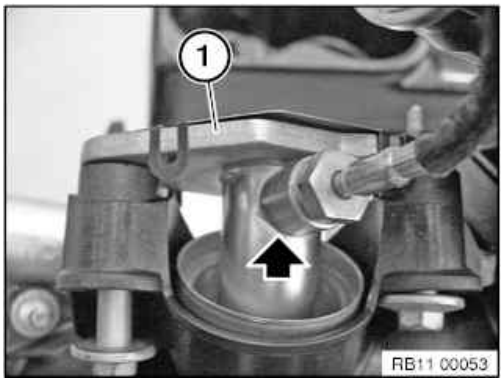
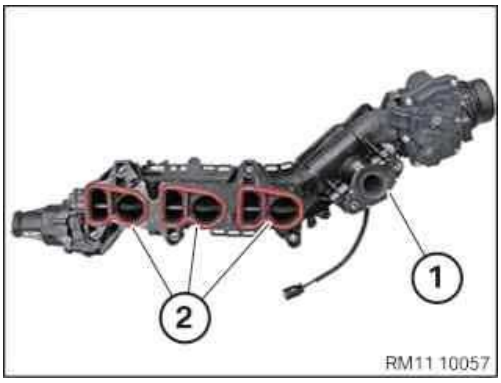
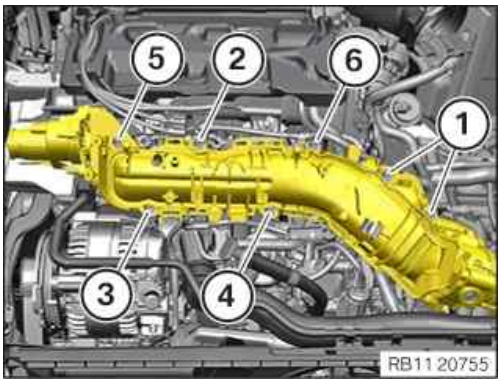


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

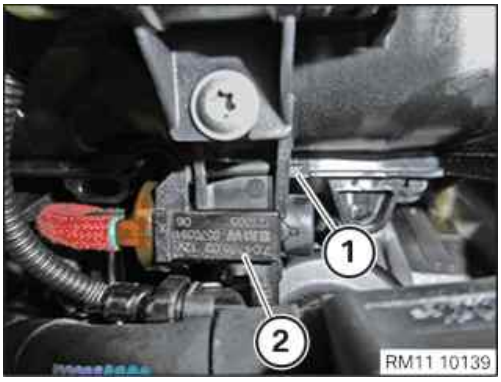
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



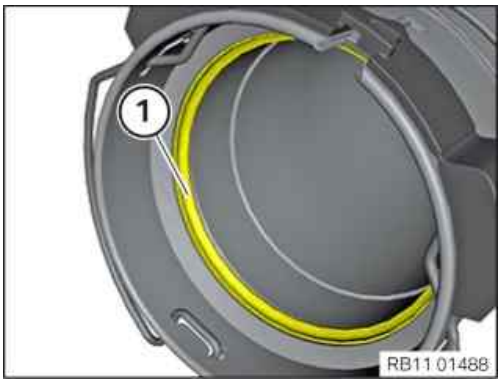
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring

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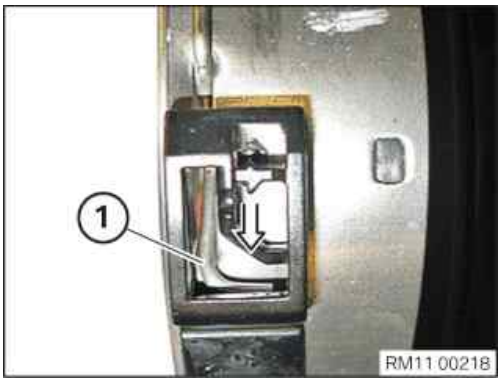
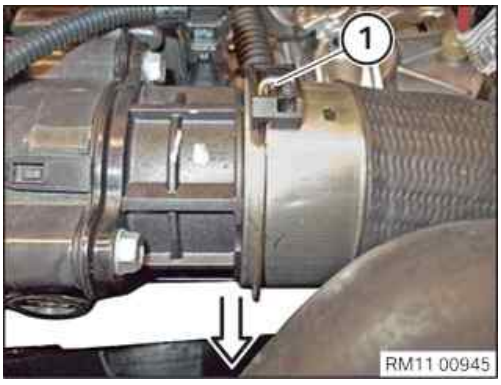


- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

46 – Remove the engine from the assembly stand

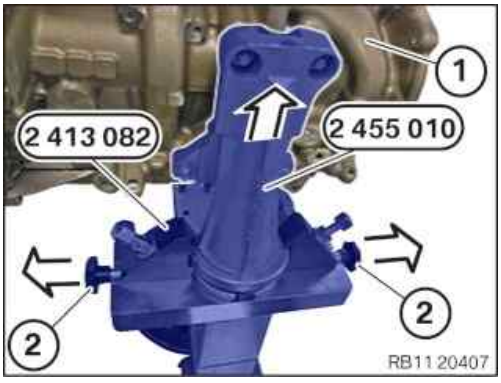
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.

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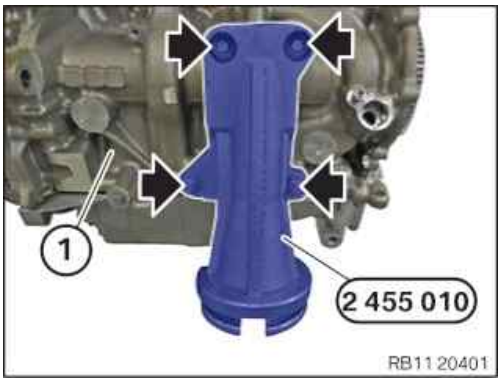
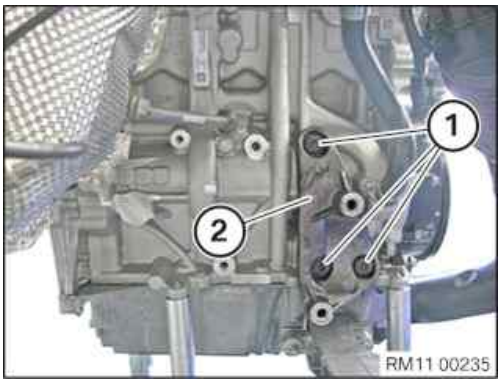


- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

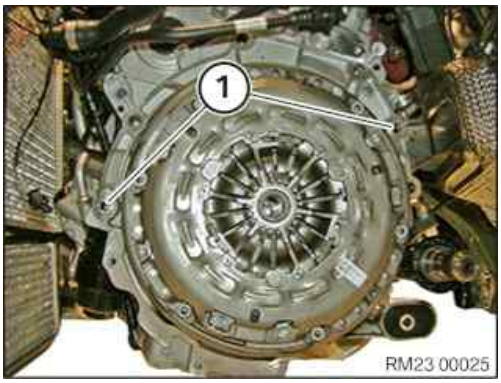
Holder to crankcase

M10		Tightening torque	38 Nm

47 – Mounting engine on manual gearbox

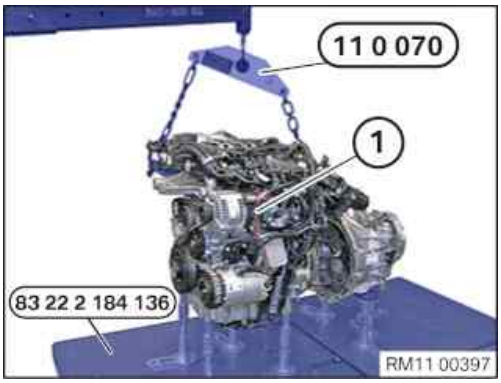
Prerequisite

Engine has been removed.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Remove any grease from the transmission input shaft (arrow) and clean the shaft.
- Do not grease transmission input shaft.
- Check the clutch disc for frictional corrosion in the gearing and renew if necessary.



- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.

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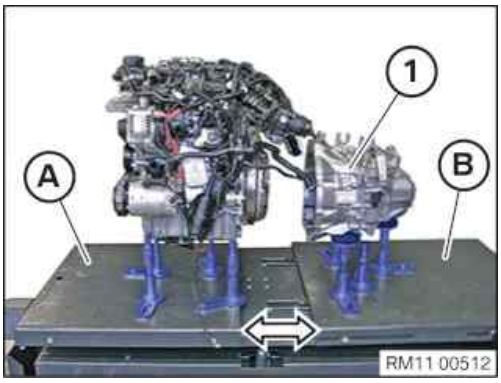
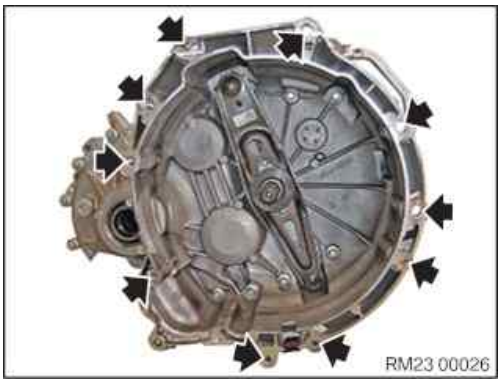


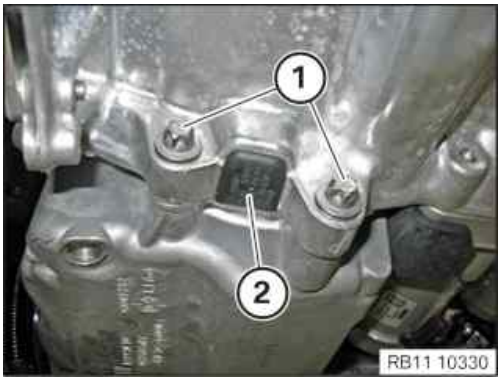
- Push table top (B) in direction of arrow and position manual gearbox (1) on engine.



- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm



- Tighten the screws (1).

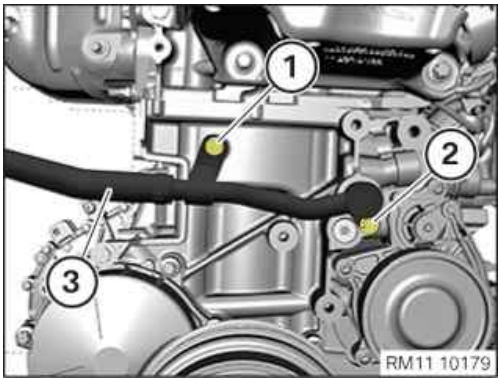
Transmission to oil sump

M8		Tightening torque	19 Nm

- Install the protective cap (2).

- Unscrew the bolts (1) of the special tool **2 459 012**.
- Feed out the special tool **2 459 012** at the cylinder head and remove.

48 – Attaching assemblies (on lifting table)



- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm

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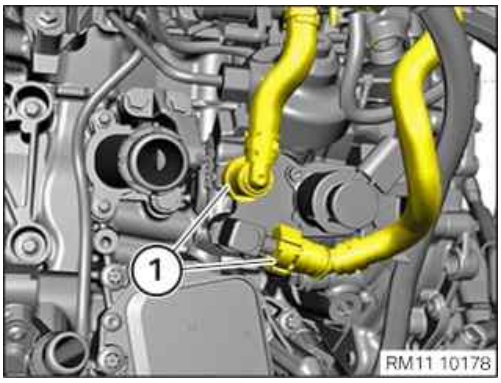


- Connect and lock fuel lines (1).

  The locks must engage audibly.

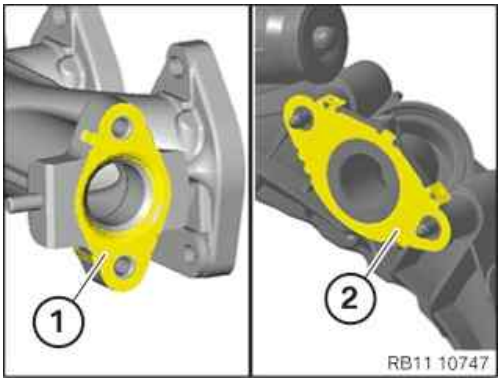
▶ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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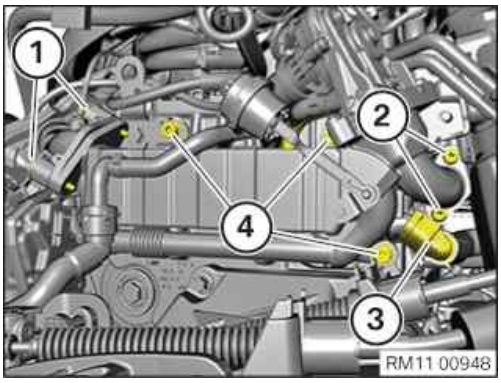


- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

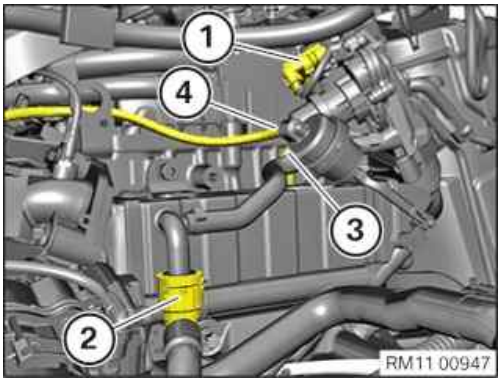
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

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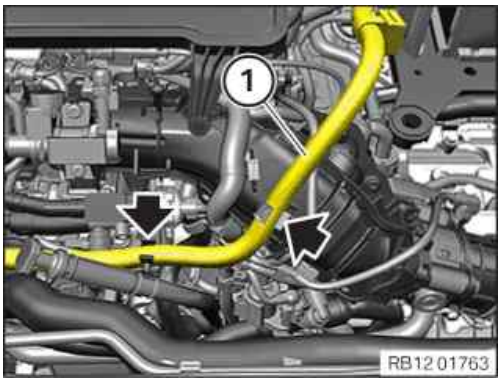


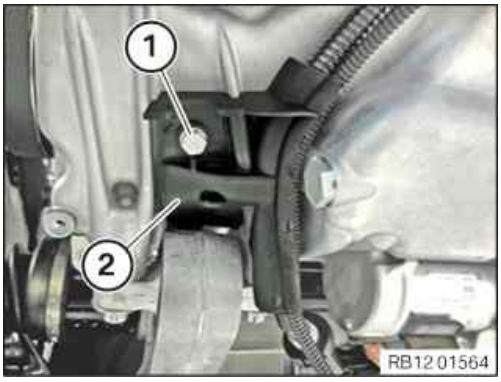
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

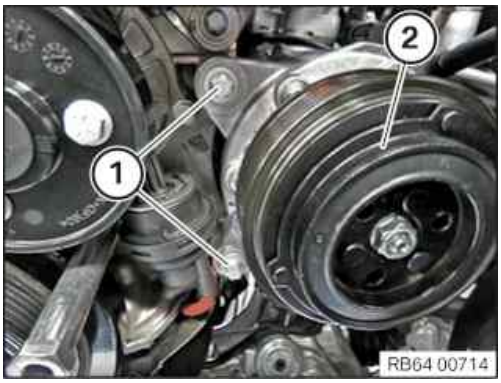
- Insert the positive battery cable (1) into the clamps (arrows).
- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

- Tighten the screws (1).

- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

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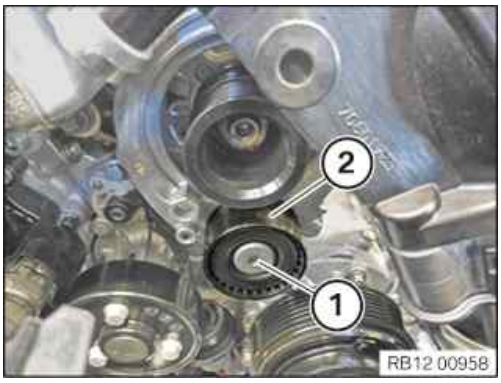
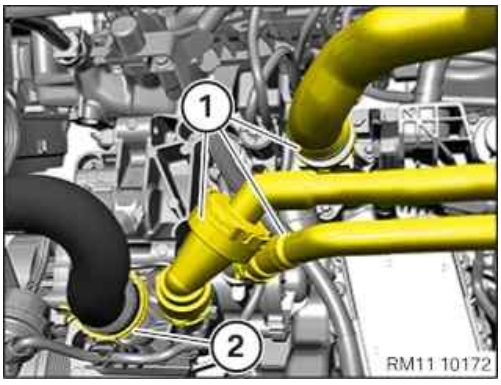


- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

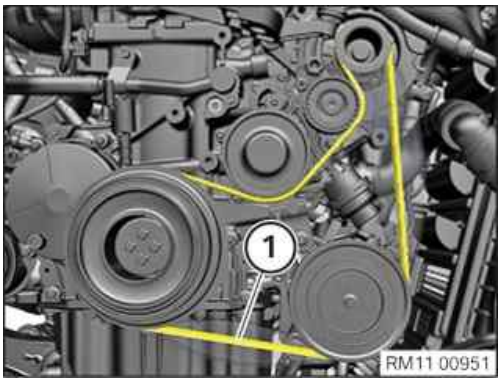
▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ Install the acoustic cover for the engine at the front

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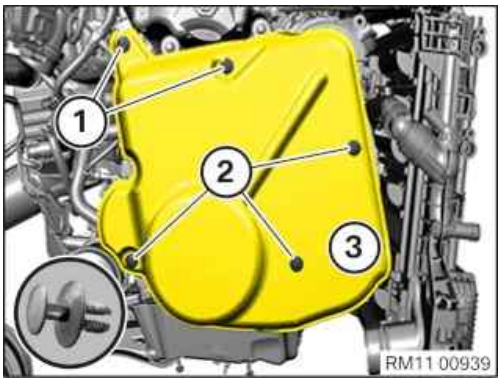
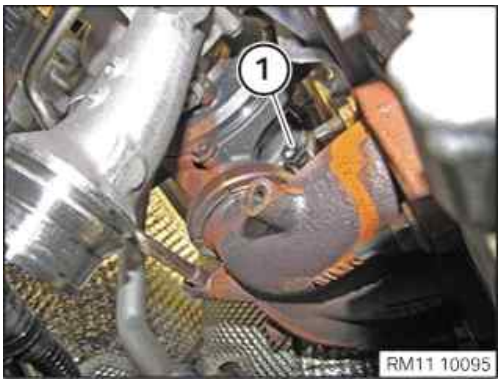


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

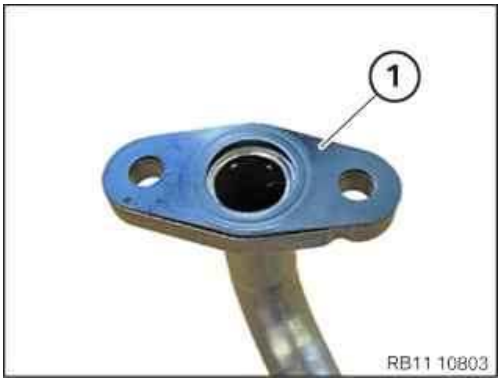
▸ **Installing the oil return line for the exhaust turbocharger**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

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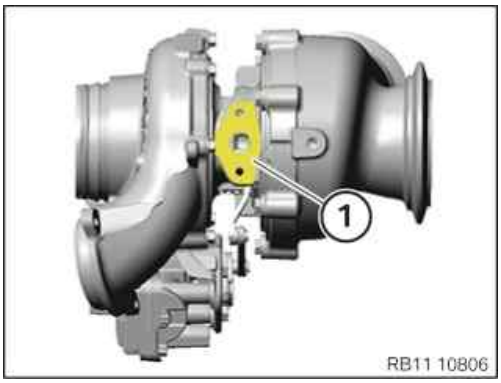
- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

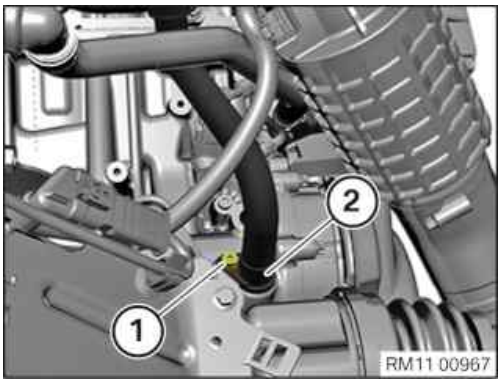
- Do not use any metal-cutting tools.

- Clean sealing surface.

- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm



- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

▸ **Install the oil feed line for the exhaust turbocharger**

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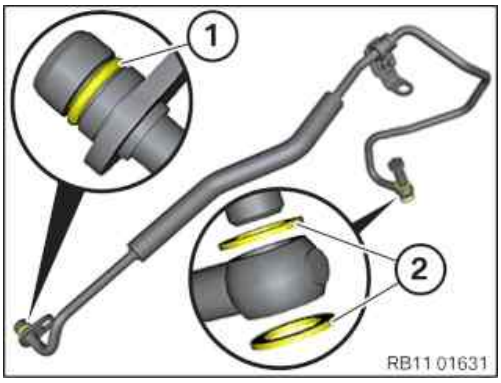
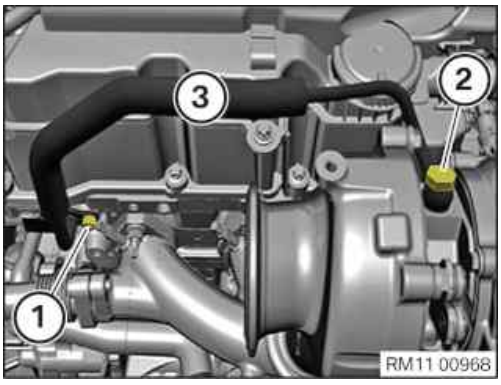


- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

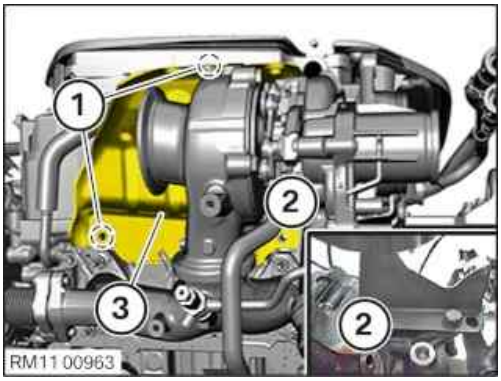
▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

▸ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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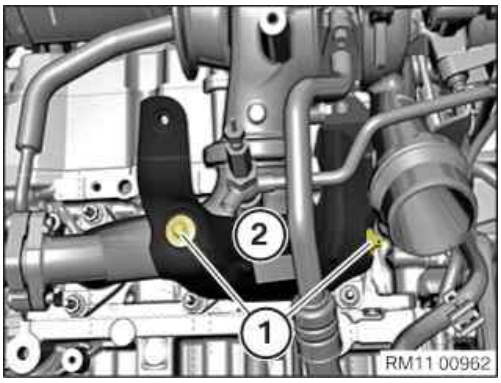


- Feed in and install the heat shield (2).
- Tighten the screws (1).

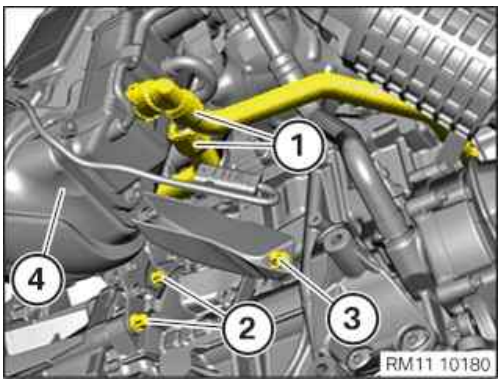
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

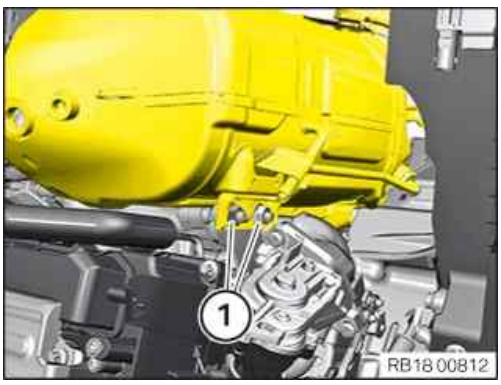
M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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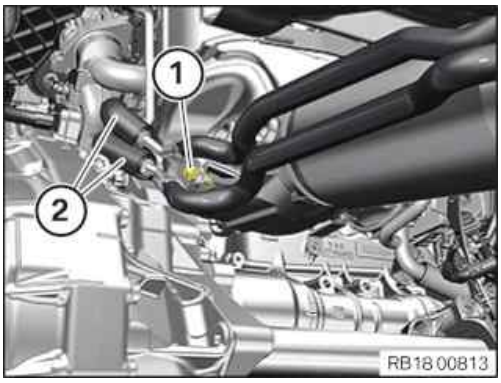


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

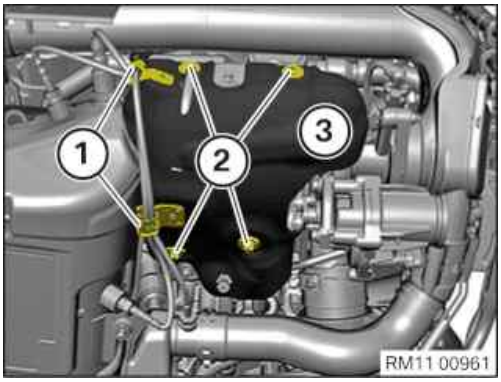
▶ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



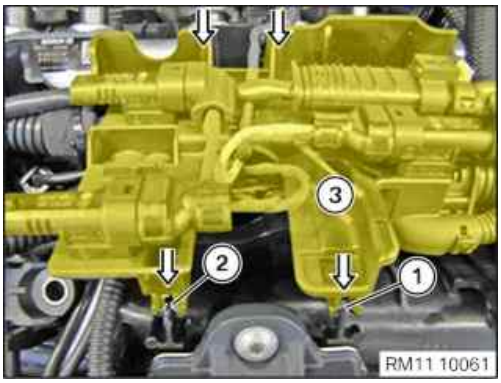
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

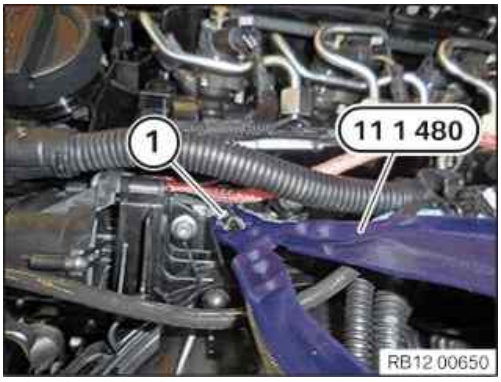
Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▶ **Installing the cable clip for the intake plenum**



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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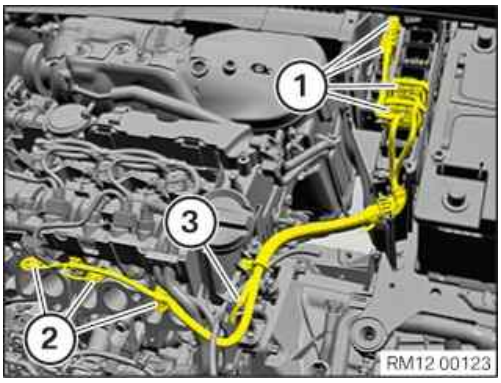
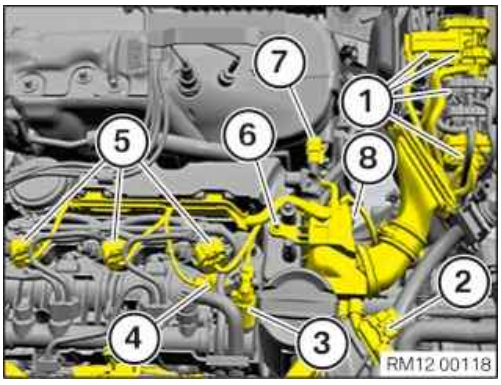


- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

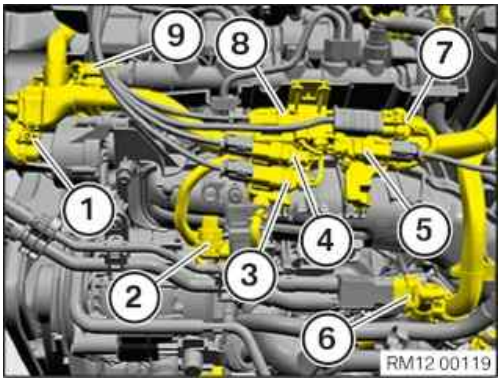


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

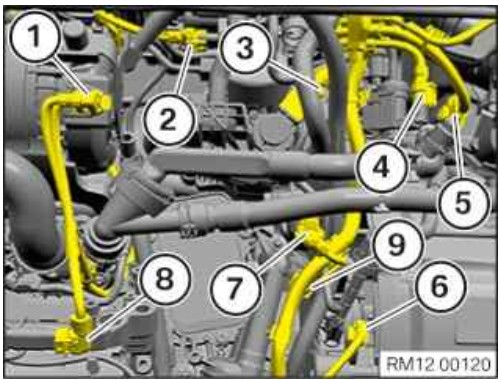
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.

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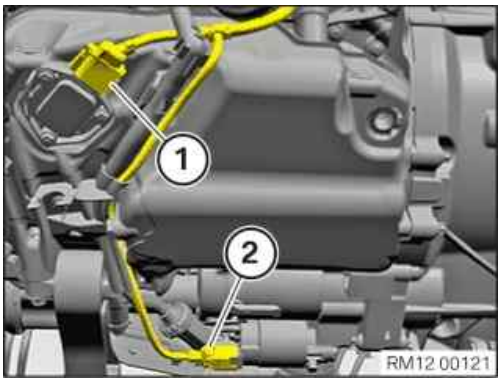
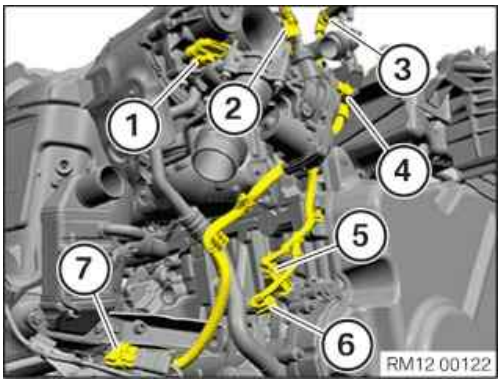
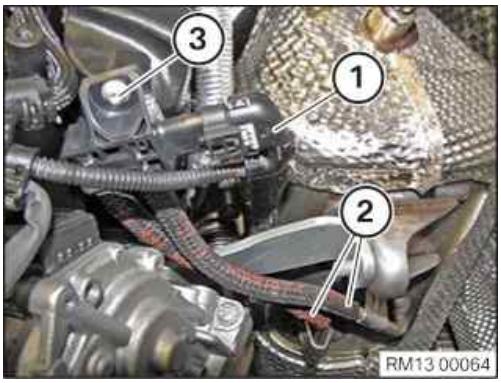


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

49 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

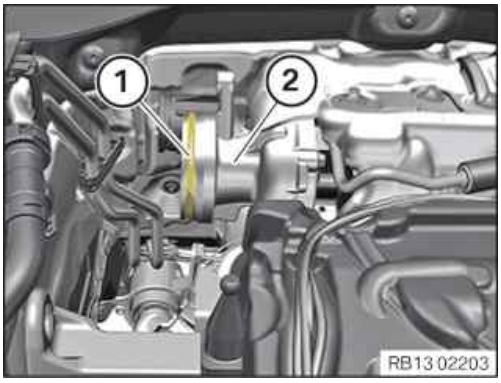
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

50 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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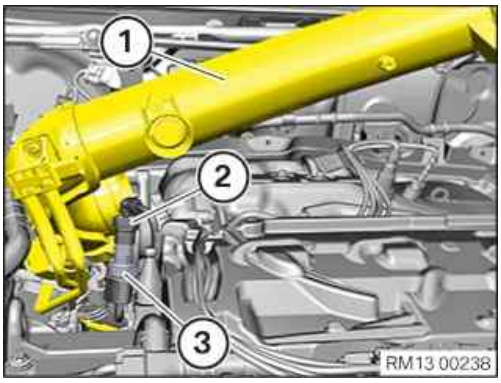


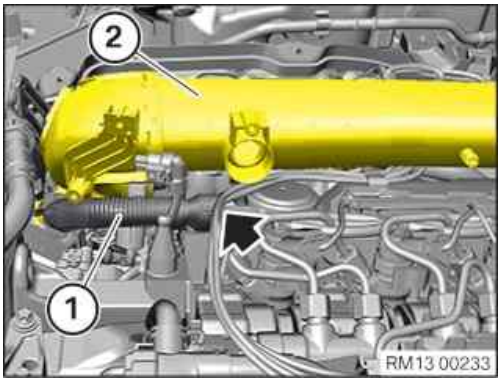
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

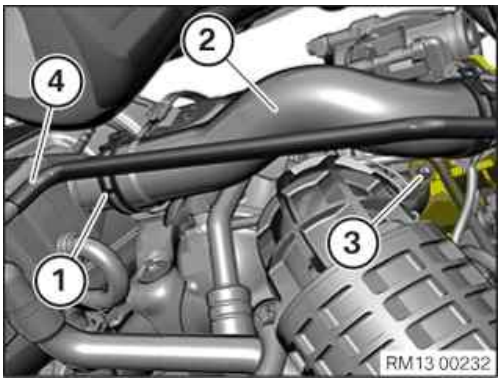
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

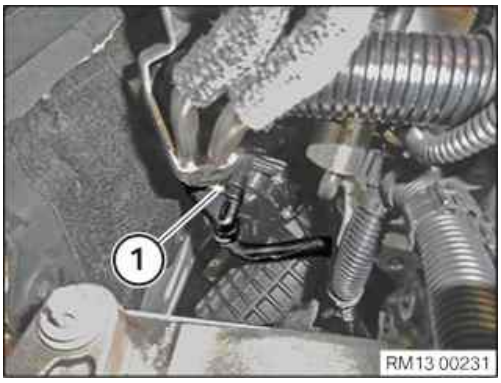
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.

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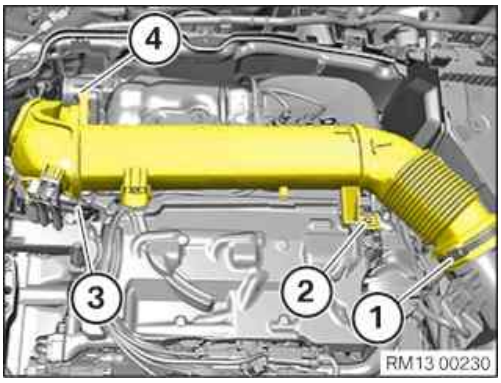


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

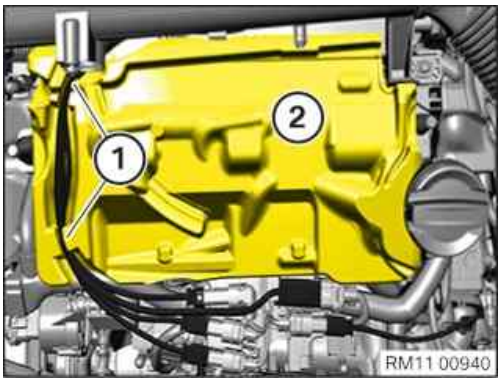
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

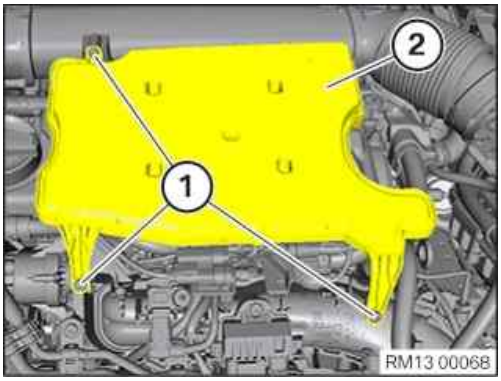
Clamp		Tightening torque	3 Nm

51 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

52 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

53 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

54 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head — Used in step 8

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase — Used in step 9

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320 — Used in step 9

M14x35		Tightening torque	160 Nm

Bearing journal of tensioning and guide rail — Used in step 28

M8	*Replace bearing journal.*	Tightening torque	20 Nm

Chain tensioner to crankcase — Used in step 28

M6x22		Tightening torque	10 Nm

Camshaft sprocket on high pressure pump — Used in step 28

M12		Tightening torque	65 Nm

Rear timing case cover to crankcase — Used in step 29

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover — Used in step 29

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase — Used in step 29

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 29

M8x40		Tightening torque	19 Nm

Oil sump to crankcase — Used in step 29

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump — Used in step 29 47

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine — Used in step 29

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft — Used in step 30

M12x1.5	Renew screws.	Tightening torque	120 Nm

Clutch to flywheel — Used in step 31

M8	Renew screws.	Jointing torque	15 Nm
		Angle of rotation	90 °

Glow elements to cylinder head — Used in step 34

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head — Used in step 35

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support — Used in step 36

M6x31		Tightening torque	10 Nm

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Bearing journal to cylinder head

Used in step 36

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 36

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 36 48

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 36

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 36

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 40

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 41

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 41

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 42

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 42

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 44

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 45

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 46 48

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 47 48

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 48

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 48

M6		Tightening torque	11 Nm

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Exhaust-gas recirculation cooler to exhaust manifold — Used in step 48

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 48

M8x20		Tightening torque	19 Nm

Bracket to oil sump — Used in step 48

M6		Tightening torque	8 Nm

Air conditioning compressor in component carrier — Used in step 48

M10		Tightening torque	38 Nm

Alternator to component carrier — Used in step 48

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner — Used in step 48

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold — Used in step 48

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase — Used in step 48

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger — Used in step 48

M6x12		Tightening torque	8 Nm

Oil return line to crankcase — Used in step 48

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head — Used in step 48

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger — Used in step 48

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger — Used in step 48

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 48

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder — Used in step 48

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 48

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter — Used in step 48

Torx bolt BM6x16		Tightening torque	8 Nm

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Ground cable to cylinder head — Used in step 48

M6x12		Tightening torque	8 Nm

Wiring harness to cylinder head cover — Used in step 48

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 49

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 49 50

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor — Used in step 50

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 50

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 50

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 50

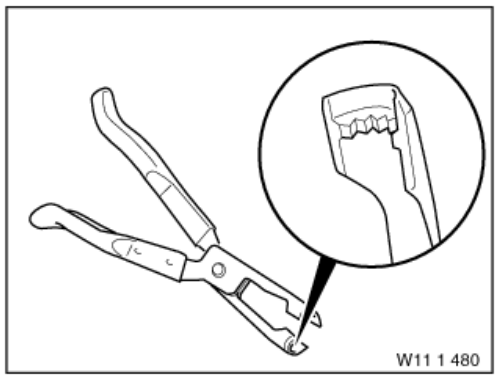
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 52

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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2 459 012 Holder

Common

Used in step 8 47

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 490 579 (11 0 070) Lifting gear

Used in step 8 9 46 47

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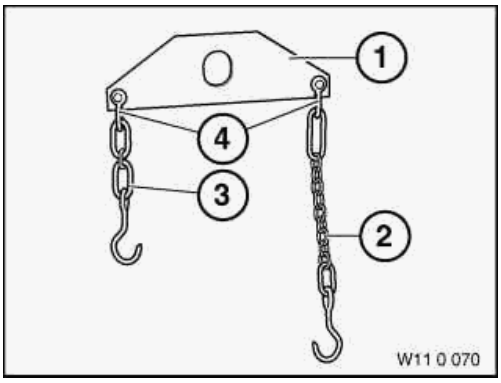

Common

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

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2 455 010 Engine support

Common Used in step 9 46

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 9

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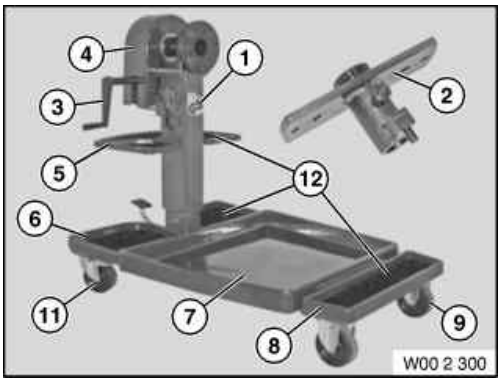

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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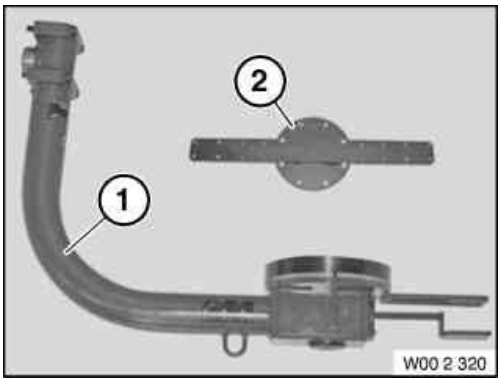
0 495 196 (00 2 320) Support arm



Common

Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common

Used in step 11 14 42 44

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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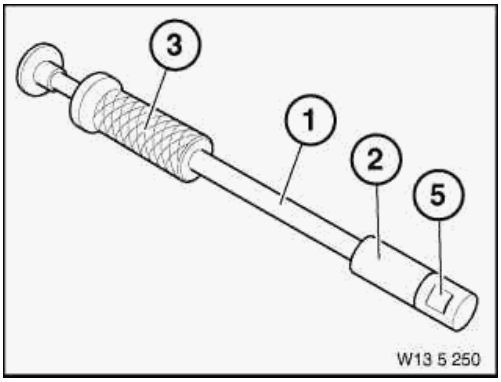
2 413 106 Fastener

Common Used in step 11 44

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush

Common Used in step 13

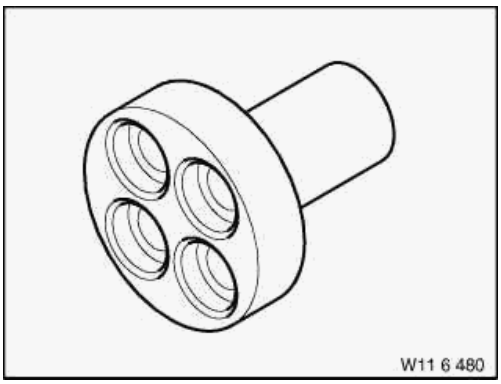
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 13

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 16 36 39

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 288 380 Locating stud

Common Used in step 16 36 37 39

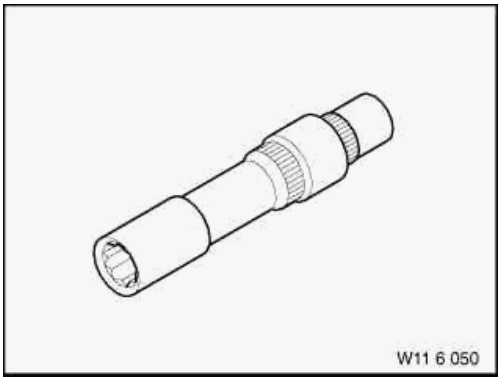
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common Used in step 16 36 38 39

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 21 34

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

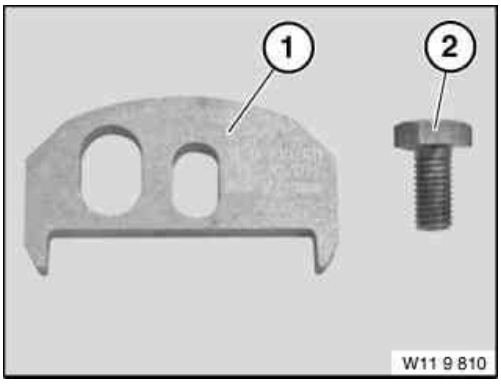
Common Used in step 22 23 36

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 171 (11 9 811) Holder



Common Used in step 24 25 30

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush

Common Used in step 24 25 30

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

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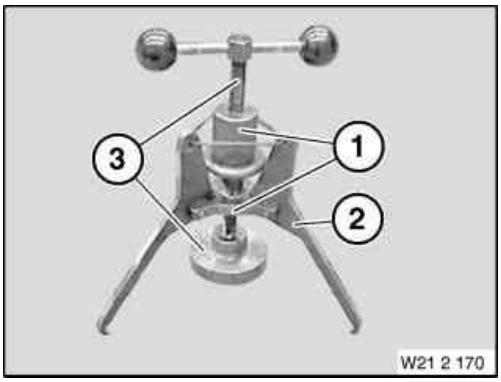
0 493 839 (21 2 170) Device



Common

Used in step 24 31

Usage	(tensioning device) For resetting adjusting ring and installing self-adjusting clutch on flywheel without tension.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 00 (622)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 558 (21 2 171)		**Basic body** (Basic body) Basic body with adjusting spindle Deletion, only available via tool set	
2	0 494 559 (21 2 172)		**Claw** (Clamping claw (1 piece)) Available as part of complete tool set 0493839 only.	
3	0 494 560 (21 2 173)		**Spindle** (Pressure spindle with washer) Available as part of complete tool set 0493839 only.	

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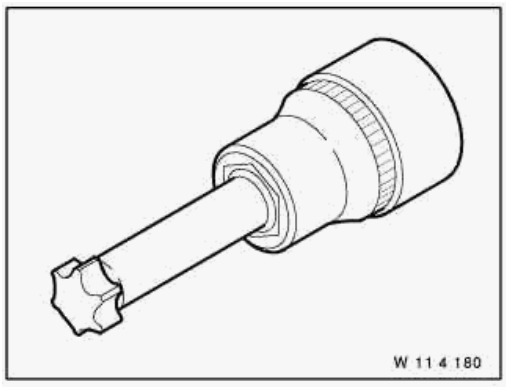
2 288 165 Synchronising key

Common	Used in step 24 31
Usage	Conversion kit for 21 2 170, for orders till 02.2014. Orders as of March 2014 do not require the conversion, as the new thrust piece has been accounted for.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 25 30
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

2 357 904 Gauge

Common	Used in step 27 28
Usage	For positioning the high pressure pump to the crankshaft . Replaced by gauge 2420824
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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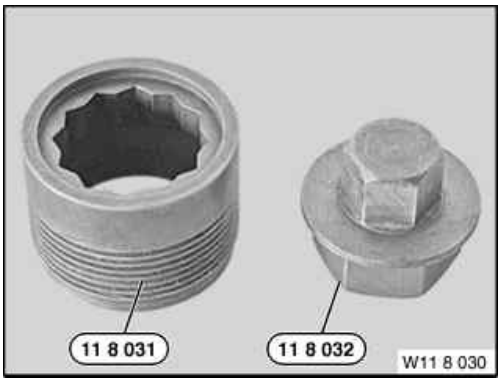
0 496 725 (11 8 030) Extractor



Common

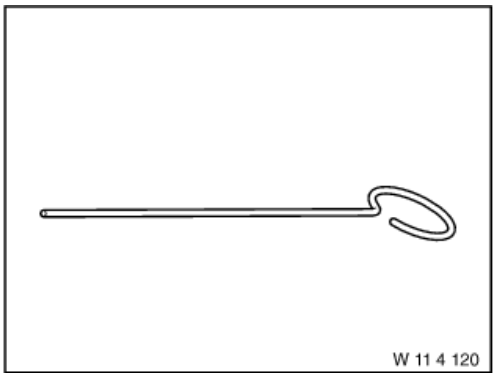
Used in step 27

Usage	for the disassembly of the high pressure pump (replaces SWZ 11 8 740 as of 08/2009) 11 8 740 will be replaced by 83 30 2 448 914.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 757 (11 8 031)	**2 448 914**	**Holding sleeve** Replaces SWZ11 8 741 from 08/2009, 09/2011 no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	
2	0 496 758 (11 8 032)	**2 448 914**	**Adapter** Replaces special tool 11 8 742 from 08/2009, 09/2011 remaining inventories will be sold off - no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	

0 491 012 (11 4 120) Pin



Common

Used in step 27 28

Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

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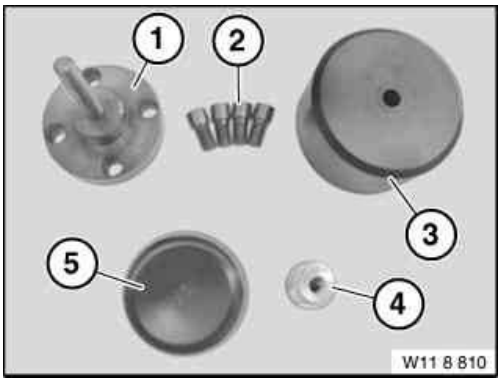
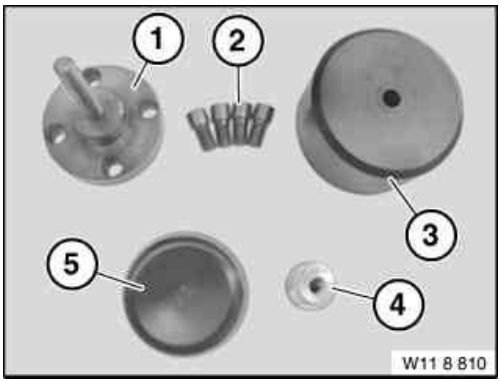
0 496 137 (11 8 815) Holding sleeve



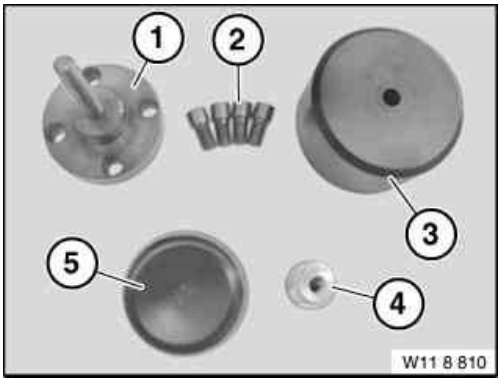
Common	Used in step 29
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body



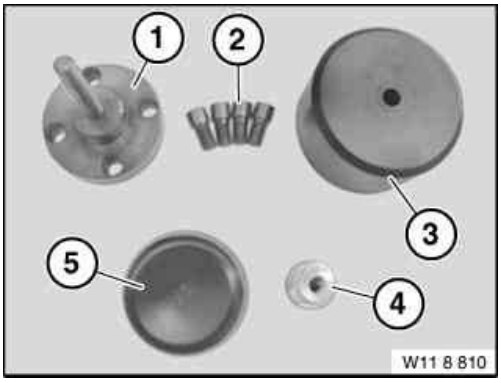
Common	Used in step 29
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 29
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve



Common	Used in step 29
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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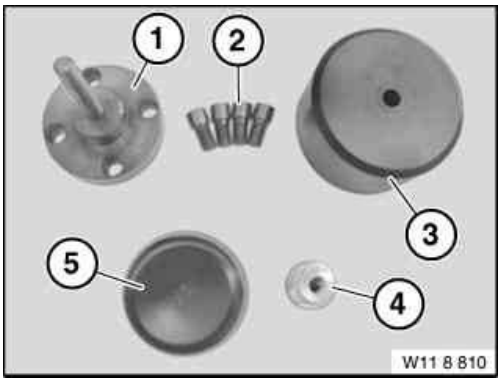
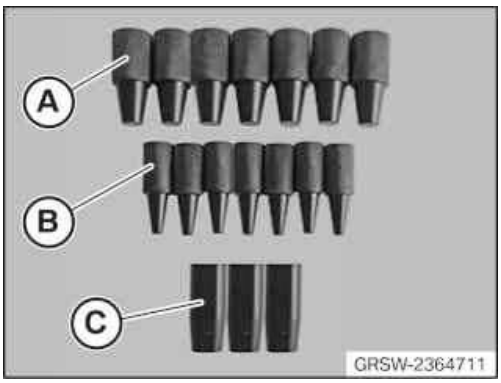
0 496 136 (11 8 814) Nut



Common	Used in step 29
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug

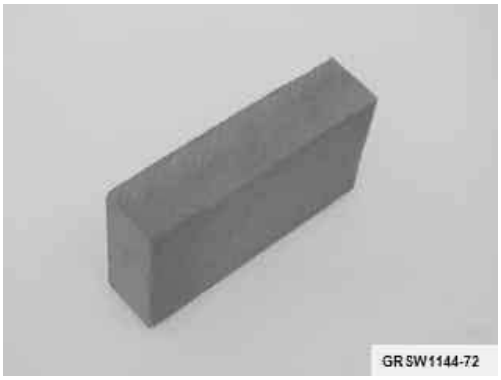


Common	Used in step 29
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common	Used in step 29
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 29
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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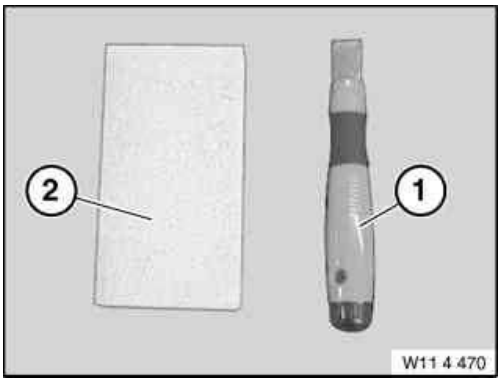
0 495 102 (11 4 470) Tool



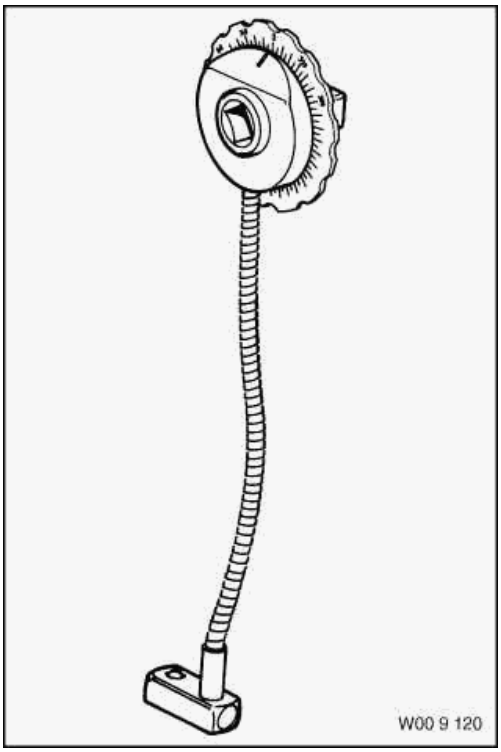
Common Used in step 29

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 29

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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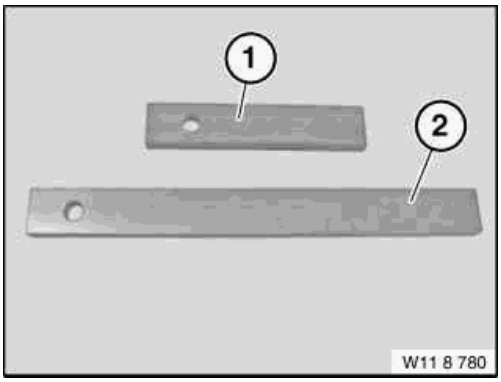
0 496 120 (11 8 780) Plate



Common

Used in step 29

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set

Common

Used in step 30

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

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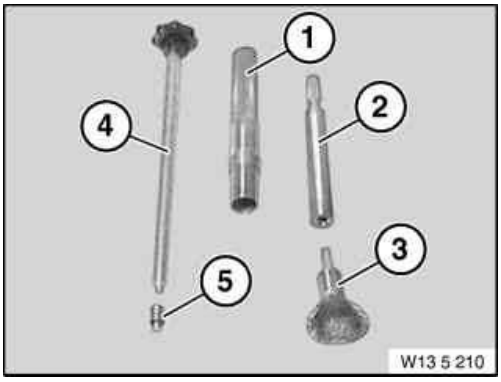
2 358 471 Clutch tool

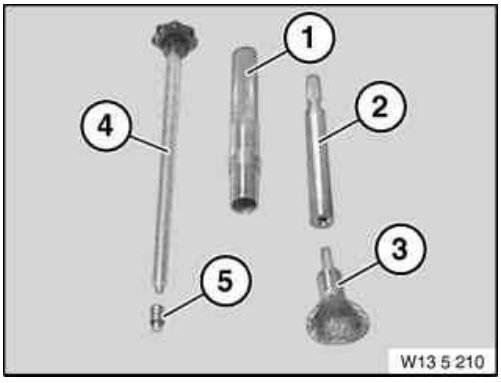
Common	Used in step 31
Usage	For installation of coupling drive plate.. (Getrag transmission) . Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A55
Replaced by	
In connection with	
SI-Number	01 09 14 (088)

0 493 763 (13 5 215) Plug



Common	Used in step 41
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 41
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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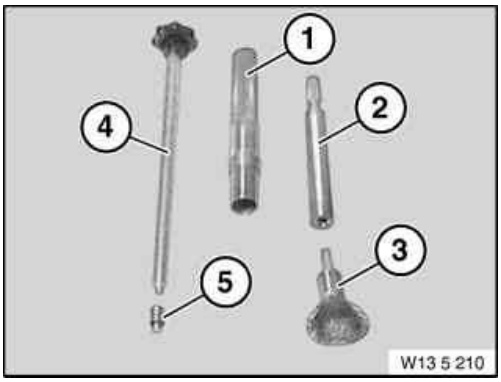
0 493 758 (13 5 210) Tool



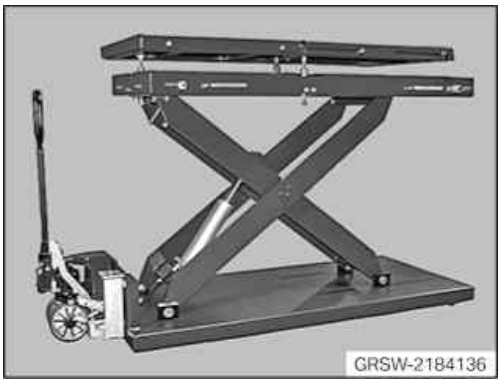
Common Used in step 41

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 47

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

Replacement tools:

2 299 563 Adapter

Common Used in step 9

Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

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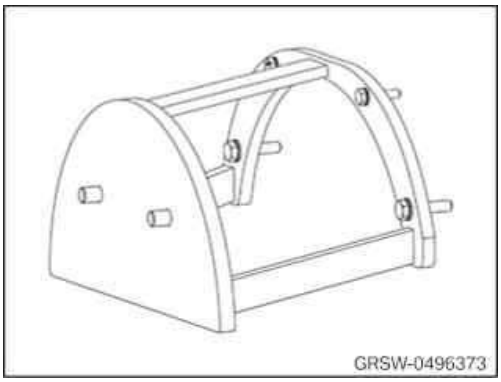
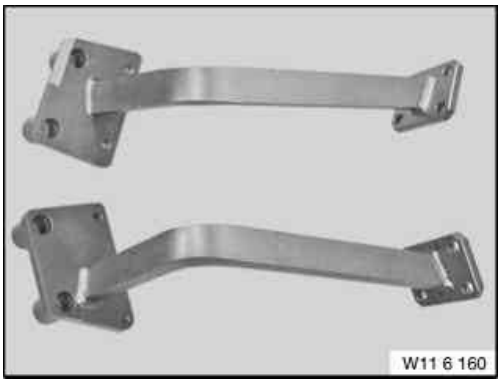
0 496 373 (11 5 420) Plate



Common	Used in step 9
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 9
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

2 448 914 Extractor

Common	Used in step 27
Usage	For removing and installing high pressure pump. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A49
Replaced by	
In connection with	
SI-Number	01 15 16 (411)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 30
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 48
EGR controller	7 48

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	29

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Repair instructions	Used in step
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
31 10 001 Completely removing and installing front axle with engine and transmission	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
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11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Removing and installing the engine (manual gearbox)	1 54
11 00 050 Remove and install engine (Automatic)	1 54
11 00 050 Remove and install engine	1 54
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11 00 050 Removing and installing engine	1 54
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11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine \PREMIUM	1 54
11 00 050 Removing and installing/replacing engine (N63)	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Removing and installing engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine (Automatic)	1 54
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11 00 050 Remove and install engine (Automatic)	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Remove and install engine	1 54
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 54
11 00 050 Remove and install engine	1 54
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21 29
61 35 ... Notes on ESD protection (Electro Static Discharge)	29

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	36
Exhaust-gas recirculation cooler seal on exhaust manifold	48
Exhaust-gas recirculation cooler seal on intake plenum	48

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This documentation refers to special tools that were not yet available when going to press.

11 31 052 Replacing both timing chains

PRELIMINARY WORK

1 – Removing engine

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

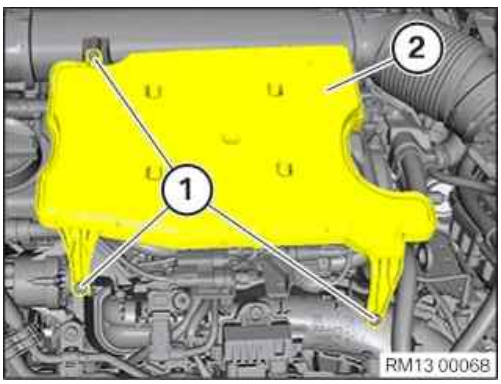
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

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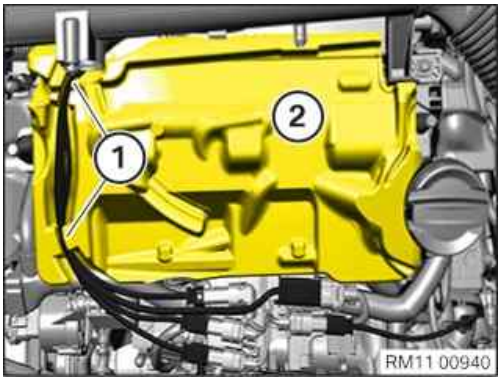
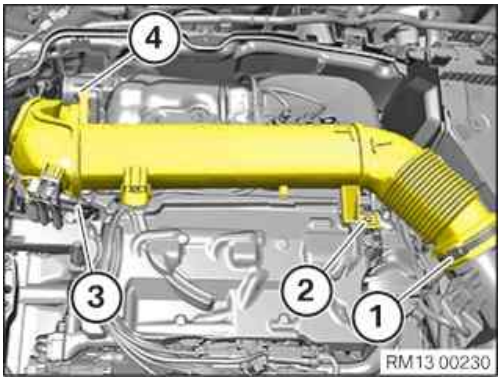
4 – Remove the acoustic cover for the injectors

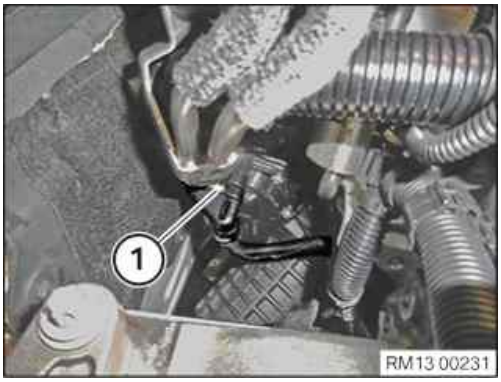


- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

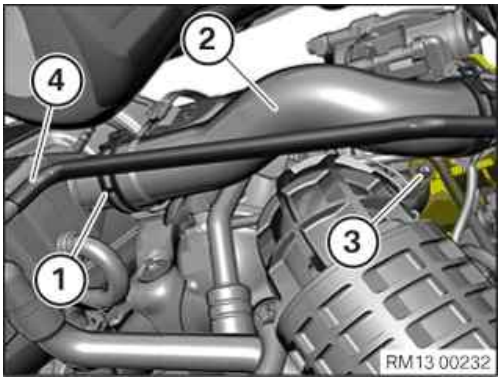
5 – Removing clean air pipe



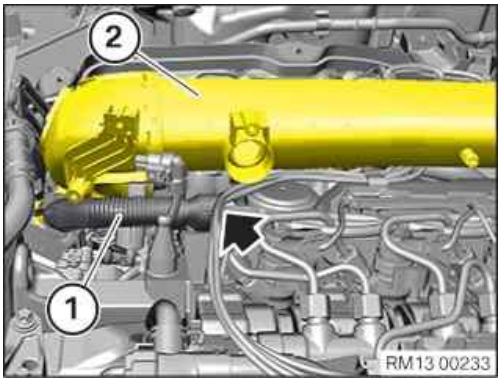
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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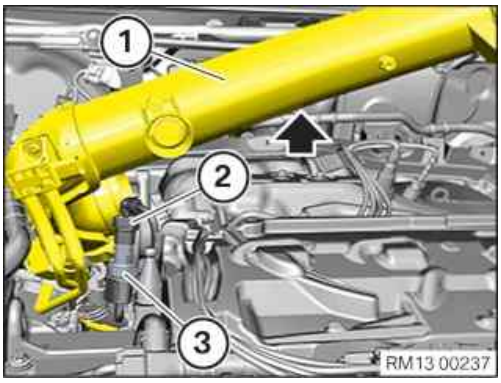


- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

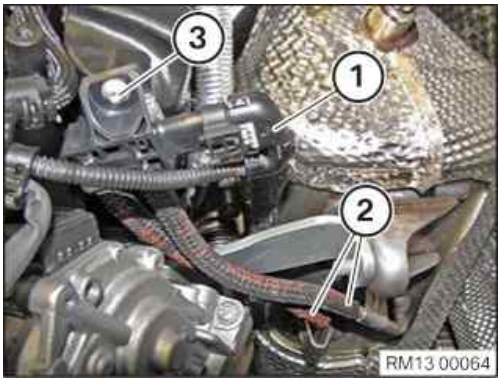
6 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

7 – Removing assemblies (on lifting table)

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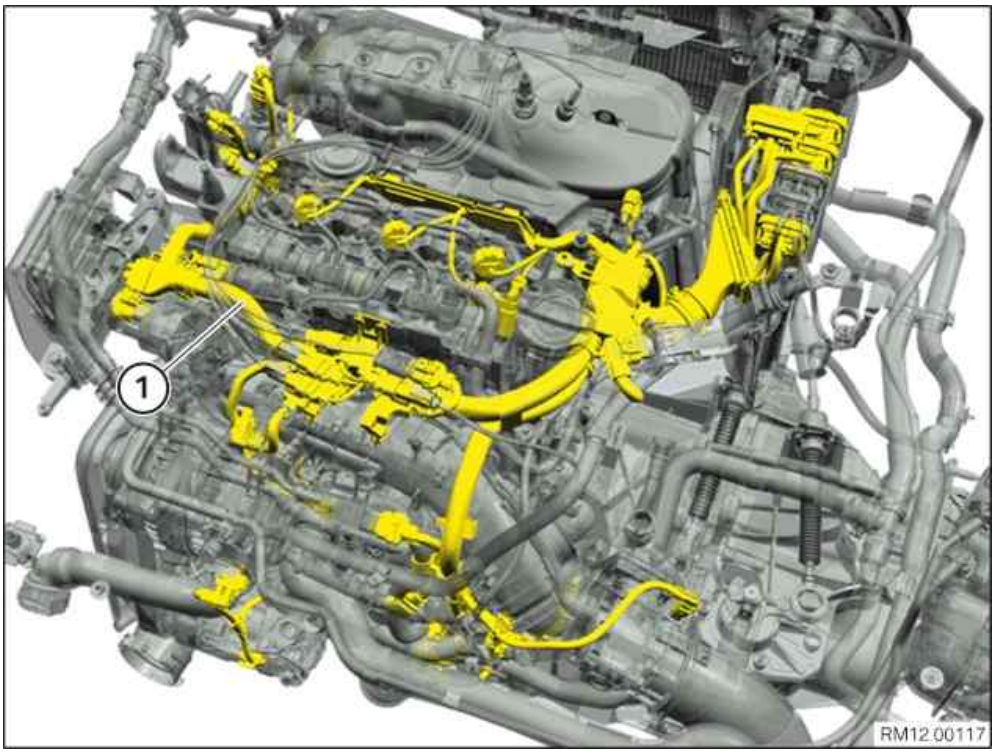
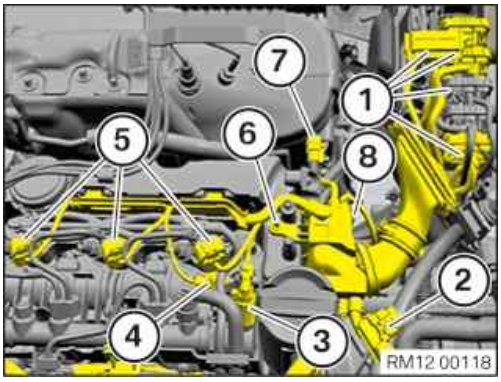
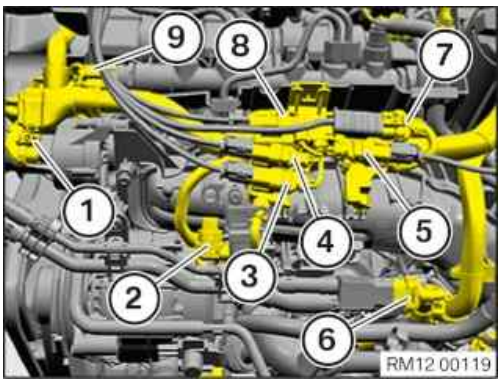
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Remove the connector (1) of the integrated supply module (PDM) and the DME control unit.
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock the connector (3) and disconnect it from the fuel pressure regulator.
- Unlock the connector (4) and disconnect it from the camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock the connector (7) and disconnect it from the differential pressure sensor.
- Unlock the connector (8) and disconnect it from the exhaust-gas recirculation valve.



- Unlock the connector (1) and disconnect it from the servomotor for the swirl flaps.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock the connector (3) and disconnect it from the exhaust temperature sensor after the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock the connector (6) and disconnect from the fuel pressure and temperature sensor.
- Unlock connector (7) and pull it off from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.
- Unlock connector (9) and pull off from the rail pressure sensor.

▶ **Removing the cable clips from the intake plenum**

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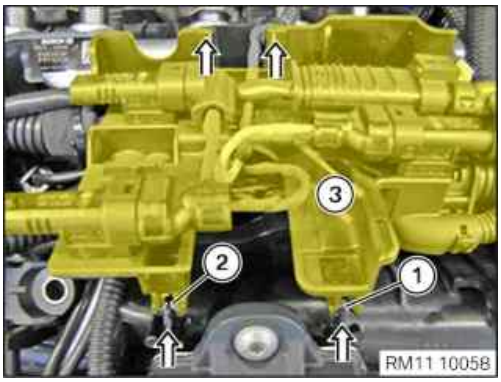
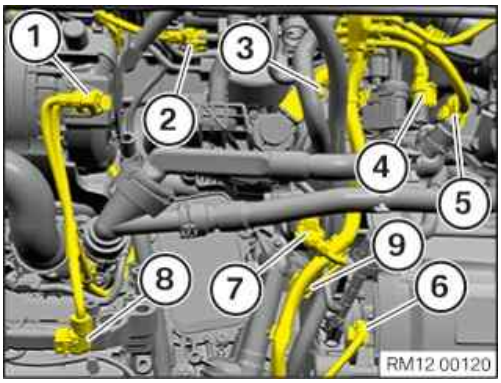
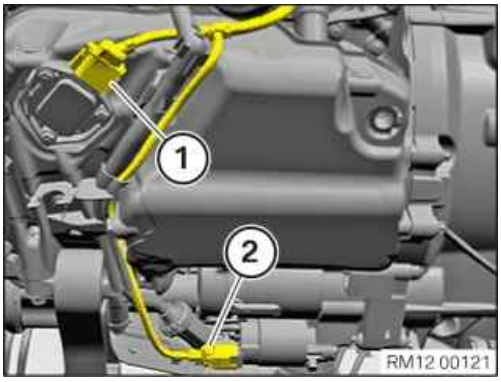


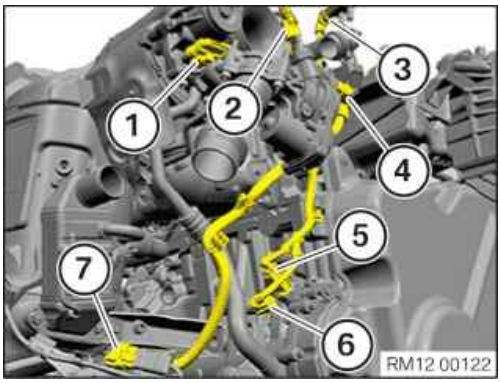
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.



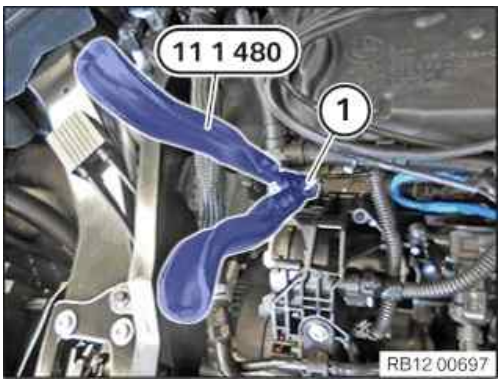
- Unlock and disconnect the connector (1) from the alternator.
- Unlock and disconnect the connector (2) from the electric changeover valve.
- Unlock the connector (3) and pull it off the high pressure pump.
- Unlock and disconnect the connector (4) from the electric changeover valve.
- Unlock connector (5) and pull off from throttle body.
- Unlock the connector (6) and pull it off the crankshaft sensor.
- Unlock the connector (7) and disconnect it from the oil pressure sensor.
- Unlock the connector (8) and disconnect it from the air conditioning compressor.
- Unlock and disconnect the connector (9) from the solenoid valve.



- Unlock the connector (1) and pull off of the oil-level sensor.
- Unlock connector (2) and remove from starter motor.



- Unlock the connector (1) and pull it off the exhaust turbocharger.
- Unlock the connector (2) and disconnect it from the exhaust gas pressure sensor.
- Unlock the connector (3) and disconnect it from the differential pressure sensor.
- Unlock connector (4) and pull off from low pressure exhaust-gas recirculation valve.
- Unlock the connector (5) and pull it off the oil pressure switch .
- Unlock connector (6) and disconnect from switching valve.
- Unlock connector (7) and pull it off from the monitoring oxygen sensor.
- Detach, feed out and remove the wiring harness from the clamps.



- Unlock the connectors (1) of all glow elements with the special tool **0 490 796 (11 1 480)** and release them.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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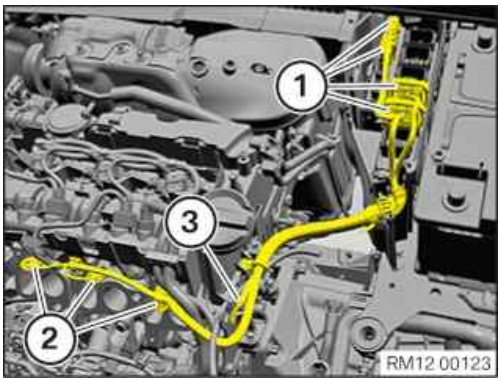


- Pull off the connector (2) of the glow elements using the special tool **0 490 796 (11 1 480)** .
- Loosen screw (3).
- Guide out and remove the connector (1) with the wiring harness.

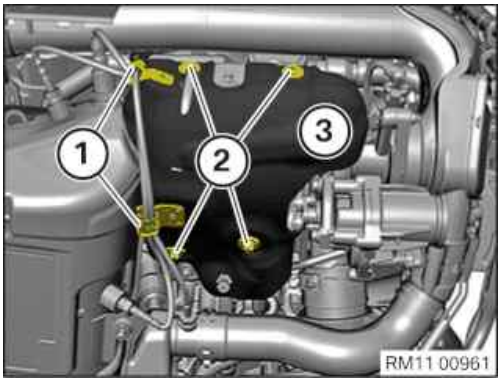
▶ Removing heat shield from top exhaust turbocharger

WARNING

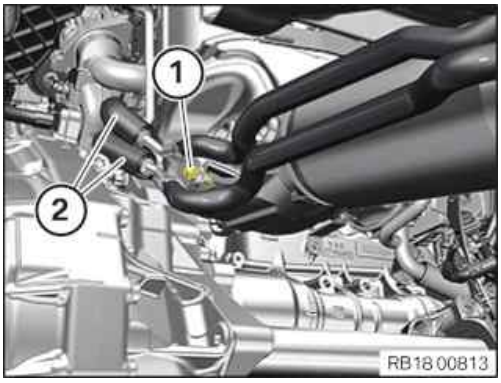
Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.

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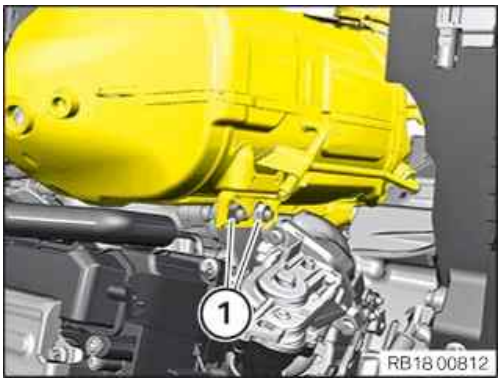
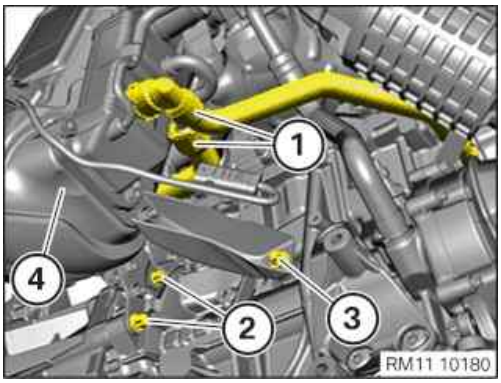


- Loosen nuts (1).



- Unlock and pull off coolant lines (1).
- Loosen screws (2).
- Loosen screw (3).
- Guide out and remove diesel particulate filter (4).

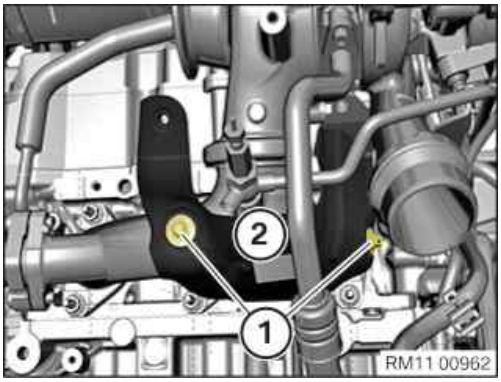
▶ **Remove the heat shield from the exhaust turbocharger at the bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

▶ **Removing heat shield from rear exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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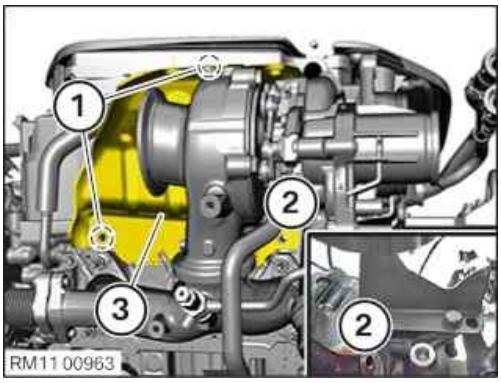


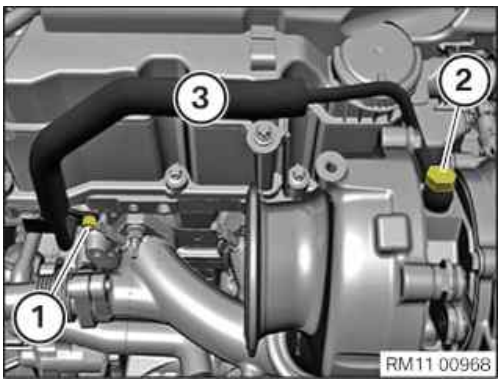
- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

▶ **Remove the oil feed line for the exhaust turbocharger**

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

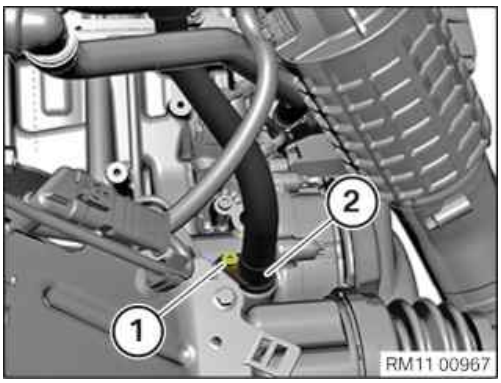
▶ **Removing the oil return line for the exhaust turbocharger**

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

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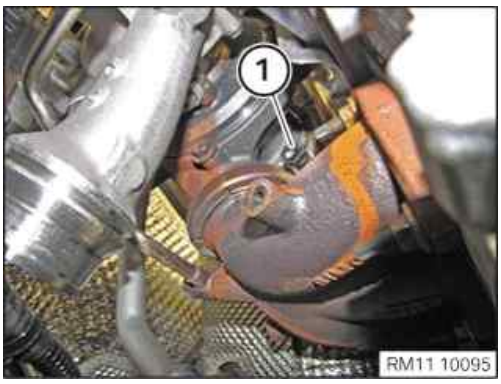
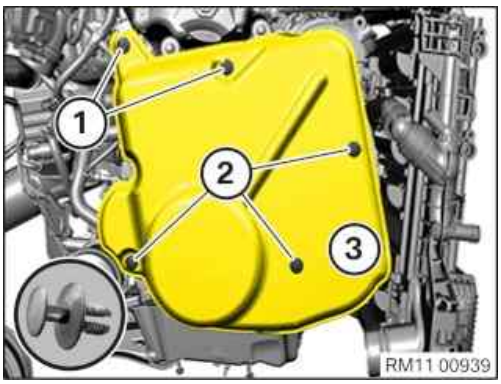
- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

- Release the screw (1) for the bracket on the exhaust turbocharger and on the crankcase.



- Release the V-clip (1) and remove.
- Take the exhaust turbocharger off of the exhaust manifold.

▶ **Removing the acoustic cover for the engine at the front**



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

▶ **Removing the drive belt for alternator**

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

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CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

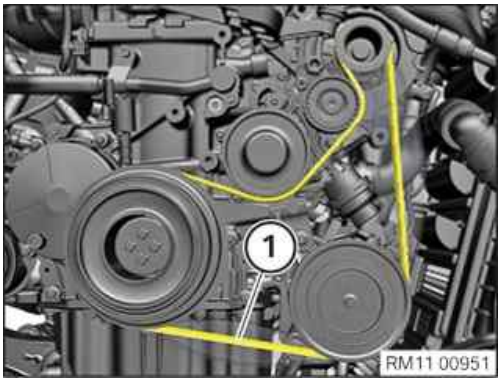
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

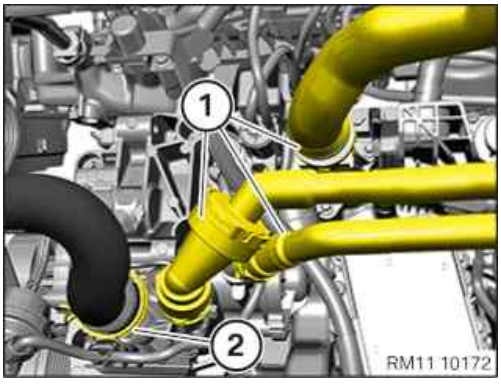
TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.



- Unlock and remove coolant lines (1).
- Release the clamp (2) and remove the coolant hose.

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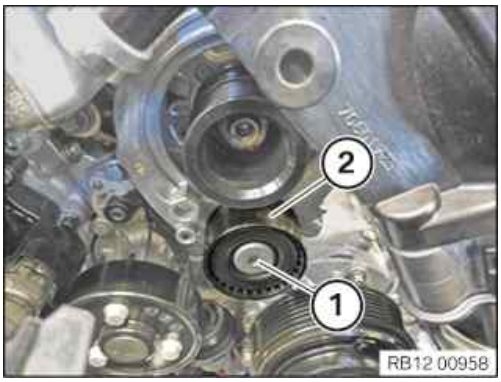
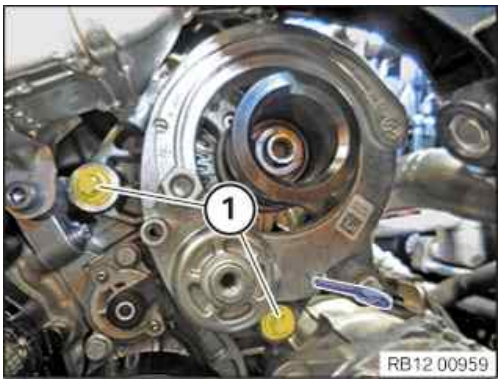
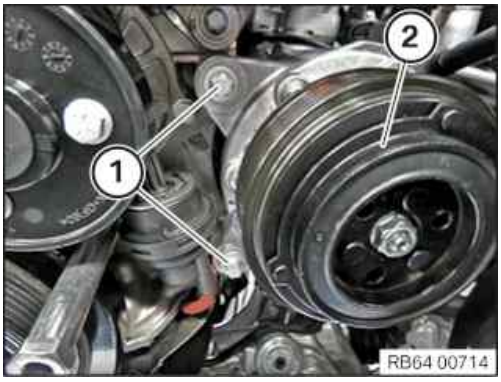


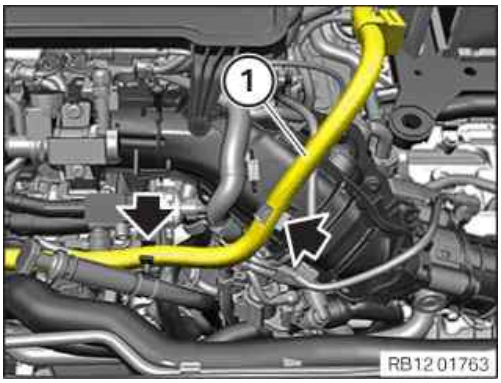
- Loosen screw (1).
- Remove the deflecting element (2).



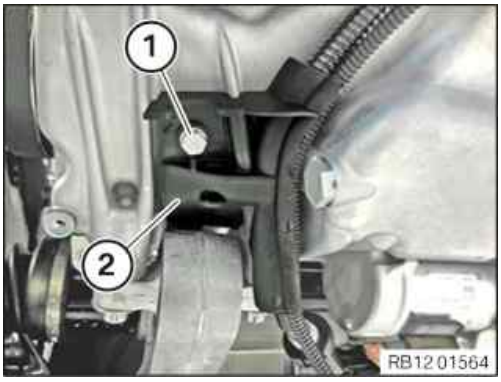
- Loosen screws (1).
- Remove alternator.



- Loosen screws (1).
- Remove air conditioning compressor (2).



- Release the positive battery cable (1) from the clamps (arrows).



- Loosen screw (1).
- Guide out and remove holder (2).

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- Feed out positive battery cable from the clamps (1) and remove.

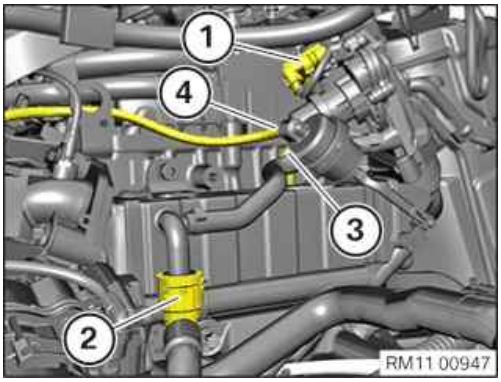
▶ Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

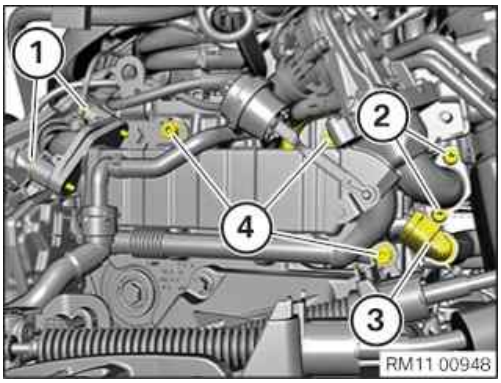
- Perform all work only on components that have cooled down.



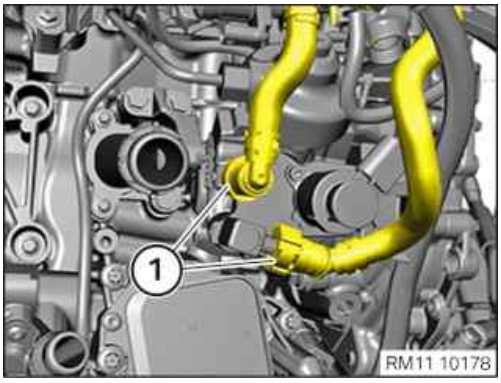
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.



- Unlock the fuel lines (1) and release them from the high pressure pump.
- Remove the fuel lines (1) .

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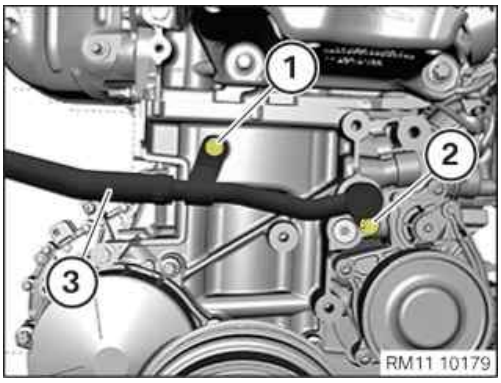


- Loosen screws (1) and (2).
- Remove coolant line (3).

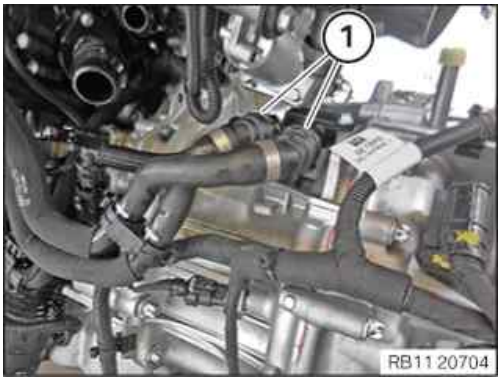
8 – Disconnect the engine from the double-clutch transmission (DKG)

RISK OF DAMAGE

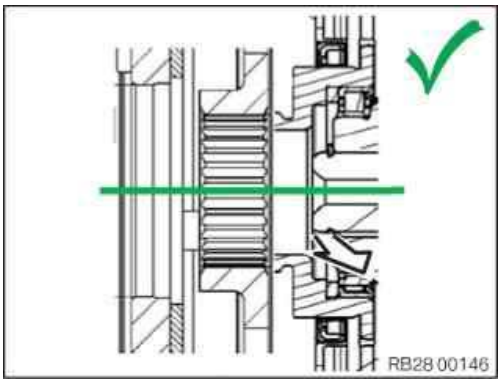
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

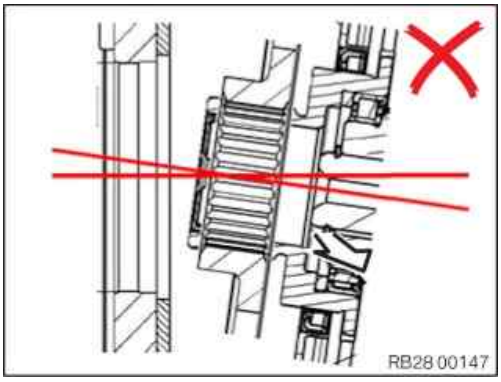
- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.



- Unlock and release coolant line (1).
- Catch and dispose of escaping coolant.



- **Correct:** Pull the double-clutch transmission (DKG) horizontally off the flywheel.



- **Wrong:** Do not pull the double-clutch transmission (DKG) off the flywheel if it is tilted.

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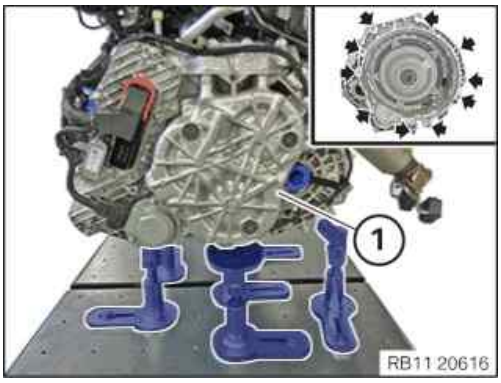
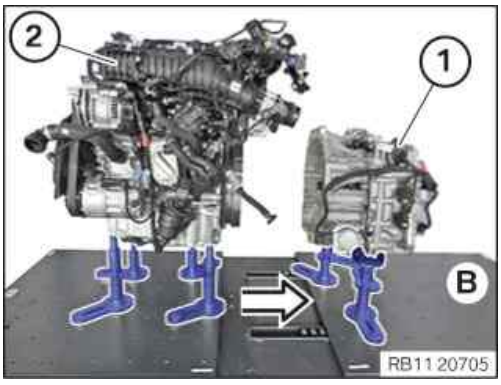


- Remove screws (arrows).
- Pull the double-clutch transmission (DKG) (1) off the flywheel when it is **absolutely** horizontal.



NOTICE

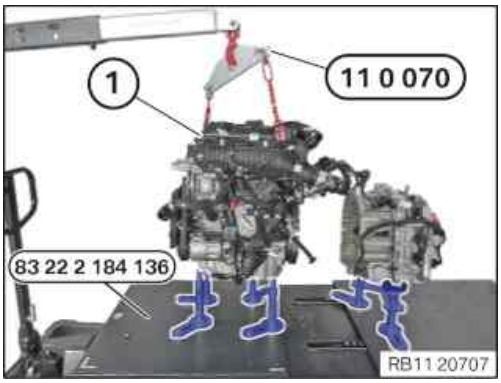
Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table top (B) in the direction of arrow and disconnect double-clutch transmission (DKG) (1) from the engine (2).

- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Attach the engine lifter with the special tool **0 490 579 (11 0 070)** and lift the engine (1) off the lifting table.

9 – Mount engine on assembly stand

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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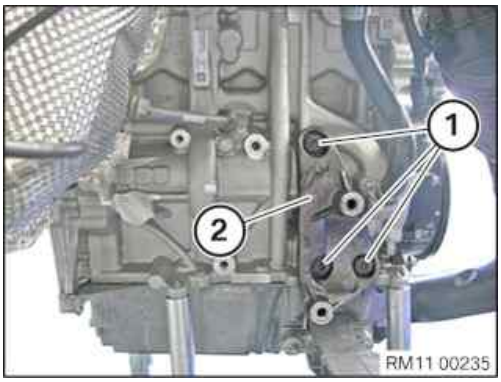
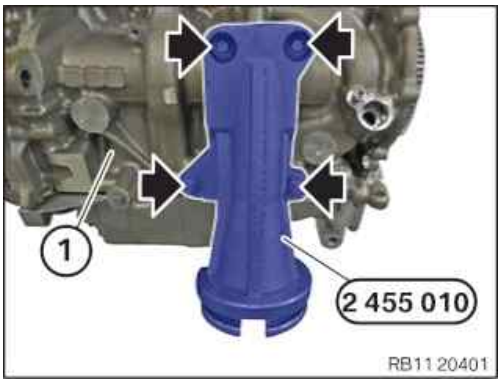


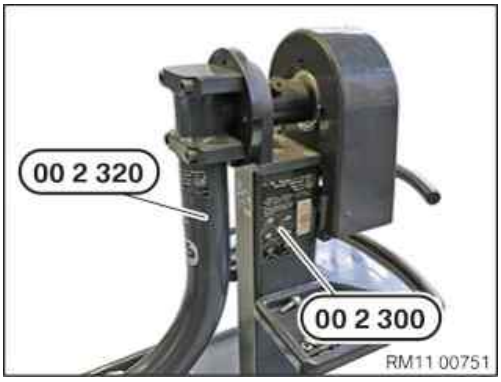
- Loosen screws (1).
- Guide out and remove holder (2).



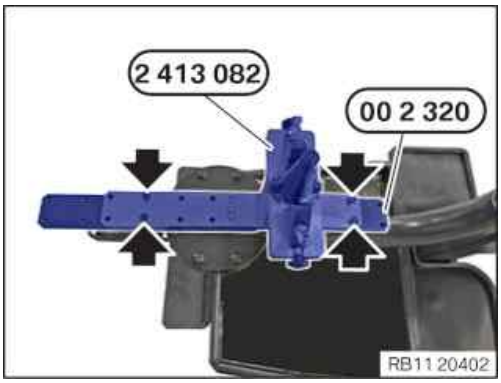
- Position the special tool **2 455 010** on the engine (1).
- Position the standard bolts **M10x30**.
- Tighten the standard bolts (arrows).
-

Special tool 2 455 010 to crankcase

M10x30		Tightening torque	38 Nm



- Prepare the assembly stand **0 495 187 (00 2 300)** with the special tool **0 495 196 (00 2 320)**.



- Screw the special tool to the **0 495 196 (00 2 320)** special tool.
- Tighten screws (arrows).
-

Special tool 11 8 930 to special tool 00 2 320

M14x35		Tightening torque	160 Nm

- Position the engine lifter with the special tool **0 490 579 (11 0 070)** and the engine on the special tool **0 495 187 (00 2 300)**.

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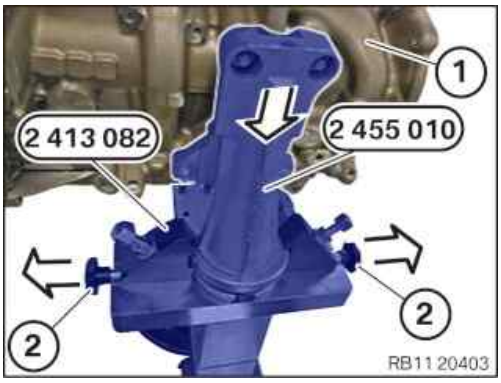
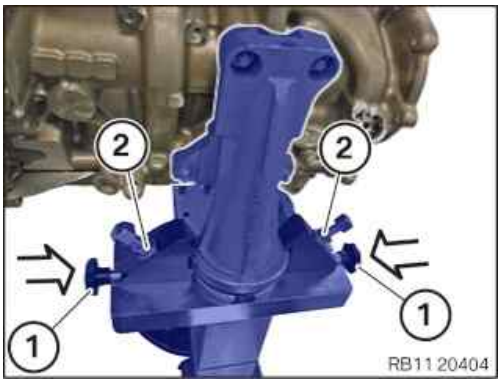


- Detach the holder (2) in the direction of the arrow.
- Position the engine (1) with the special tool **2 455 010** in the direction of the arrow on the special tool .



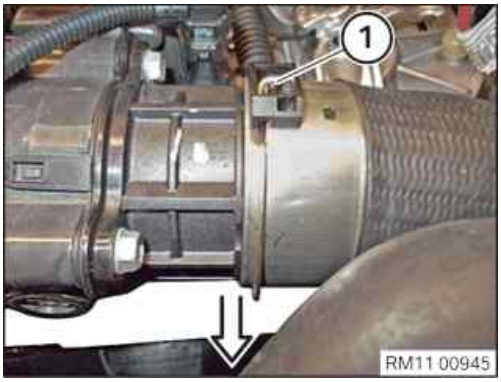
- Lock the holder (1) in direction of arrow.
- Tighten nuts (2).

10 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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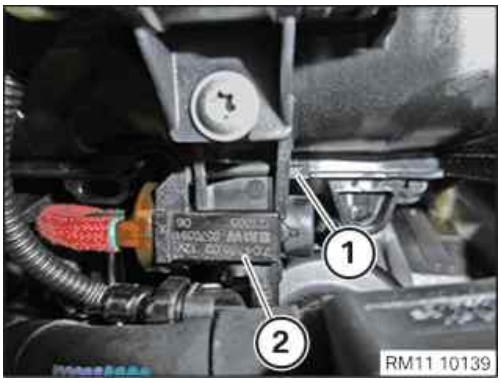
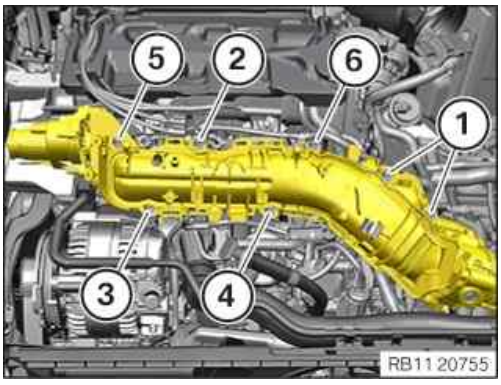
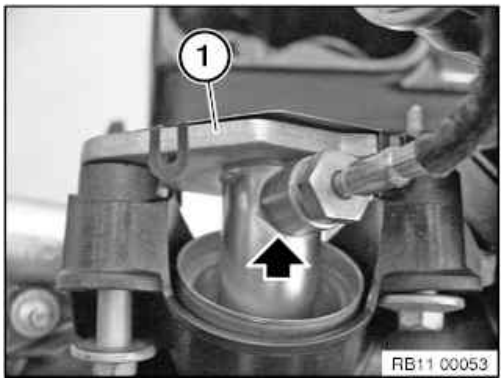


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

11 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

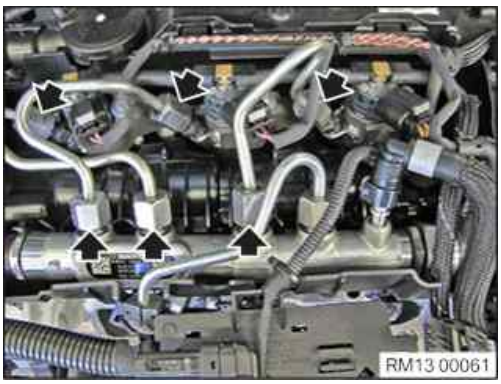
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

12 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

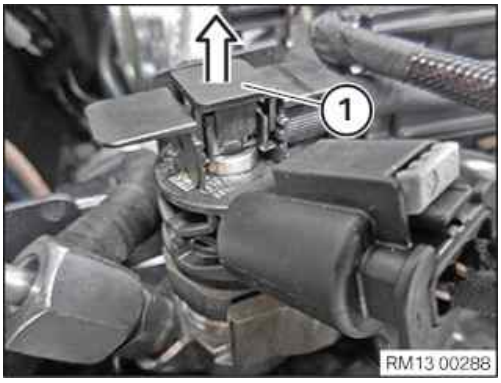
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

13 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.

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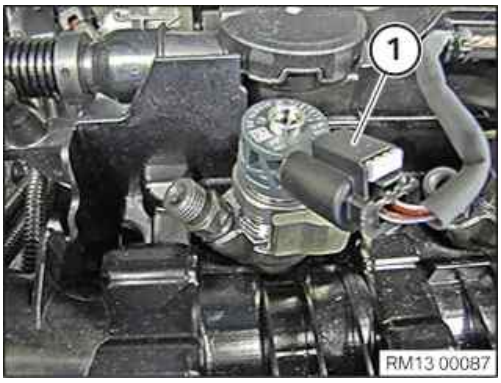
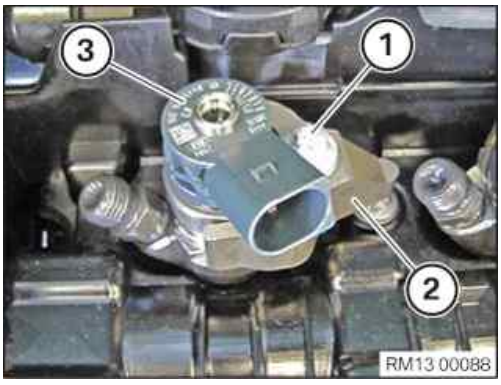


- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

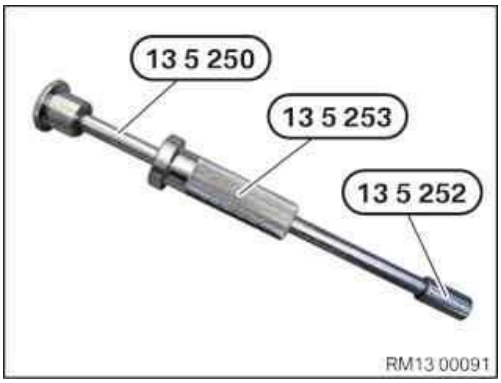
▶ **Loosen stuck injectors**

RISK OF DAMAGE

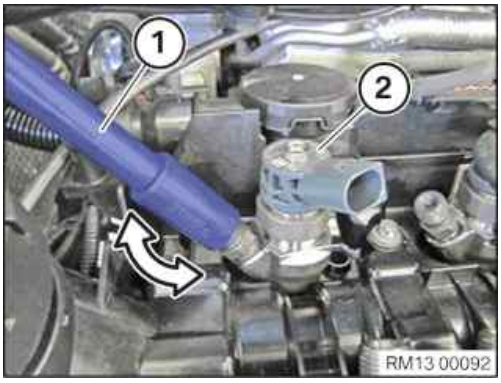
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

14 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

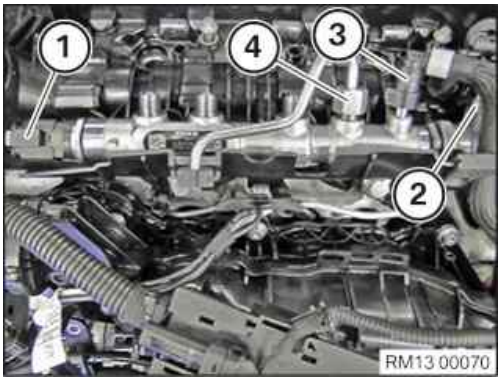
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

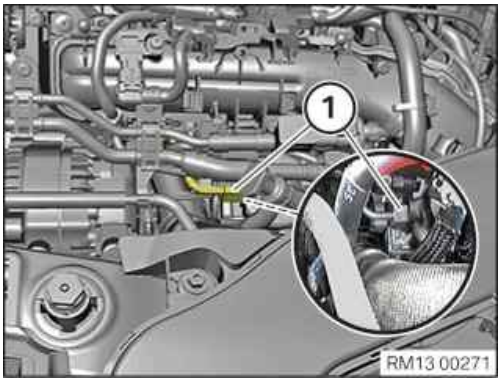
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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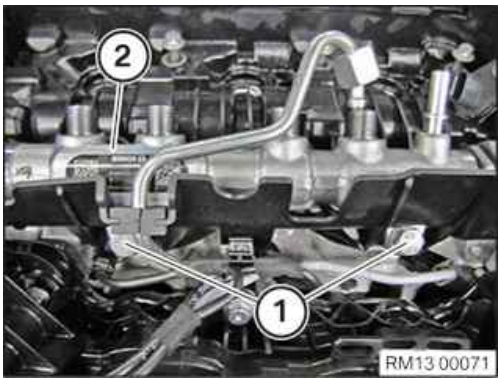
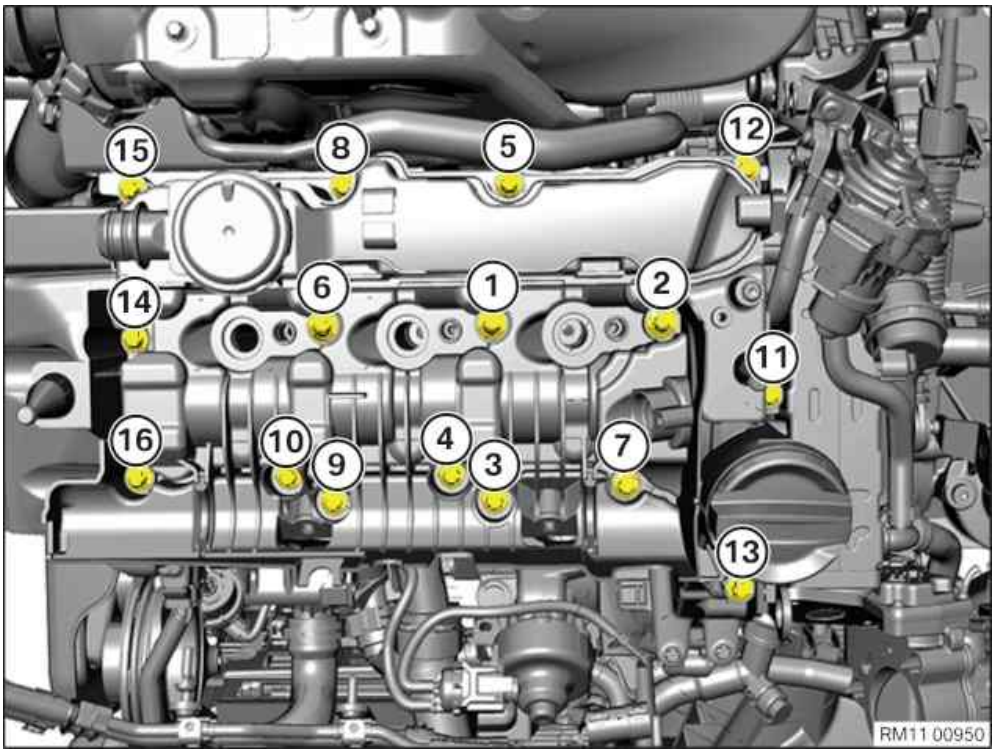


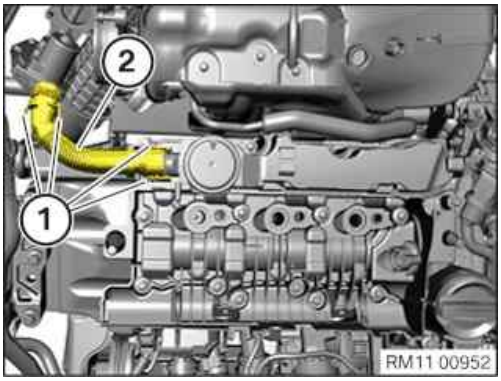
- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

15 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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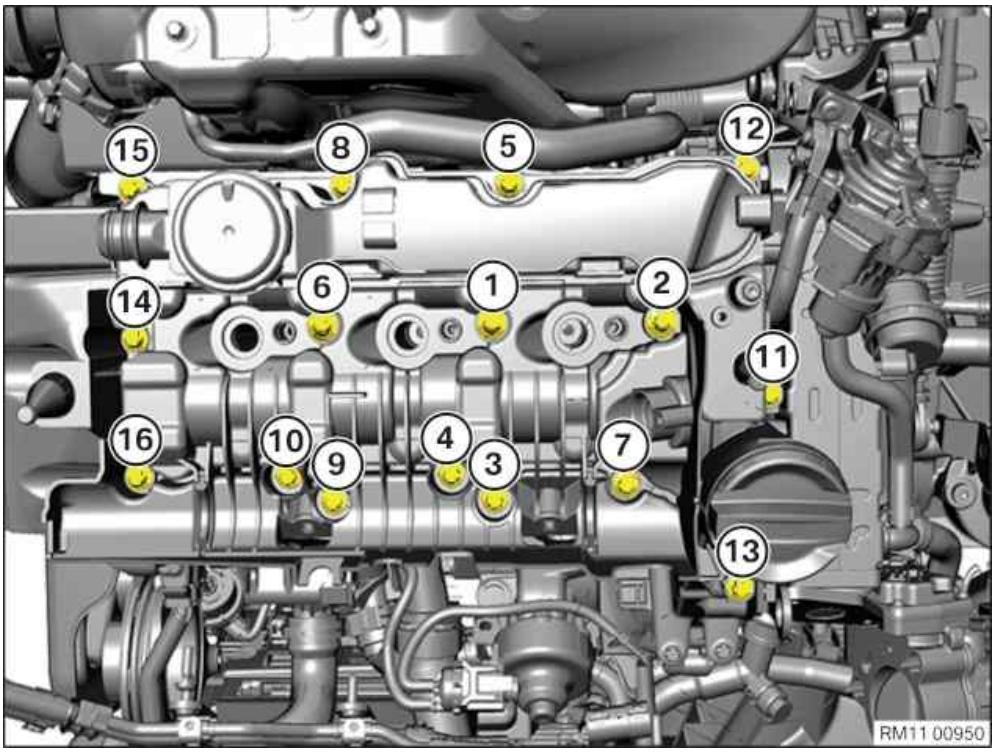

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

16 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

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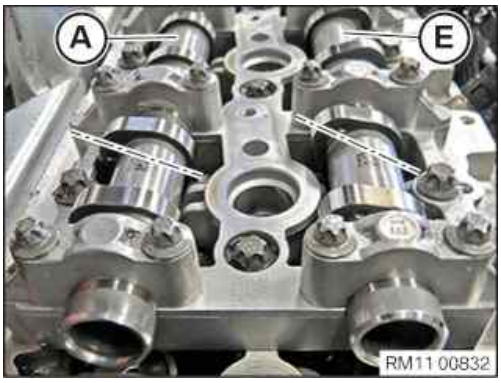
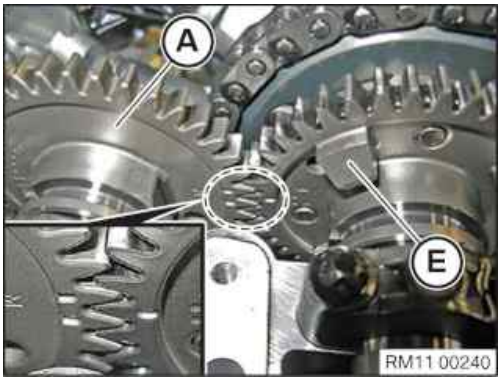


- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

17 – Remove chain tensioner piston

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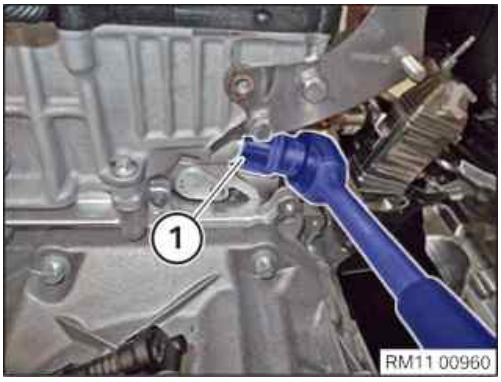
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

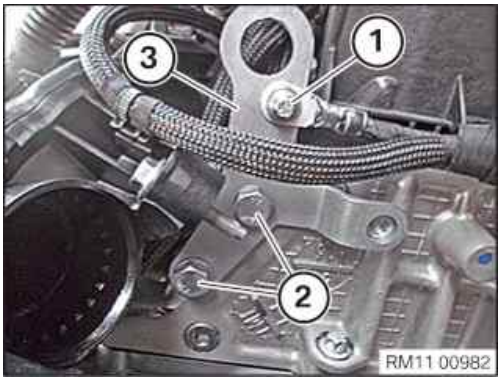


TECHNICAL INFORMATION

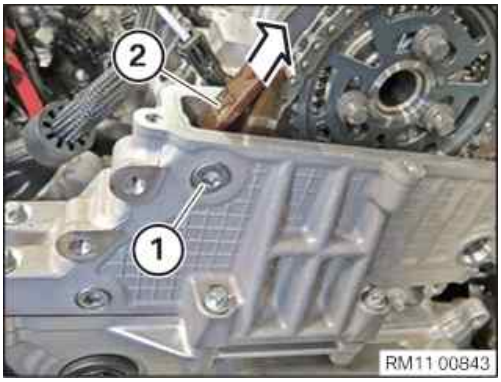
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

18 – Remove the timing chain guide rail

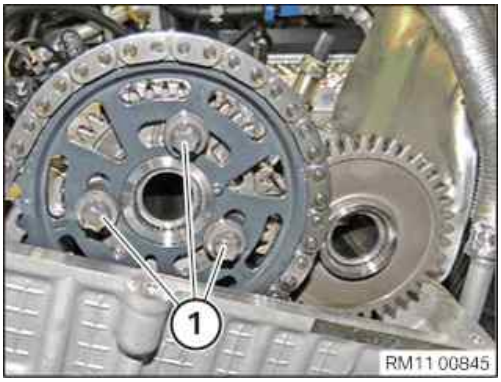


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

19 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

20 – Removing the camshaft support

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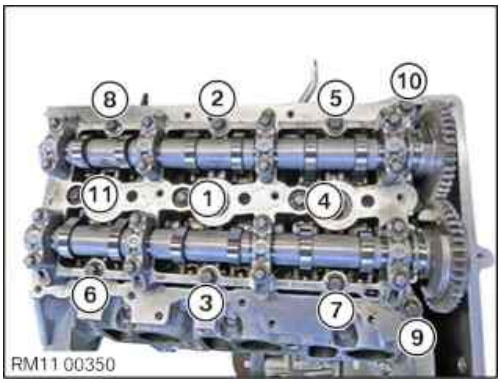
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

21 – Removing glow elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the glow elements.

Excessive force may damage the glow elements and they may then have to be renewed.

- Handle glow elements with care and do not drop.
- Do not rest the cylinder head on glow elements. Glow elements protrude from the sealing surface of the cylinder head.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

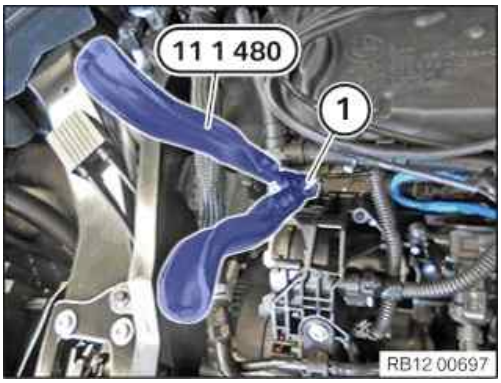
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect plug connection (1) using special tool **0 490 796 (11 1 480)**.

- Release the glow elements with the special tool **0 491 068 (11 6 050)** or conventional tools.
- Feed out preheating elements and remove.

22 – Remove roller cam followers

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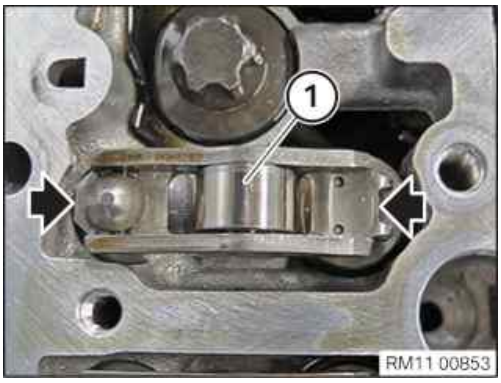


- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

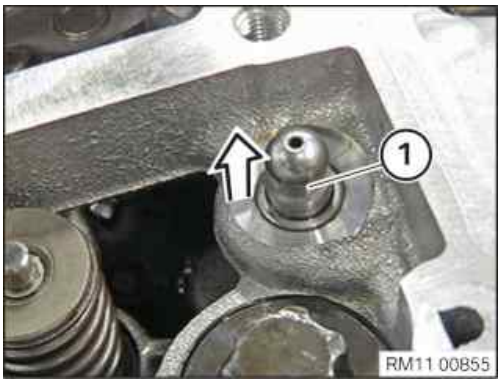
23 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

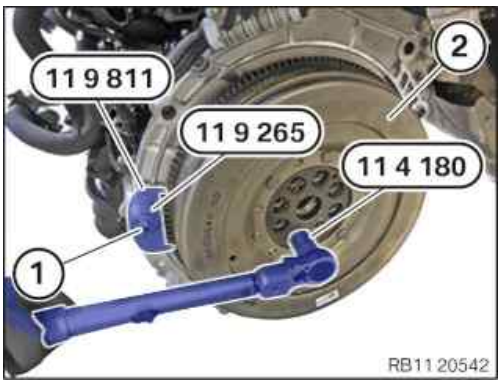
24 – Remove flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Position special tool **0 496 171 (11 9 811)** with a **standard** 5 mm thick washer between the crankcase and the flywheel.

  The 5 mm thick washer must be mounted between the crankcase and special tool **0 496 171 (11 9 811)** .
- Secure the special tool **0 494 793 (11 9 265)** with the transmission bolt (1).
- Protect the flywheel (2) from falling.
- Unscrew the flywheel bolts with the special tool **0 491 018 (11 4 180)**.
- Guide out the flywheel (2) and remove.

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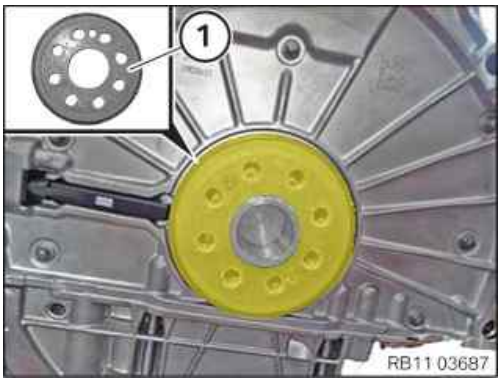


RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

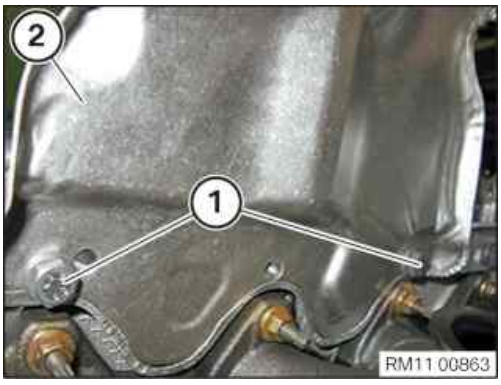
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Remove increment wheel (1) from the crankshaft and set it aside properly.

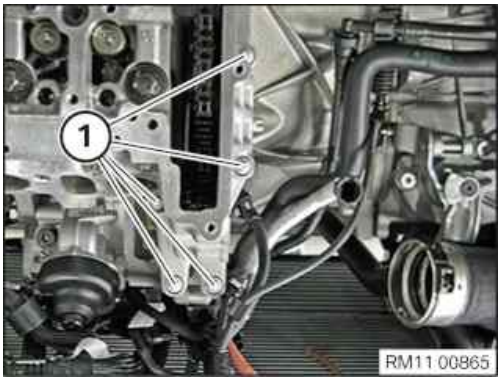
25 – Remove rear timing case cover

Prerequisite

Transmission is removed.



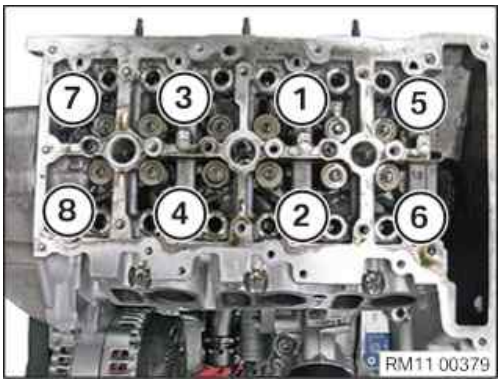
- Loosen screws (1).
- Feed out the heat shield (2) and place to one side.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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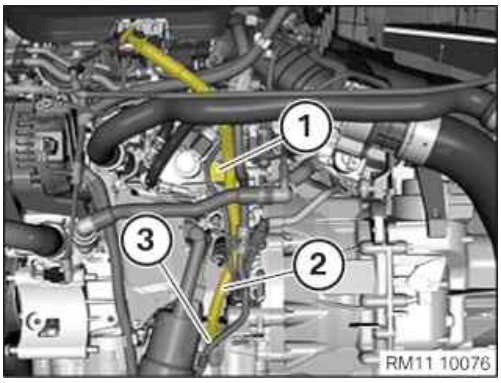
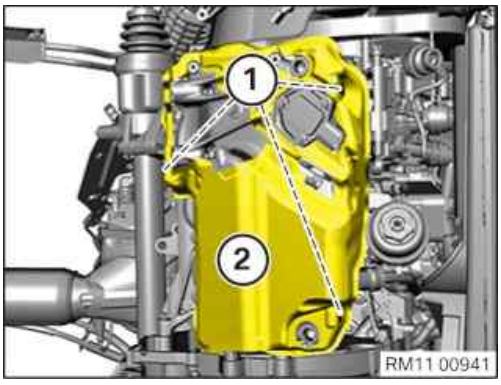
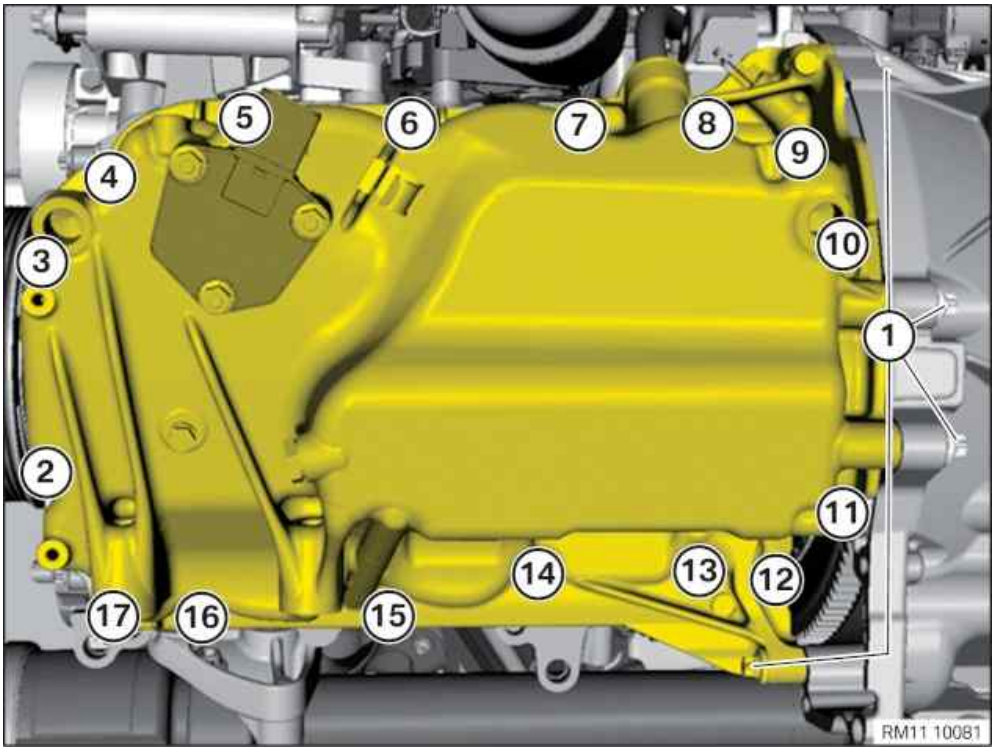


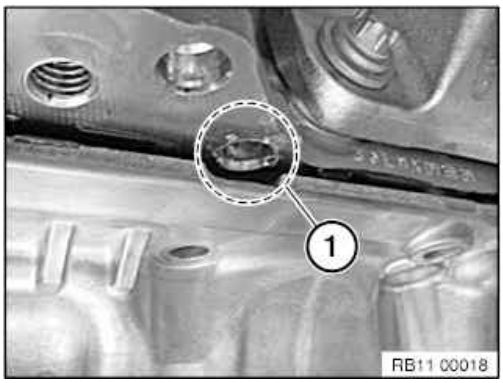
- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- If required, remove sealing ring (3) from oil sump.



- Remove the expanding rivet (1) on both sides of the acoustic cover (2).
- Feed out and remove the acoustic cover (2).



- Tighten the transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release oil sump only in area (1).

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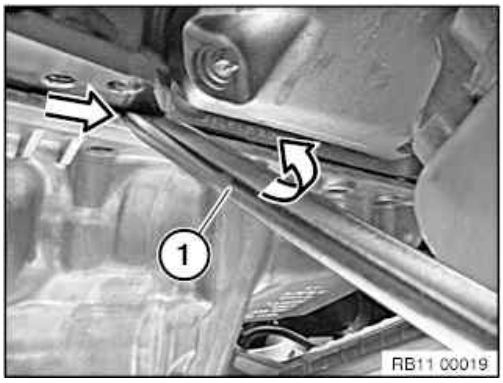
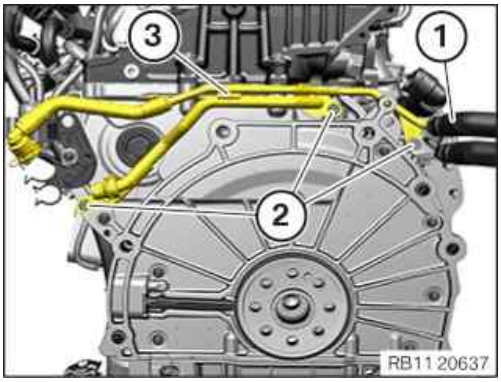
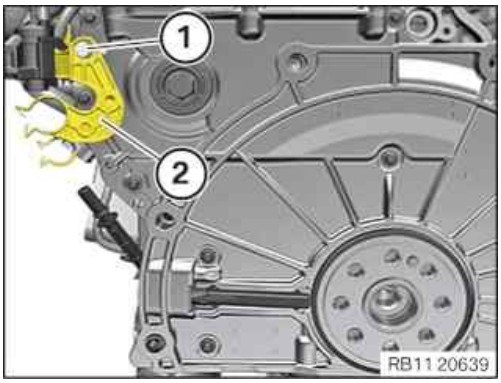


- Release the oil sump using a suitable mounting lever (1) carefully at the position intended for that.
- If required, secure the oil sump against falling.

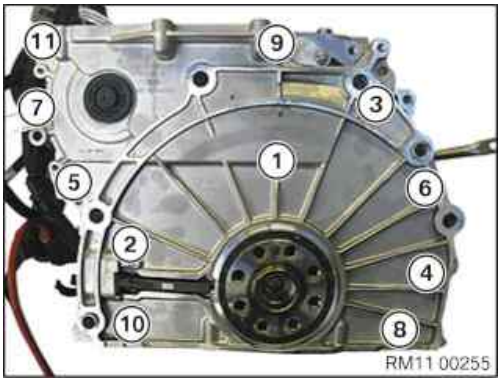
► **If installed: Remove coolant line of the SCR metering module**



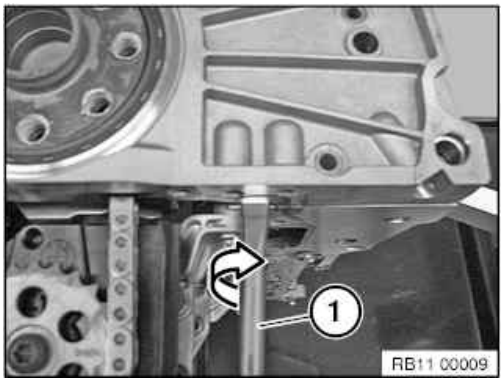
- Unlock and disconnect the coolant hose (1).
- Loosen screws (2).
- Remove the coolant line (3).



- Loosen screw (1).
- Guide out and remove holder (2).



- Loosen screws in the order (11) to (1).



- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.

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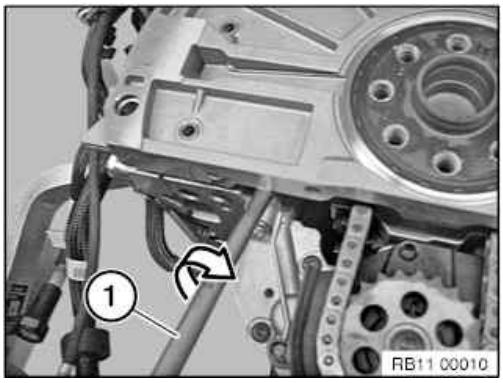
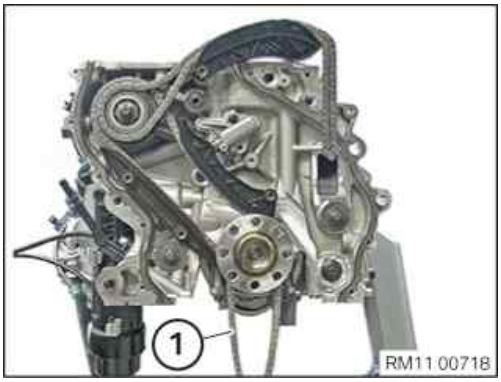


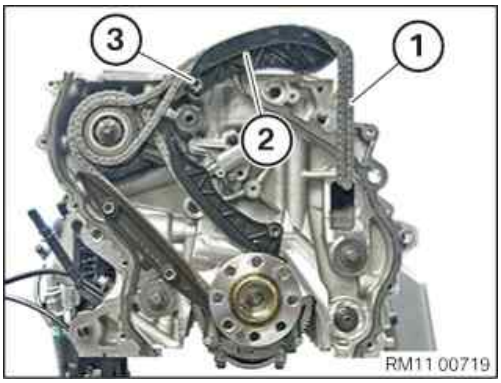
- Loosen the timing case cover with a screwdriver (1) in the direction of the arrow.
- Remove the timing case cover.

MAIN WORK

26 – Remove both timing chains

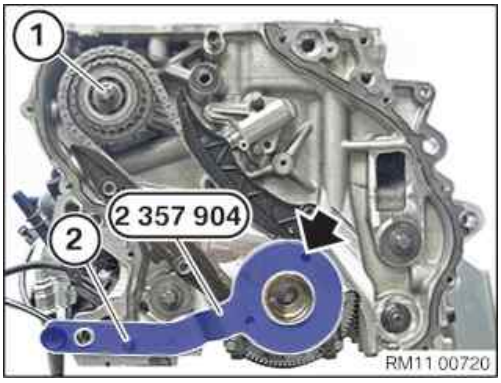


- Remove drive chain (1) for oil pump.

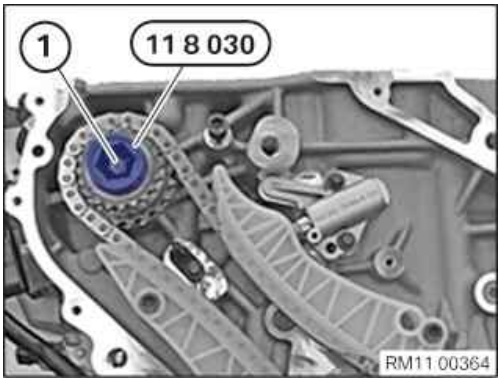


- Remove the timing chain (1) for the camshafts.
- Remove the tensioning rail (2) from the bearing journal (3).

  Bearing journal (3) does not have to be disassembled.



- Secure crankshaft to release central bolt (1) of high pressure pump.
- Position crankshaft with guide pin (arrow).
- Secure special tool **2 357 904** with bolt (2) on crankcase.
- Release central bolt (1) of high pressure pump; do not remove.



- Screw special tool **0 496 725 (11 8 030)** into sprocket of high pressure pump.
- Unscrew central bolt (1) of high pressure pump until central bolt can be supported on special tool **0 496 725 (11 8 030)**.
- Continue turning central bolt (1) until camshaft sprocket is released from high pressure pump shaft.

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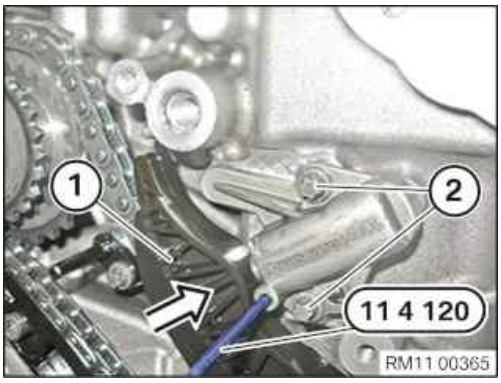
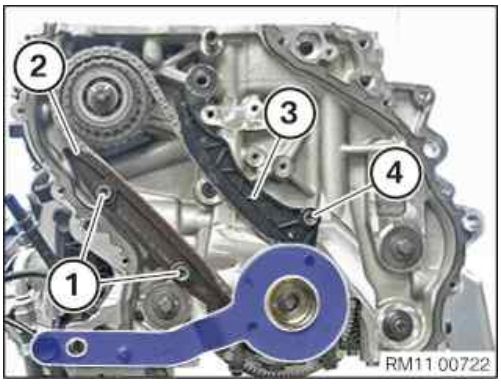
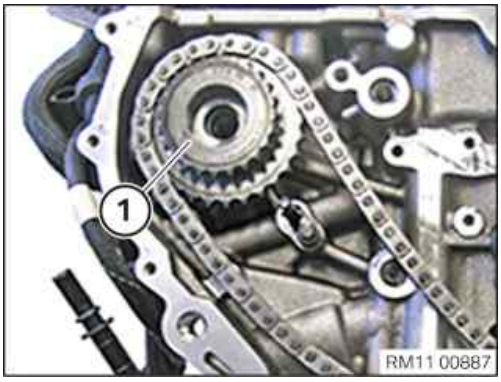


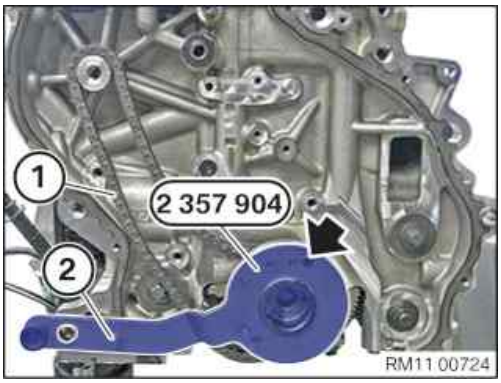
- Press chain tensioner in with tensioning rail (1) by hand in the direction of the arrow until the special tool **0 491 012 (11 4 120)** can be positioned.
- Loosen screws (2).
- Remove chain tensioner.



- Loosen both bearing journals (1).
- Remove the guide rail (2).
- Loosen the bearing journals (4).
- Remove the tensioning rail (3).



- Remove bolt and camshaft sprocket (1) of high pressure pump.

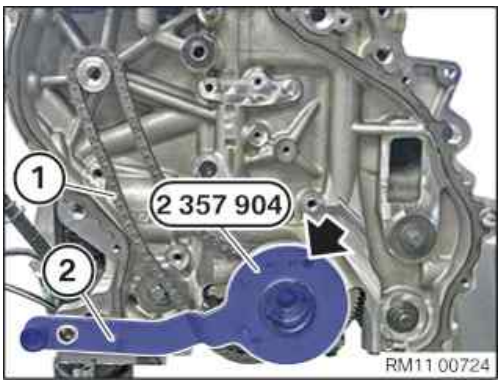


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Unscrew the bolt (2) and remove the special tool **2 357 904**.
- Remove the timing chain (1).

27 – Install both timing chains



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the timing chain (1).
- Secure crankshaft with special tool **2 357 904**.
- Secure special tool **2 357 904** with bolt (2) on crankcase.

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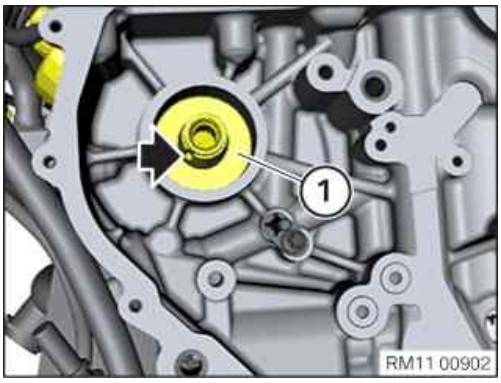
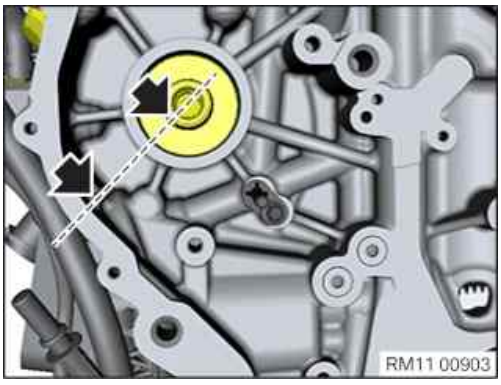
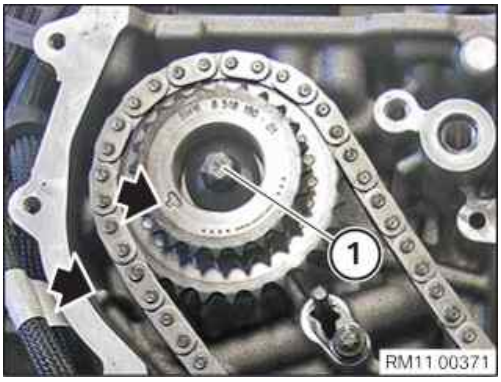


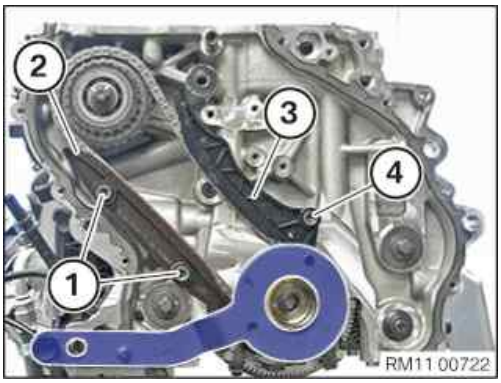
- Note spline groove on high pressure pump (1).



- Mark and groove (arrows) on high pressure pump and crankcase must align.



- Position the impeller with timing chain on the high pressure pump.
- Screw in and fasten central bolt (1) of high pressure pump.
- Mark and cast lug (arrows) must align.



- Position tensioning rail (3).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten the bearing journals (4).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

- Position the guide rail (2).
- Replace bearing journal.

  Parts: Bearing journal
- Tighten both bearing journals (1).

Bearing journal of tensioning and guide rail

M8	*Replace bearing journal.*	Tightening torque	20 Nm

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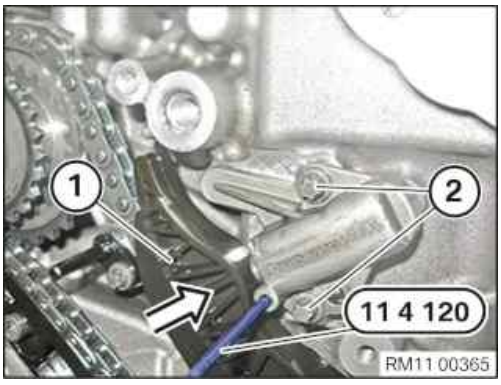
- Clean sealing surfaces (1) with compressed air.

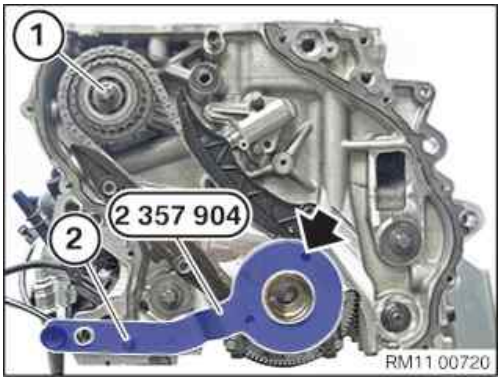


- Position hydraulic chain tensioner.
- Tighten down screws (2).

Chain tensioner to crankcase

M6x22		Tightening torque	10 Nm

- Press chain tensioner in by hand with tensioning rail (1) in direction of arrow until special tool **0 491 012 (11 4 120)** can be removed.

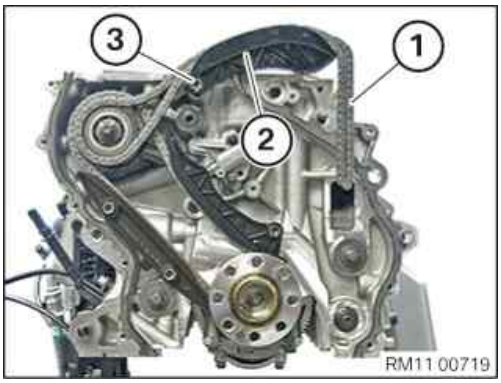


- To fasten central bolt (1) of high pressure pump, crankshaft must remain secured with special tool **2 357 904** and bolt (2).
- Renew central bolt (1).

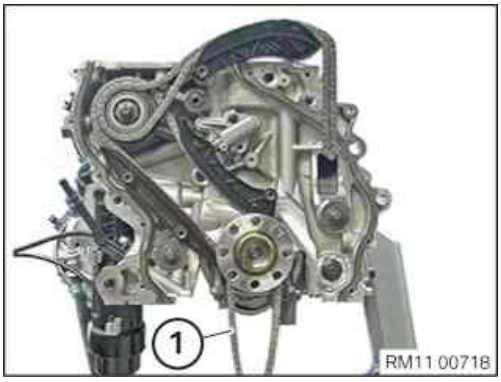
  Parts: Central bolt
- Tighten central bolt (1).

Camshaft sprocket on high pressure pump

M12		Tightening torque	65 Nm



- Position tensioning rail (2) on bearing journal (3).
- Position camshaft timing chain (1).



- Mount drive chain (1) for oil pump on crankshaft.

POSTPROCESSES

28 – Install the rear timing case cover

Prerequisite

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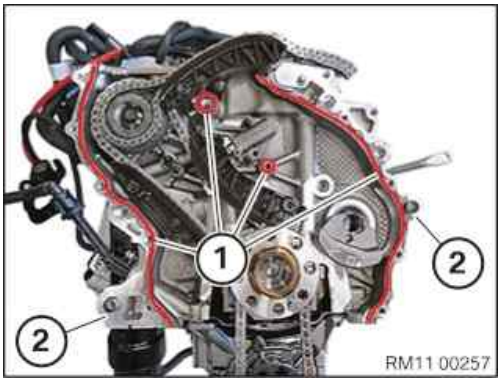
Transmission is removed.



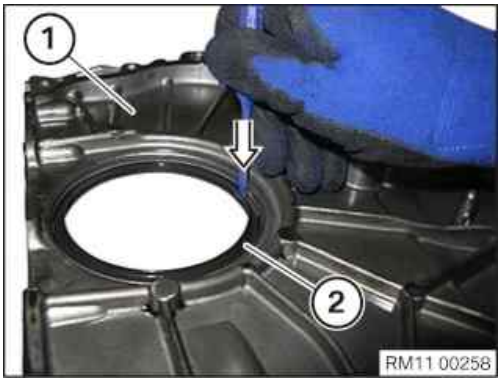
RISK OF DAMAGE

Damage to the surface.

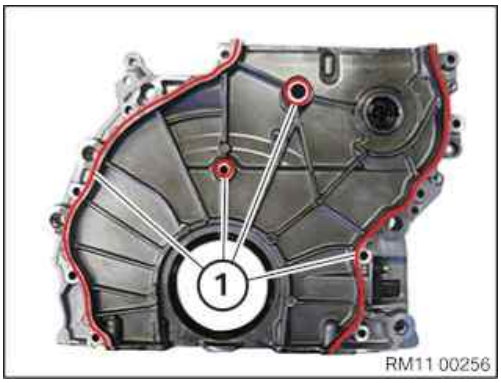
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

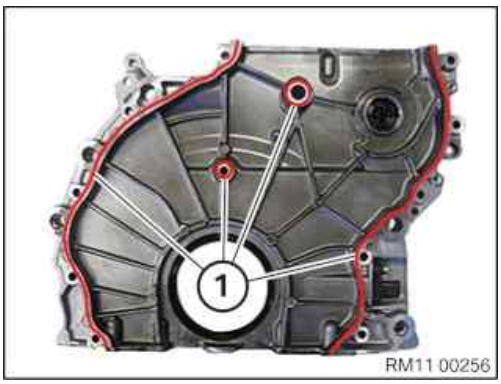
- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.
- Check fitting sleeves (2) for damage and for tight fit; renew if necessary.



- Position the timing case cover (1) underneath.
- Position punch on inner side of crankshaft seal (2).
- Drive out crankshaft seal (2) outwards.



- Remove seal residue from the sealing surfaces (1) using special tool **0 495 102 (11 4 470)**.

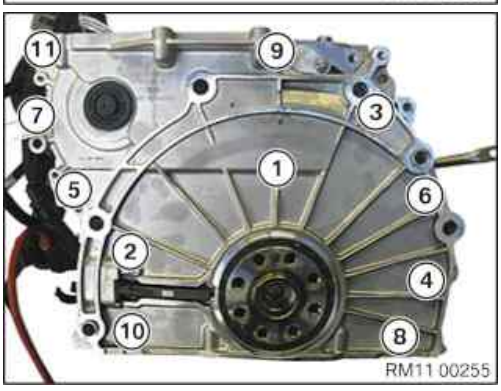


TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

- Apply sealing bead (1) with a height of approx. 1.5 mm to 2.0 mm on inner side of timing case cover in marked locations. Use liquid sealing compound for this.

  Application time of sealing bead (1) must not exceed 12 minutes.



- Mount the timing case cover without the crankshaft seal.
- Renew screws (1) to (11).

  Parts: Bolts
- Join the bolts in with the sequence (1) to (11).
- Tighten screws in the order (1) to (11).

Rear timing case cover to crankcase

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

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▶ **Installing the rear crankshaft seal**

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) on the radial shaft seal with the sharp-edged connector gearing of the output shaft will result in destruction and/or leaks.

- When inserting the output shaft, make sure that the connector gearing of the output shaft does not touch the sealing lip (inner) of the radial shaft seal.

RISK OF DAMAGE

Radial shaft seal damage.

Touching the sealing lip (inner) and applying oil to the radial shaft seal will lead to its destruction.

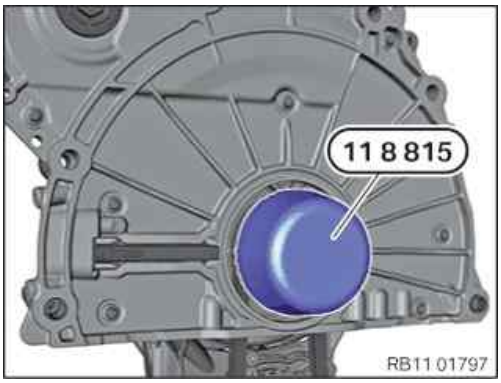
- Do not touch the sealing lip (inner) of the radial shaft seal.
- Do not apply oil to the radial shaft seal.
- Install the radial shaft seal dry.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Position special tool **0 496 137 (11 8 815)** on crankshaft. Make sure that the crankshaft sensor is not damaged.

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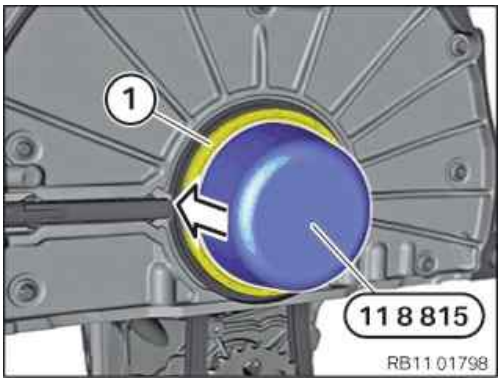
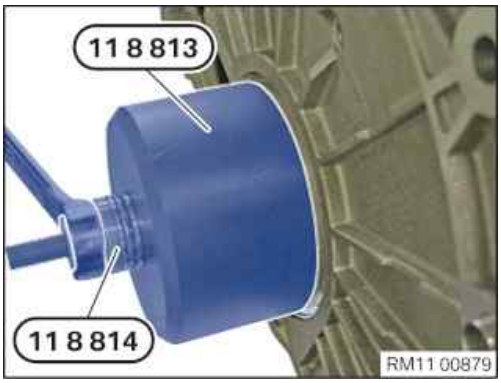


- Fit the crankshaft seal (1) up to the timing case cover in the direction of the arrow using special tool **0 496 137 (11 8 815)** and position.
- Remove special tool **0 496 137 (11 8 815)**.

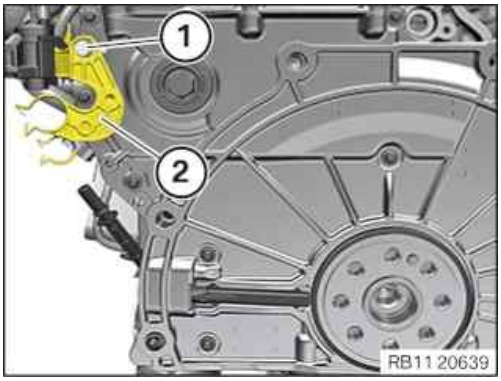
- Secure special tool **0 496 133 (11 8 811)** to the crankshaft using special tool **0 496 134 (11 8 812)**.

- Check the freedom of movement between the special tool **0 496 135 (11 8 813)** and the crankshaft sensor during installation.

  Otherwise there is a risk that the crankshaft sensor will be damaged.
- Slide on special tool **0 496 135 (11 8 813)**.
- Screw down special tool**0 496 136 (11 8 814)**.



- Press in crankshaft seal with special tool **0 496 135 (11 8 813)**.
- Screw in special tool **0 496 135 (11 8 813)** up to timing case cover.



- Insert and install the holder (2).

► **If installed: Installing the coolant line of the SCR metering module**

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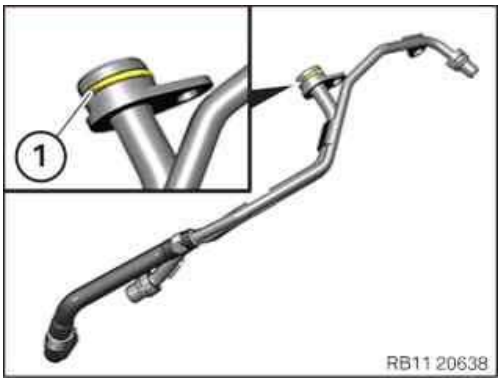
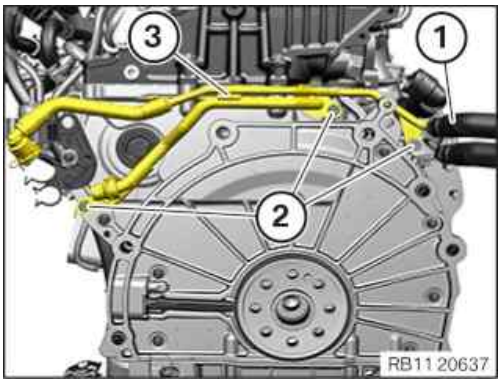


- Renew the O-ring 1.

  Parts: O-ring



- Feed in and install coolant line (3).
- Tighten down screws (2).

SCR coolant lines to crankcase end cover

Hexagon screw M6x16		Tightening torque	8 Nm

- Connect and lock the coolant line (1).

  Coolant line (1) must audibly engage.

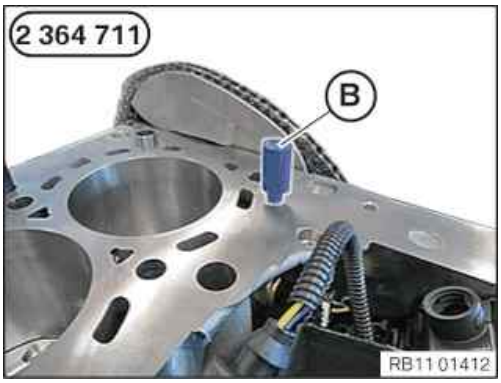
▶ **Cleaning the sealing surface**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

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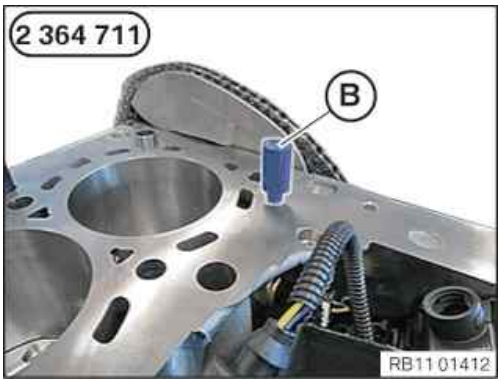
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

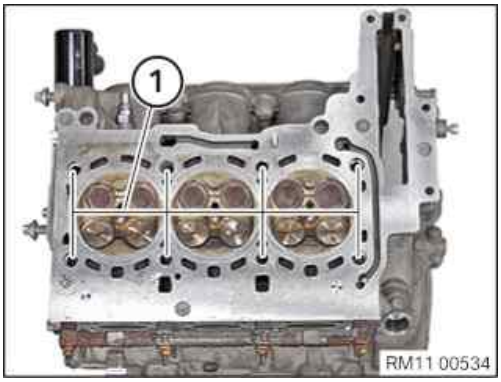
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

▸ **Renewing the cylinder head gasket**



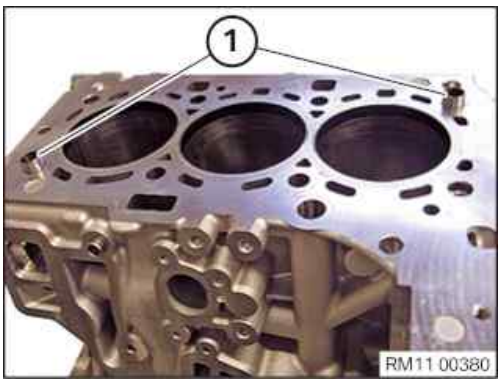
RISK OF DAMAGE

Damage to the surface.

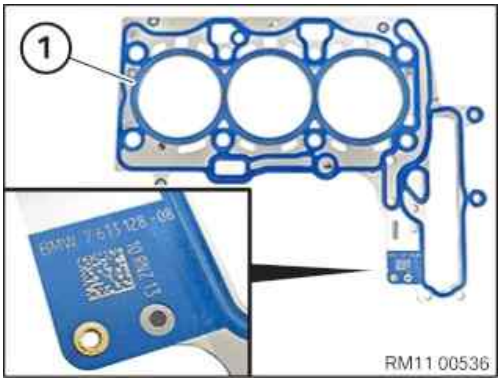
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).



- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**

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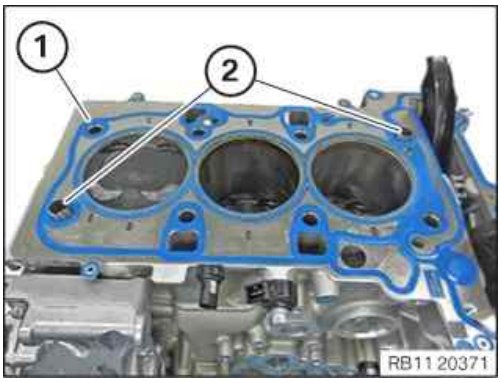
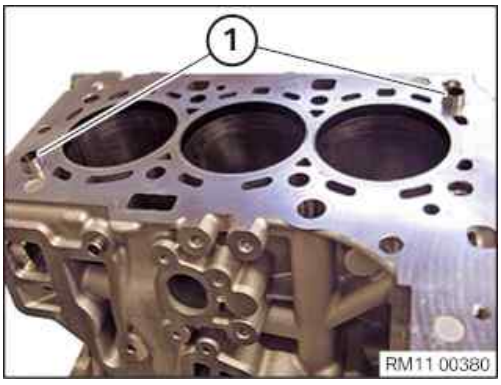


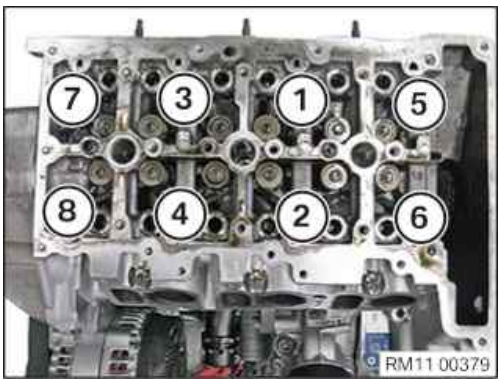
- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Fit new cylinder head screws.

  Parts: Cylinder head bolts
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

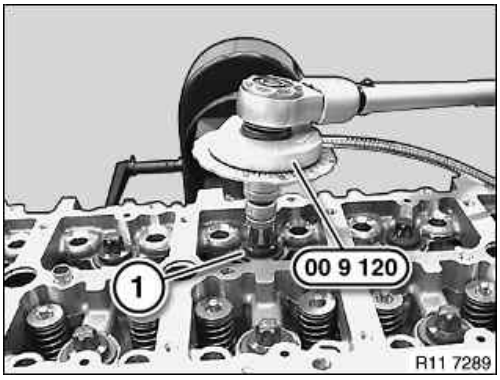
  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolts in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

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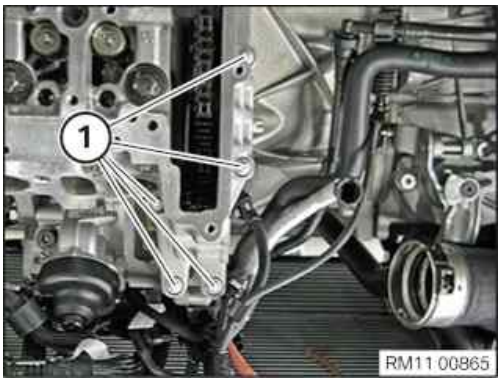

- Tighten the cylinder head bolts (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1) and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

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TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

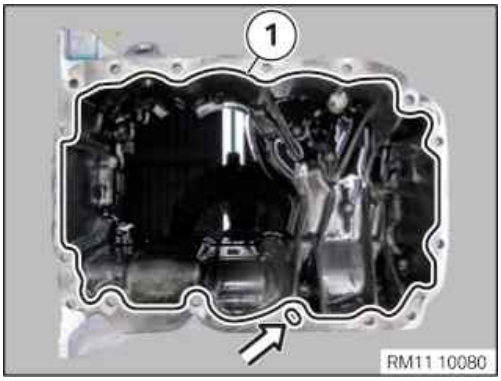
- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)



TECHNICAL INFORMATION

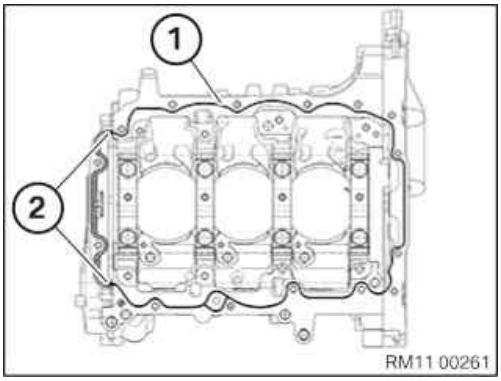
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.

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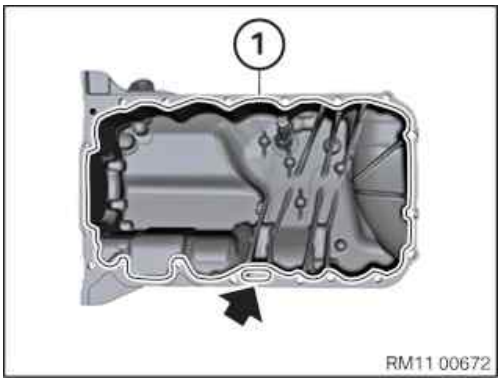
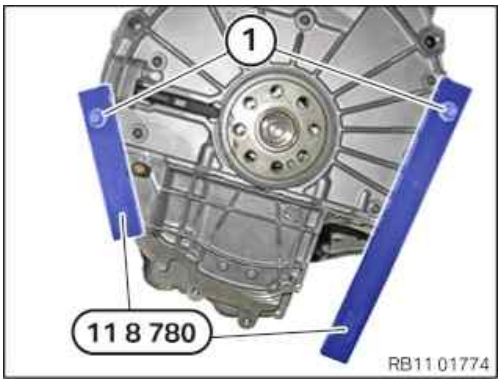


TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- Apply the sealing compound along the line (1) with a thickness of 2 mm to 2.5 mm.

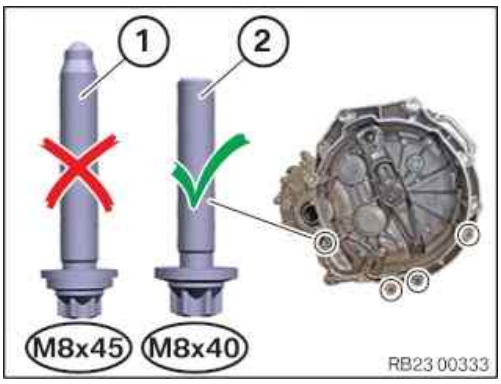
  The sealing compound must be applied along the inner edge.
- Completely encircle the oil return orifice (arrow) with the sealing compound.



TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

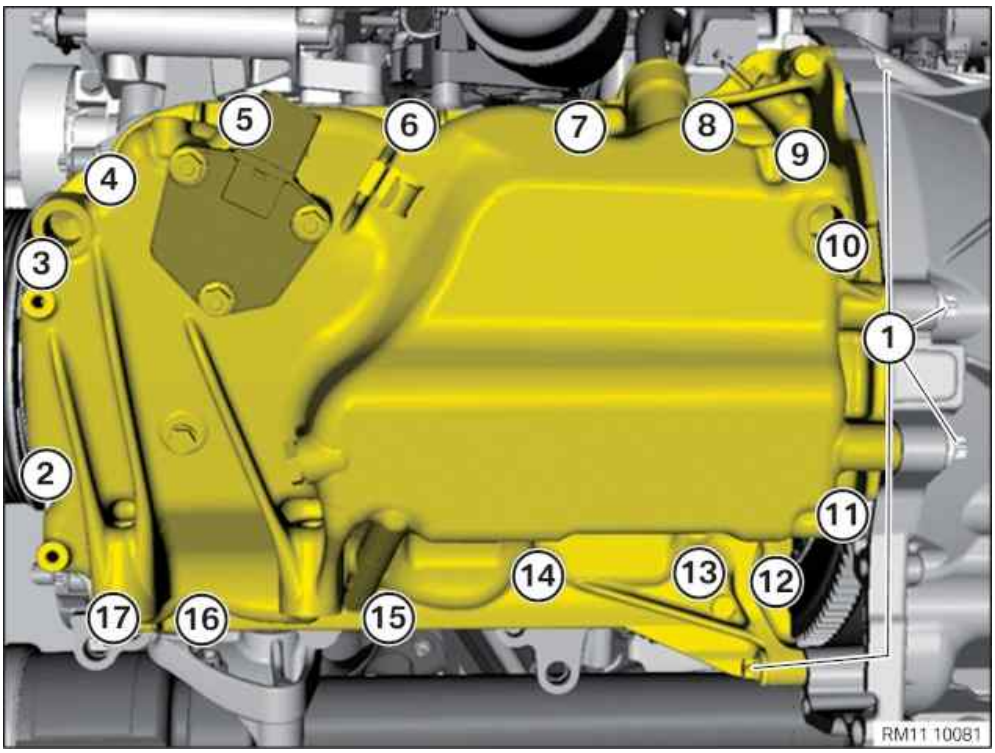
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Hand tighten the screws of oil sump (2) to (17) , but do **not** tighten completely yet.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws(2) to (17) of the oil sump.

Oil sump to crankcase

M8x30		Tightening torque	2 Nr
M8x110		Tightening torque	2 Nr

- Tighten transmission bolts (1) on oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nr

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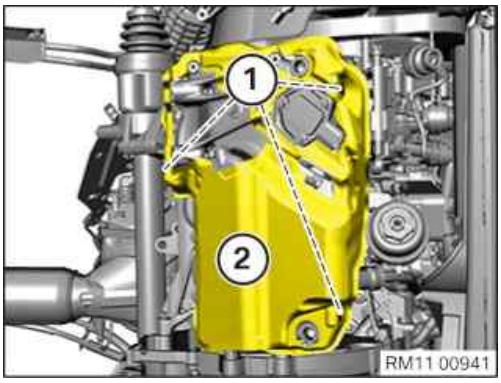
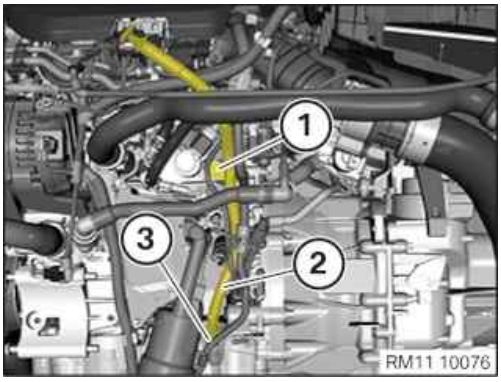


- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).

- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and insert it into oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

29 – Installing the flywheel (DKG)

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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TECHNICAL INFORMATION

Clean all threads with a screw tap.

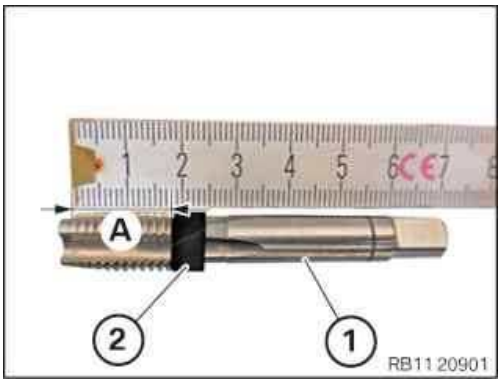
- Clean all the screw threads (1).

- Use the set of special tools **2 285 058**.

Description
Twist drill
Thread cutter M12x1.5
Depth
Insertion tool

- Assemble tool set.

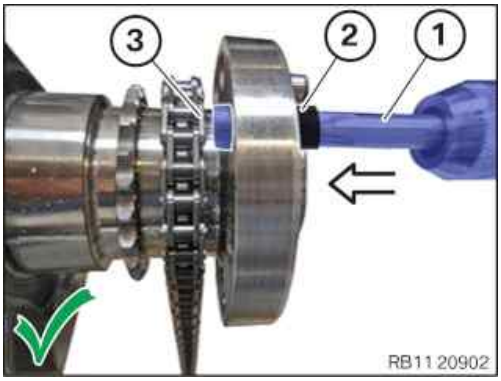
Number	Description
1	Tool holder
2	Thread cutter M12X1,5



- Mark the depth of insertion (A) on the thread cutter (1) from the set of special tools **2 285 058** with a standard tool (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm



NOTICE

To provide a better overview: Shown with engine removed.

- Screw in the thread cutter (1) from the set of special tools **2 285 058** in direction of arrow up to the installation dimension (2).

Screw-in depth of thread cutter

Screw-in depth	18 mm

- Make sure that the thread cutter does (1) **not** rest on the timing chain (3).

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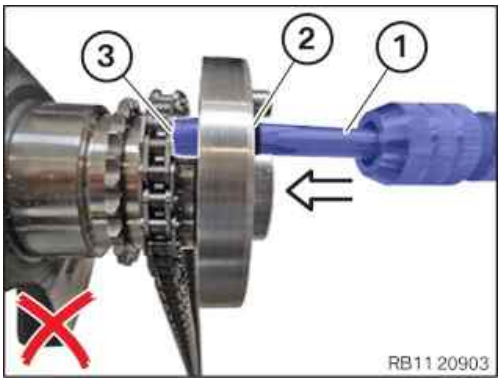
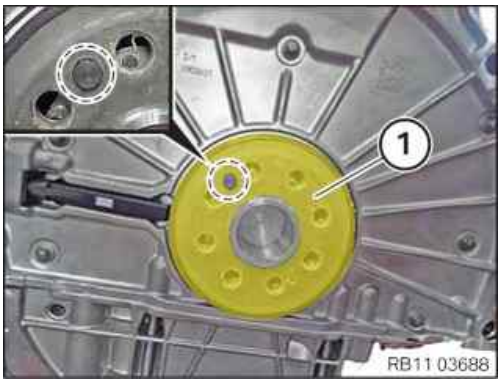


TECHNICAL INFORMATION

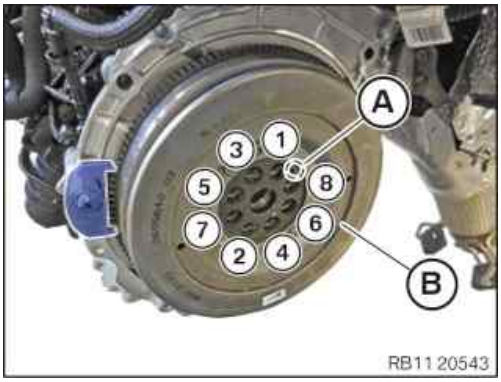
- **Carefully** handle the timing chain, to protect the timing chain and timing chain drive against damage.

- Make sure that the depth of insertion (2) of the screw tap (1) is not exceeded.

  The thread cutter (1) may not rest on the timing chain (3).



- It is essential to observe the marking shown during installation.
- Install special tool (1) on the crankshaft as shown.

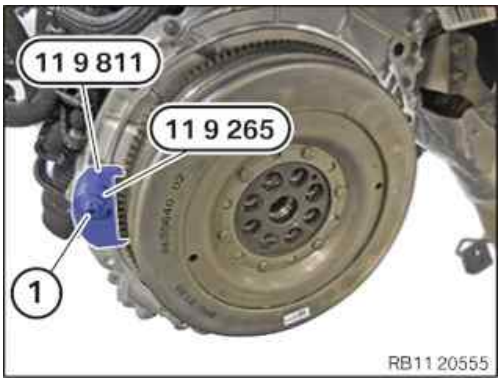


- Position flywheel (B) .
- Renew flywheel bolts (1) to (8).

  Parts: Flywheel bolts
- Tighten flywheel bolts hand-tight with special tool **0 491 018 (11 4 180)**.
- Tighten the flywheel bolts using the special tool **0 491 018 (11 4 180)** in sequence (1) to (8).

Flywheel to crankshaft

M12x1.5	Renew screws.	Tightening torque	120 Nm



- Loosen the transmission bolt (1).
- Thread out special tools **0 496 171 (11 9 811)** and **0 494 793 (11 9 265)** remove.
- Ensure that the washer (5 mm) is removed.

30 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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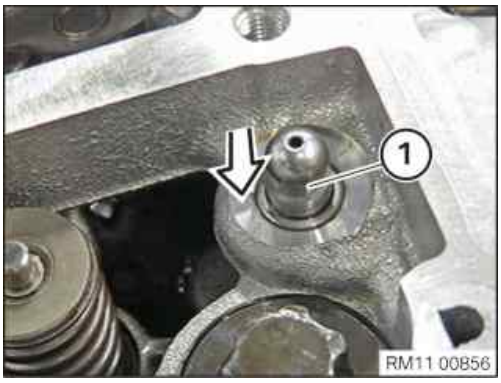
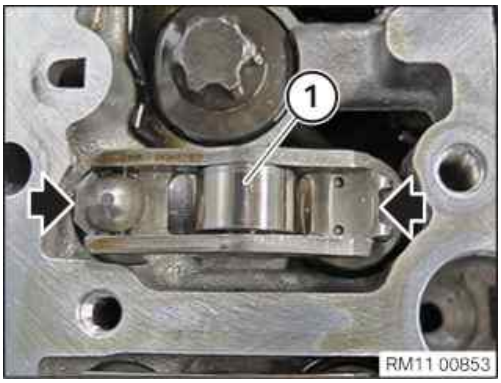


- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

31 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.

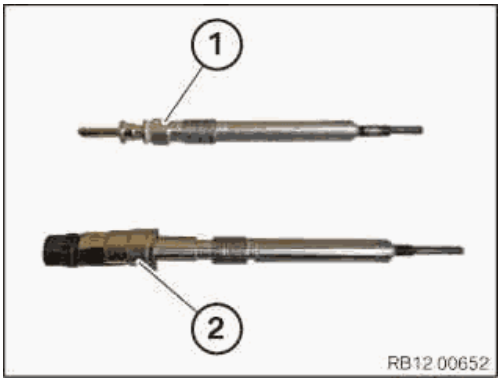


- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

32 – Install glow elements



- Install glow elements (1) in cylinders 1, 2, 3 and 4.
- If fitted: Glow element (2) with the **combustion chamber pressure sensor** must be installed in cylinder **2**.

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

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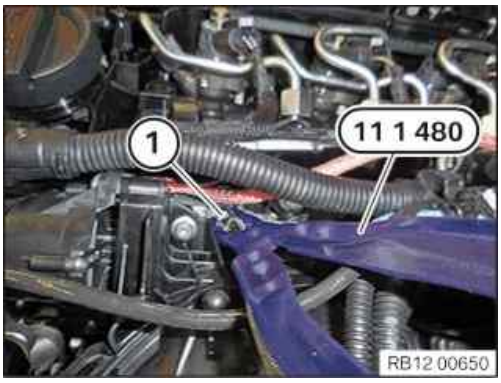


- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

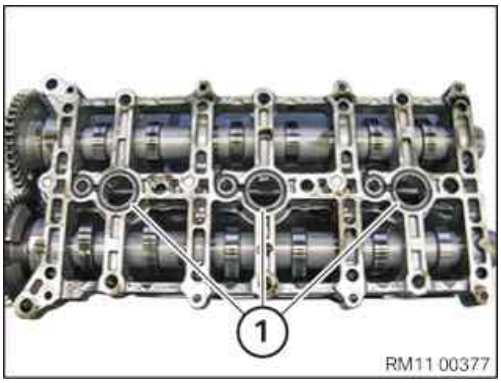
33 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

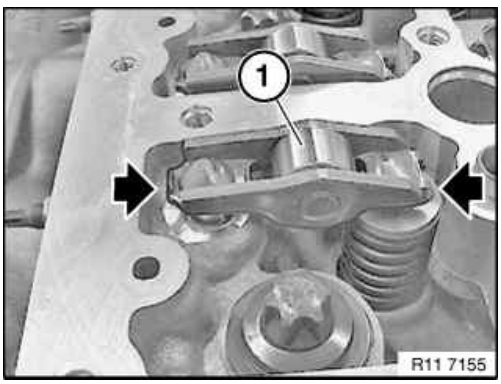
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

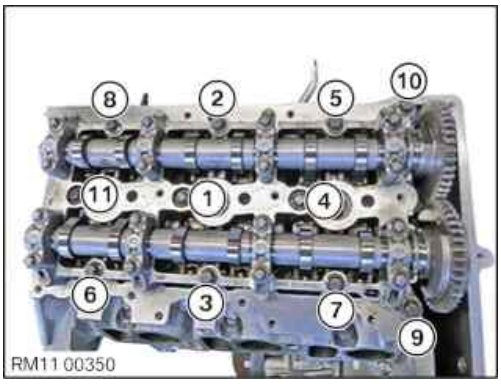


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

34 – Adjusting the timing of the camshafts

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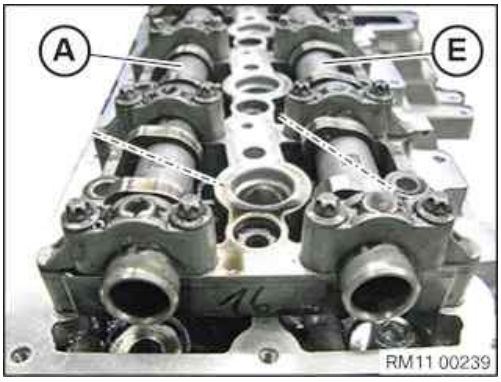
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.

- Slide the special tool **2 288 380** completely into the bore hole of the oil sump.
- Use the special tool to block **2 288 380** the crankshaft in the TDC firing position at the first cylinder.



- The cam of the intake camshaft (E) at the first cylinder points up at an angle.
- The cam of the exhaust camshaft (A) at the first cylinder points outward at an angle.

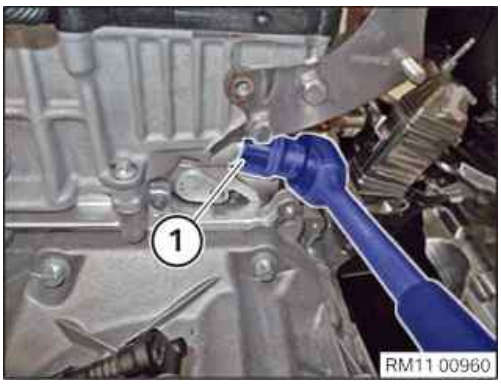
▶ **Remove chain tensioner piston**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

▶ **Remove exhaust camshaft.**

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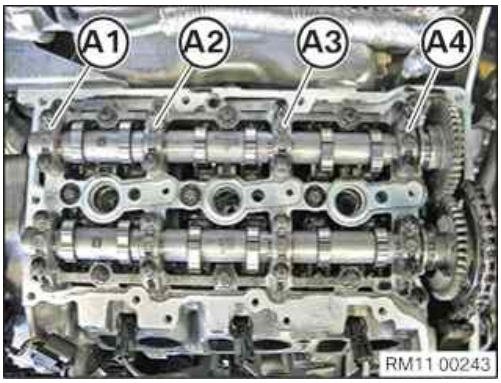
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

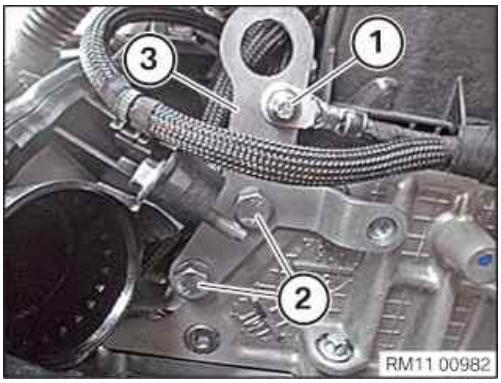


TECHNICAL INFORMATION

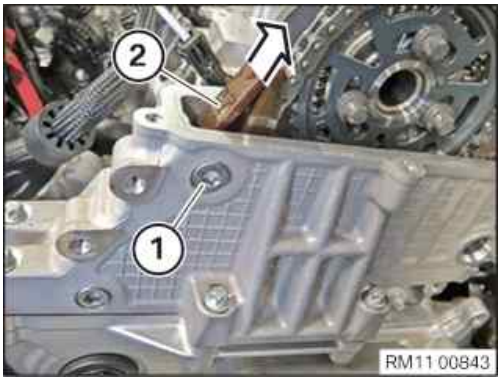
The camshaft is tensioned by the valve springs. Tighten or loosen each screw on the camshaft bearing caps one at a time in the specified sequence and by half a turn only. Repeat procedure.

- Loosen all screws of the exhaust camshaft bearing caps (A1) to (A4) from the outside to the inside, step by step in 1/2 turns.
- Remove exhaust camshaft in upward direction.
- Place all components in special tool **0 495 105 (11 4 480)** in an orderly fashion.

▶ **Remove the timing chain guide rail**



- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

▶ **Removing the camshaft sprocket on the intake camshaft**

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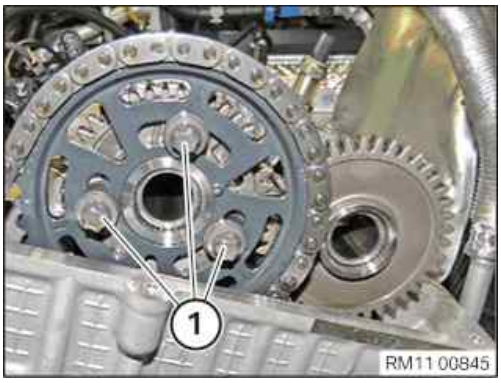


- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

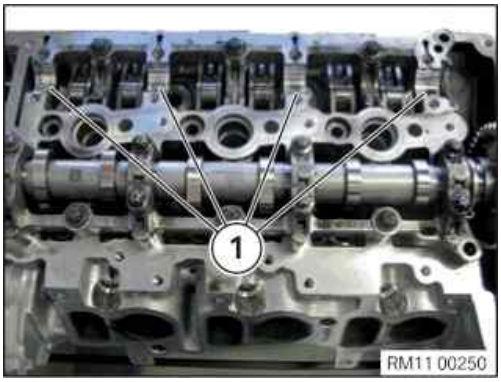
▶ **Installing exhaust camshaft**

RISK OF DAMAGE

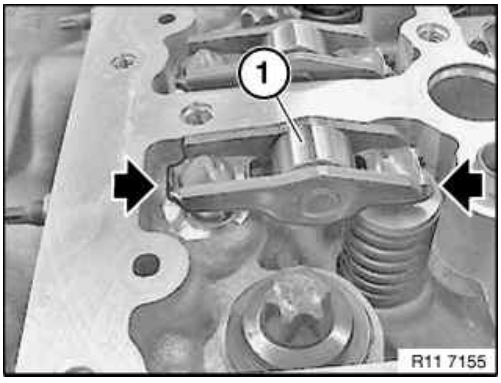
Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

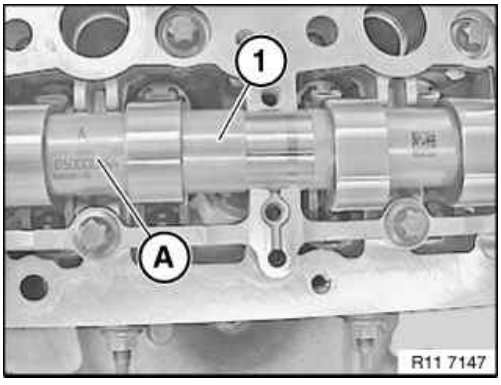
- Comply with the regulations for the installation and disassembly.
- Perform work with care.



- Oil all bearing positions (1).



- Make sure the roller cam followers (1) have the correct mounting orientation.



- Insert exhaust camshaft (1) so that the identification (A) points upwards.

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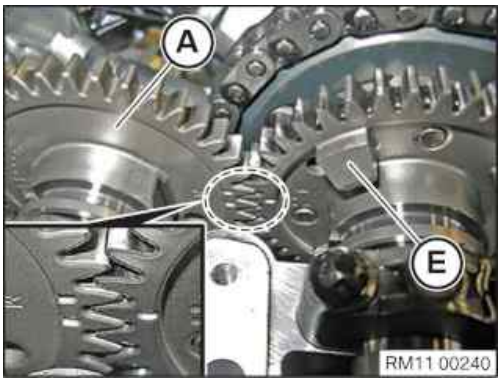
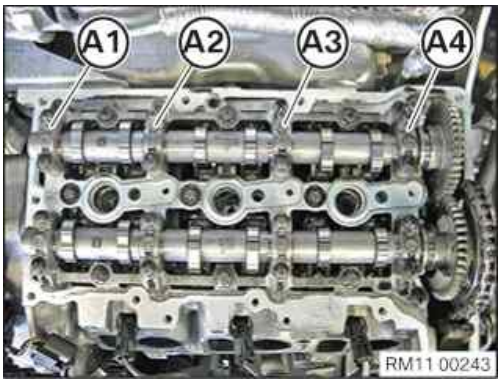


- Insert the exhaust camshaft (A) so that the marks on the camshafts (A) and (E) correspond in the highlighted area.
- Position the camshafts (A) and (E) accordingly.



- Tighten all exhaust camshaft bearing caps (A1) to (A4) from the inside to the outside by 1/2 a turn at a time.

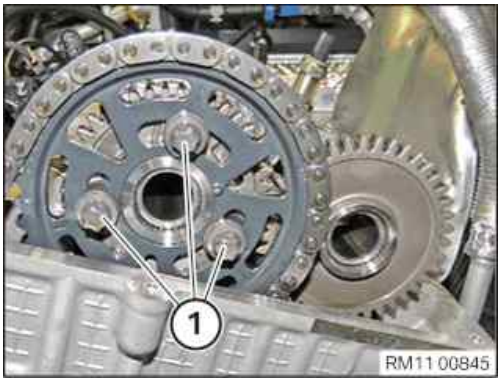
Intake and exhaust camshaft in camshaft support

M6x31		Tightening torque	10 Nm

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

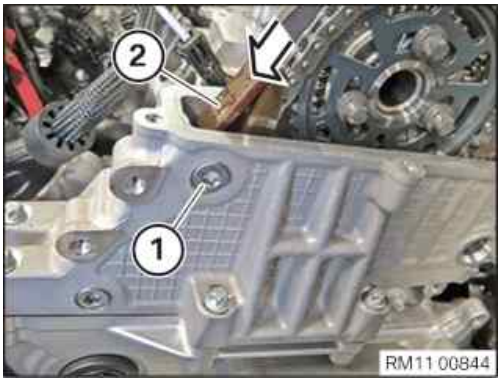
  Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

▶ **Installing the camshaft sprocket on the intake camshaft**



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

▶ **Install the timing chain guide rail**



- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

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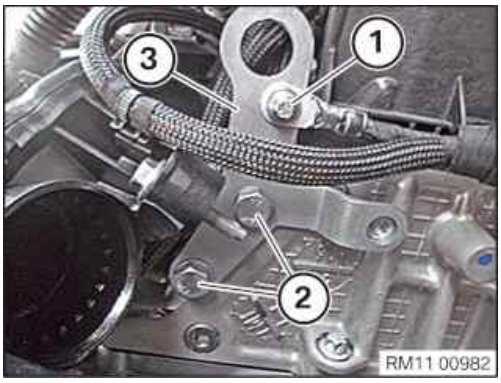


- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

▸ Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

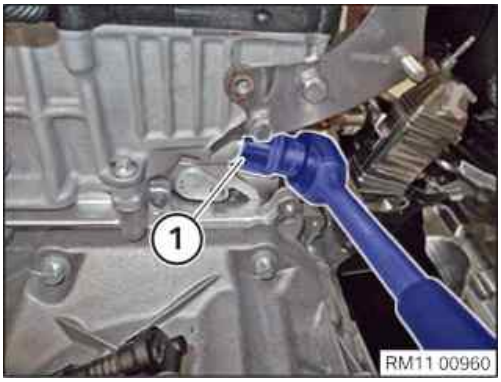
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

▸ Tightening the camshaft sprocket on the intake camshaft

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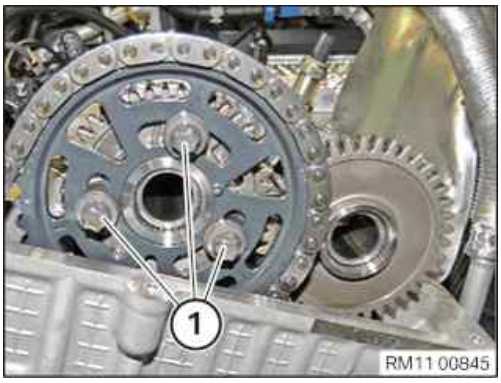

- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

35 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

36 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

37 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

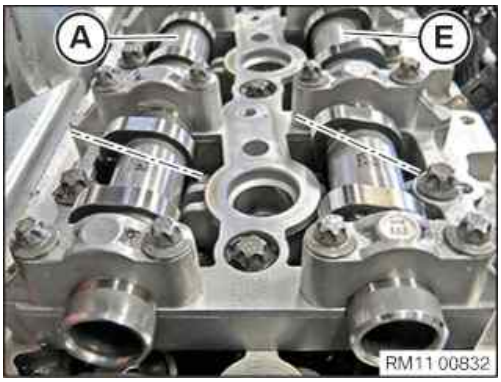
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

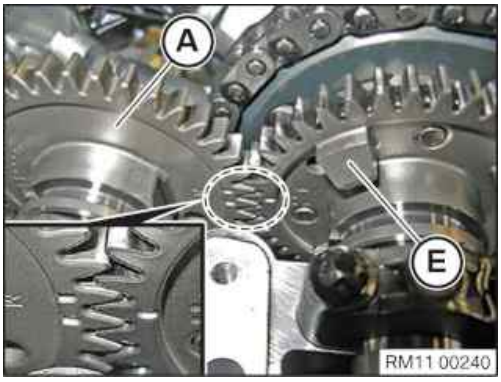
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.

For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

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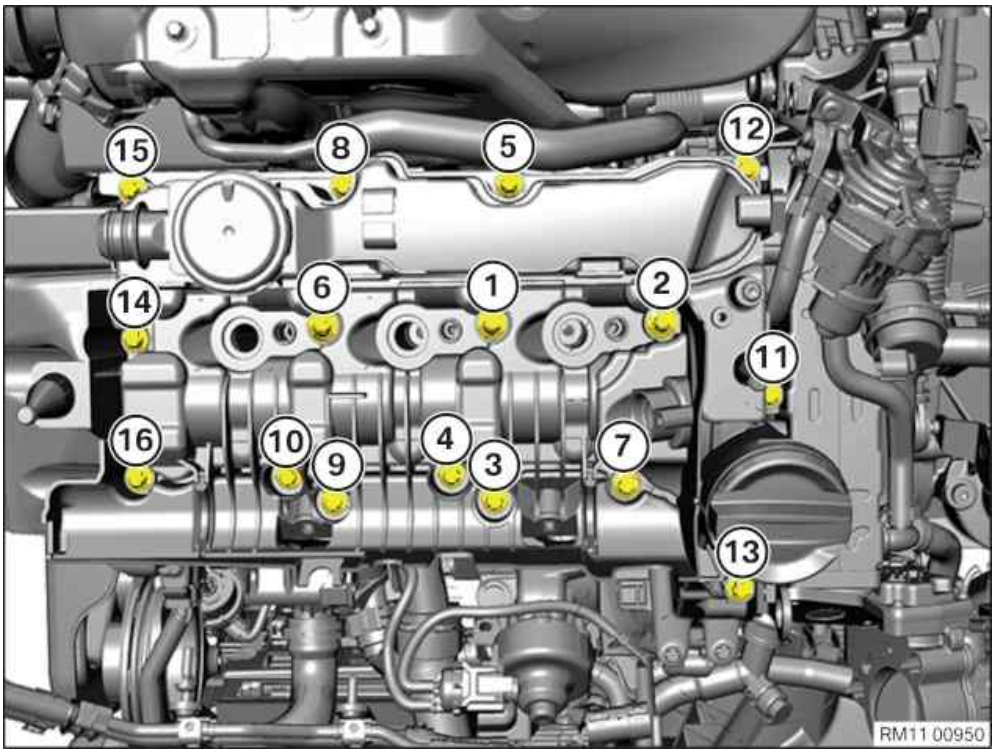
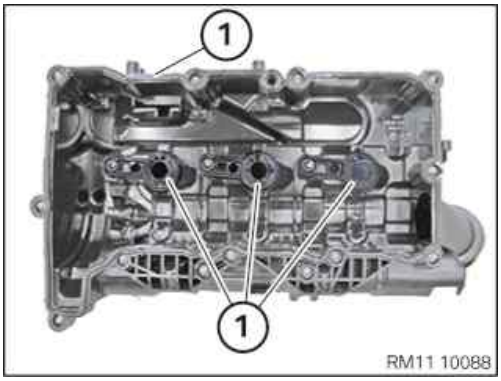
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

38 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket

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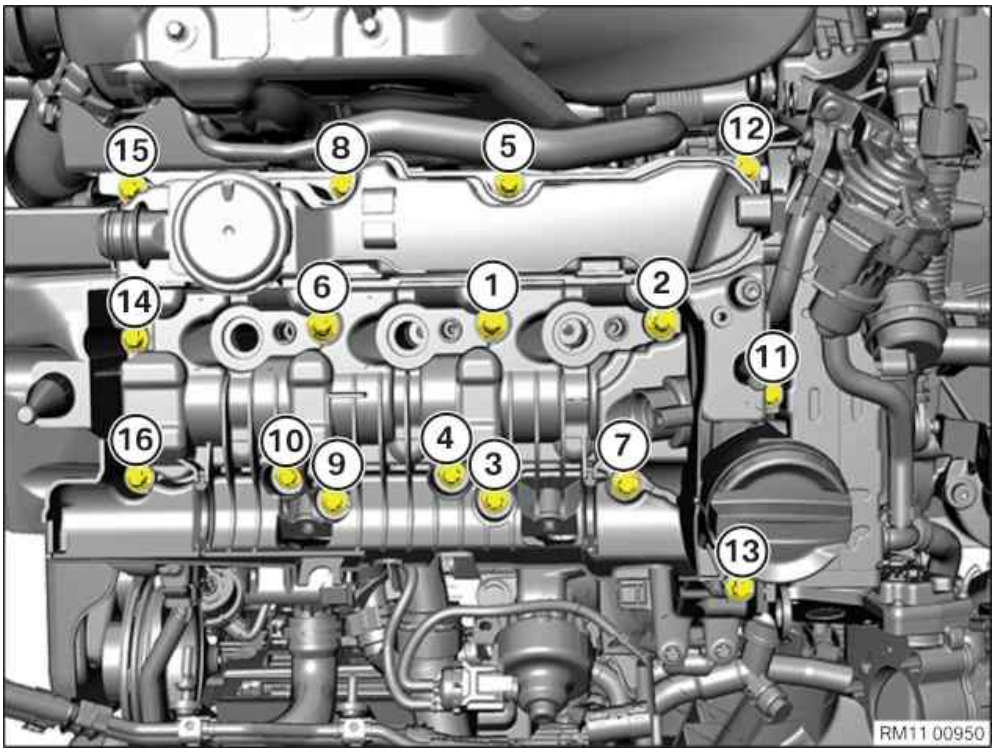
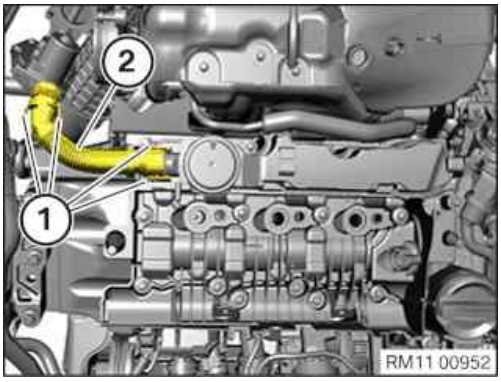


- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm



- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

39 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

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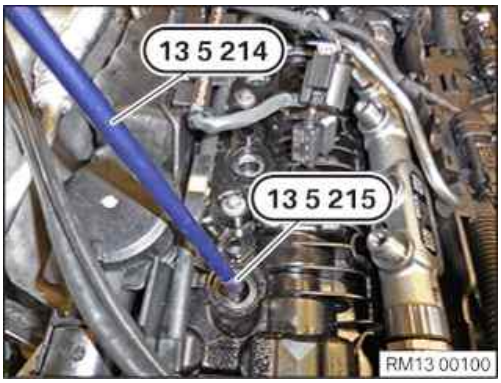
RISK OF DAMAGE

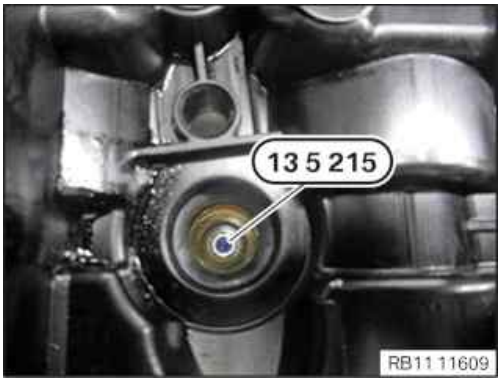
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.

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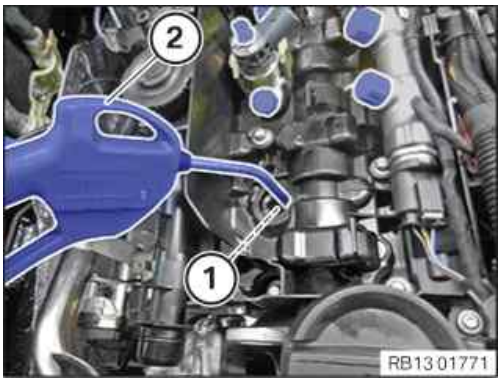
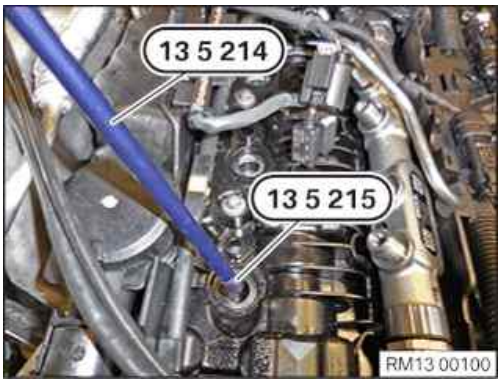


- Blow out injector shaft (1) with air gun (2).



- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

▸ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▸ **Prepare the injector for installation**

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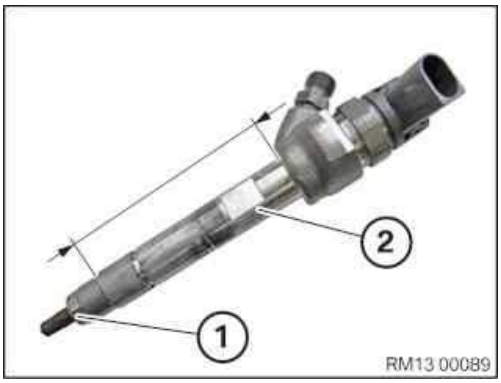
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

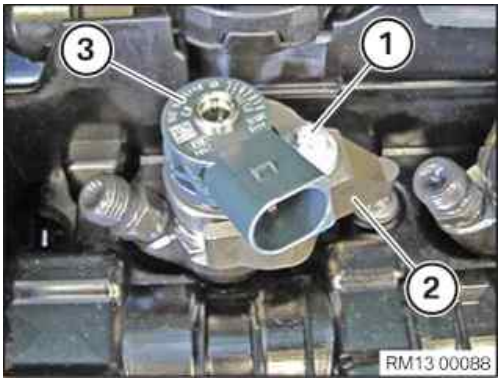


- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring
- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

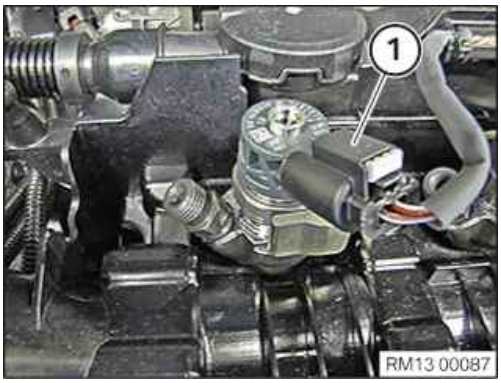
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

▸ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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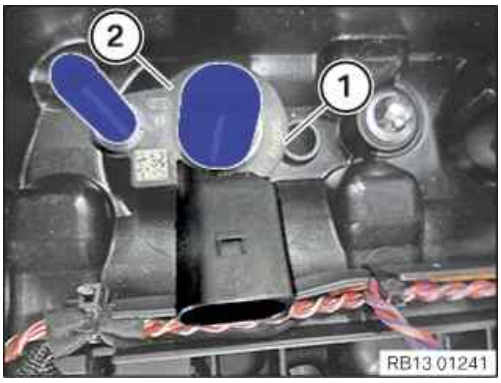
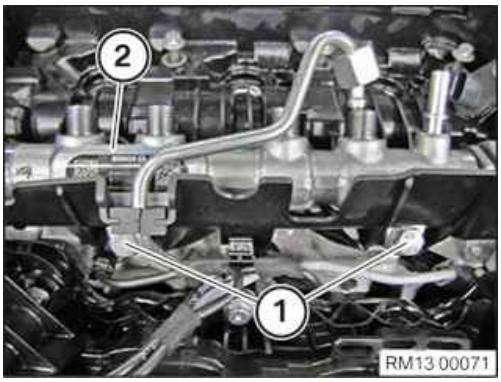


- Read off the adjustment value (1) on the new injector (2).

- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

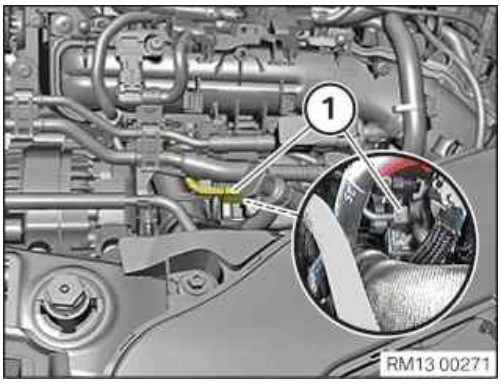
40 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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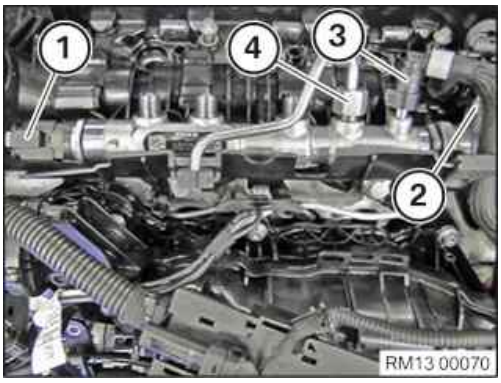

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

41 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

42 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

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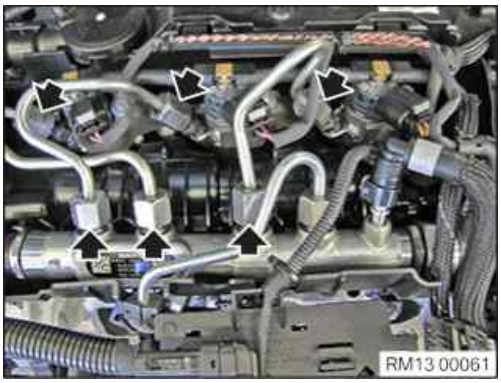
TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

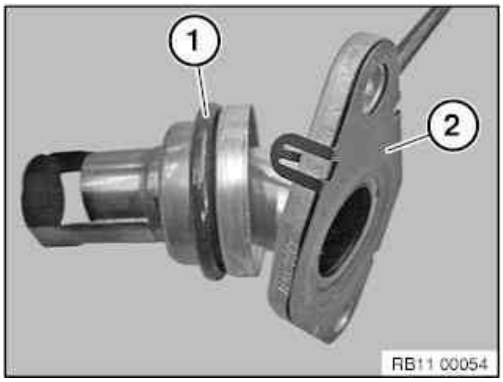
- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

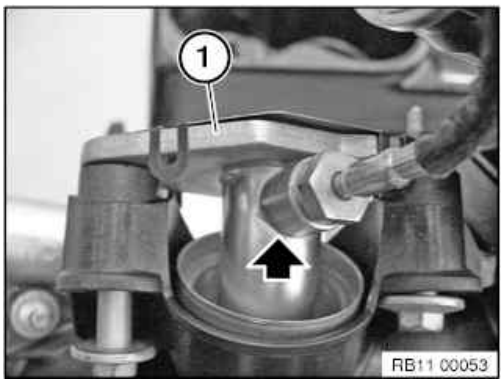
43 – Installing the intake plenum



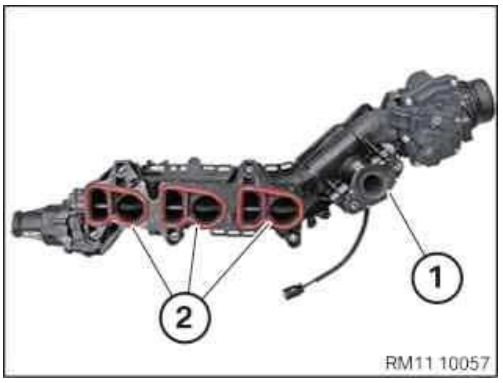
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

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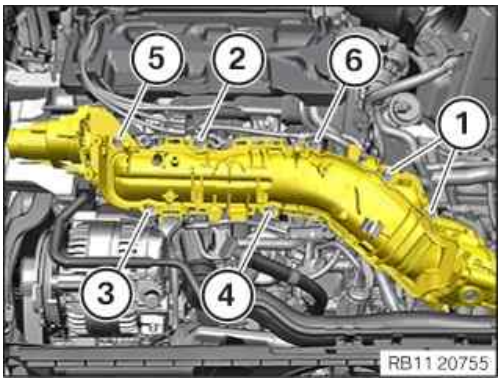
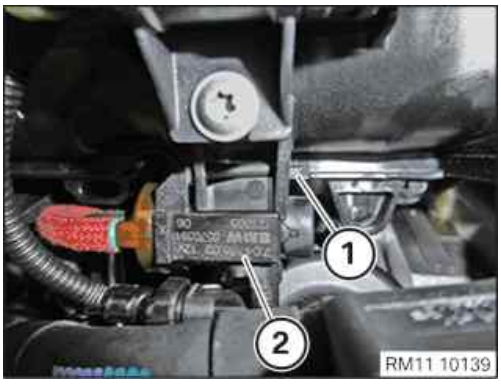


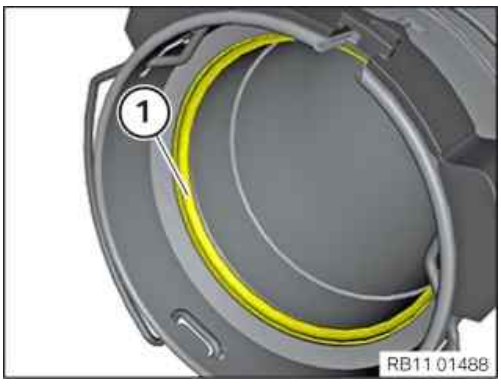
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

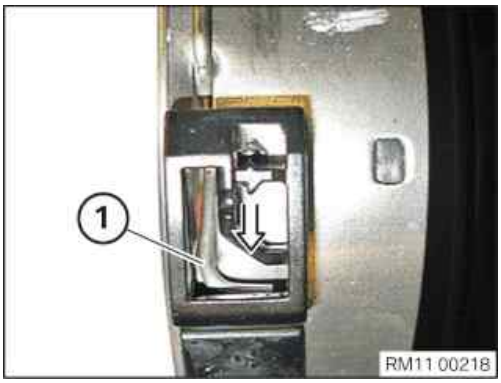


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.

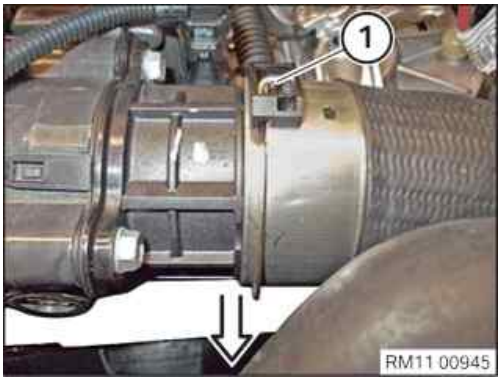


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

44 – Remove the engine from the assembly stand

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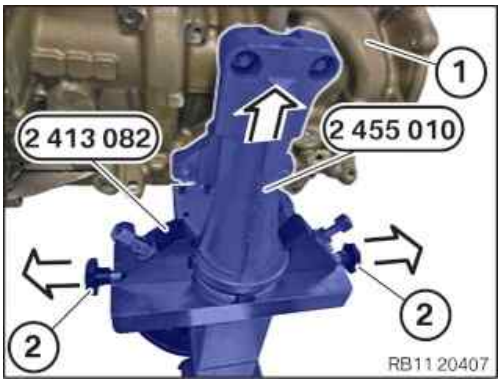
CAUTION

Heavy component.

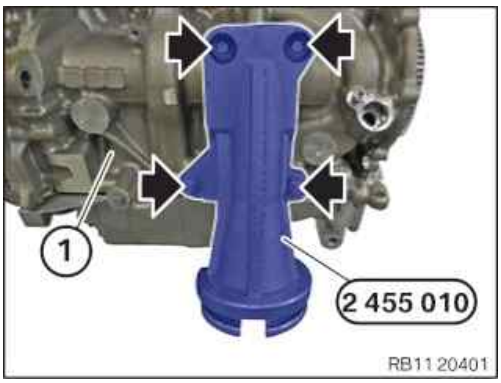
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

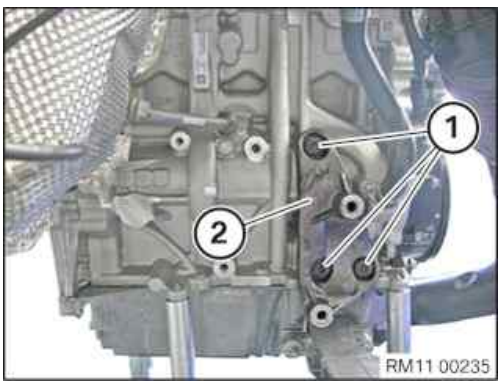
- Insert engine lifter with special tool **0 490 579 (11 0 070)** and position engine (1).



- Unscrew the nuts on special tool .
- Detach the holder (2) in the direction of the arrow.
- Detach the engine (1) with special tool **2 455 010** out of the special tool in the direction of arrow.



- Remove conventional screws (arrows).
- Feed out the special tool **2 455 010** on the engine (1) and remove.



- Insert and install the holder (2).
- Tighten the screws (1).

Holder to crankcase

M10		Tightening torque	38 Nm

45 – Install the engine on the double-clutch transmission (DKG)

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RISK OF DAMAGE

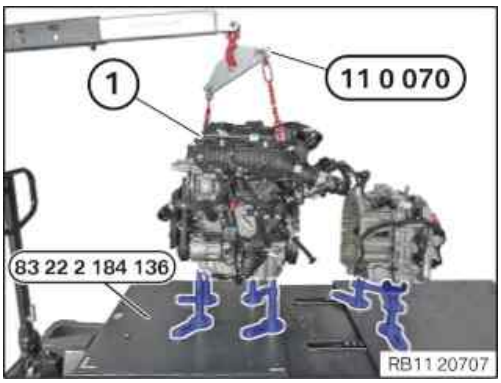
Damage to the flywheel and the double-clutch transmission (DKG).

Damage to the flywheel and the double-clutch transmission (DKG) due to incorrect removal and installation of the double-clutch transmission (DKG).

- Align the double-clutch transmission (DKG) absolutely horizontally during removal and installation.

TECHNICAL INFORMATION

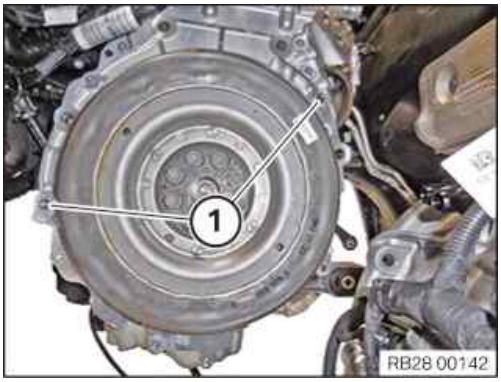
Transmission oil temperature 20 °C up to a maximum 40 °C!
Carry out the "Transmission oil adjustment" service function with the diagnosis system.
The double clutch also needs to be replaced if you exceed the oil change interval by more than 3000 km!
Failure to comply with this instruction will result in serious damage to the twin-clutch gearbox (DKG).



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Position the engine (1) on the lifting table **2 184 136** using the engine lifter and the special tool **0 490 579 (11 0 070)**.
- Feed out engine lifter from engine (1) with special tool **0 490 579 (11 0 070)** and push aside.



- Check for correct fit of fitting sleeves(1).
- Replace damaged fitting sleeves.

- Clean the gearing (1) of the drive shaft.
- Coat the gearing (1) with MI-Setral-43N grease (BMW part number 83 23 2 152 082).

  Tooth gaps must be filled with grease up to tooth height!

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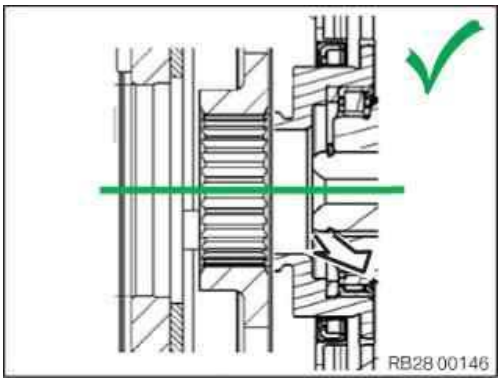
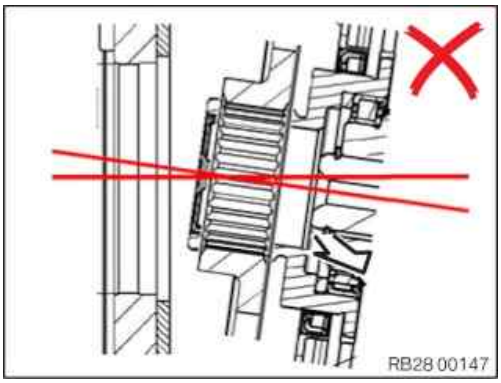
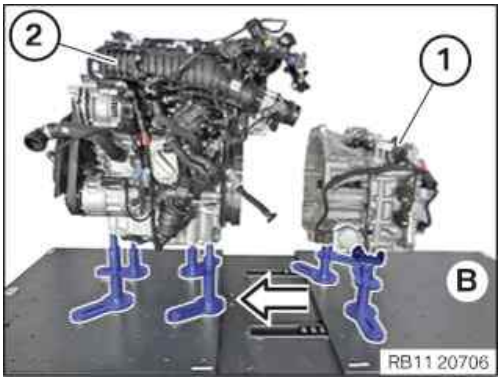


- **Correct:** Insert the double-clutch transmission (DKG) horizontally into the flywheel.



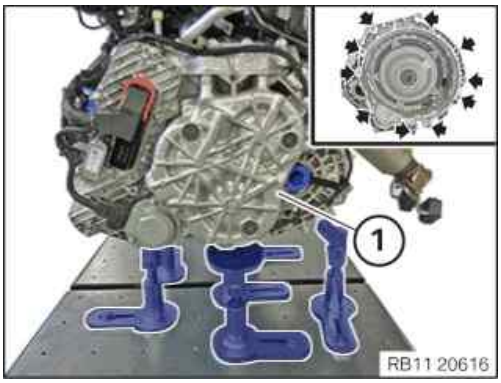
- **Wrong:** Do not tilt the double-clutch transmission (DKG) when inserting it into the flywheel.



NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Slide table plate (B) in the direction of the arrow and position double-clutch transmission (DKG) (1) **carefully** on the engine (2).



- Flange-mount the double-clutch transmission (DKG) to the engine so that it is **absolutely** horizontal.
- Tighten screws (arrows).

Transmission to engine

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Connect and lock the coolant lines (1).
- Make sure that you can hear the coolant lines (1) engage.

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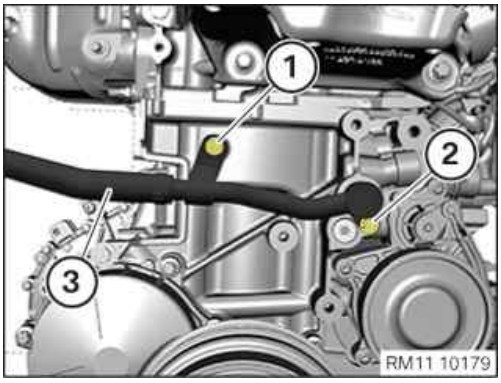
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.

46 – Attaching assemblies (on lifting table)

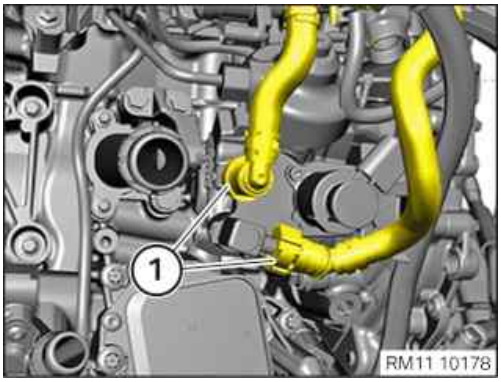


- Renew sealing ring of the coolant line (3).

  Parts: Sealing ring
- Coat the sealing ring and install the coolant line (3) .
- Tighten down screws (1) and (2).

Standard screw connection M6

M6		8 Nm



- Connect and lock fuel lines (1).

  The locks must engage audibly.

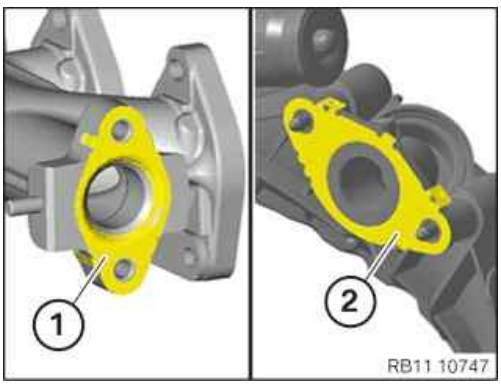
▸ **Installing the exhaust-gas recirculation cooler**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket
- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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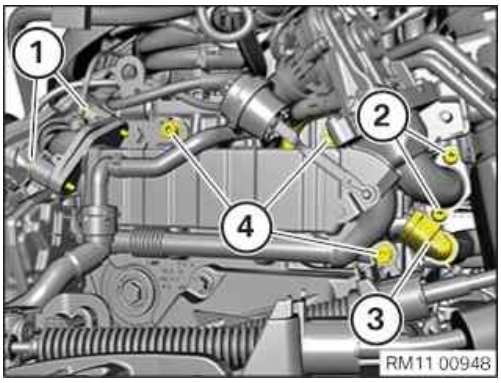


- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

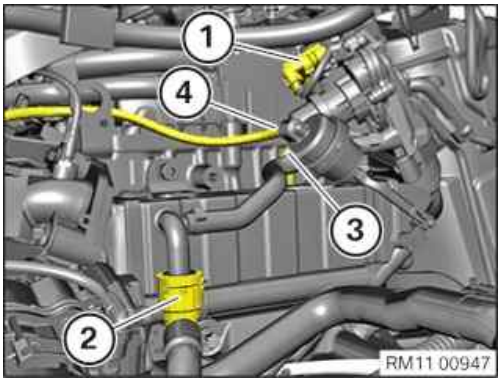
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

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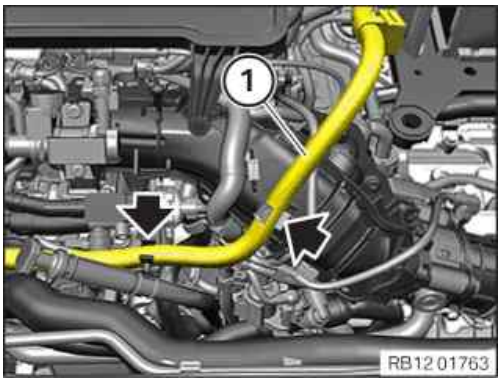


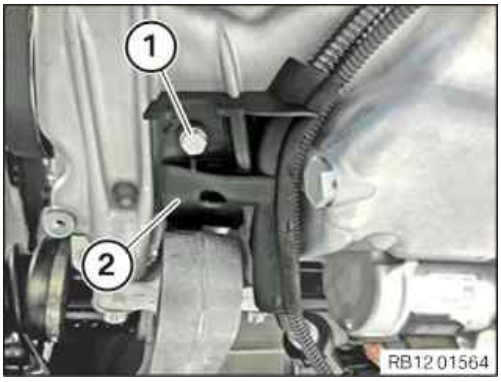
CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

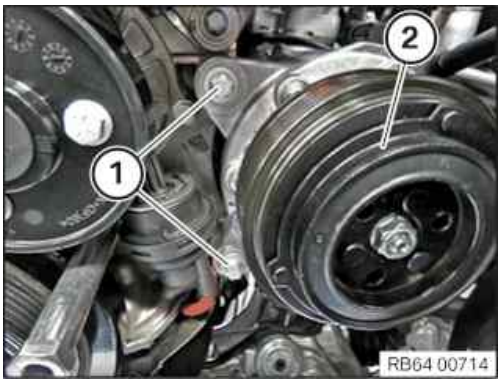
- Insert the positive battery cable (1) into the clamps (arrows).
- Feed in and install positive battery cable at the clamps (1).



- Insert and install the holder (2).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm



- Insert and install the air conditioning compressor (2).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

- Tighten the screws (1).

- Insert and install the alternator .
- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

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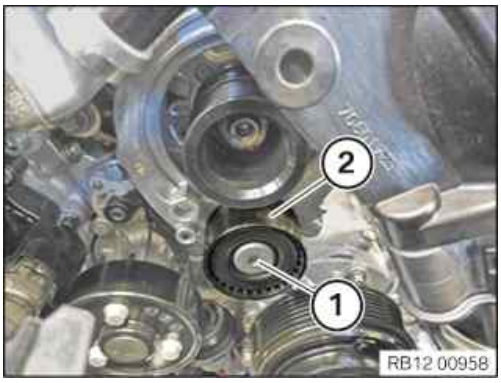
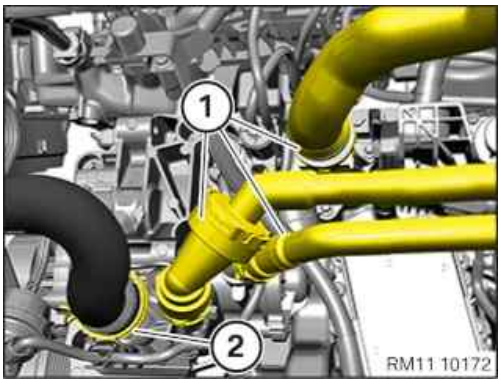


- Install the deflecting element (2).
- Tighten down screw (1).

Deflecting element to belt tensioner

M8		Tightening torque	38 Nm



- Install the coolant hose and secure with the clamp (2) .
- Connect and lock the coolant lines (1).

  The locks must engage audibly.

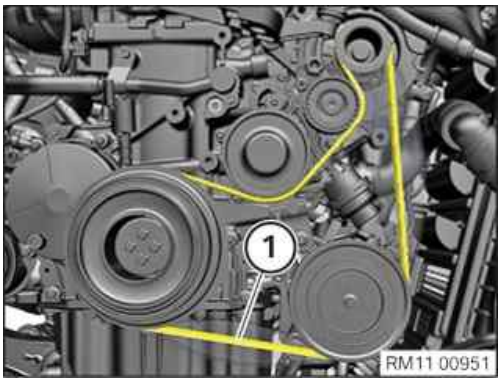
▸ Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

▸ Install the acoustic cover for the engine at the front

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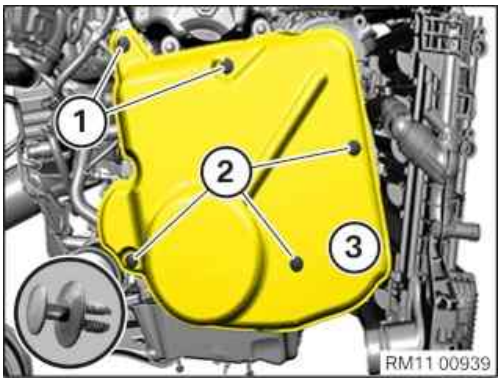
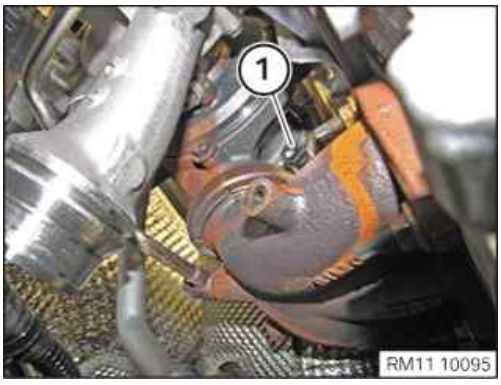


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.



- Renew the seal between the exhaust turbocharger and the exhaust manifold.

  Parts: Gasket
- Position the exhaust turbocharger with the seal.
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Tighten down screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

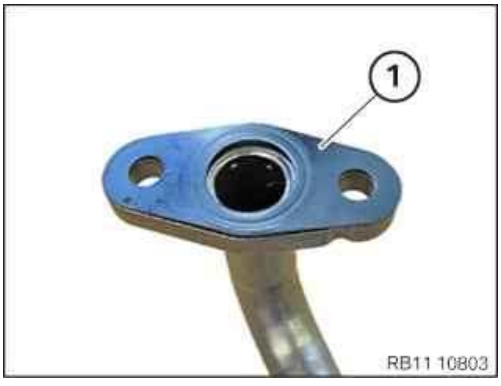
▸ **Installing the oil return line for the exhaust turbocharger**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

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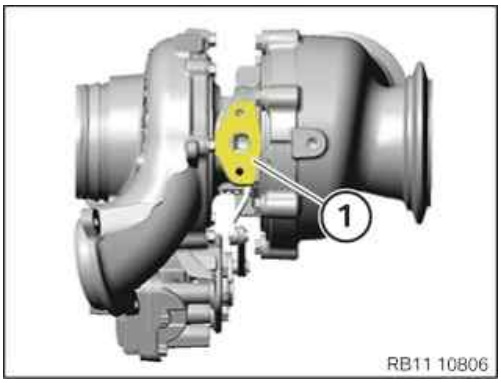
- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

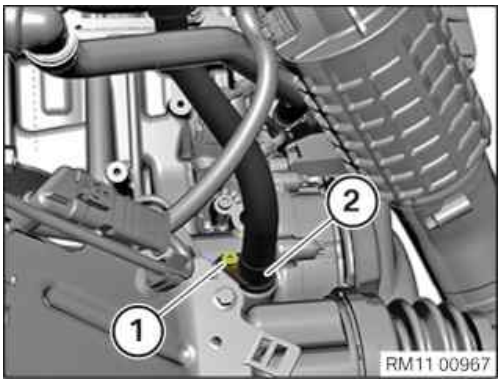
- Do not use any metal-cutting tools.

- Clean sealing surface.

- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm



- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

▸ **Install the oil feed line for the exhaust turbocharger**

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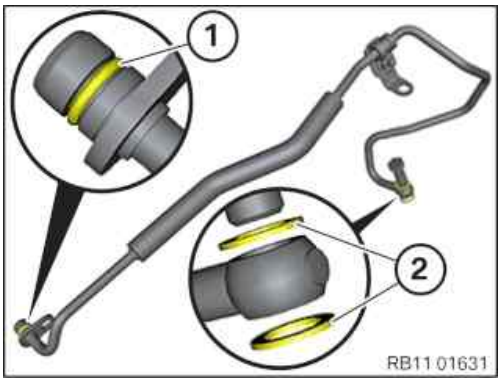
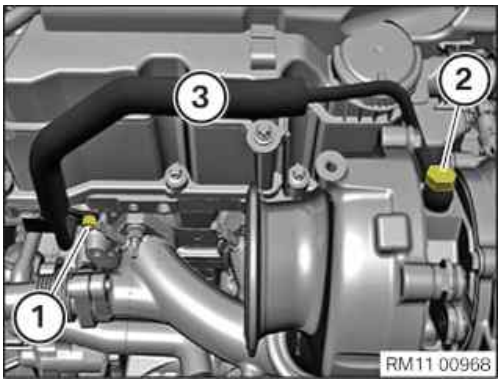


- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

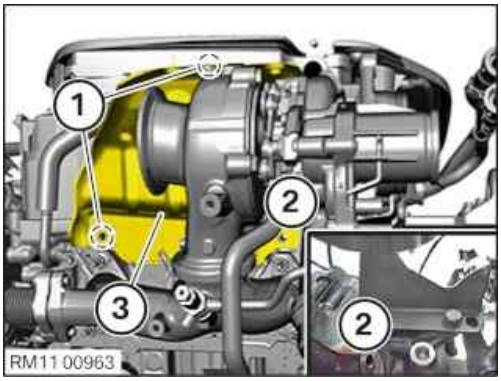
▸ **Installing heat shield on exhaust turbocharger at the rear**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

▸ **Installing heat shield on exhaust turbocharger at bottom**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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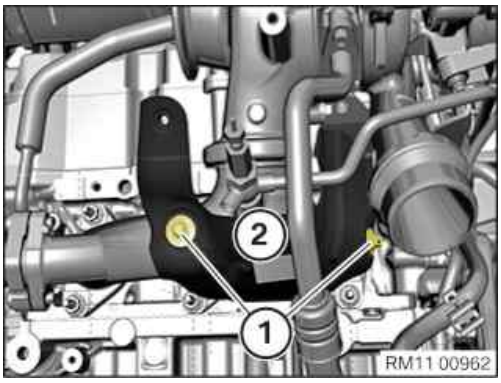


- Feed in and install the heat shield (2).
- Tighten the screws (1).

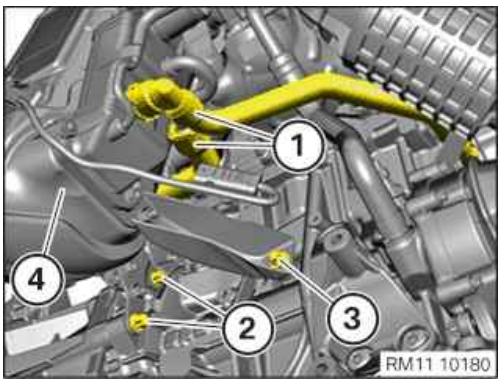
Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket



- Insert and position the diesel particulate filter (4) .
- Tighten down screws (2).

Transmission to engine

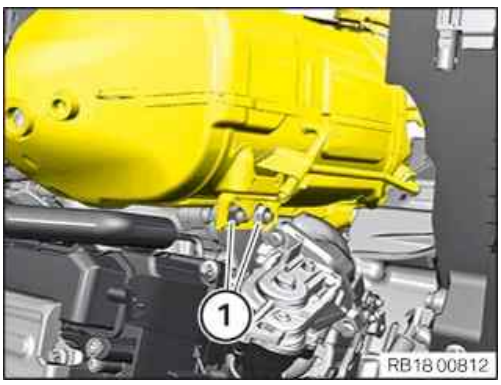
M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

- Tighten down screw (3).

Holder to crankcase

M10		Tightening torque	38 Nm

- Connect and audibly lock coolant lines (1).



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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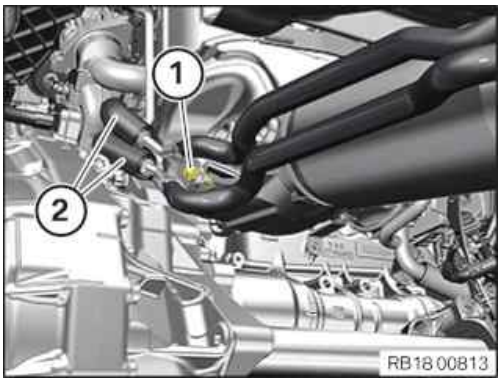


- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

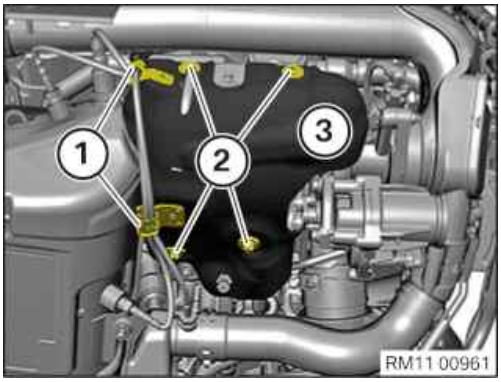
▶ **Install the heat shield on the exhaust turbocharger**

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



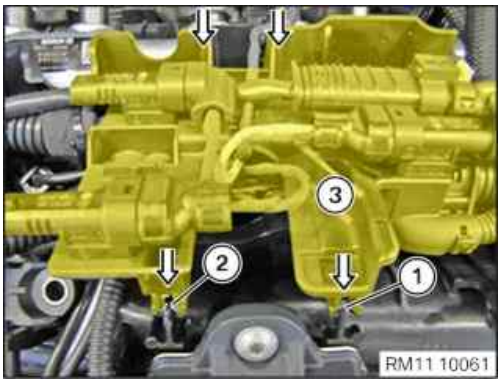
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

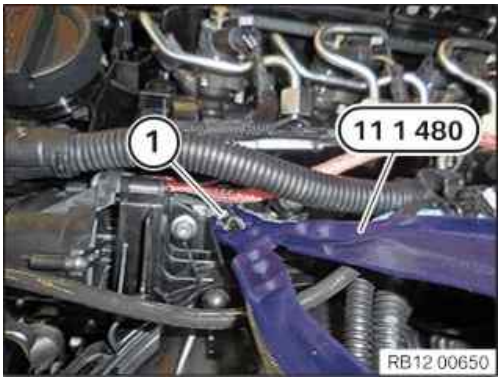
Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

▶ **Installing the cable clip for the intake plenum**



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).



- Connect and lock the connector (1).

  The connector (1) must engage audibly.

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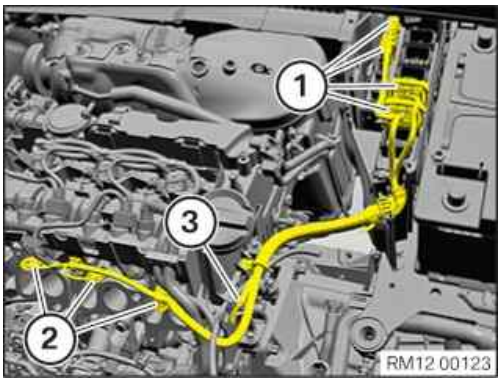
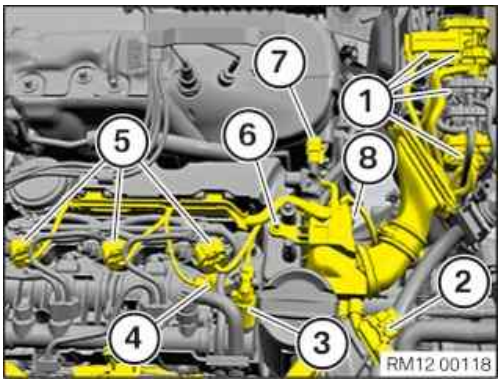


- Guide in and install the connector (1) with the wiring harness.
- Plug the connector (2) into the glow element and lock it audibly.
- Mount ground strap and tighten screw (3).

Ground cable to cylinder head

M6x12		Tightening torque	8 Nm

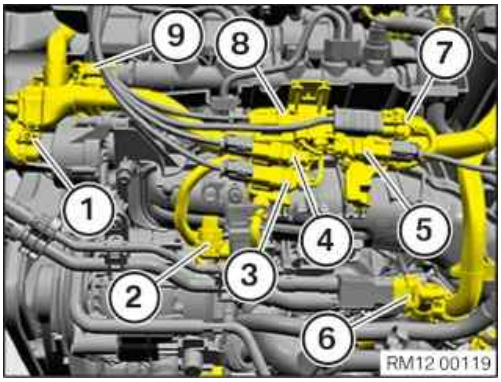


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route the connector (1) to the integrated supply module (PDM) and to the DME control unit.
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

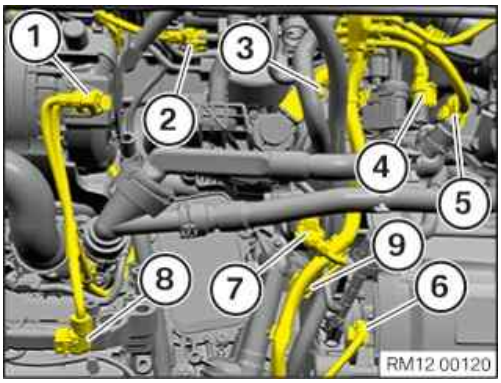
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.
- Attach connector (8) to the exhaust-gas recirculation valve and lock audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.
- Connect the connector (9) to the rail pressure sensor and lock it audibly.



- Connect the connector (1) to the alternator and lock audibly.
- Connect the connector (2) to the electric changeover valve and lock audibly.
- Connect the connector (3) to the high pressure pump and lock audibly.
- Connect the connector (4) to the electric changeover valve and lock audibly.
- Attach connector (5) to the throttle bodies and lock it audibly.
- Connect the connector (6) to the crankshaft sensor and lock it audibly.
- Connect the connector (7) to the oil pressure sensor and lock it audibly.
- Connect the connector (8) to the air conditioning compressor and lock audibly.
- Connect the connector (9) to the solenoid valve and lock audibly.

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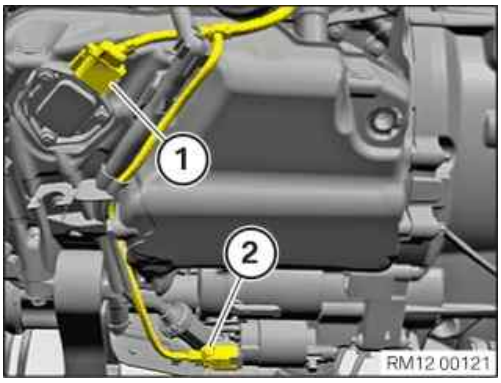
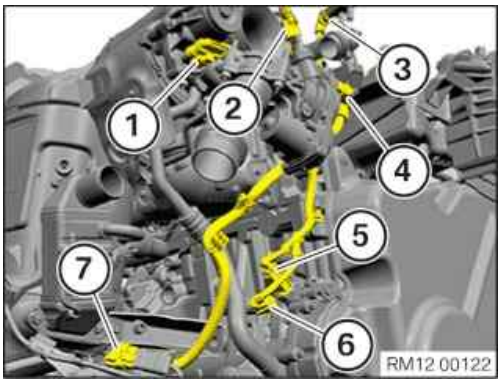
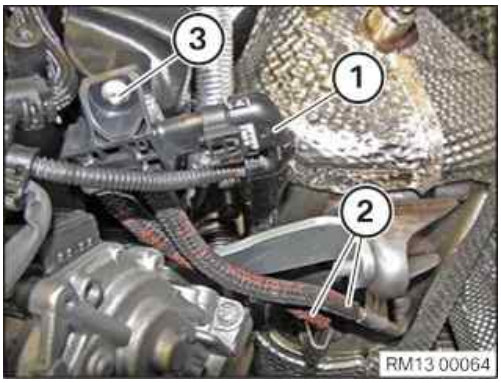


- Connect the connector (1) to the oil-level sensor and lock it audibly.
- Connect connector (2) to the starter motor and lock audibly.



- Attach connector (1) to the exhaust turbocharger and lock it audibly.
- Attach connector (2) to the exhaust gas pressure sensor and lock it audibly.
- Attach connector (3) to the differential pressure sensor and lock it audibly.
- Attach connector (4) to the low pressure exhaust-gas recirculation valve and lock it audibly.
- Attach connector (5) to the oil pressure switch and lock it audibly.
- Attach connector (6) to the switching valve and lock it audibly.
- Connect the connector (7) to the monitoring oxygen sensor and lock audibly.

47 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

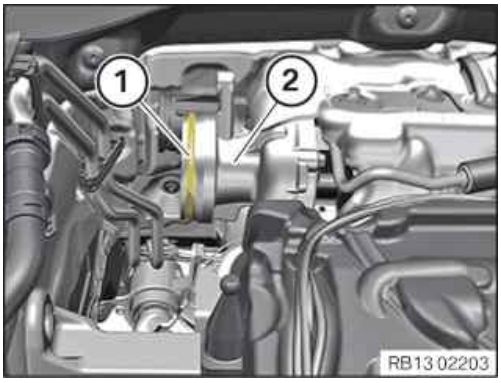
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

48 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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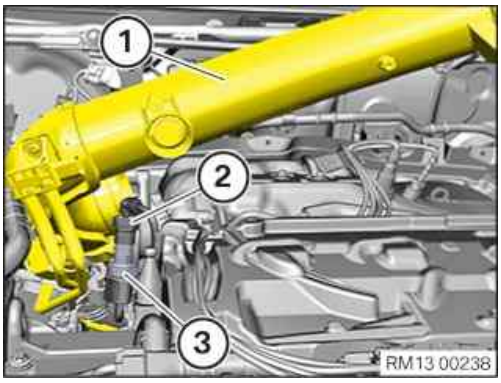


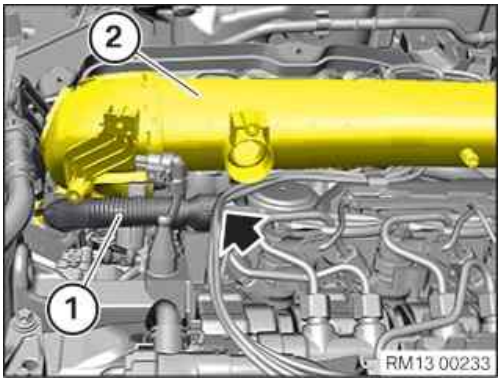
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

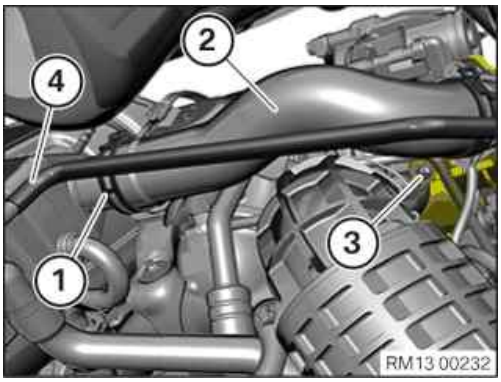
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

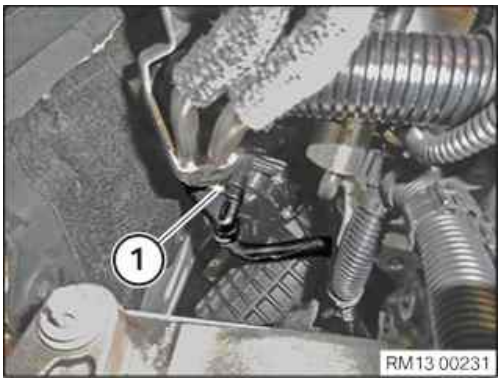
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.

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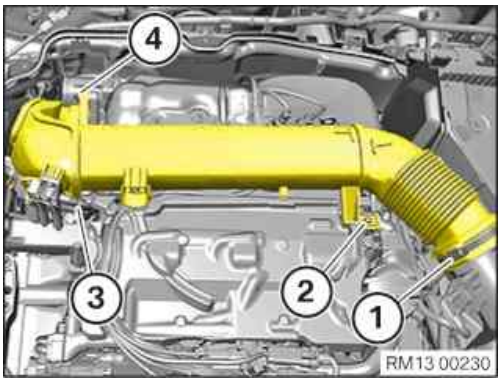


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

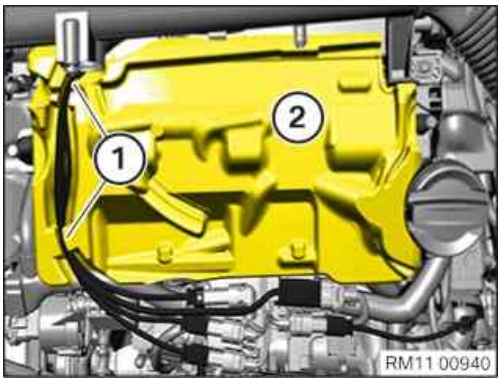
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

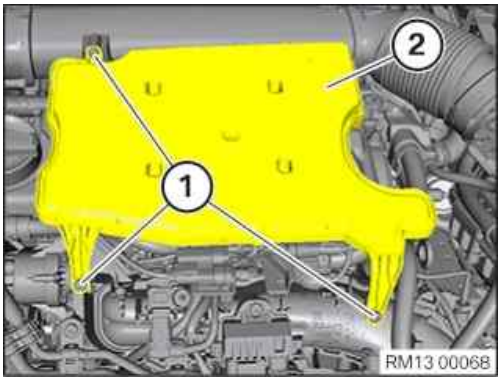
Clamp		Tightening torque	3 Nm

49 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

50 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

51 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

52 – Install engine

- See additional information.

Additional Information

Overview of Tightening Torques

Special tool to cylinder head — Used in step 8

M8		Tightening torque	21,5 Nm

Special tool 2 455 010 to crankcase — Used in step 9

M10x30		Tightening torque	38 Nm

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Special tool 11 8 930 to special tool 00 2 320

Used in step 9

M14x35		Tightening torque	160 Nm

Bearing journal of tensioning and guide rail

Used in step 27

M8	*Replace bearing journal.*	Tightening torque	20 Nm

Chain tensioner to crankcase

Used in step 27

M6x22		Tightening torque	10 Nm

Camshaft sprocket on high pressure pump

Used in step 27

M12		Tightening torque	65 Nm

Rear timing case cover to crankcase

Used in step 28

M6	Renew screws.	Jointing torque	8 Nm
		Angle of rotation	90 °

SCR coolant lines to crankcase end cover

Used in step 28

Hexagon screw M6x16		Tightening torque	8 Nm

Cylinder head to crankcase

Used in step 28

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover

Used in step 28

M8x40		Tightening torque	19 Nm

Oil sump to crankcase

Used in step 28

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 28

M8		Tightening torque	19 Nm

Guide tube for oil dipstick on engine

Used in step 28

M8x16		Tightening torque	19 Nm

Flywheel to crankshaft

Used in step 29

M12x1.5	Renew screws.	Tightening torque	120 Nm

Glow elements to cylinder head

Used in step 32

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 33

M7x35		Tightening torque	13 Nm

Intake and exhaust camshaft in camshaft support

Used in step 34

M6x31		Tightening torque	10 Nm

Bearing journal to cylinder head

Used in step 34

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

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Standard screw connection M8

Used in step 34

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 34 46

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 34

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 34

M7x17.			17 Nm

Cylinder head cover to cylinder head

Used in step 38

M6		Tightening torque.	8,5 Nm

Clamping claw facing to cylinder head cover

Used in step 39

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 39

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 40

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 40

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 42

High pressure lines		Tightening torque	28 Nm

Intake plenum to cylinder head

Used in step 43

M6		Tightening torque	11 Nm

Holder to crankcase

Used in step 44 46

M10		Tightening torque	38 Nm

Transmission to engine

Used in step 45 46

M8		Tightening torque	19 Nm
M12		Tightening torque	66 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 46

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 46

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 46

M8x28	Replace screws	Tightening torque	32 Nm

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Exhaust-gas recirculation cooler to cylinder head — Used in step 46

M8x20		Tightening torque	19 Nm

Bracket to oil sump — Used in step 46

M6		Tightening torque	8 Nm

Air conditioning compressor in component carrier — Used in step 46

M10		Tightening torque	38 Nm

Alternator to component carrier — Used in step 46

M10x75 / M10x125		Tightening torque	38 Nm

Deflecting element to belt tensioner — Used in step 46

M8		Tightening torque	38 Nm

Exhaust turbocharger to exhaust manifold — Used in step 46

V-band clamp		Tightening torque	19 Nm

Holder to exhaust turbocharger and crankcase — Used in step 46

M8x16		Tightening torque	22 Nm

Oil return line to turbocharger — Used in step 46

M6x12		Tightening torque	8 Nm

Oil return line to crankcase — Used in step 46

M6x12		Tightening torque	8 Nm

Oil feed line on cylinder head — Used in step 46

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger — Used in step 46

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Heat shield for exhaust turbocharger — Used in step 46

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 46

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particle filter to holder — Used in step 46

M8 hexagon nut		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 46

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Holder for coolant lines to diesel particulate filter — Used in step 46

Torx bolt BM6x16		Tightening torque	8 Nm

Ground cable to cylinder head — Used in step 46

M6x12		Tightening torque	8 Nm

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Wiring harness to cylinder head cover — Used in step 46

TS5x20		Tightening torque	3,5 Nm

Differential pressure sensor to holder — Used in step 47

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 47 48

Clamp 15–19mm		Tightening torque	3 Nm

Exhaust gas pressure sensor — Used in step 48

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 48

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 48

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 48

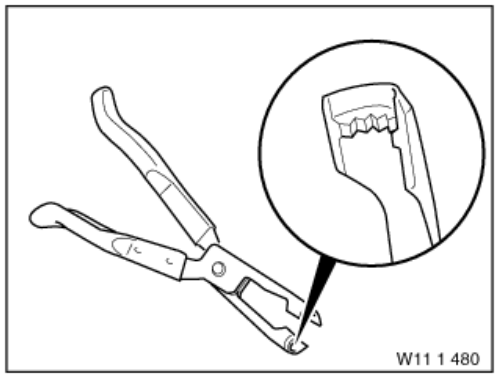
Clamp		Tightening torque	3 Nm

Resonator to manifold and clean air pipe — Used in step 50

Screw TS6	Renew screw.	Tightening torque	5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 7 21

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

2 459 012 Holder

Common — Used in step 8 45

Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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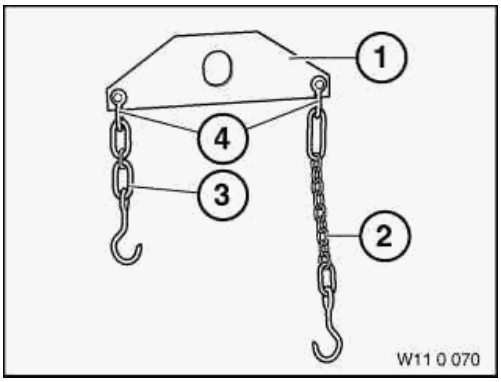
0 490 579 (11 0 070) Lifting gear



Common

Used in step 8 9 44 45

Usage	(Lifting gear) For removing and installing engines As of 08/2011, only available as a complete set, no separate components!. Delivered with TÜV inspection certificate and operating instructions.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 96 (107)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 493 753 (11 0 079)		**Shackle** (Shackle) 2 pieces As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 582 (11 0 073)		**Chain** (Chain) Version: short As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 580 (11 0 071)		**Lifting gear** (Cross member) As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 581 (11 0 072)		**Chain** (Chain) Version: long As of 08/2011, only available as a complete set via 11 0 070 = 0490579. Delivered with TÜV inspection certificate and operating instructions.	

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2 455 010 Engine support

Common Used in step 9 44

Usage	For accommodating engine on assembly stand. Engine: B3x, B4x, N47.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

0 495 187 (00 2 300) Assembly stand

Used in step 9

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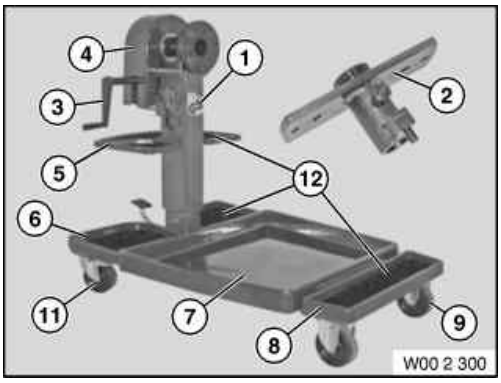

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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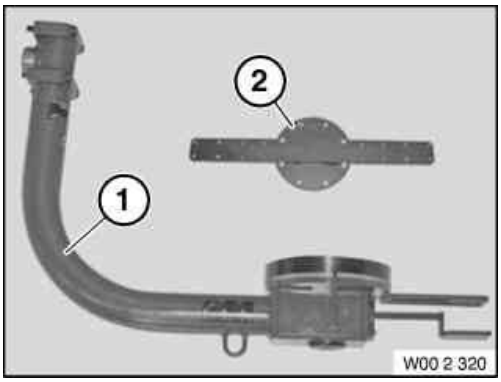
0 495 196 (00 2 320) Support arm



Common

Used in step 9

Usage	(Support arm with fixture) For mounting engines using the engine mounting bracket.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 197 (00 2 321)		**Support arm**	
2	0 495 198 (00 2 322)		**Panel** (take-up plate)	
3	0 495 380 (00 2 323)		**Panel** (fixture) Engine N73	
6	0 496 287 (00 2 326)		**Panel** (fixture) Engine: M73	
5	0 496 288 (00 2 327)	**0 496 373**	**Panel** (fixture) Engine: S62 Replaced by 11 5 420 (0 496 373)	
8	0 496 533 (00 2 328)		**Support** (Engine mount) Engine: N57, N57Top	
9	0 496 579 (00 2 329)	**0 496 680**	**Support** (Engine mount) Engine: N74 Replaced by 116160 (0 496 680)	
4	0 495 379 (00 2 324)		**Panel** (fixture) Engine M67TU	
5	0 495 381 (00 2 325)		**Panel** (fixture) Engine N62, N62TU	

0 495 910 (37 1 152) Socket wrench

Common

Used in step 11 14 40 42

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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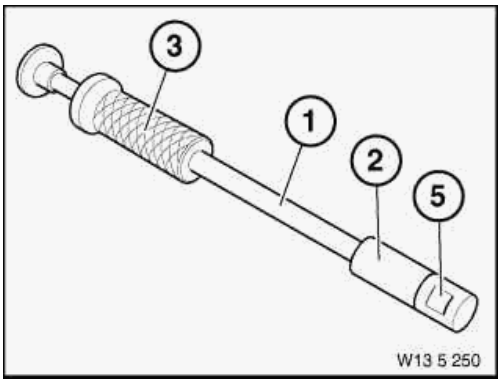
2 413 106 Fastener

Common Used in step 11 42

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller



Common Used in step 13

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush

Common Used in step 13

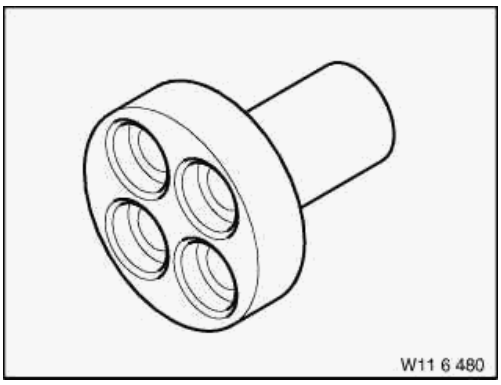
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 13

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 16 34 37

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 288 380 Locating stud

Common Used in step 16 34 35 37

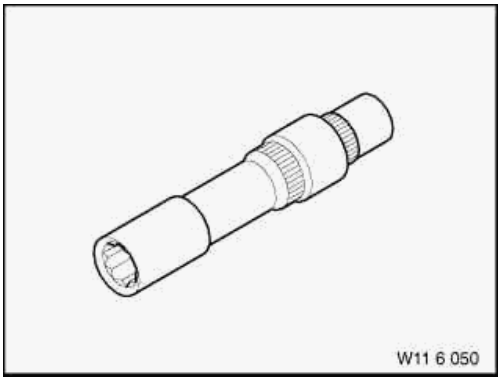
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

0 496 112 (11 8 760) Gauge

Common Used in step 16 34 36 37

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 491 068 (11 6 050) Socket wrench insert



Common Used in step 21 32

Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

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0 495 105 (11 4 480) oddments tray

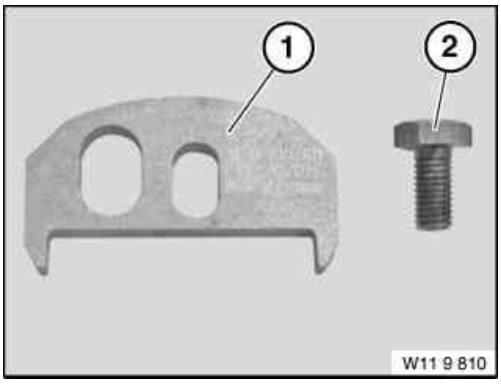
Common Used in step 22 23 34

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

0 496 171 (11 9 811) Holder



Common Used in step 24 29

Usage	Available only as a complete tool set 11 9 810 (83 30 0 496 170) - as of 13.01.12
Included in the tool or work	0 496 170
Storage location	C86
Replaced by	
In connection with	
SI-Number	01 07 07 (355)

0 494 793 (11 9 265) Bush

Common Used in step 24 29

Usage	
Included in the tool or work	0 493 938
Storage location	A44
Replaced by	
In connection with	
SI-Number	

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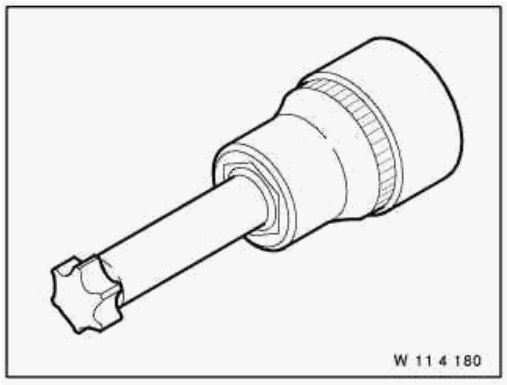
0 491 018 (11 4 180) Socket WAF 46



Common	Used in step 24 29
Usage	(screwdriver bit Torx T60) For releasing and tightening down dual-mass flywheel - model year: from Jan 94
Included in the tool or work	
Storage location	C9
Replaced by	
In connection with	
SI-Number	01 02 94 (777)

2 357 904 Gauge

Common	Used in step 26 27
Usage	For positioning the high pressure pump to the crankshaft . Replaced by gauge 2420824
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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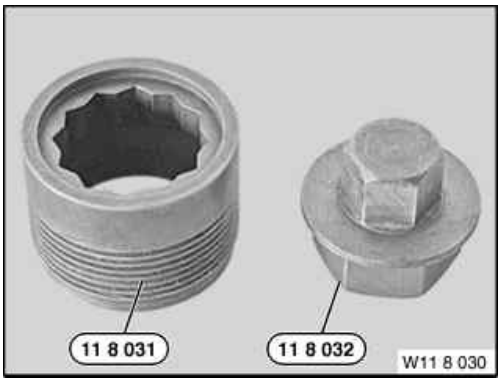
0 496 725 (11 8 030) Extractor



Common

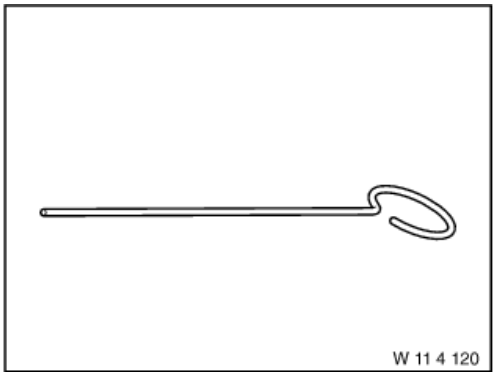
Used in step 26

Usage	for the disassembly of the high pressure pump (replaces SWZ 11 8 740 as of 08/2009) 11 8 740 will be replaced by 83 30 2 448 914.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 757 (11 8 031)	**2 448 914**	**Holding sleeve** Replaces SWZ11 8 741 from 08/2009, 09/2011 no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	
2	0 496 758 (11 8 032)	**2 448 914**	**Adapter** Replaces special tool 11 8 742 from 08/2009, 09/2011 remaining inventories will be sold off - no longer available individually. From 10/2016, can only be ordered as a new set of special tools 2 448 914.	

0 491 012 (11 4 120) Pin



Common

Used in step 26 27

Usage	(lock pin) For chain tensioners, for locking the chain tensioner piston (e.g. during cylinder head removal and fitting)
Included in the tool or work	
Storage location	B1
Replaced by	
In connection with	
SI-Number	01 12 93 (701)

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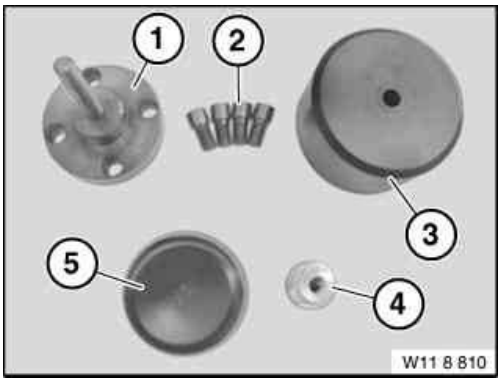
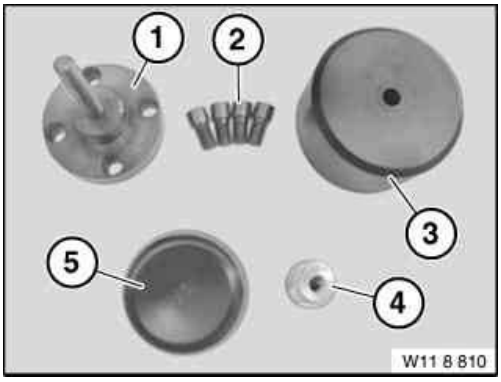
0 496 137 (11 8 815) Holding sleeve



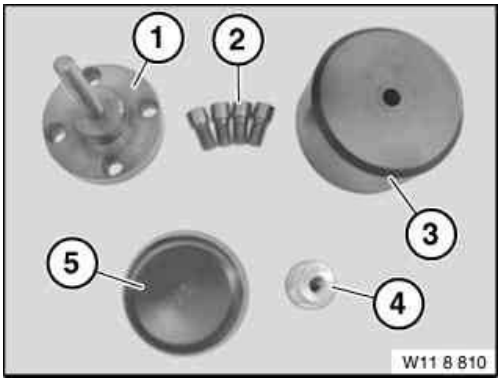
Common	Used in step 28
Usage	(Slip sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 133 (11 8 811) Basic body



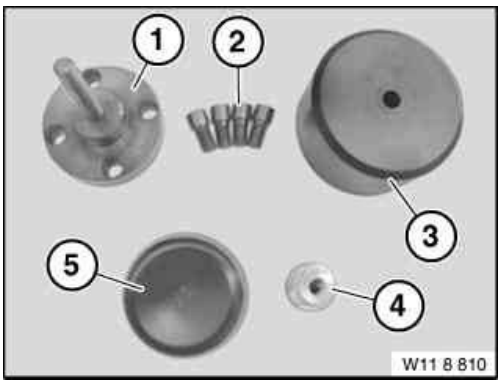
Common	Used in step 28
Usage	Liquidation of existing inventory and then available only as a complete tool set 11 8 810 = 83 30 0 496 132 - as of 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 134 (11 8 812) Screw



Common	Used in step 28
Usage	(Screw set) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

0 496 135 (11 8 813) Holding sleeve



Common	Used in step 28
Usage	(Thrust sleeve) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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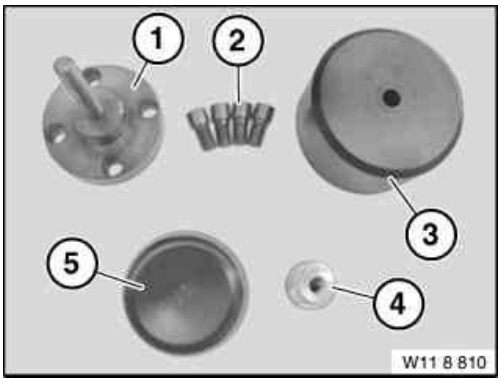
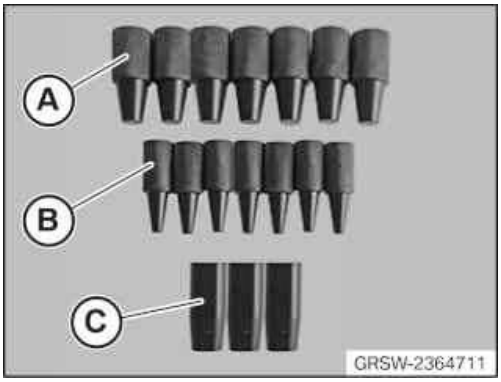
0 496 136 (11 8 814) Nut



Common	Used in step 28
Usage	(Nut with bearing) Liquidation of existing inventory and then available only via complete tool set 11 8 810 = 83 30 0 496 132 - status 09.12.2011
Included in the tool or work	0 496 132
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 364 711 Plug

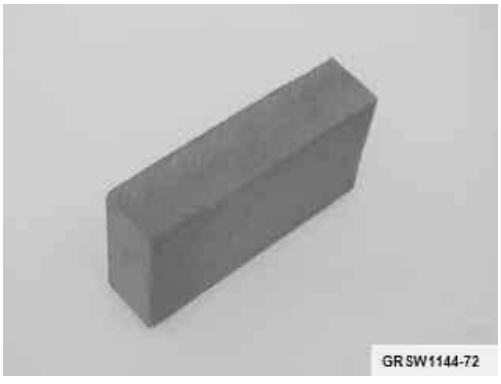


Common	Used in step 28
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common	Used in step 28
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 28
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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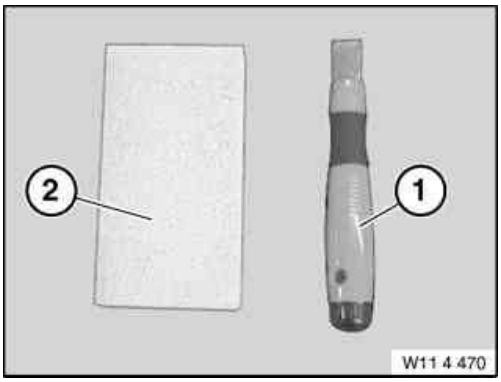
0 495 102 (11 4 470) Tool



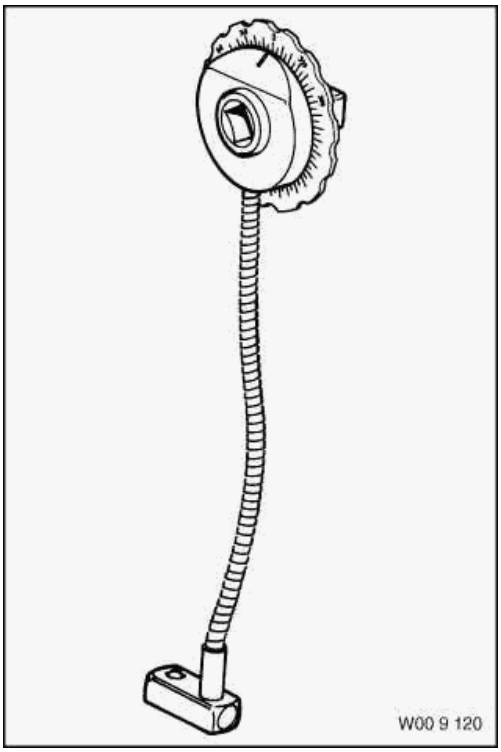
Common Used in step 28

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 28

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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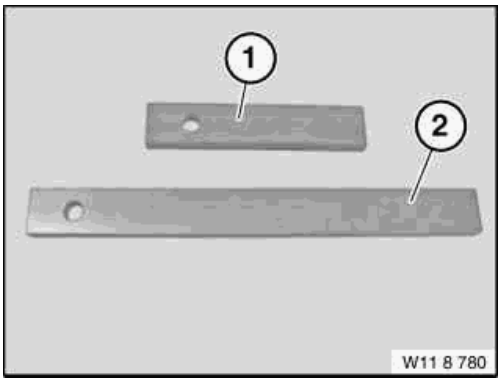
0 496 120 (11 8 780) Plate



Common

Used in step 28

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

2 285 058 Tool set

Common

Used in step 29

Usage	
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 02 14 (069)

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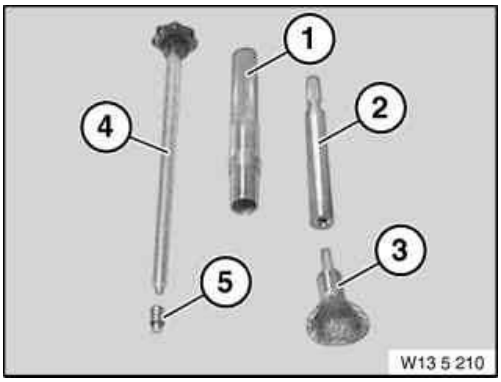
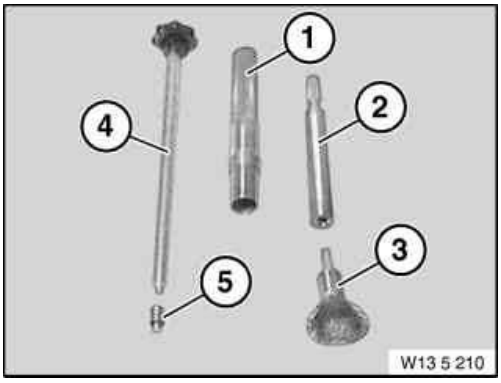
0 493 763 (13 5 215) Plug



Common	Used in step 39
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 39
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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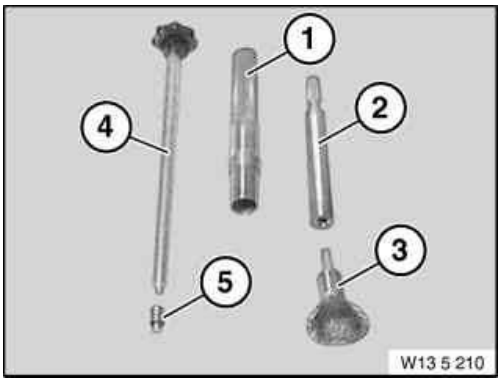
0 493 758 (13 5 210) Tool



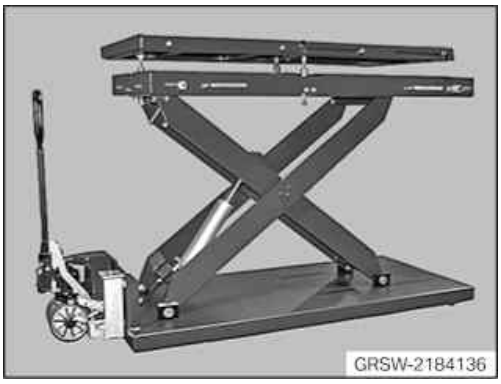
Common Used in step 39

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

2 184 136 Mobile equipment table lift



Common Used in step 45

Usage	Table lift MHT 1200
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	06 01 10 (649)

Replacement tools:

2 299 563 Adapter

Common Used in step 9

Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

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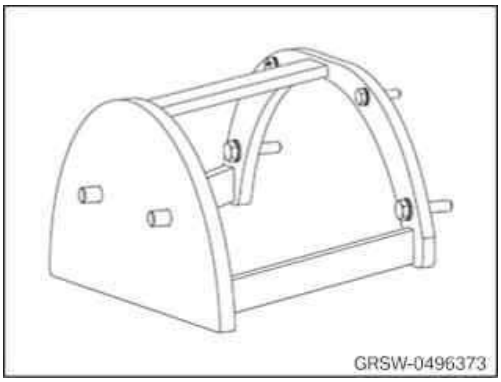
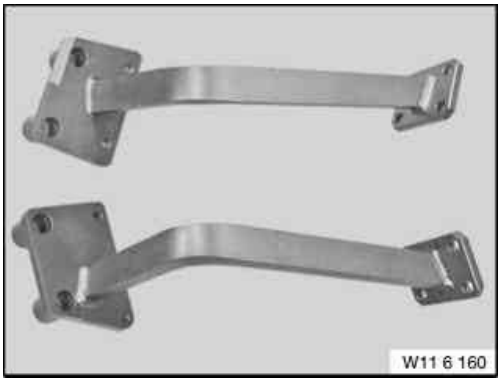
0 496 373 (11 5 420) Plate



Common	Used in step 9
Usage	(Fixture) Engine S62
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	

0 496 680 (11 6 160) Support



Common	Used in step 9
Usage	For mounting N74 engine on the assembly stand. In combination with 00 2 300, 00 2 320
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	00 2 300; 00 2 320 = 0495196
SI-Number	01 31 09 (604)

2 448 914 Extractor

Common	Used in step 26
Usage	For removing and installing high pressure pump. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A49
Replaced by	
In connection with	
SI-Number	01 15 16 (411)

Overview Technical Data

Screw-in depth of thread cutter	Used in step 29
Screw-in depth	18 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	7 46
EGR controller	7 46

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	28

Repair instructions	Used in step

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11 00 050 Removing and installing engine	1 52
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11 00 050 Removing and installing engine	1 52
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11 00 050 Removing and installing engine	1 52
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11 00 050 Removing and installing engine	1 52
11 00 050 Removing and installing engine	1 52
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11 00 050 Removing and installing engine	1 52

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11 00 050 Removing and installing engine	1 52
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11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine (Automatic)	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Remove and install engine	1 52
11 00 050 Removing and installing the engine with a double-clutch transmission (DKG)	1 52
11 00 050 Remove and install engine	1 52
61 35 ... Notes on ESD protection (Electro Static Discharge)	6 13 21 28
61 35 ... Notes on ESD protection (Electro Static Discharge)	28

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	34
Exhaust-gas recirculation cooler seal on exhaust manifold	46
Exhaust-gas recirculation cooler seal on intake plenum	46

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11 31 052 Replacing both timing chains (B37C)

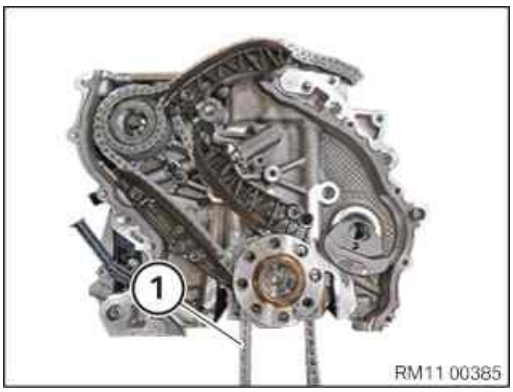
Special tools required:

- 2 357 904
- 11 8 030
- 11 4 120

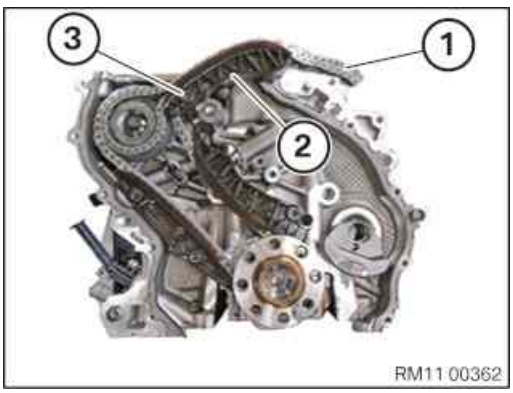
Necessary preliminary tasks:

- Remove engine with transmission.
- Remove transmission.
- Mount engine on assembly stand.
- Remove flywheel.
- Remove cylinder head.
- Remove oil pump.
- Remove rear timing case cover.

Removal:



Remove drive chain (1) for oil pump.



Remove camshaft timing chain (1).

Remove tensioning rail (2) from bearing journal (3).

Note:
Bearing journal (3) does not have to be removed.

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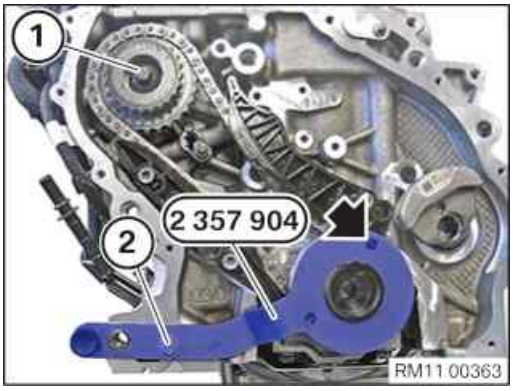


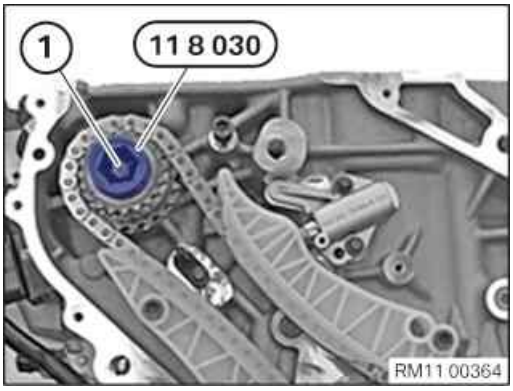
The crankshaft must be blocked in order to release central bolt (1) of the high pressure pump.

Position crankshaft with guide pin (see arrow). Position special tool2 357 904 with screw (2) at the crankcase.

Release central bolt (1) of high pressure pump.

Important!

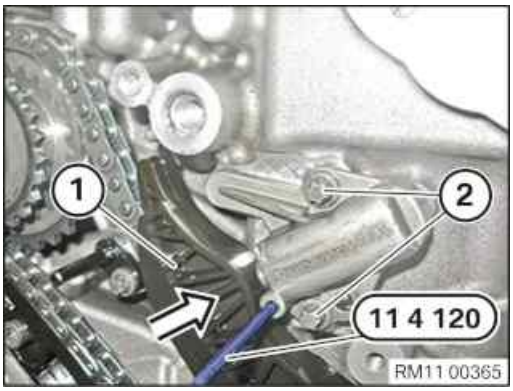
Release central bolt only, do not remove.



Screw special tool11 8 030 into sprocket of high pressure pump.

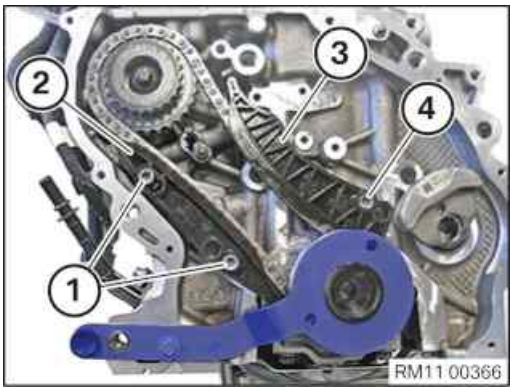
Unscrew central bolt (1) of high pressure pump so far that central bolt can rest on special tool 11 8 030 .

Keep turning the central bolt (1) until the sprocket has come loose from the high pressure pump shaft.



Press chain tensioner in with tensioning rail (1) by hand in the direction of the arrow until the special tool 11 4 120 can be positioned.

Unfasten screws (2). Remove chain tensioner.



Undo both bearing journals (1).

Remove guide rail (2).

Release bearing journal (4).

Remove tensioning rail (3).

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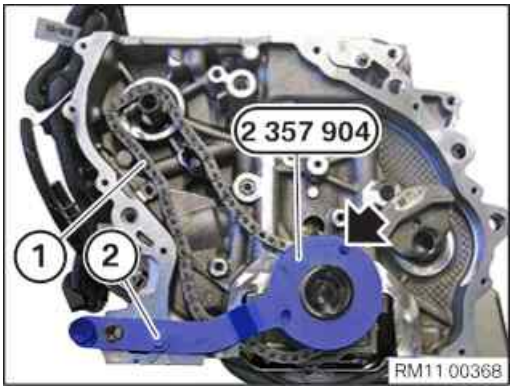
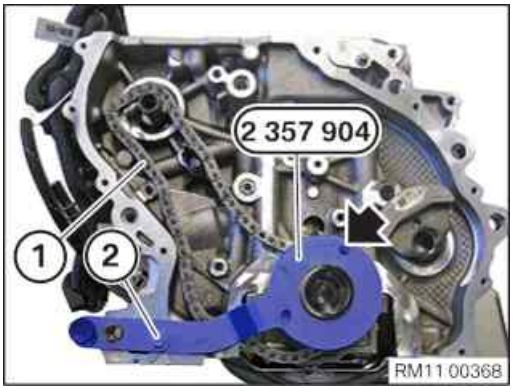
Remove screw and camshaft sprocket for high pressure pump (1).



Remove special tool 2 357 904 . Remove timing chain (1).

Installation:



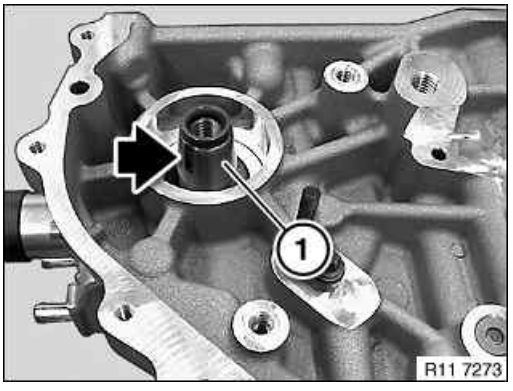
Important!

High pressure pump and crankshaft must be positioned **to each other**.

Fit timing chain (1).

Position crankshaft with special tool 2 357 904 .

Fix special tool 2 357 904 with screw (2) in position at the crankcase.



Installation note:
Note spline groove on high pressure pump (1) (graphic N57).

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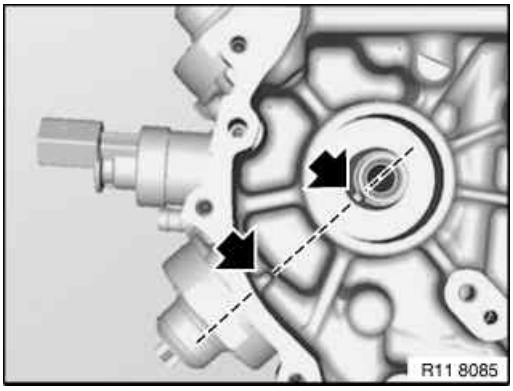
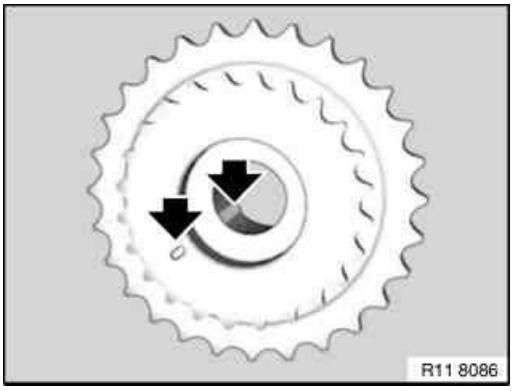
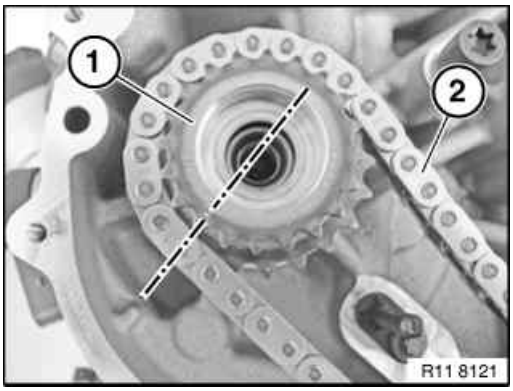


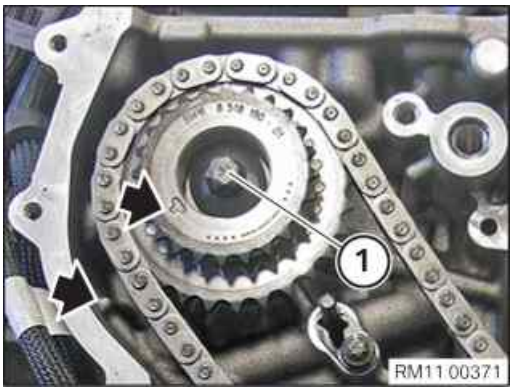
Installation note:
Marking on crankcase and groove on high pressure pump must be in line (graphic shows N57).



Installation note:
Spline and mark on pinion are on a single plane (graphic N57).



Position impeller (1) with timing chain (2) on high pressure pump.
Mark and cast lug must align (graphic N57).



Insert central bolt (1) of high pressure pump.

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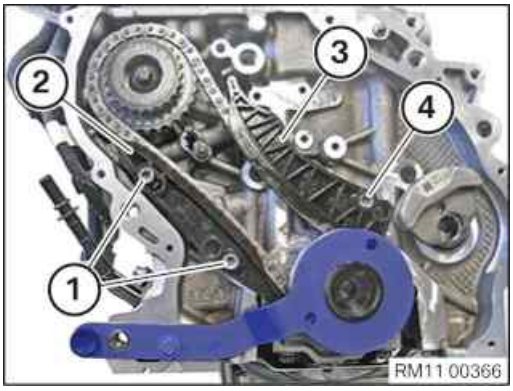


Important!

Clean all the threads of the bearing journals (if necessary with screw tap).

Parts: Replace bearing journals.

Position guide rail (2).

Screw in both bearing journals (1).

Tightening torque: 11 11 3AZ.

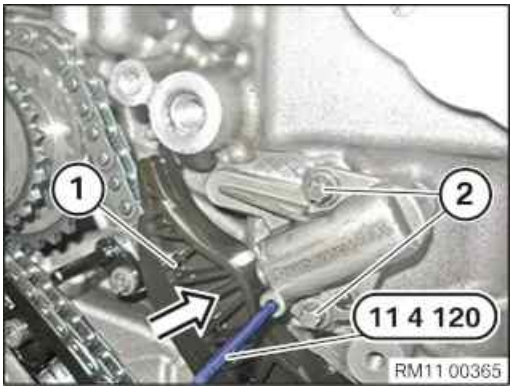
Position tensioning rail (3).

Screw in bearing journals (4).

Tightening torque: 11 11 3AZ.

Important!

Clean sealing surfaces (1) with compressed air.



Install hydraulic chain tensioner. Tighten down screws (2).

Tightening torque: 13 52 1AZ.

Remove special tool 11 4 120 .

Note:
Crankshaft must remain blocked to fasten central bolt (1) of high pressure pump.

Tighten central bolt (1) of high pressure pump.

Tightening torque: 13 52 2AZ.

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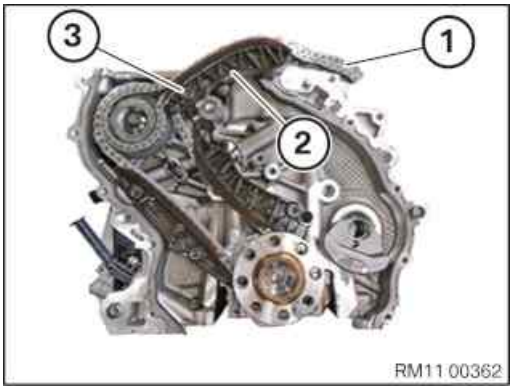
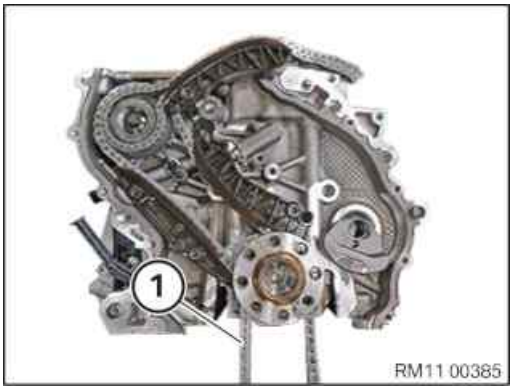


Install tensioning rail (2) with timing chain (1) for camshafts.



Mount drive chain (1) for oil pump on crankshaft.

Required follow-up work:

- Attach rear timing case cover.
- Install oil pump.
- Install flywheel.
- Install cylinder head.
- Remove engine from assembly stand.
- Attach transmission.
- Install engine with transmission.

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11 31 028 Replacing exhaust camshaft (B37C)

Special tools required:

- 11 6 480

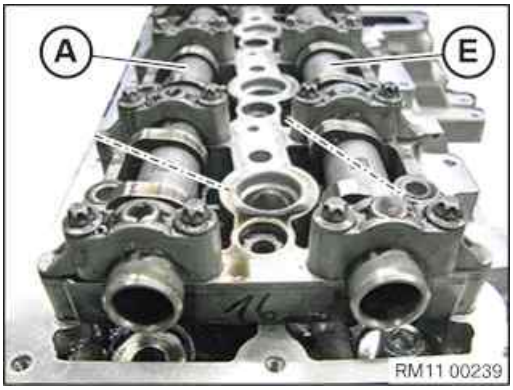
Necessary preliminary tasks:

- Remove front right wheel arch panel
- Remove cylinder head cover

REMOVAL:

Crank engine with special tool11 6 480 to firing TDC position of cylinder no. 1.**Important!**

Do not crank engine in reverse direction!



The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.

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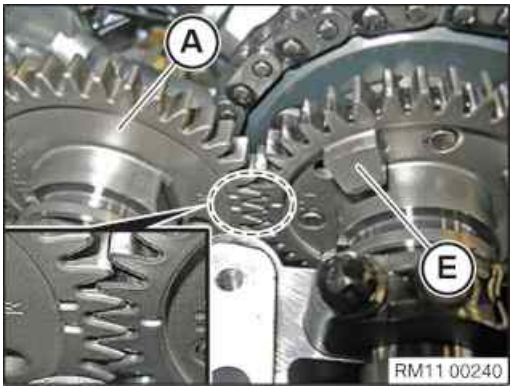
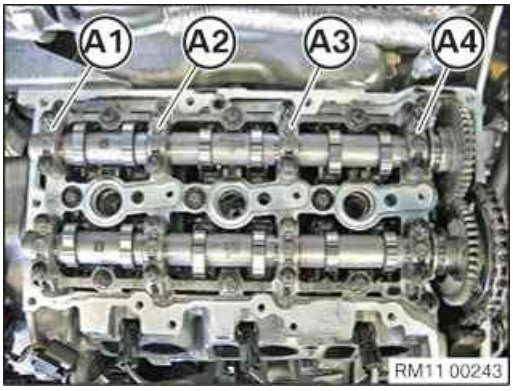


Check position of exhaust and intake camshafts (see graphic).

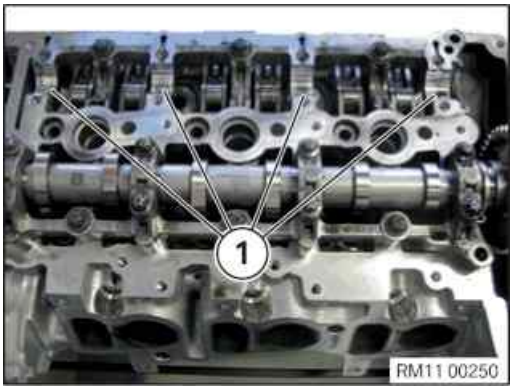


Note:
It is not necessary to adjust the engine timing in order to remove the exhaust camshaft.

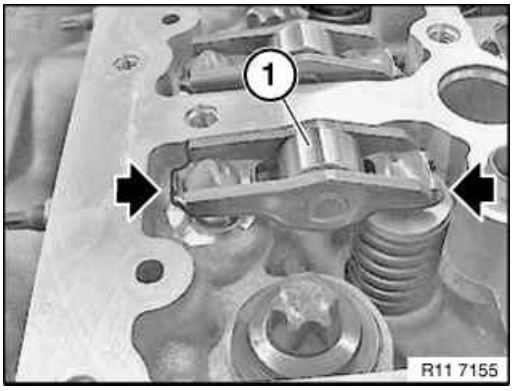
Release camshaft bearing caps **A1** to **A4** by 1/2 a turn at a time, working from the outside inwards.

Feed exhaust camshaft upwards to remove.

INSTALLATION:



Oil all bearing positions (1).



Check installation position of the roller cam followers **(risk of damage!)**.

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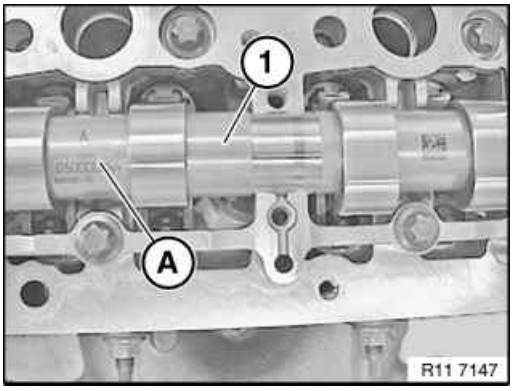
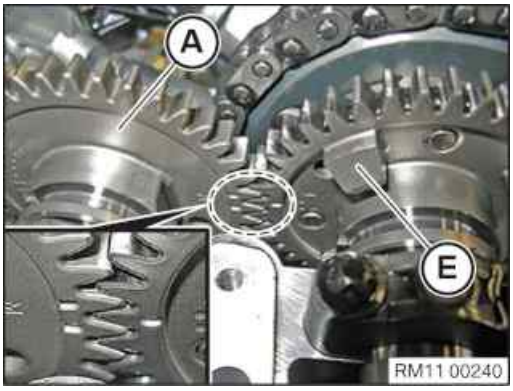
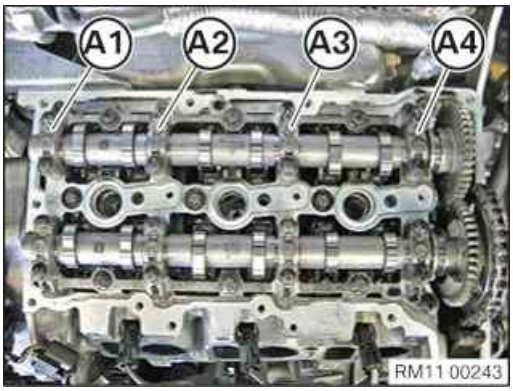


Installation note:
Identification (A) must point upwards.

Install exhaust camshaft (1).



When inserting the exhaust camshaft (A), the marks of both camshafts (A and E) must be aligned (see graphic).



Tighten down camshaft bearing caps **A1** to **A4** on the camshaft carrier by 1/2 a turn at a time, working from the inside outwards.

Tightening torque: 11 31 2AZ.

Using special tool 11 6 480 , crank engine twice in direction of engine rotation until cylinder no.1 is back in firing TDC position.

Check camshaft adjustment.

Required follow-up work:

- Install cylinder head cover
- Install front right wheel arch panel

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11 31 025 Replacing intake camshaft (B37C)

Special tools required:

- 11 6 480
- 2 288 380
- 11 8 760

Necessary preliminary tasks:

- Remove wheel arch trim panel .
- Remove cylinder head cover.
- Remove exhaust-gas recirculation cooler

REMOVAL:

Crank engine with special tool 11 6 480 to TDC firing position of cylinder no. 1.**Important!**
Do not crank engine in reverse direction!

Remove cover (1).

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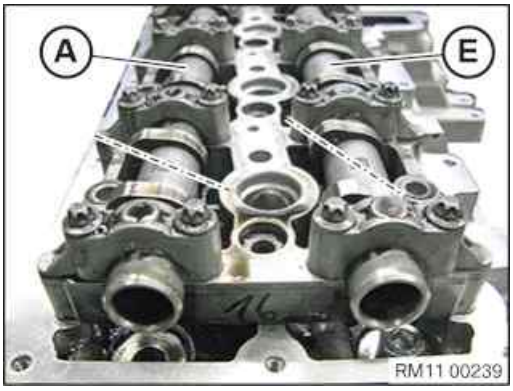
Turn engine with special tool 11 6 480 on vibration absorber.

Important!

On vehicles with manual gearbox, an additional bore hole that can be confused with dowel hole is located in front of dowel hole.

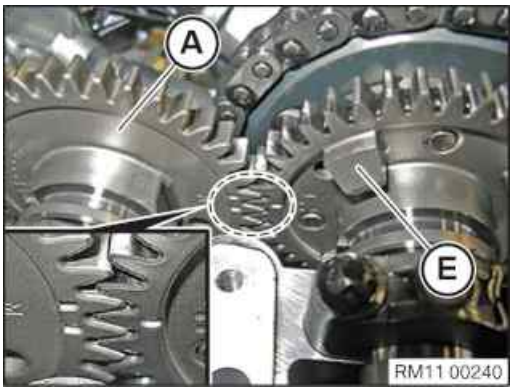
The special tool 2 288 380 must be able to slide into the oil sump up to the offset.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool2 288 380 .

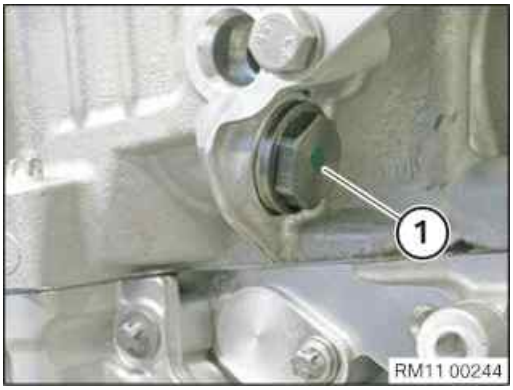


The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.



Marks on both camshafts (A and E) must match up (see graphic).



Release chain tensioner (1).

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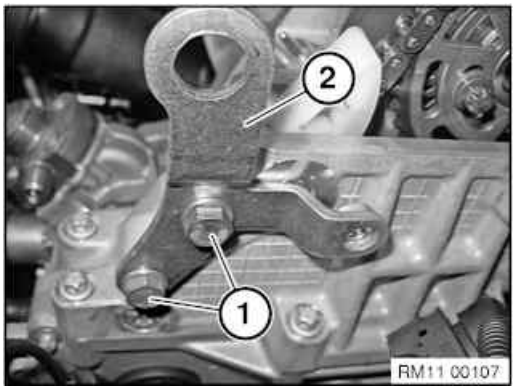
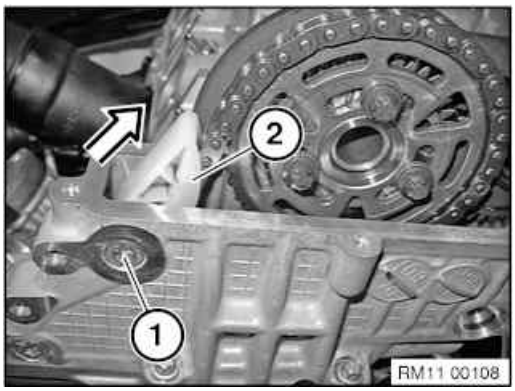


Release screws (1).

Remove suspension element (2).

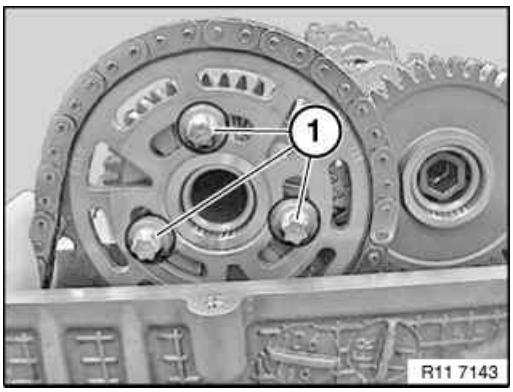
Note:
Figure N47.



Remove bearing journal (1).

Remove guide rail (2) in direction of arrow.

Note:
Figure N47.



Important!

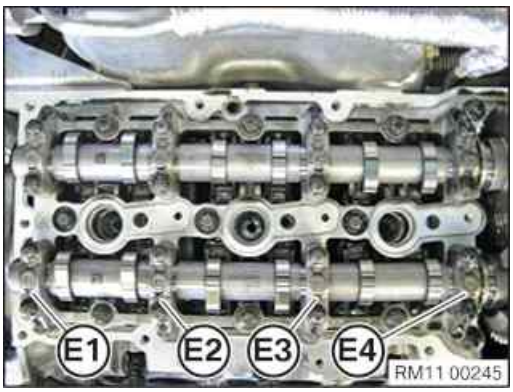
Protect timing chain to prevent it from falling.

Risk of damage to oil spray nozzle.

Release screws (1).

Remove camshaft sprocket from the intake camshaft and feed out of timing chain.

Store timing chain in cylinder head.



Note:
It is necessary to adjust the engine timing when removing the intake camshaft.

Release camshaft bearing caps **E1** to **E4** by 1/2 a turn at a time, working from the outside inwards.

Pull intake camshaft upwards to remove.

INSTALLATION:

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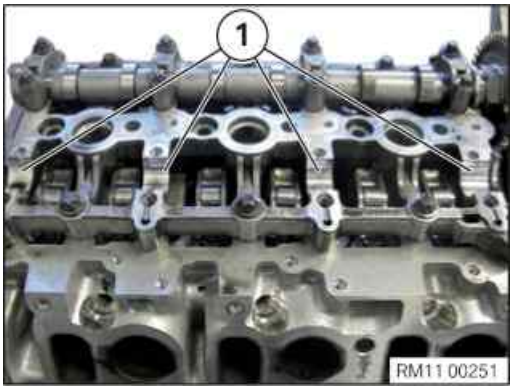
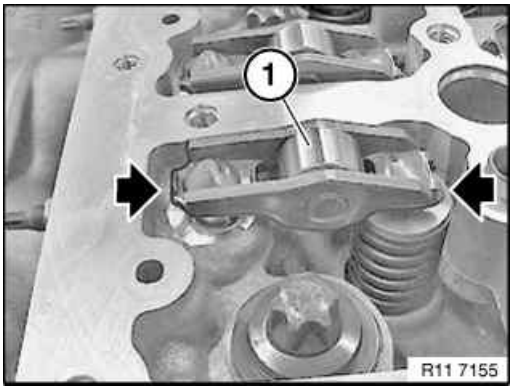
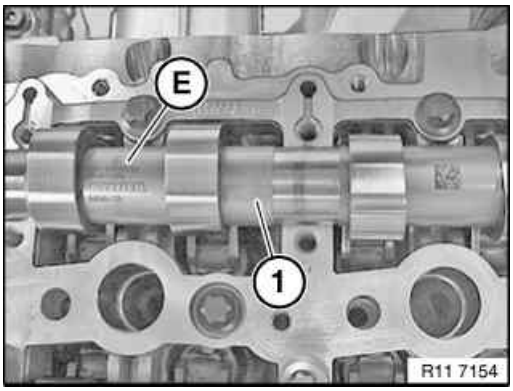


Oil all bearing positions (1).

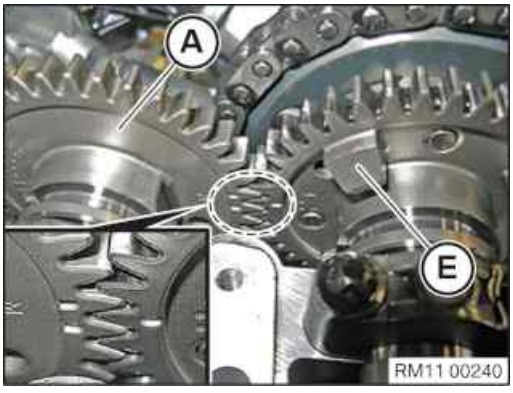


Check installation position of the roller cam followers **(risk of damage!)**.



Installation note:
Identification (E) must point upwards.

Insert intake camshaft (1).



When inserting the intake camshaft (E), the marks of both camshafts (A and E) must be aligned (see graphic).

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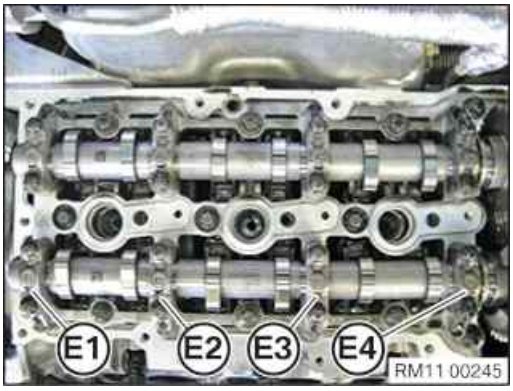
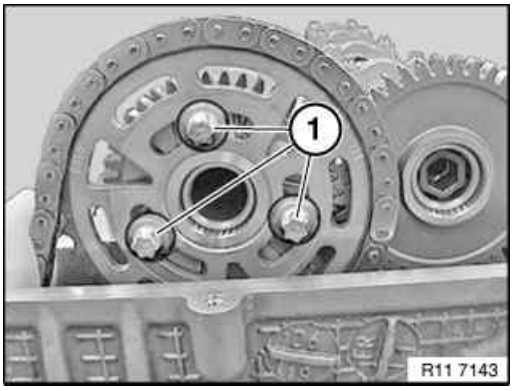


Tighten down camshaft bearing caps **E1** to **E4** on the camshaft carrier by 1/2 a turn at a time, working from the inside outwards.

Tightening torque: 11 31 2AZ.

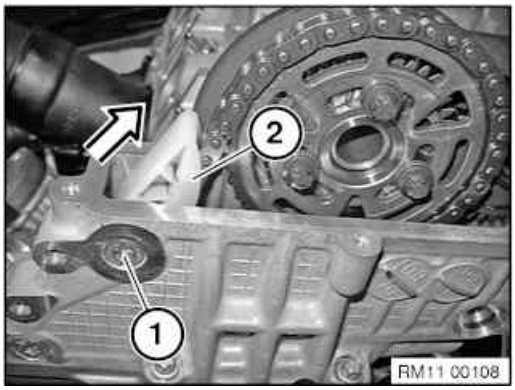


Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the elongated holes.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

Release bolts (1) again by a 90° turn.

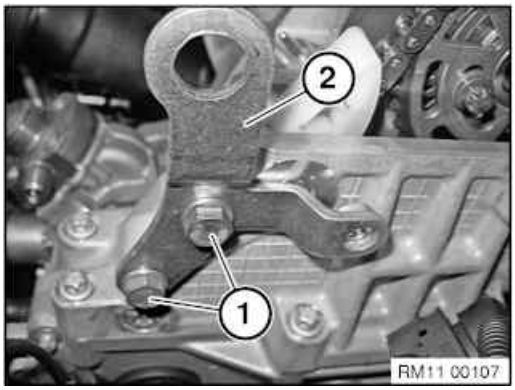


Note:
Parts: Replace bearing journal.

Install guide rail (2) against direction of arrow.

Screw in bearing journals (1).

Tightening torque: 11 12 6AZ.



Install suspension element (2).

Tighten down screws (1).

Tightening torque: 11 00 4AZ.

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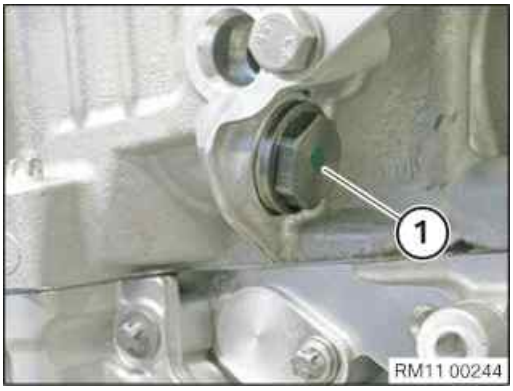


Parts:

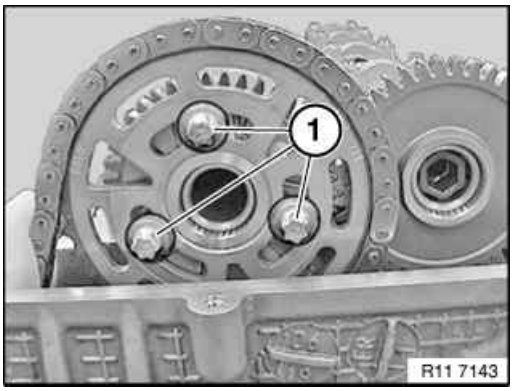
Replace sealing ring.

Install chain tensioner (1) and tighten down.

Tightening torque: 11 12 5AZ.

Place special tool 11 8 760 on exhaust camshaft.**Note:**

Special tool 11 8 760 must lie flush on cylinder head.



Tighten camshaft bolts (1).

Tightening torque: 11 31 1AZ.

Crank engine twice in direction of engine rotation with special tool 11 6 480 up to TDC firing position of cylinder no. 1.

Check camshaft adjustment.

Important!

Do not crank engine in reverse direction!

Important!

2 288 380 Remove special tool before starting engine.

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Required follow-up work:

- Install exhaust-gas recirculation cooler.
- Install cylinder head cover.
- Install wheel arch trim panel.

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11 33 062 Removing and installing/renewing all hydraulic valve clearance compensating elements (B37C)

Special tools required:

- 11 6 480
- 2 288 380
- 11 4 480
- 11 8 760

Important!

Risk of damage to engine!

Adherence to notes on checking and adjusting timing is mandatory!

Necessary preliminary tasks:

- Remove front right wheel arch cover.
- Remove cylinder head cover.
- Remove exhaust-gas recirculation cooler

Removal:

Use special tool11 6 480 to turn engine to TDC firing position of cylinder 1.**Important!**

Do not crank engine in reverse direction!

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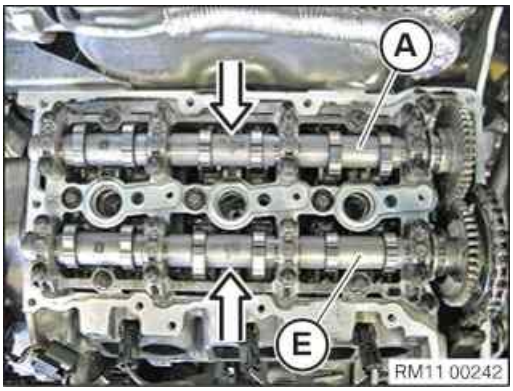
Remove protective cap on oil sump.

Important!

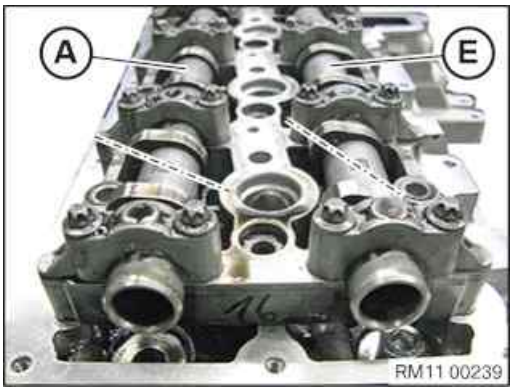
On vehicles with manual gearbox, an additional bore hole that can be confused with dowel hole is located in front of dowel hole.

It must be possible to push special tool 2 288 380 into oil sump up to throw.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool2 288 380 .



It must be possible to read the part number on the exhaust and intake camshafts (A and E) from above.*Note:*
See illustration.



The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) points obliquely outward to the left at cylinder No. 1.

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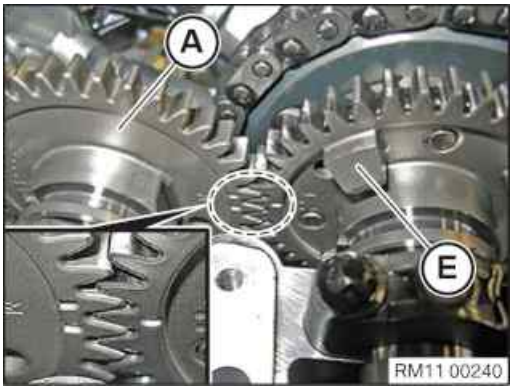
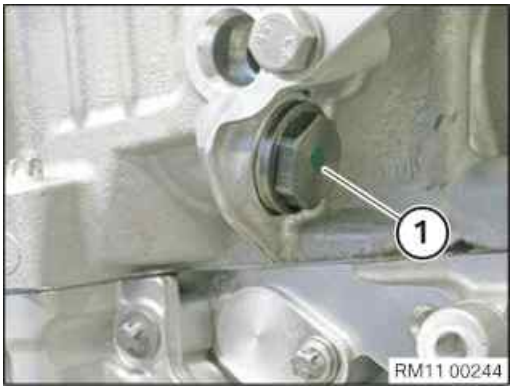
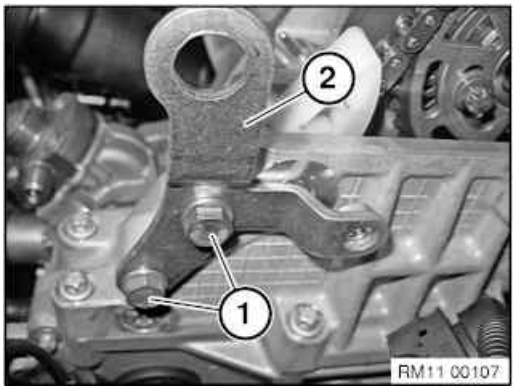


The marks on both camshafts (A and E) must match up (see graphic).



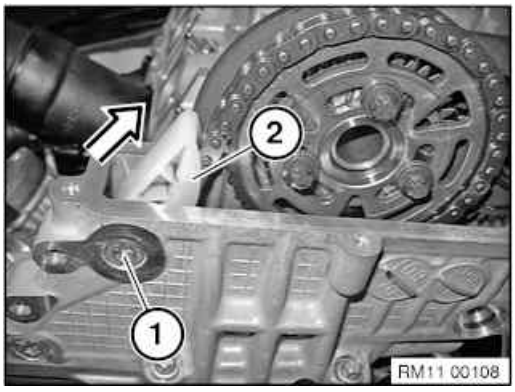
Release chain tensioner (1).



Release screws (1).

Remove suspension element (2).

Note:
Figure N47.



Remove bearing journal (1).

Remove guide rail (2) in direction of arrow.

Note:
Figure N47.

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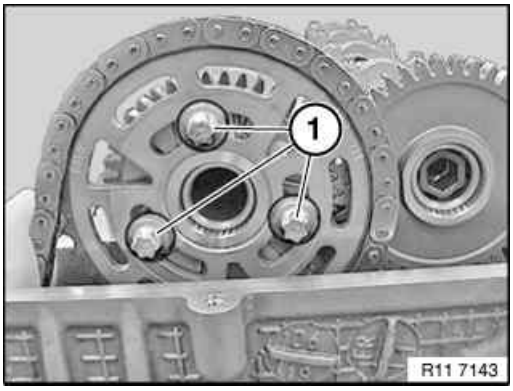


Important!

Protect timing chain to prevent it from falling.

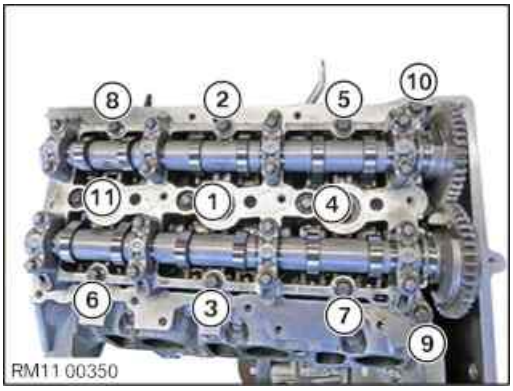
Risk of damage to oil spray nozzle.

Release screws (1) on camshaft sprocket.

Remove camshaft sprocket from intake camshaft.

Pull camshaft sprocket out of timing chain and place it neatly on the special tool 11 4 480 .

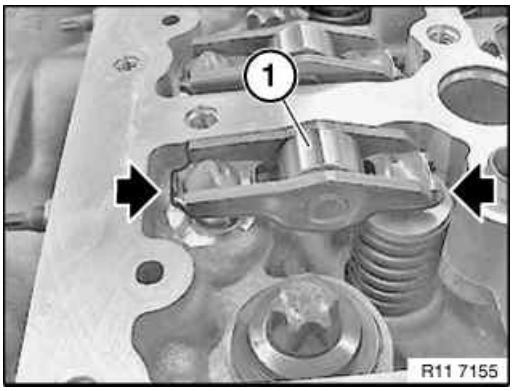
Place timing chain at the cylinder head.



Note:
Both camshafts can be removed with the camshaft carrier.

Release all screws (see graphic) in the sequence **11 - 1** in multiple steps.

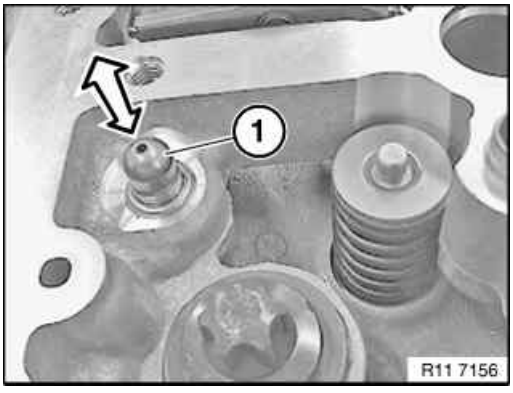
Take off camshaft carrier by lifting it upwards.



Note:
Already used rocker arms may be refitted only in the same position.

Set down all rocker arms (1) on special tool 11 4 480 in neat order.

Lift off rocker arm.



Note:
Already used valve clearance compensating elements may be refitted only in the same position.

Set down all valve clearance compensating elements (1) on special tool 11 4 480 in neat order.

Lift out valve clearance compensating elements (1).

Installation:

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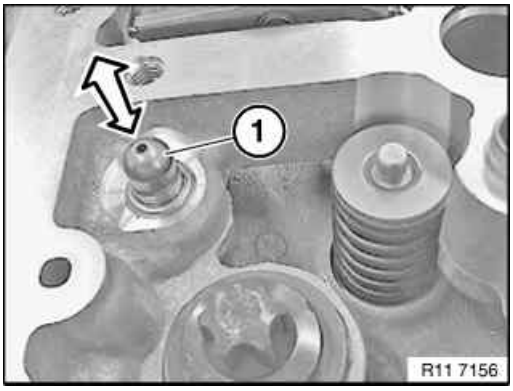
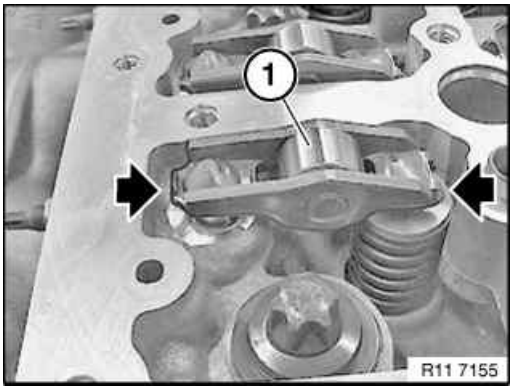


Installation note:
Already used valve clearance compensating elements may be refitted only in the same position.

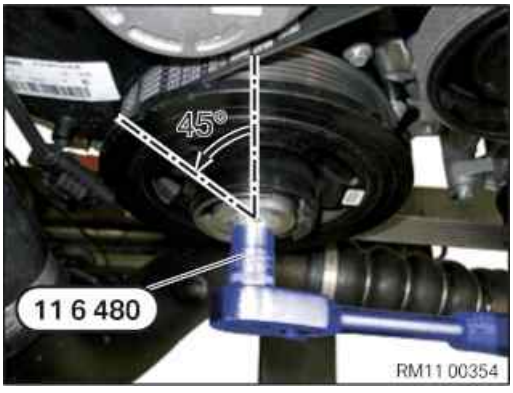
Insert valve clearance compensating element (1).



Installation note:
Already used rocker arms may be refitted only in the same position.
Make sure roller cam followers are in correct installation positions.

Install rocker arm (1).

Remove special tool 2 288 380 .



Important!
Note starting point of cylinder 1 TDC firing position.

Rotate engine with special tool 11 6 480 maximum 45° against direction of engine rotation.

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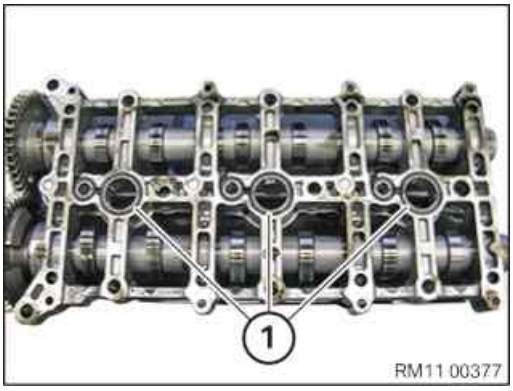
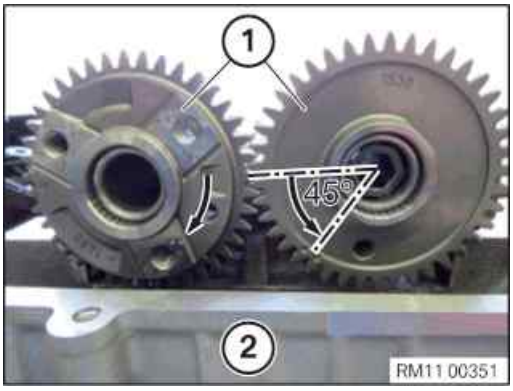


Parts: Replace gaskets (1).

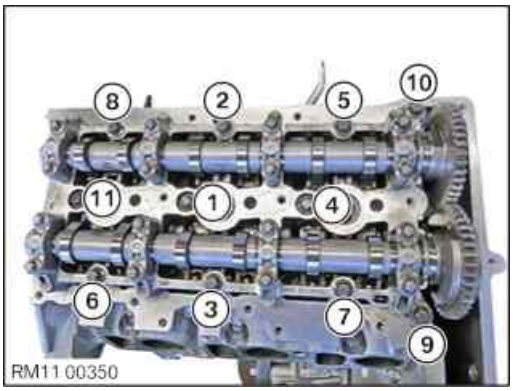


Important!

Note starting point of cylinder 1 TDC firing position.

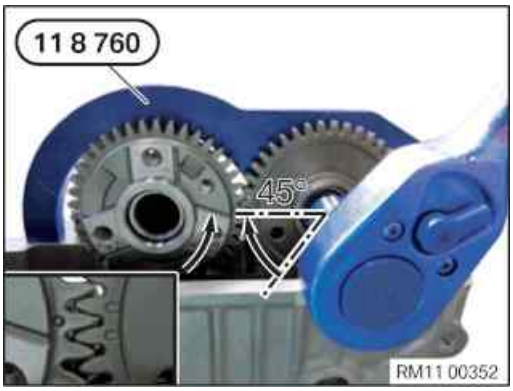
Rotate camshafts maximum 45° against direction of engine rotation.

Mount camshaft carrier on cylinder head as shown.



Tighten screws in the sequence **1** to **11** in multiple steps.

Tightening torque: 11 31 3AZ.



Rotate camshafts 45° in direction of engine rotation.

The marks on both camshafts must match up (see small figure).

Mount special tool 11 8 760 and block camshafts.

Note:

Special tool 11 8 760 must lie flush on cylinder head.

The exhaust camshaft must be removed if the marks do not match up (are not aligned).

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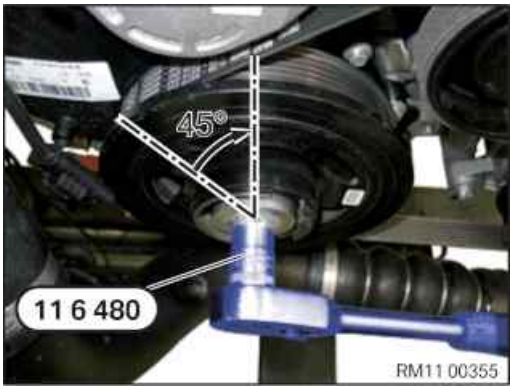
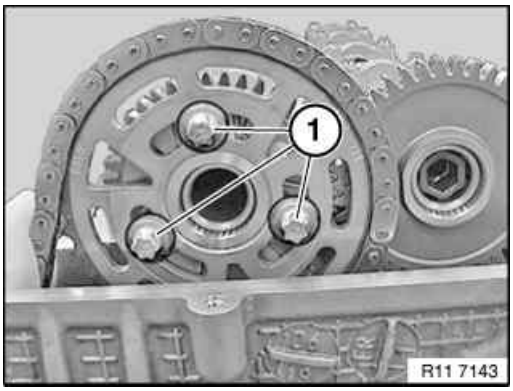


Rotate engine with special tool 11 6 480 45° in direction of engine rotation.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool2 288 380 .

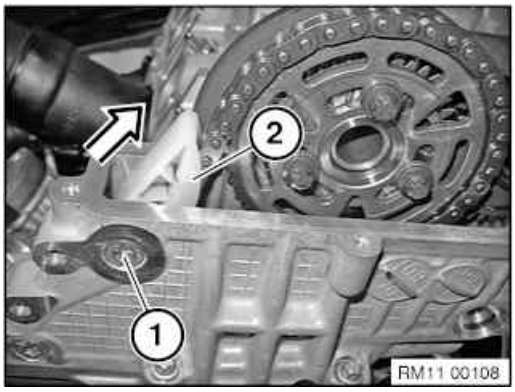


Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the elongated holes.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

Release bolts (1) again by a 90° turn.



Note:
Parts: Replace bearing journal.

Install guide rail (2).

Screw in bearing journals (1).

Tightening torque: 11 12 6AZ.

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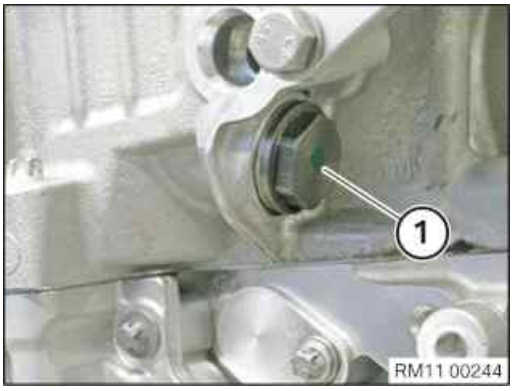
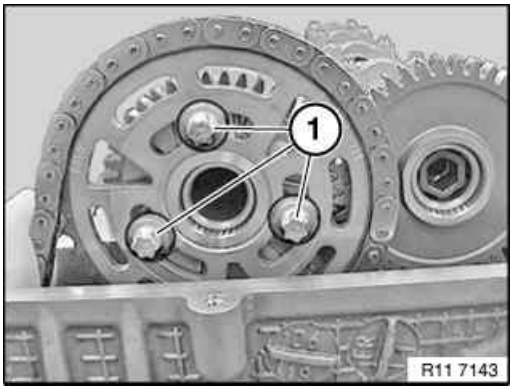


Install chain tensioner (1) and tighten down.

Parts:

Replace sealing ring.

Tightening torque: 11 12 5AZ.



Tighten down screws (1).

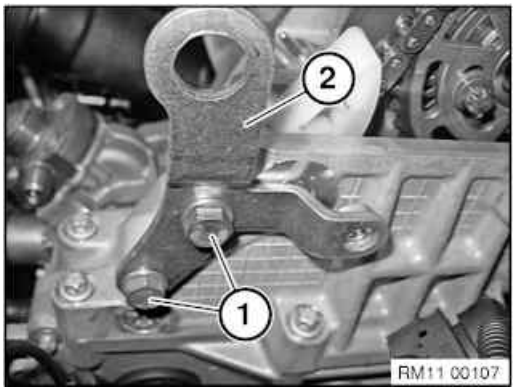
Tightening torque: 11 31 1AZ.

Crank engine with special tool 11 6 480 twice in direction of rotation.

Check timing.

Important!

Do not crank engine in reverse direction.



Install suspension element (2).

Tighten down screws (1).

Tightening torque: 11 00 4AZ.

Important!

2 288 380 Remove special tool before starting engine.

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Required follow-up work:

- Install exhaust-gas recirculation cooler.
- Install cylinder head cover.
- Install front right wheel arch cover.

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11 33 050 Removing and installing/replacing all rocker arms

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

1 – Remove vehicle battery

WARNING

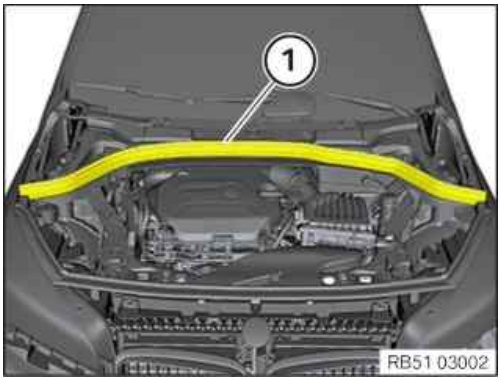
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

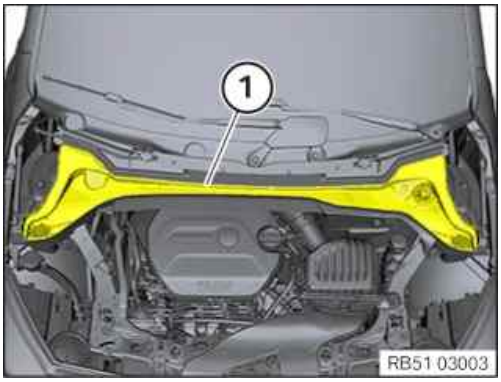
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.

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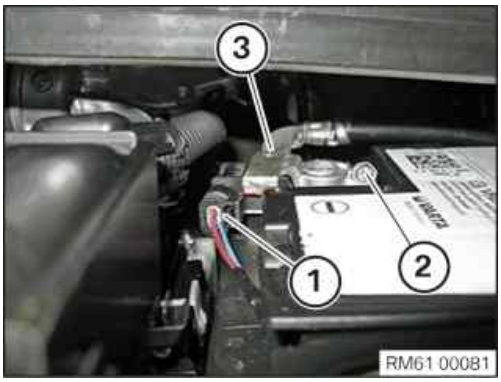
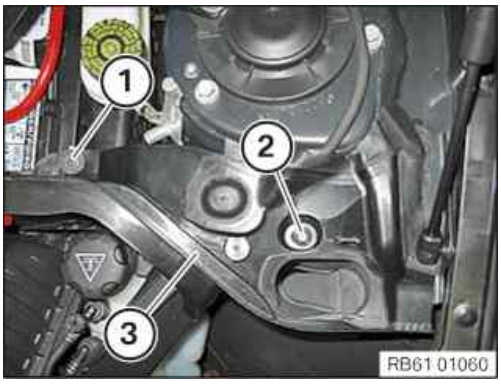
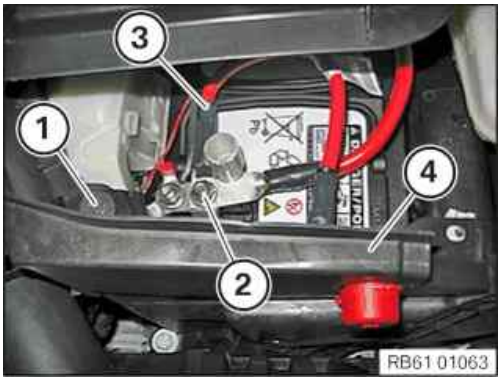


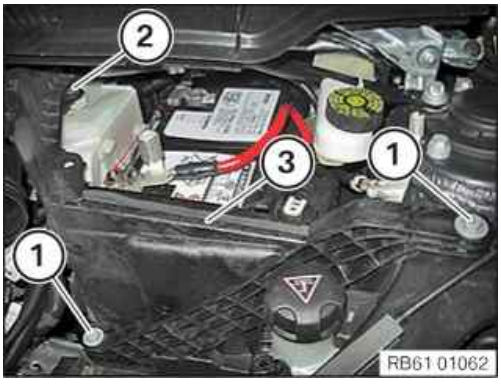
- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



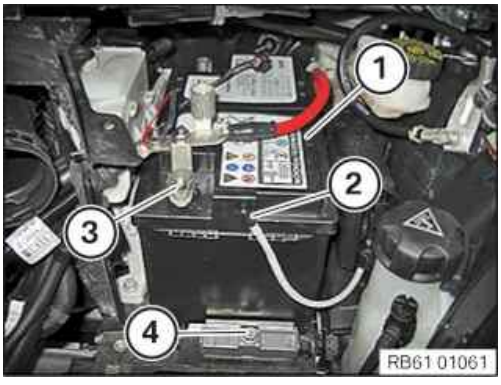
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Remove left and right wiper arm

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NOTICE

Description is for left component only. Procedure on the right side is identical.

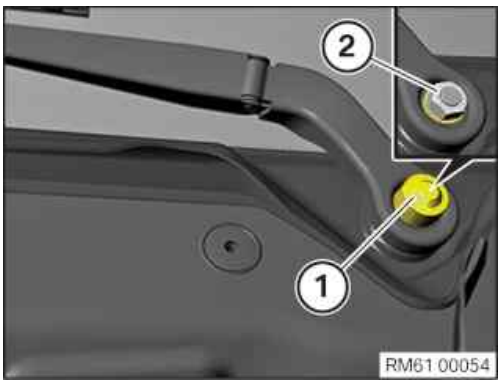
▶ **Remove the wiper arm**

RISK OF DAMAGE

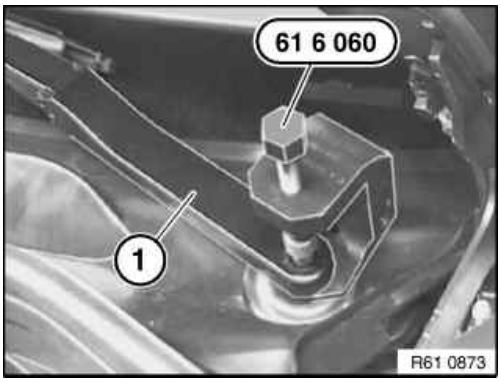
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

3 – Remove the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**

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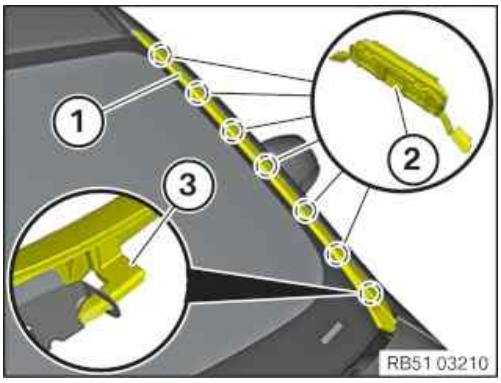
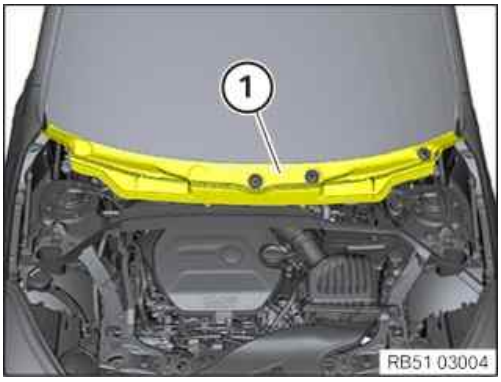


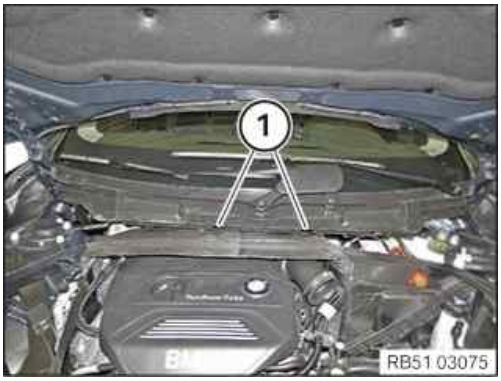
- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

4 – Remove the rear cowl panel cover

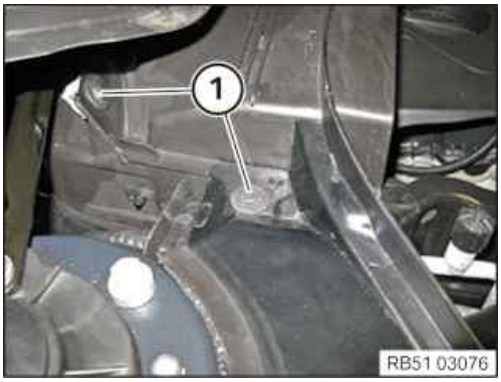


- Disengage and guide out the rear cowl panel cover (1) towards the top.

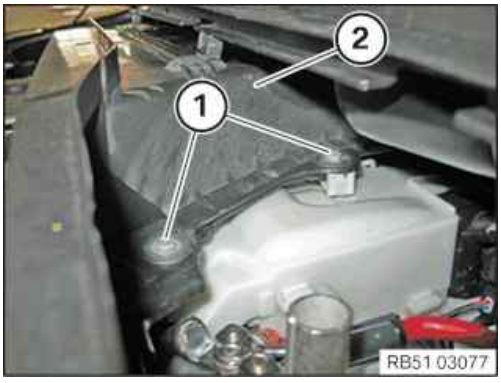
5 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

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6 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

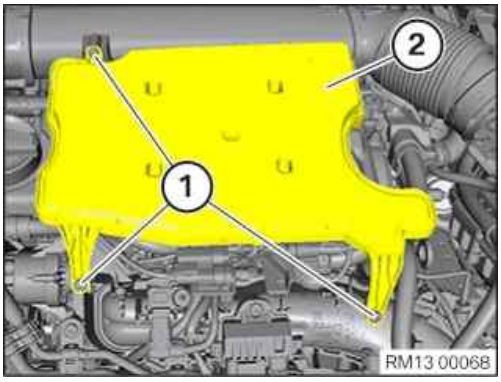
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

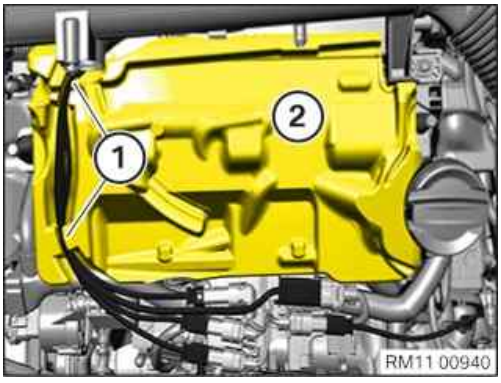
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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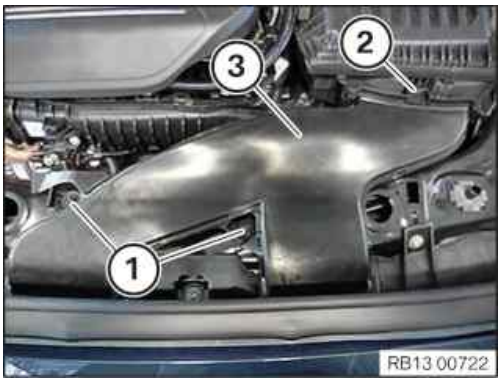
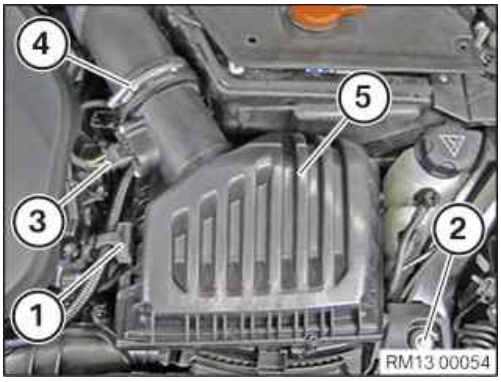


- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

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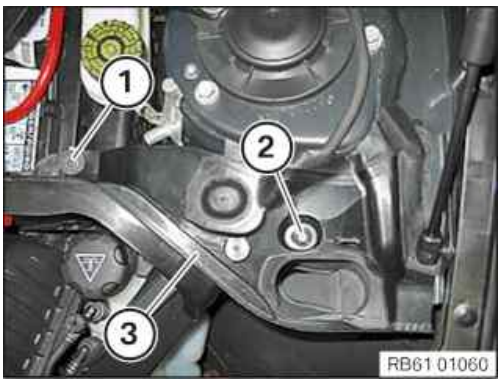
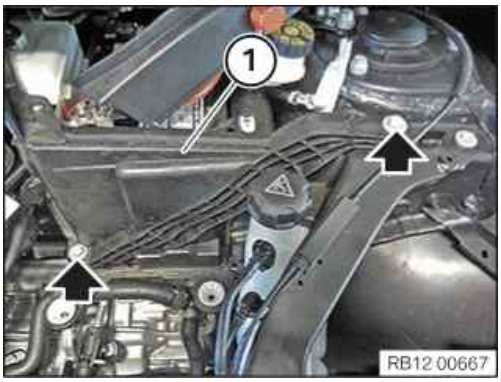
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

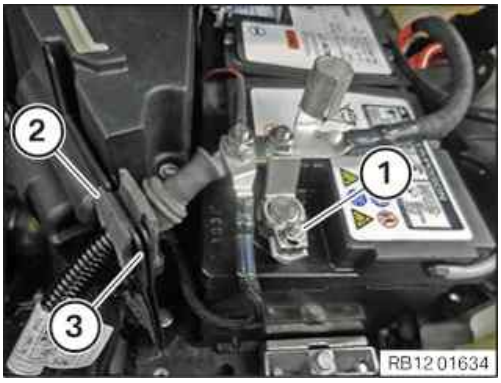


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

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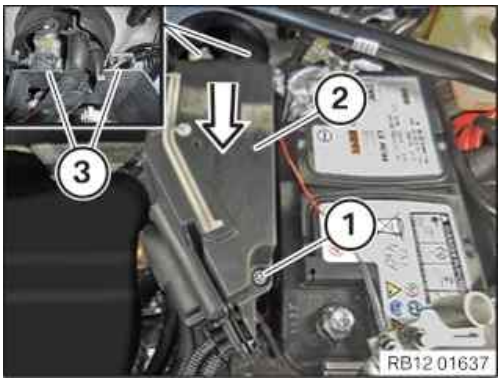
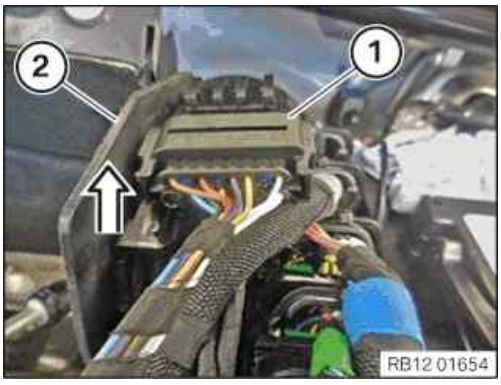
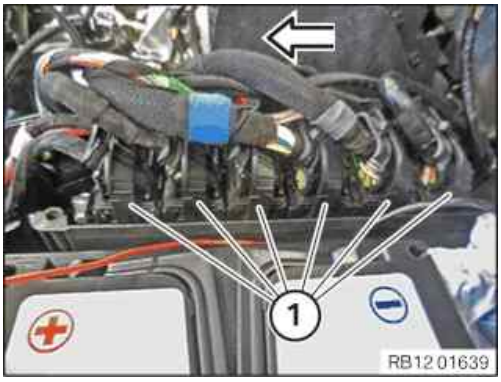


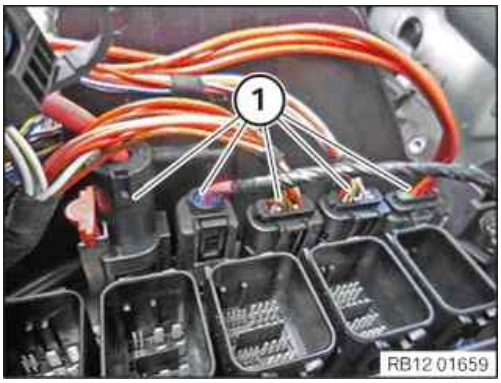
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



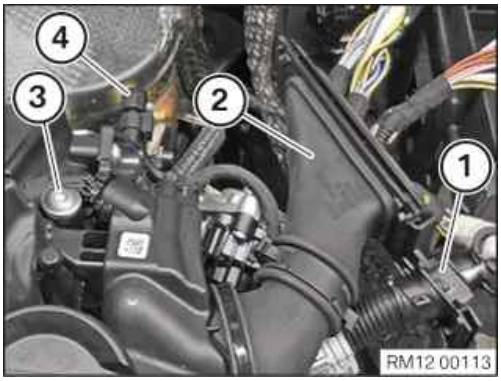
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

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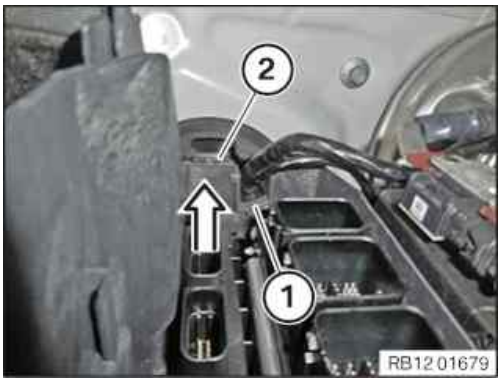
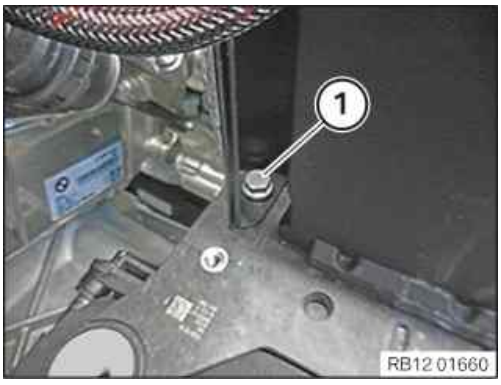
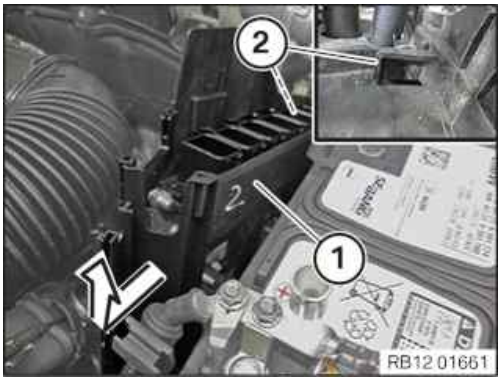


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

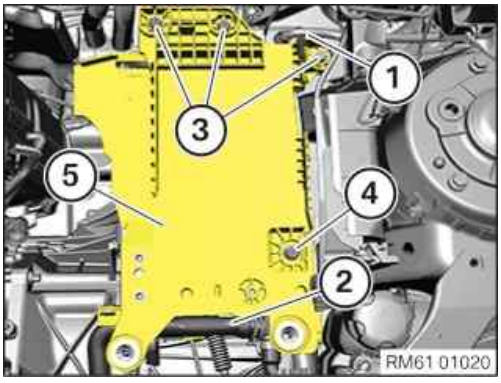


- Loosen screw (1).



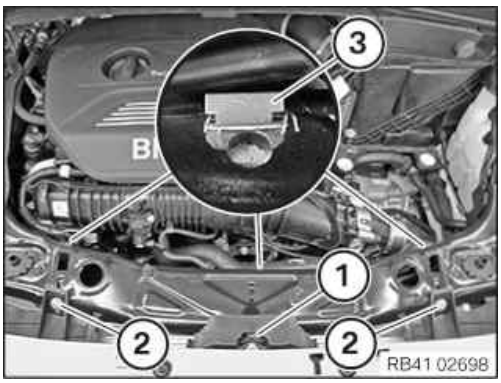
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

12 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

13 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.

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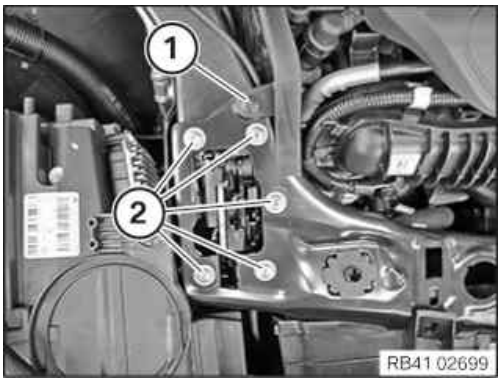
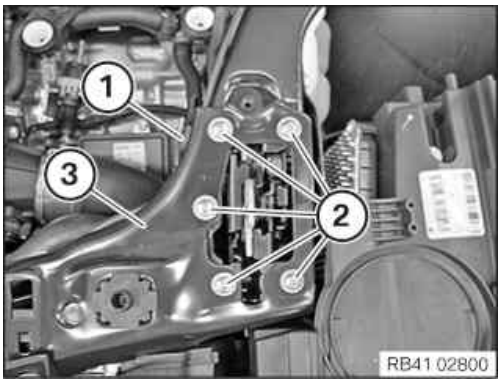
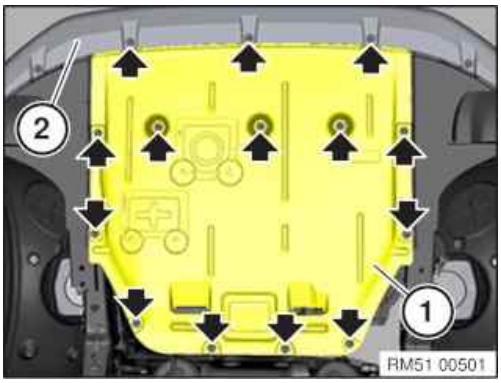


- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

14 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

15 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

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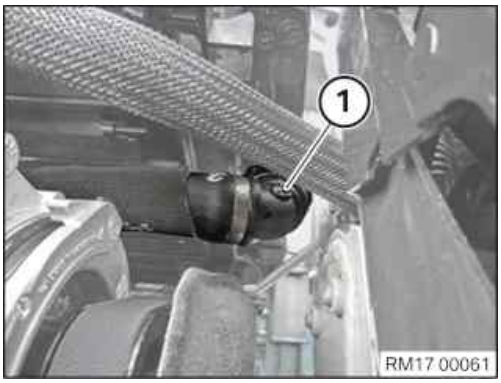
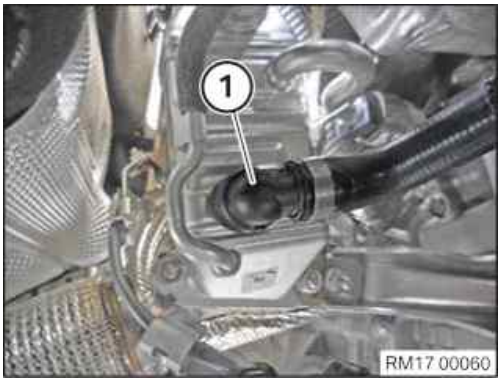
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

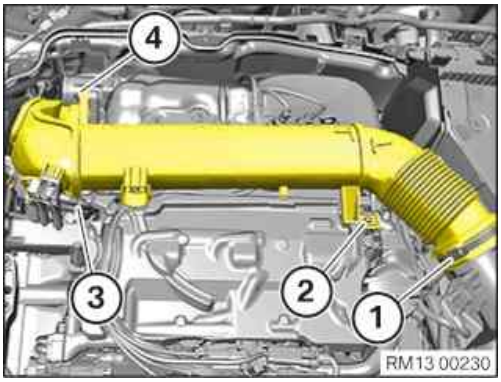


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

16 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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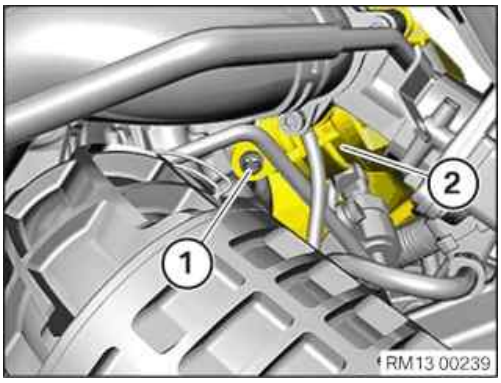
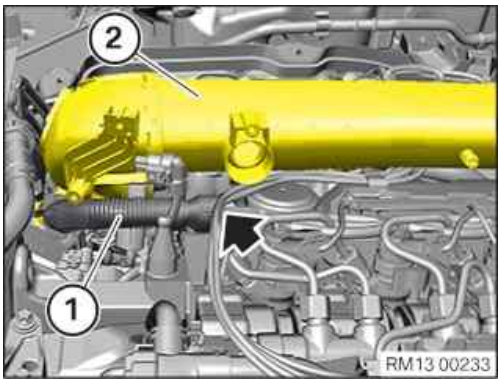


- Unscrew the screw (1) from the clean air pipe (2).



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

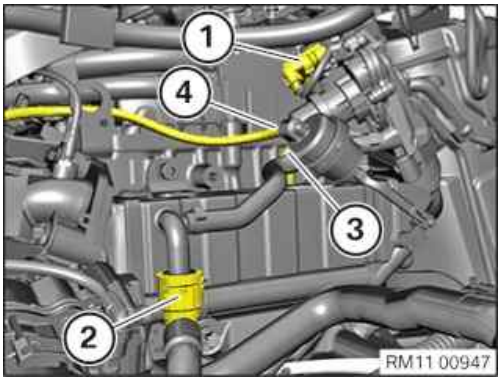
17 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.

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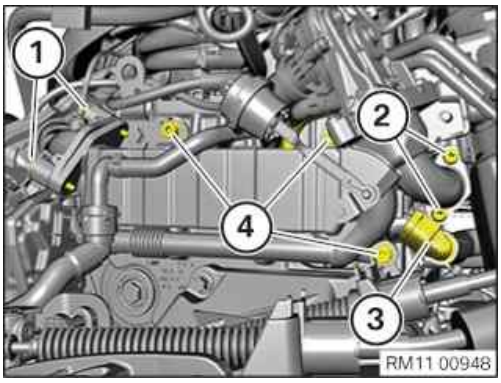
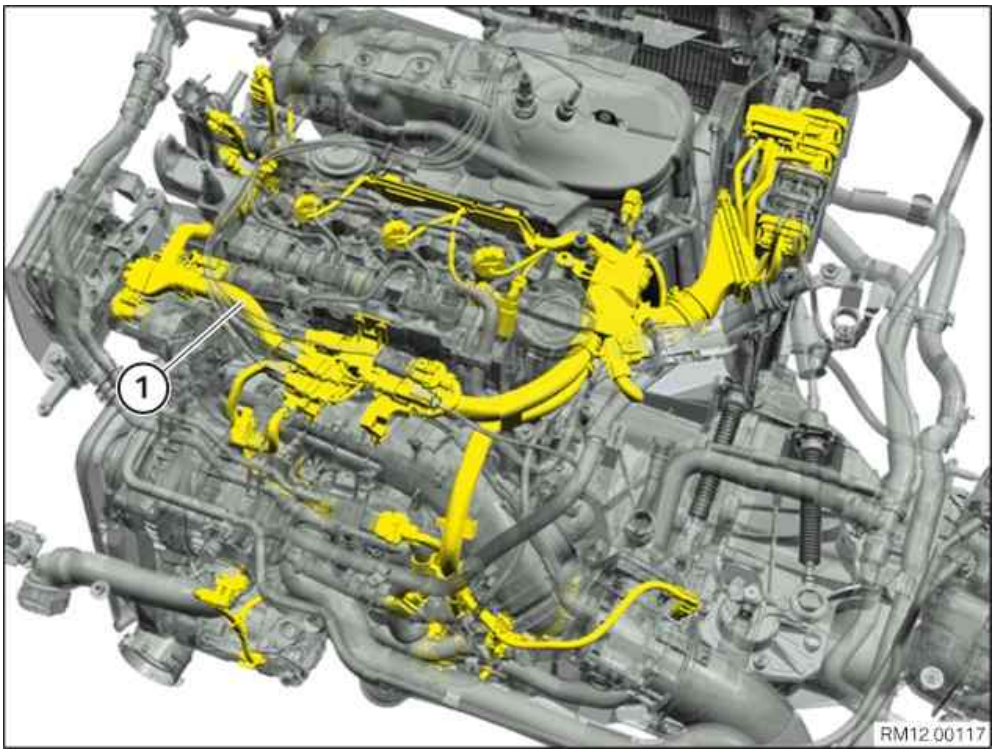


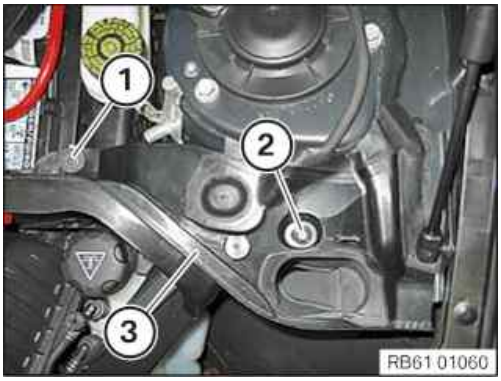
- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

18 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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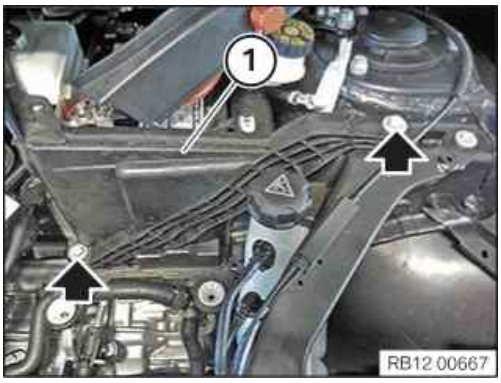
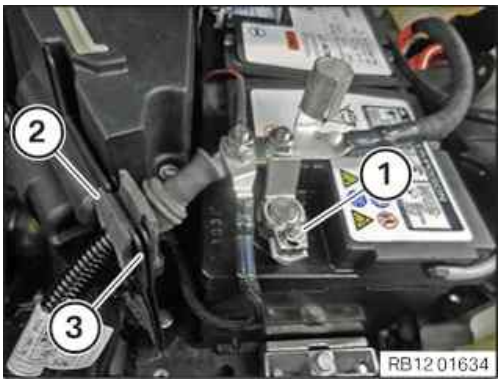
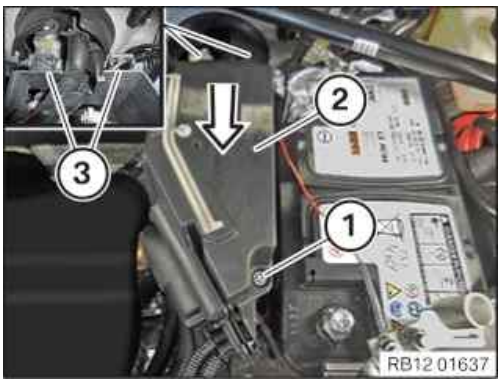


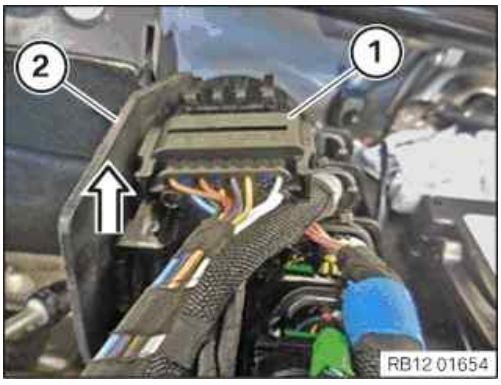
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



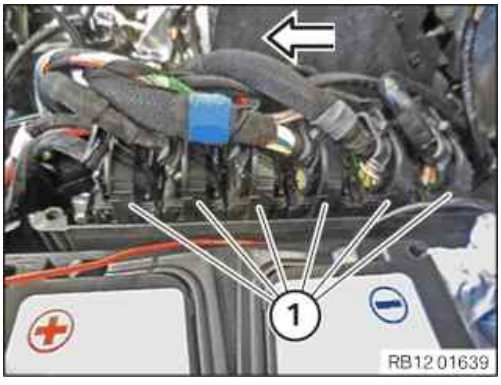
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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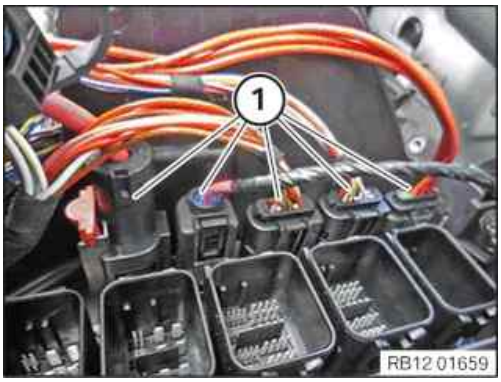
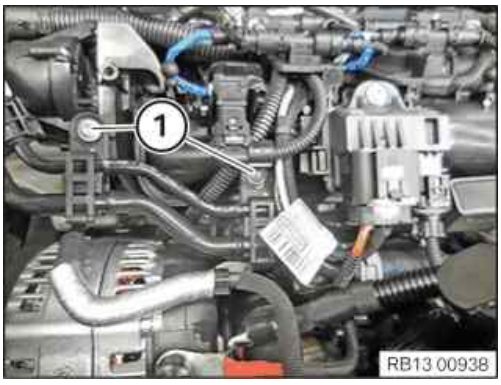
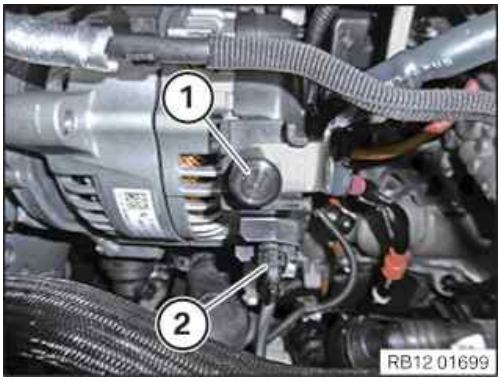


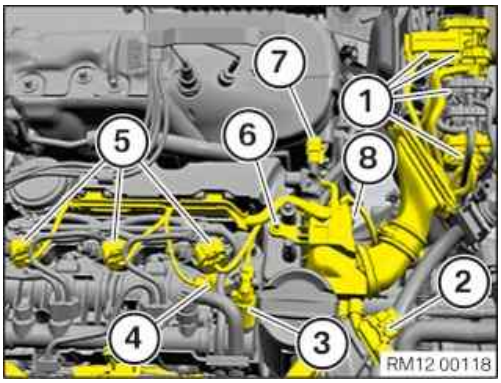
- Unlock and loosen connector (1).



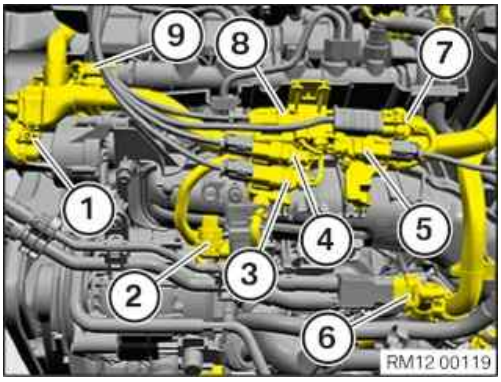
- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.

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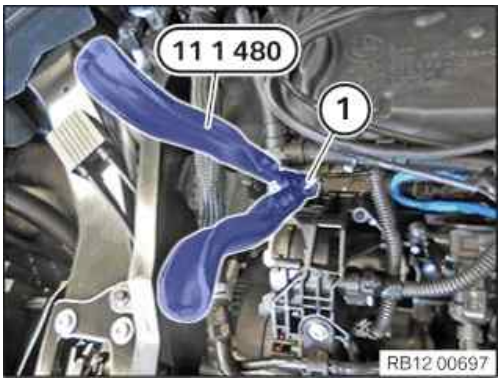
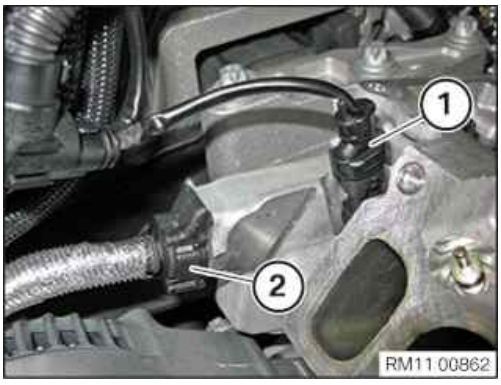
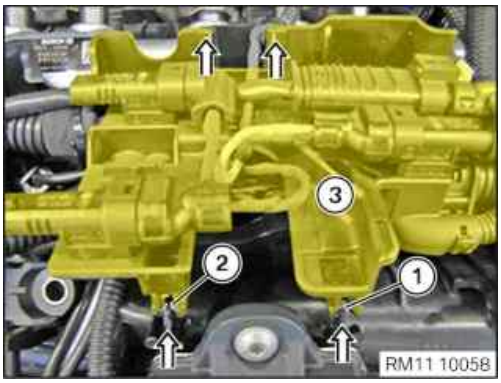


- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

19 – Removing the cable clips from the intake plenum



- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

20 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).

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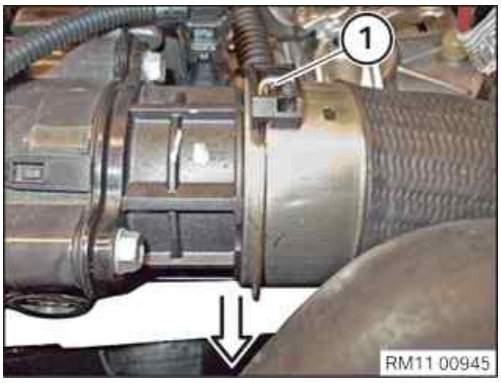
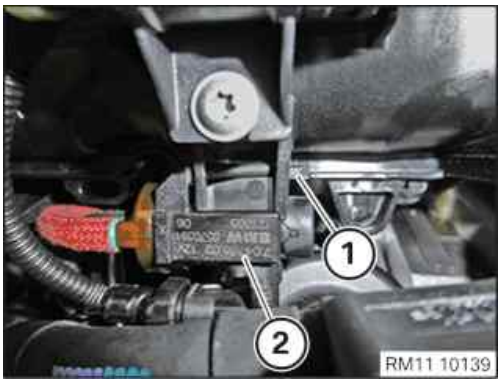
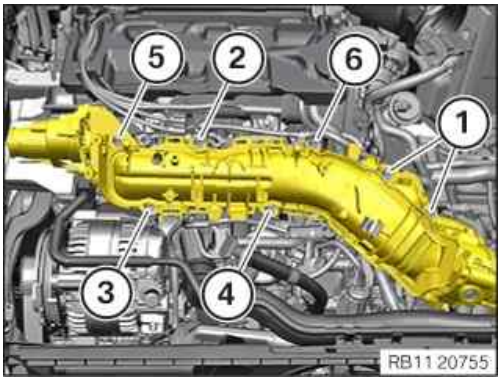


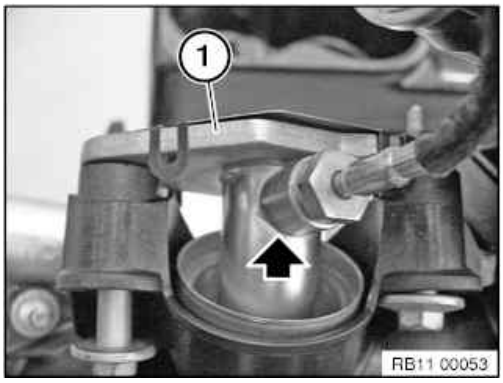
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

21 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

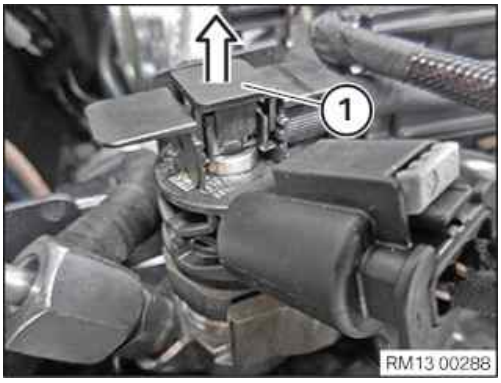
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

22 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

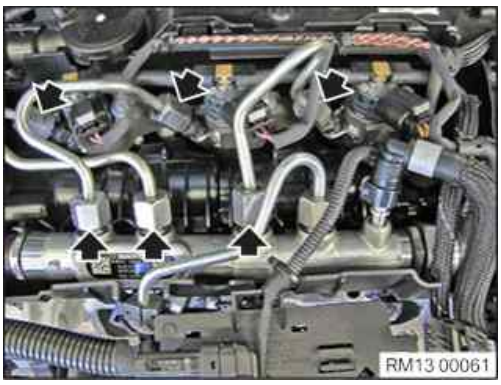
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

23 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

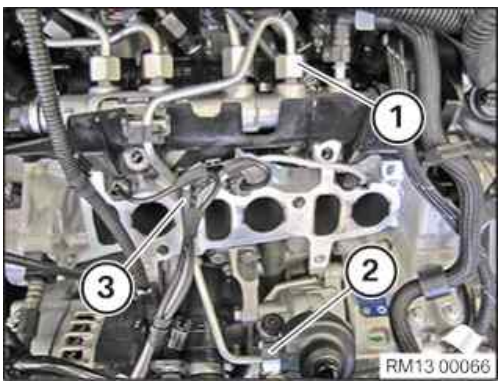
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

24 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

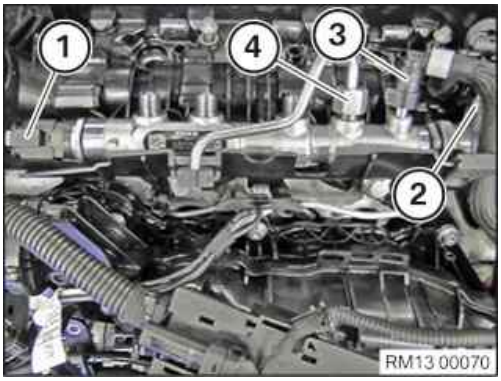
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

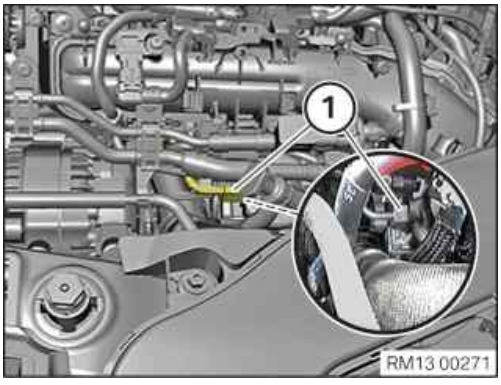
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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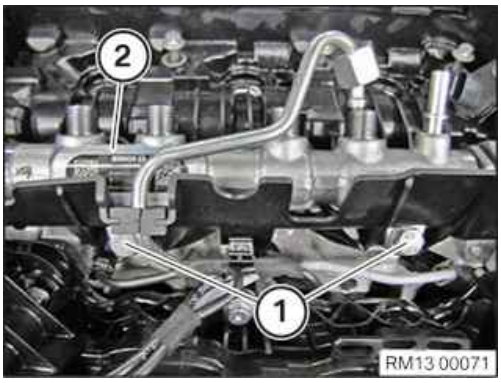

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

25 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

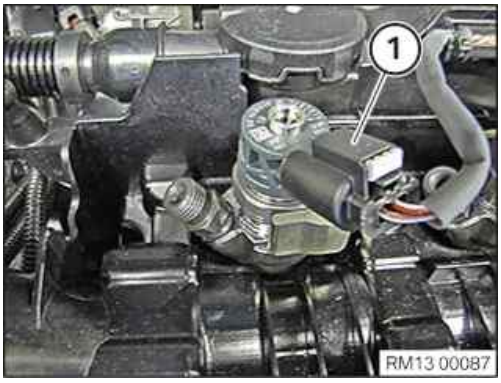
Electrostatic discharge.

Damage to or destruction of electrical components.

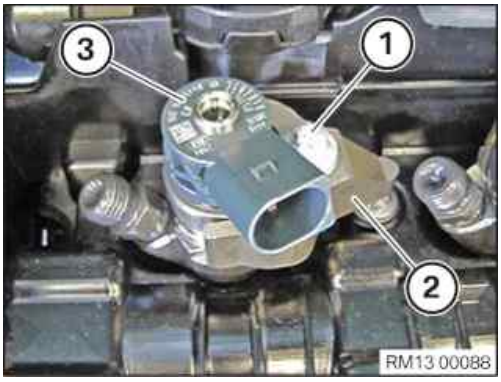
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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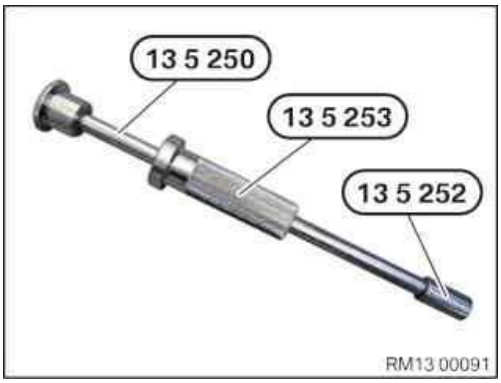
RISK OF DAMAGE

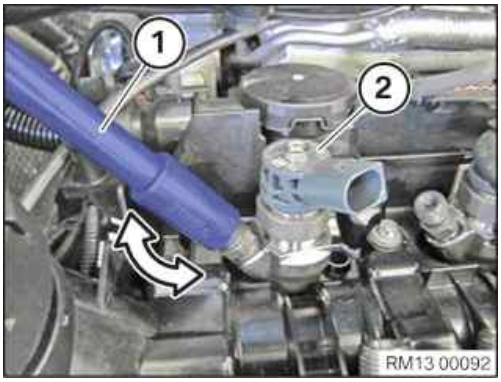
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

26 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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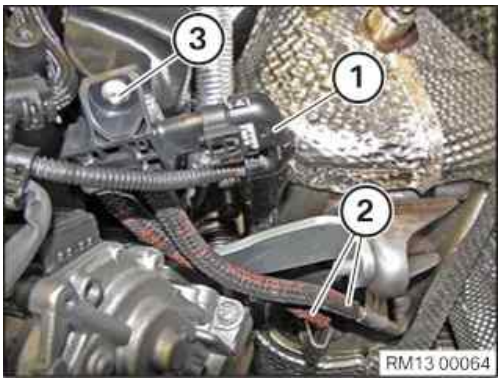
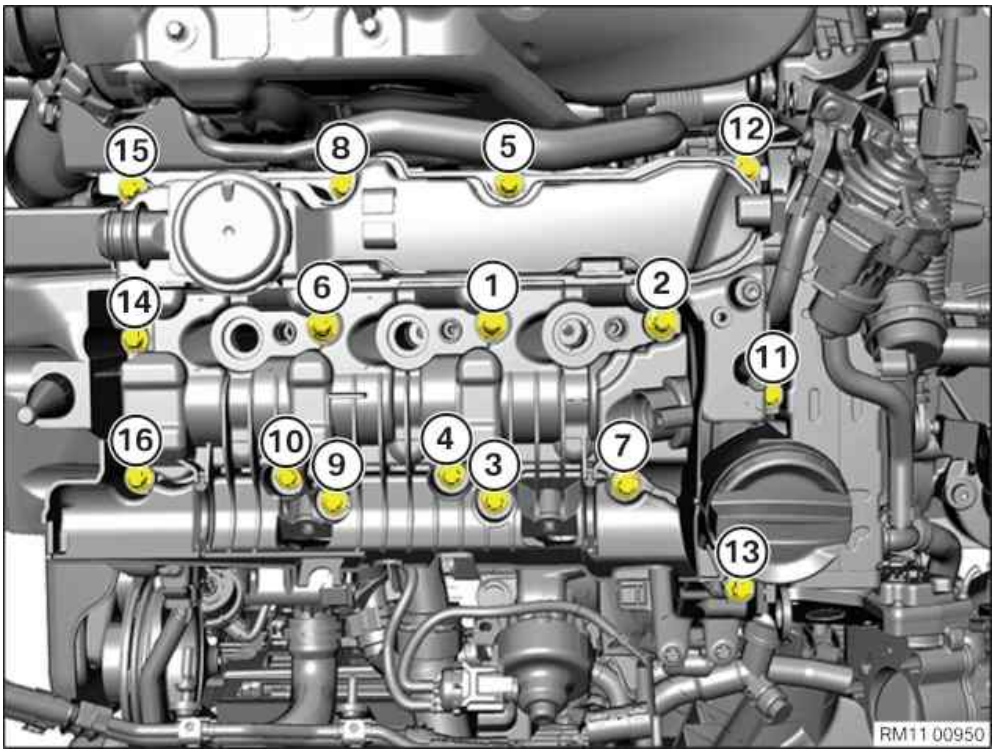


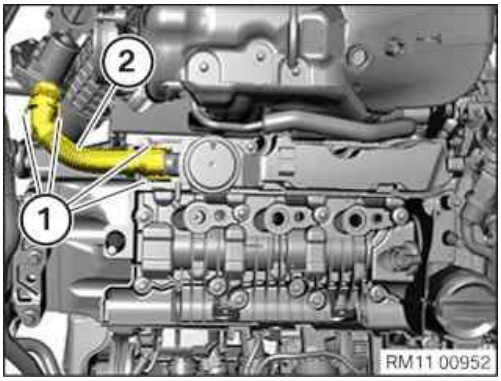
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

27 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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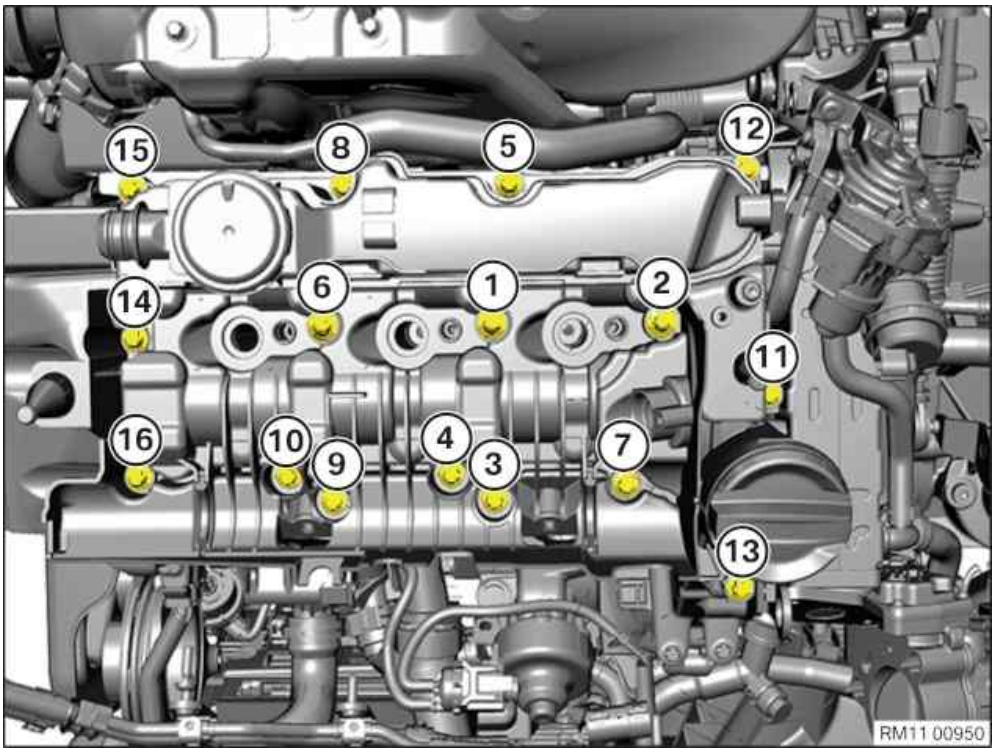

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

28 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

29 – Remove right charge-air line

- Release charge air duct screws (1) on oil sump.

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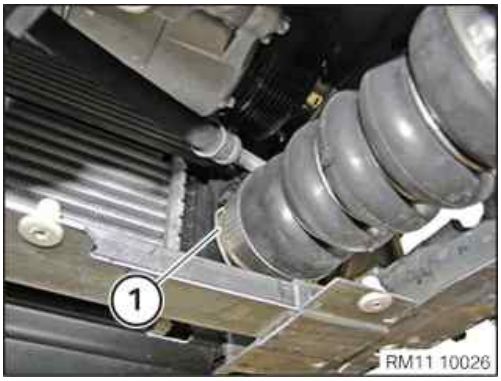
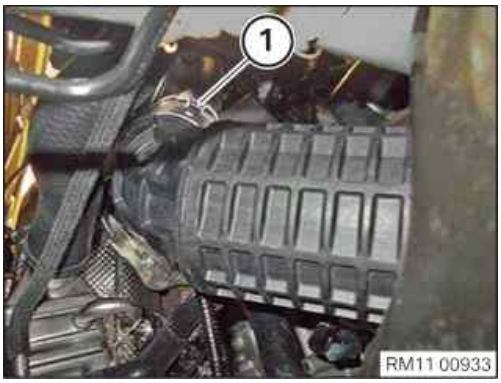
- Detach charge air duct screw connection (1) on crankcase.

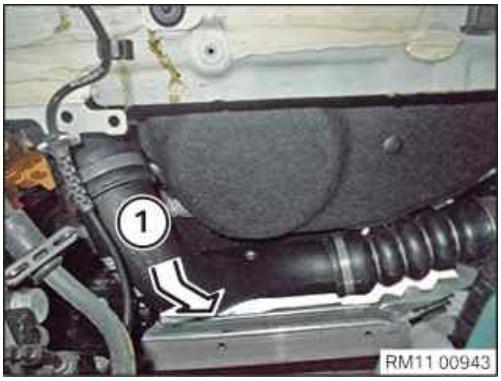
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

30 – Removing the acoustic cover for the engine at the front

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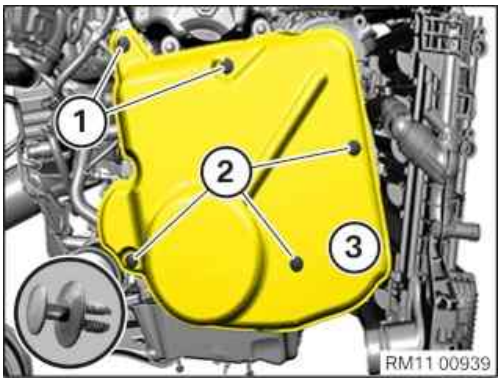


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

31 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

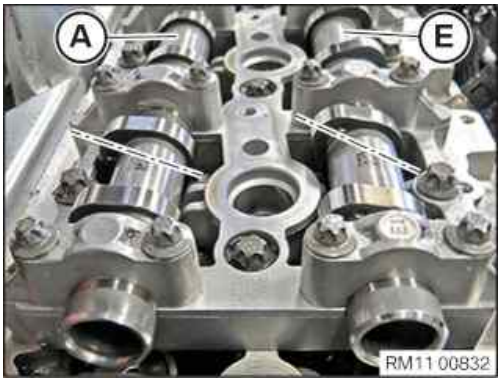
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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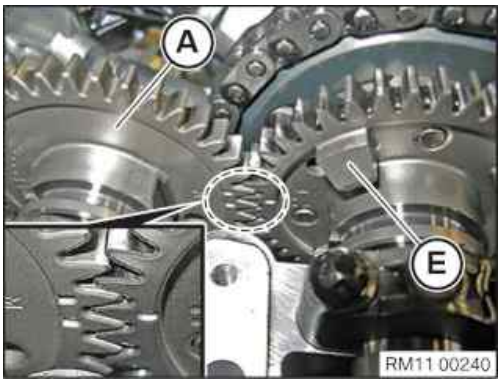
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

32 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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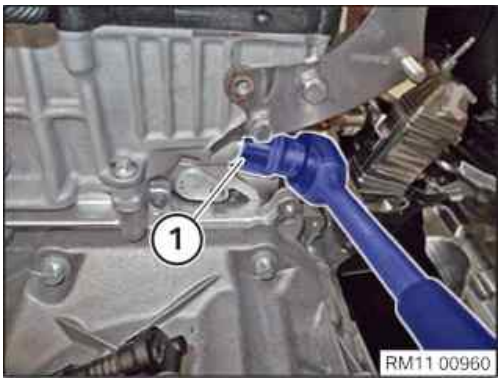
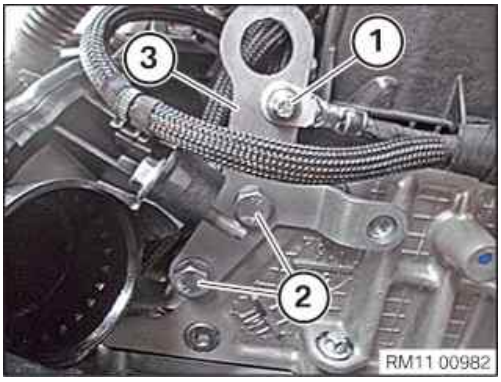


TECHNICAL INFORMATION

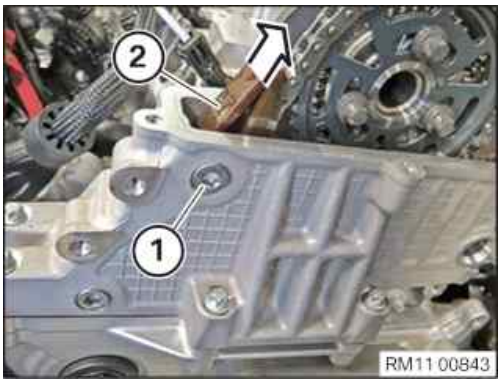
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

33 – Remove the timing chain guide rail

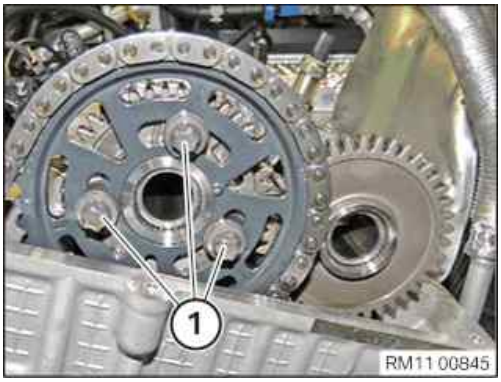


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

34 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

35 – Removing the camshaft support

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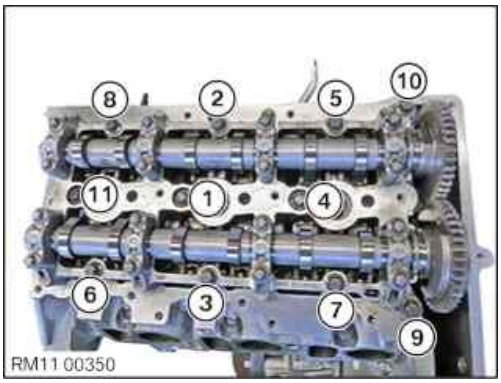
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

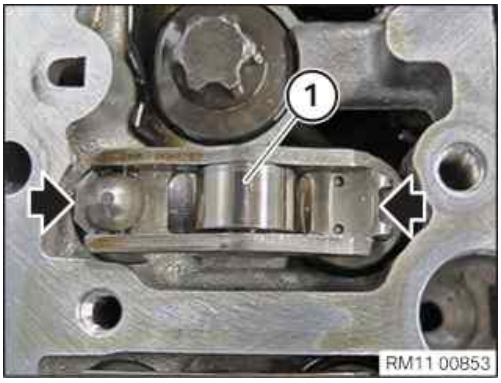


- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

MAIN WORK

36 – Remove roller cam followers



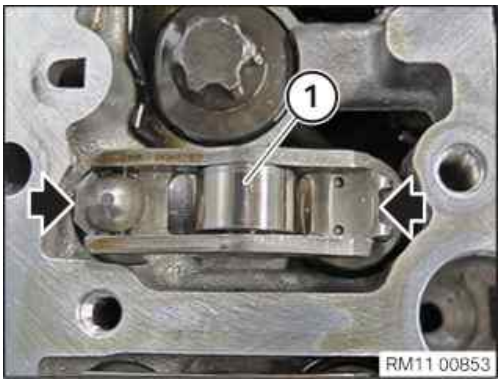
- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

37 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.



- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

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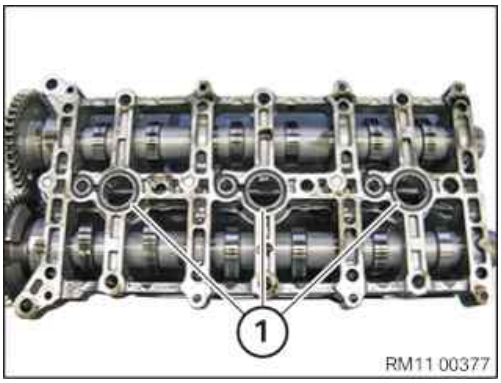
38 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

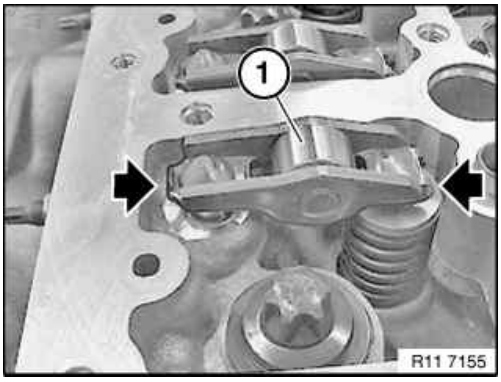
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

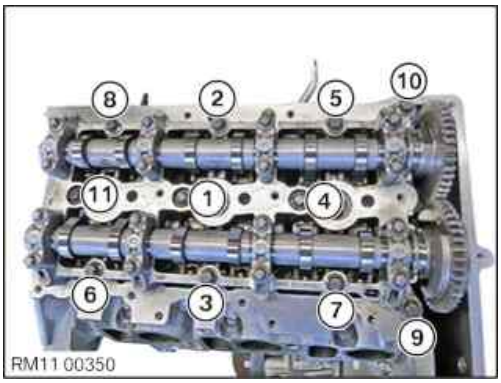


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.

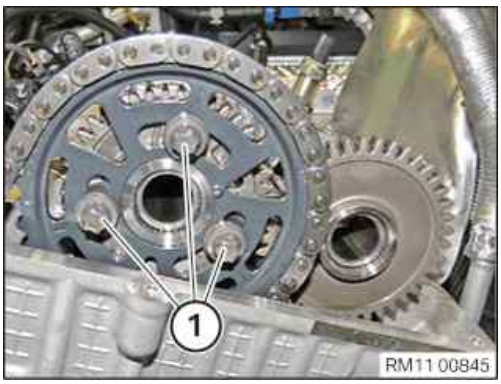


- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

39 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

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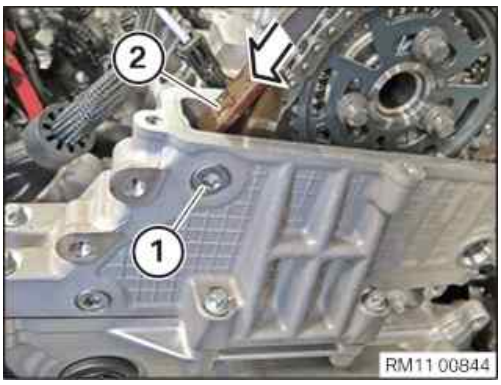
40 – Install the timing chain guide rail



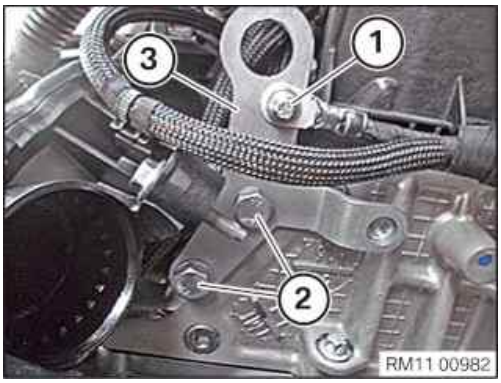
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

41 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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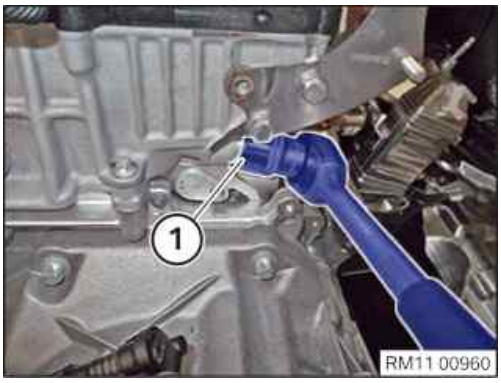
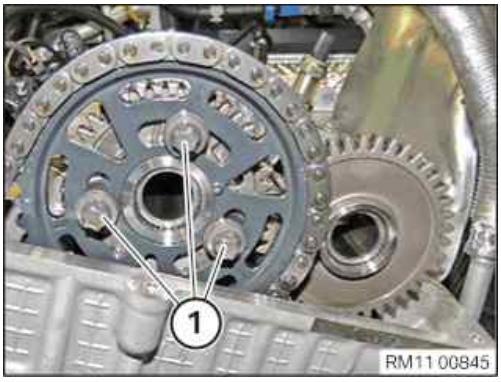


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

42 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

43 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

44 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

45 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

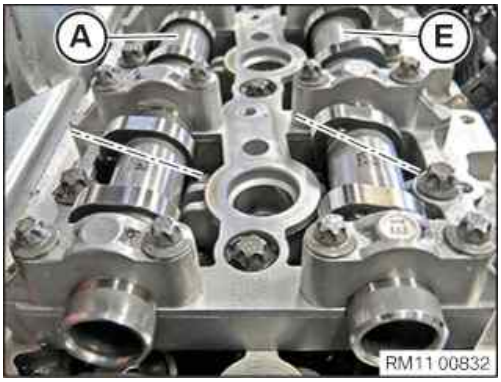
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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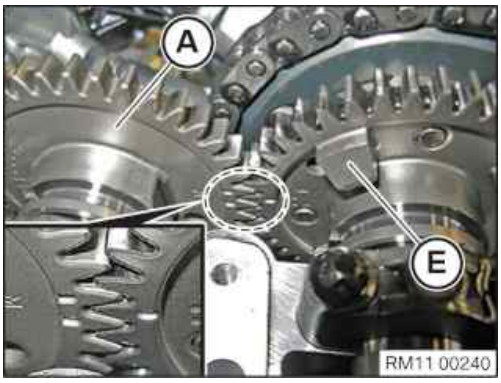


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

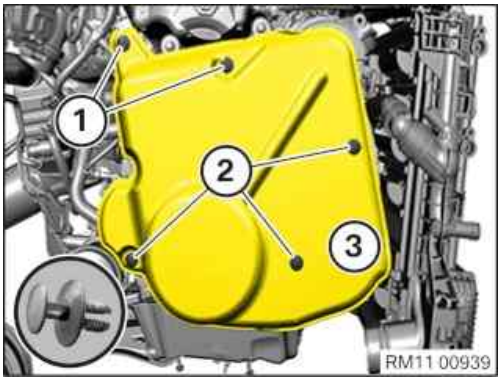
TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

46 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

47 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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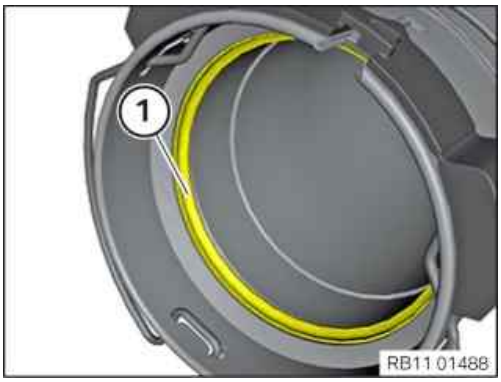
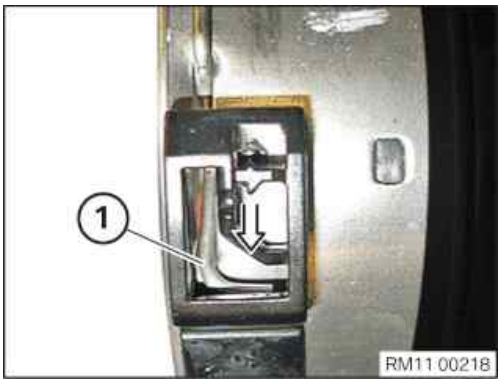
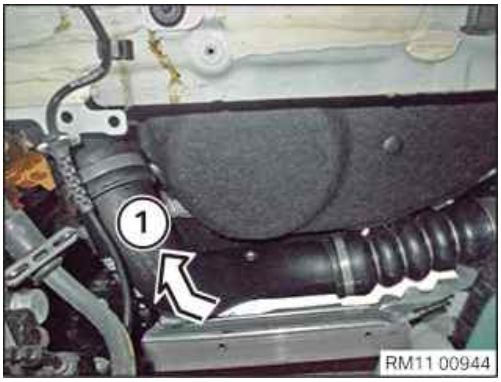


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

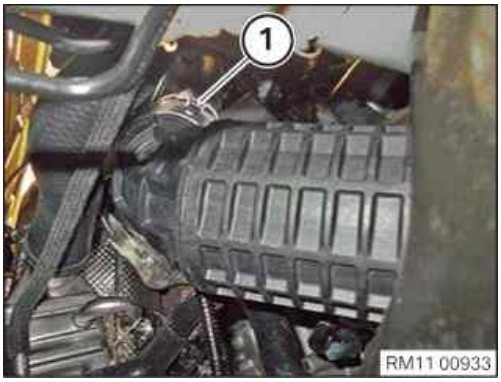
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

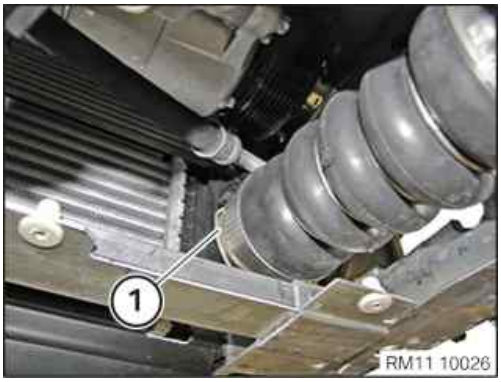


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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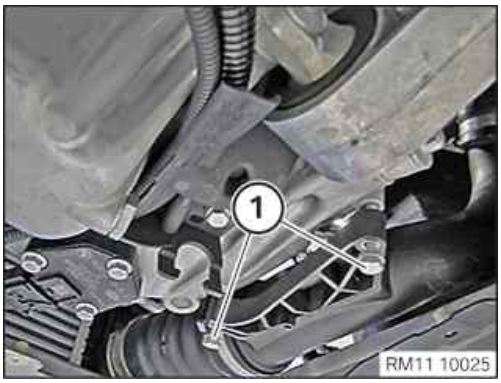
- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

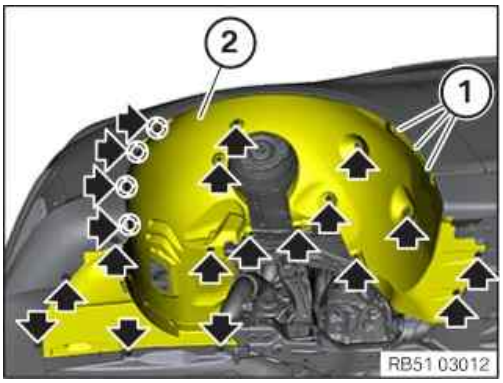


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

48 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

49 – Installing cylinder head cover

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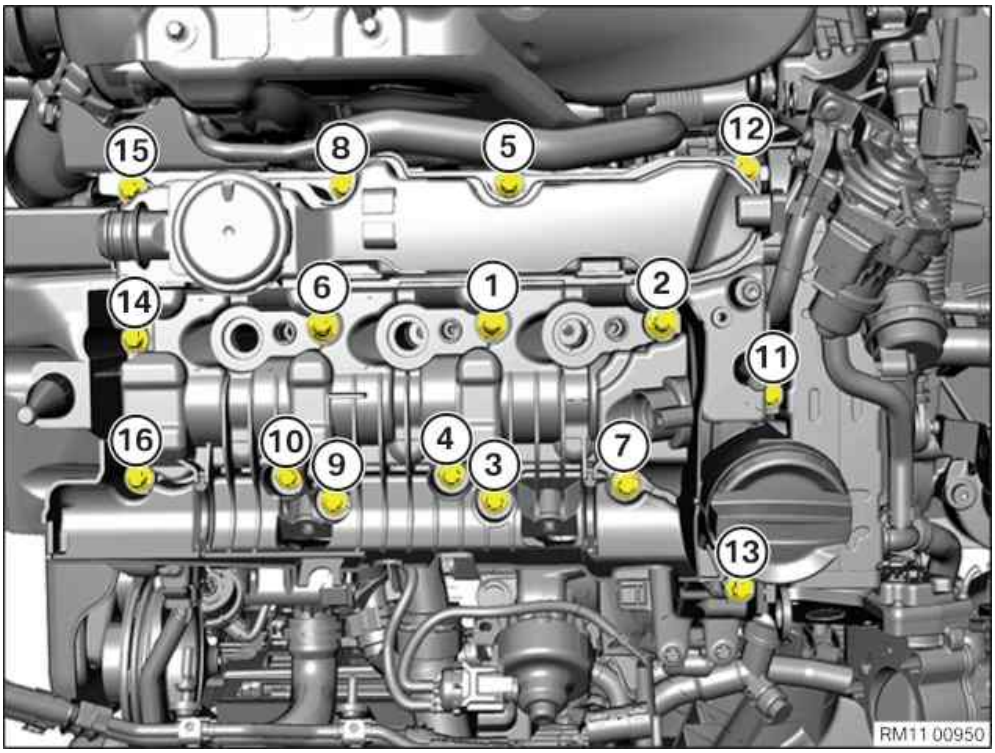
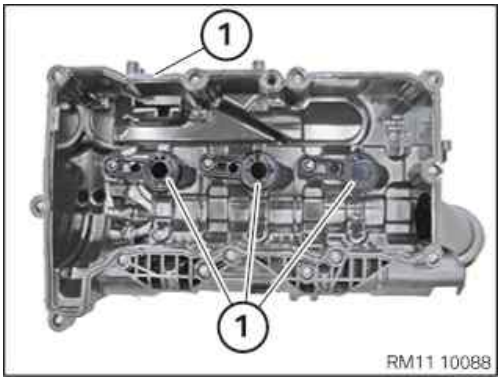
Overview: Screw connection of the cylinder head cover

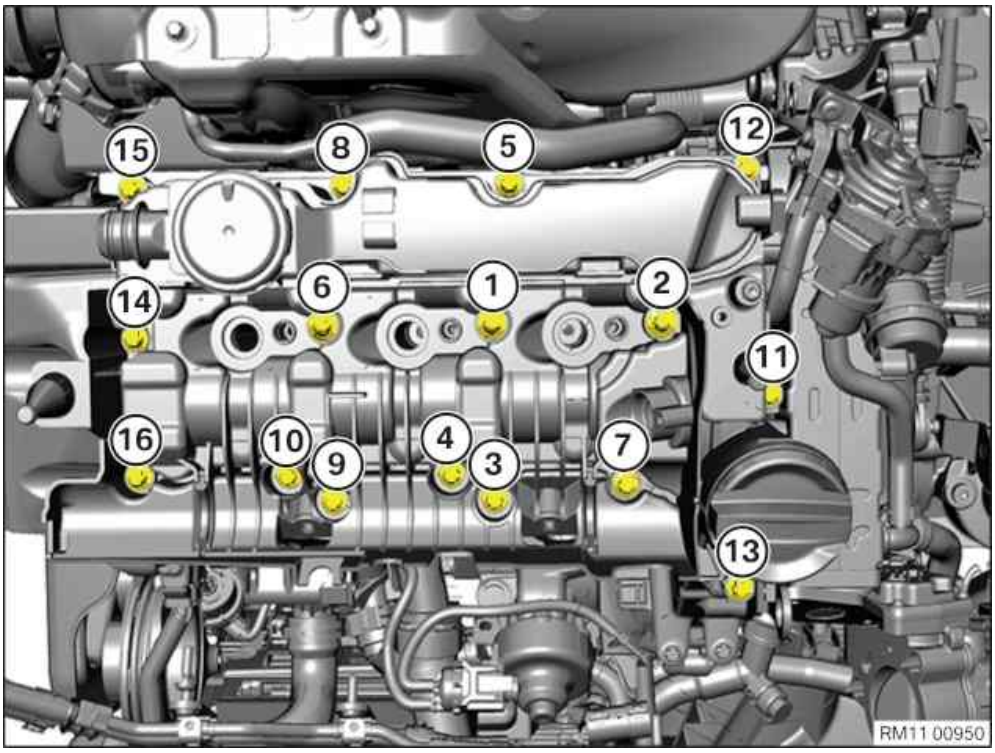


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nm

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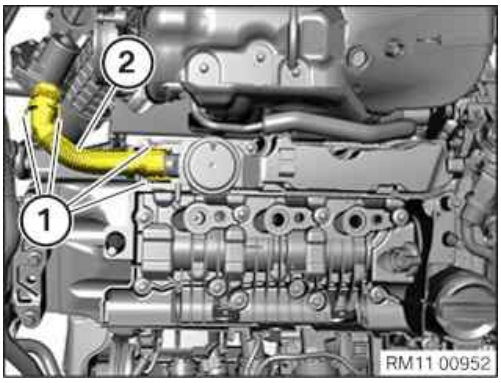
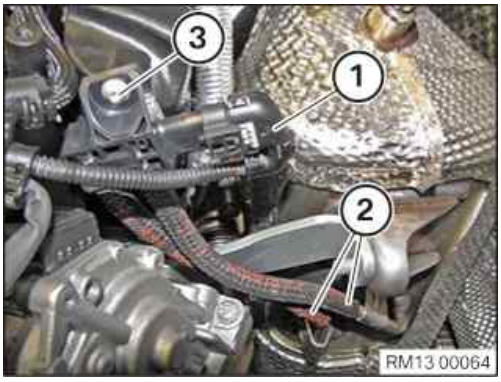


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

50 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

51 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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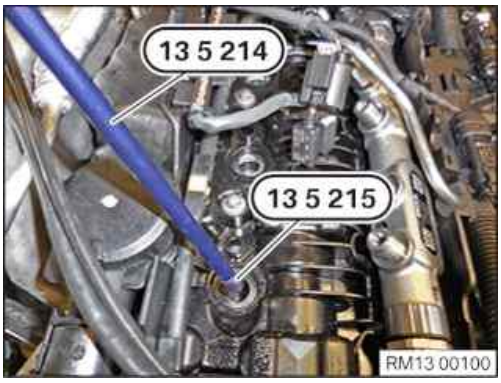
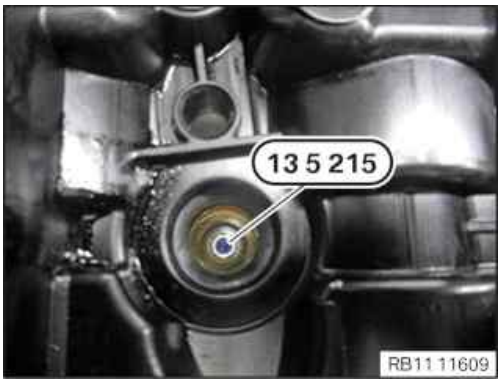


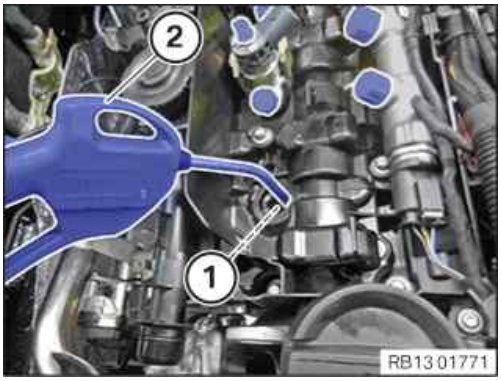
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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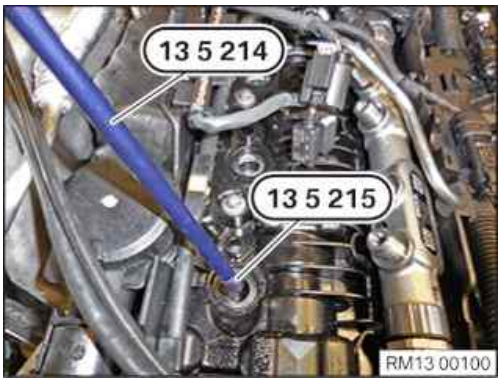


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

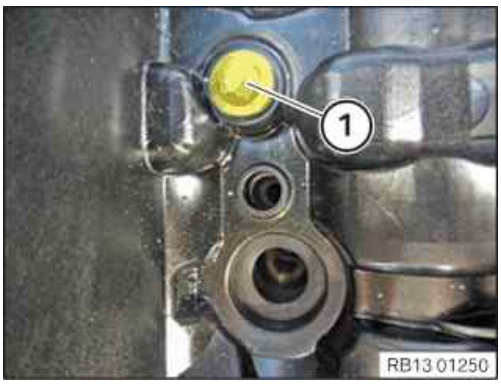
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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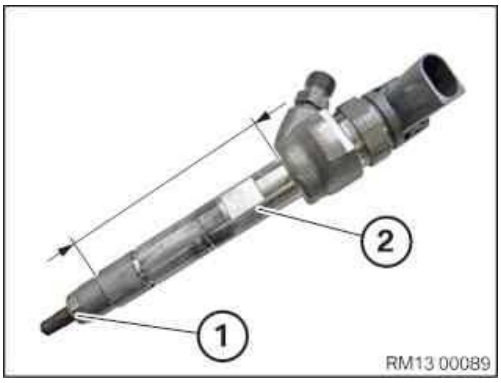


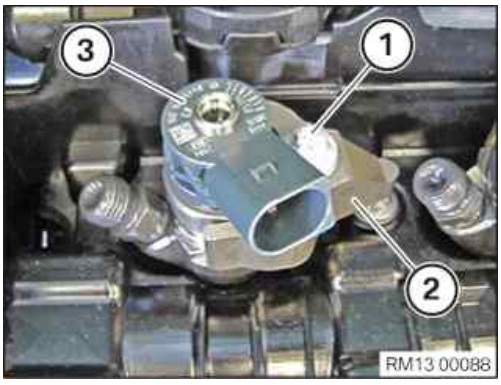
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

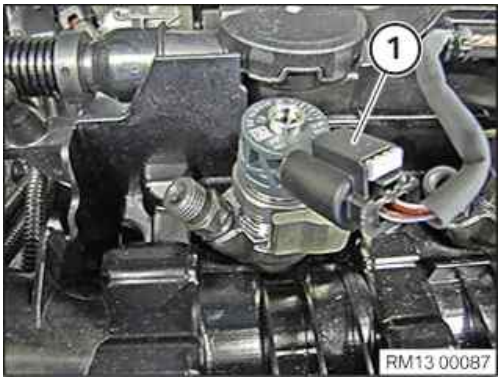
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

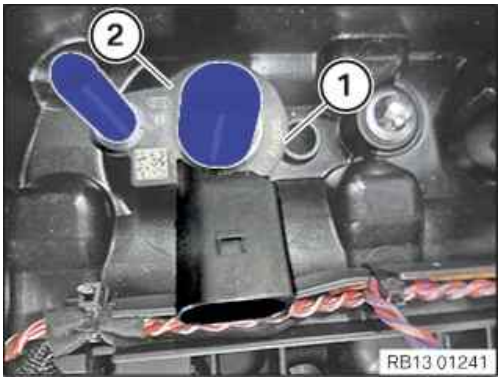
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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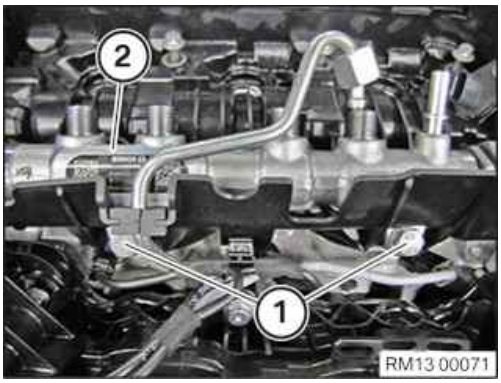
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

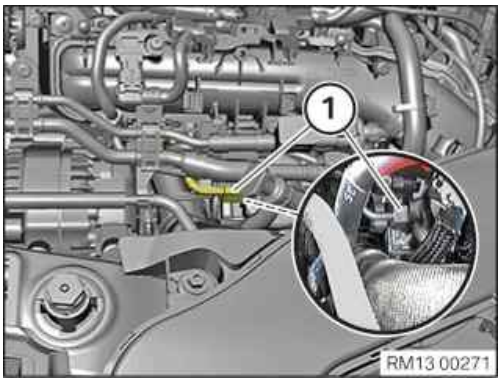
52 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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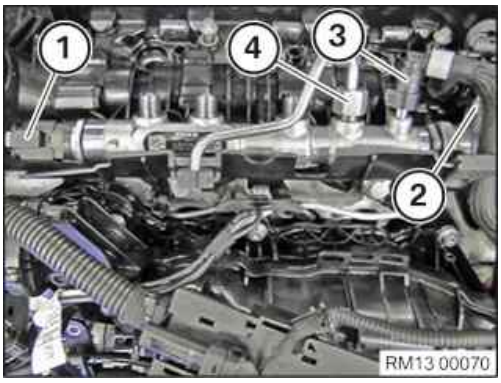

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

53 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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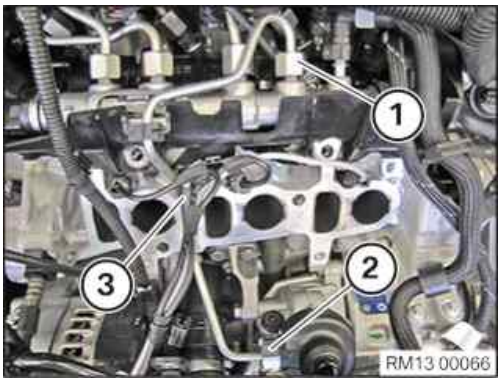

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

54 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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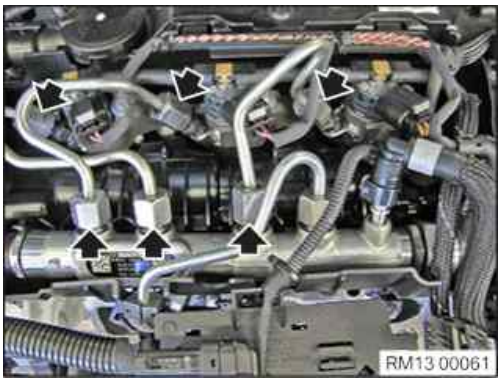

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

55 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

56 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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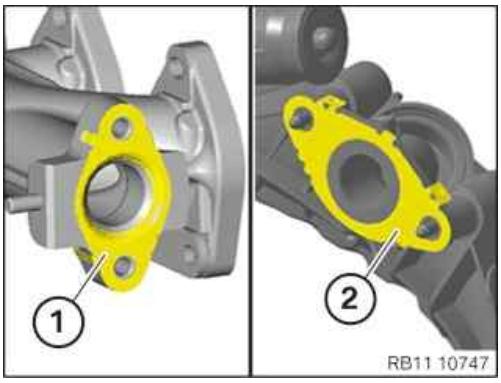
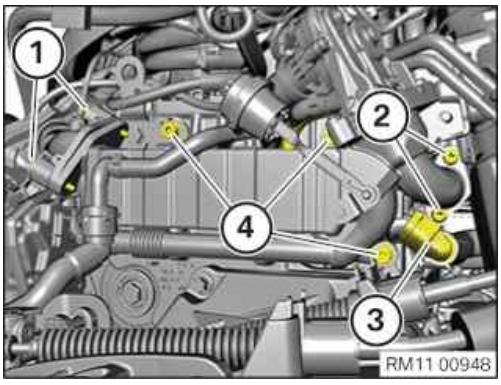


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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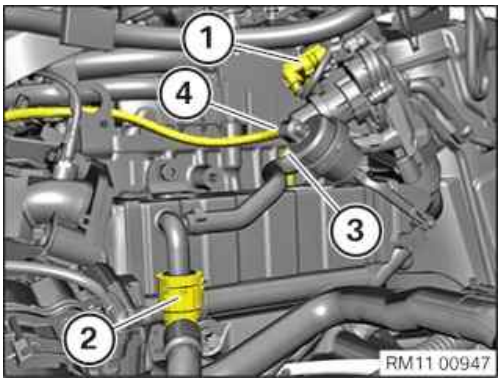


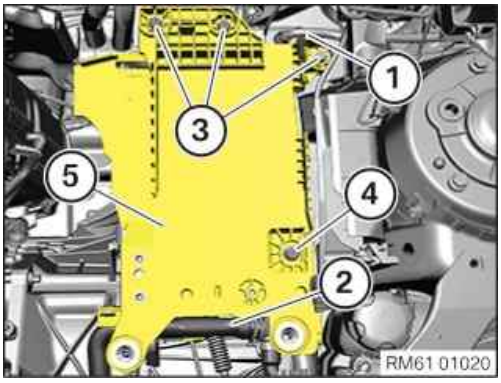
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

57 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

58 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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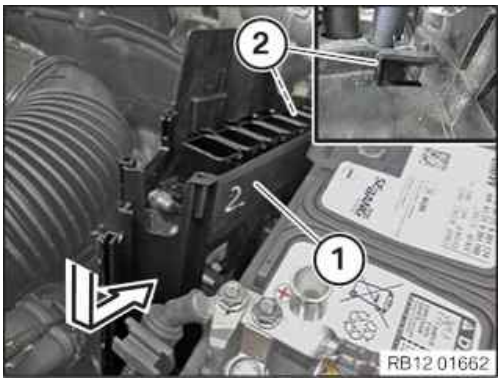
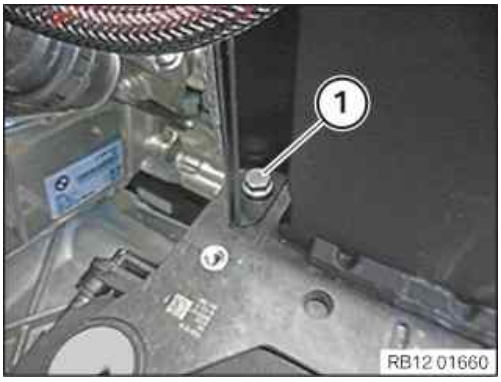


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

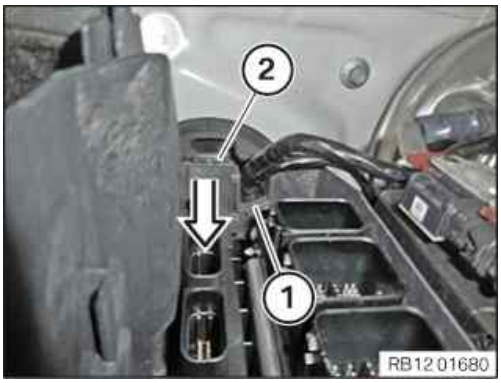
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



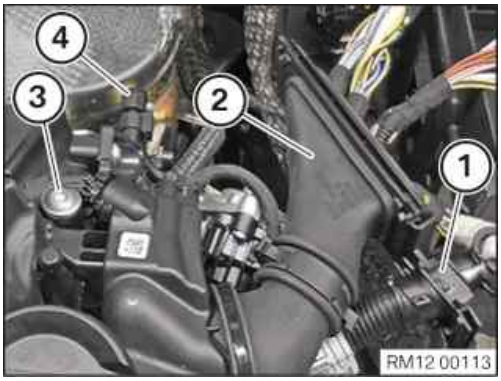
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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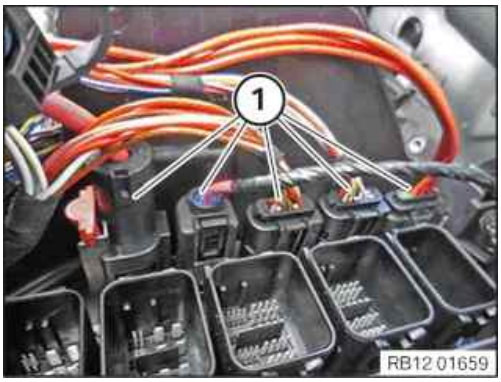
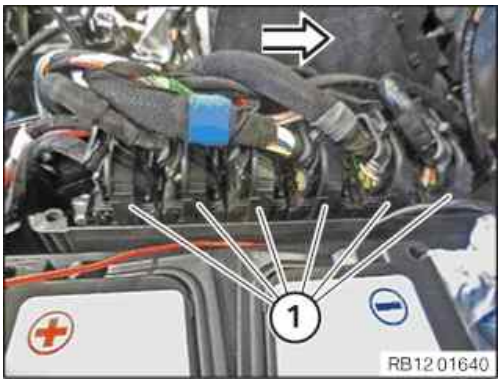
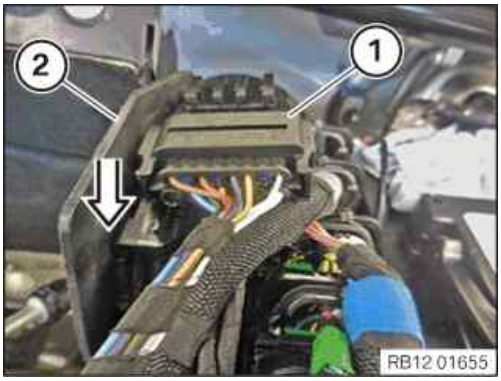


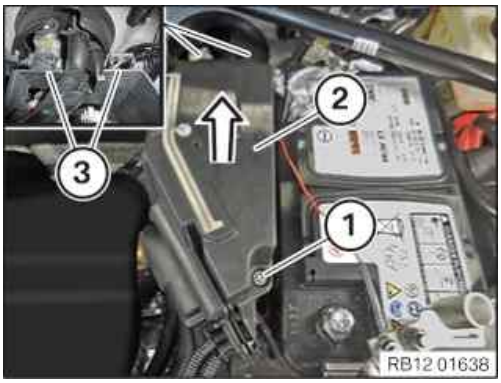
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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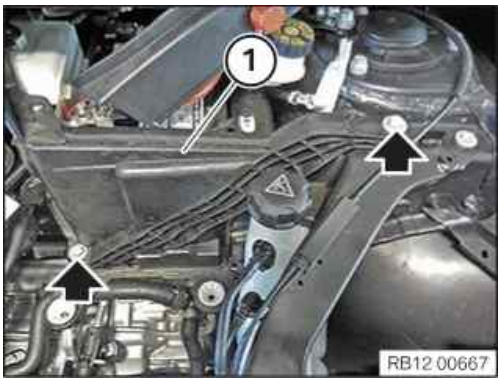


- Feed in and install tension strut (1).
- Tighten screws (arrows).

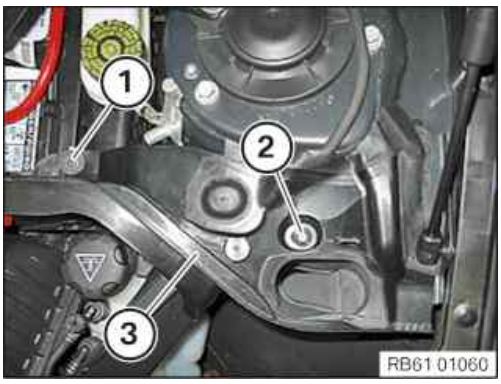
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

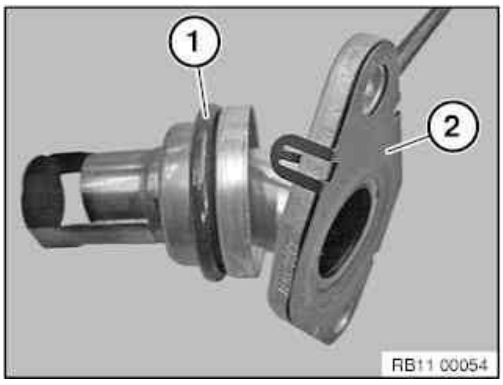


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

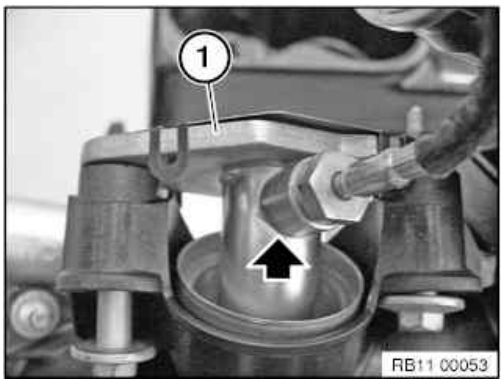
59 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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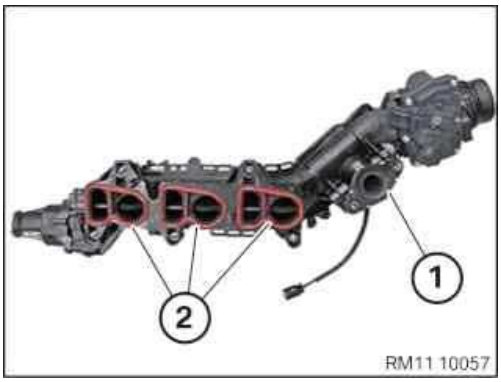
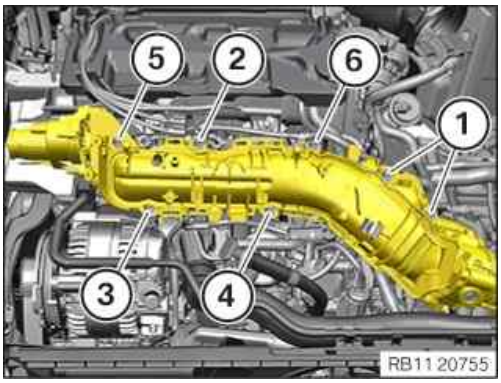


- Renew gaskets (2).

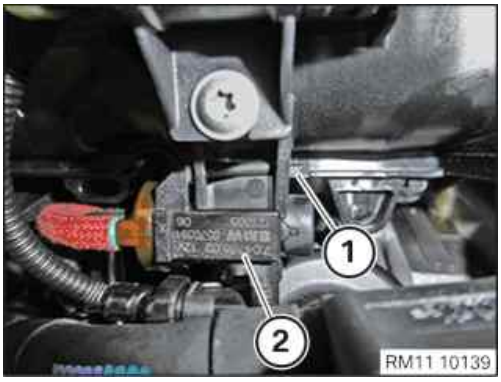
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



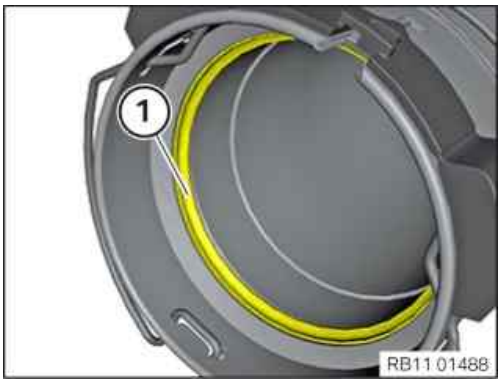
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

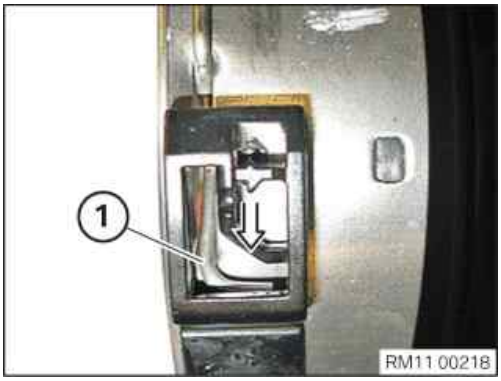


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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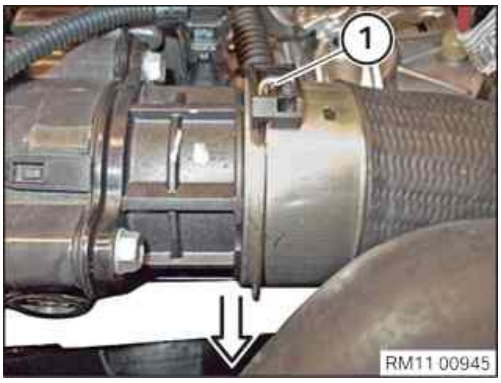
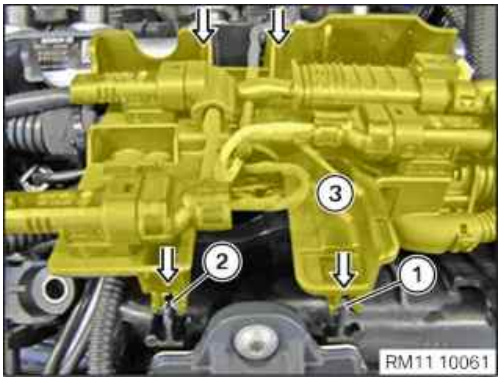


- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

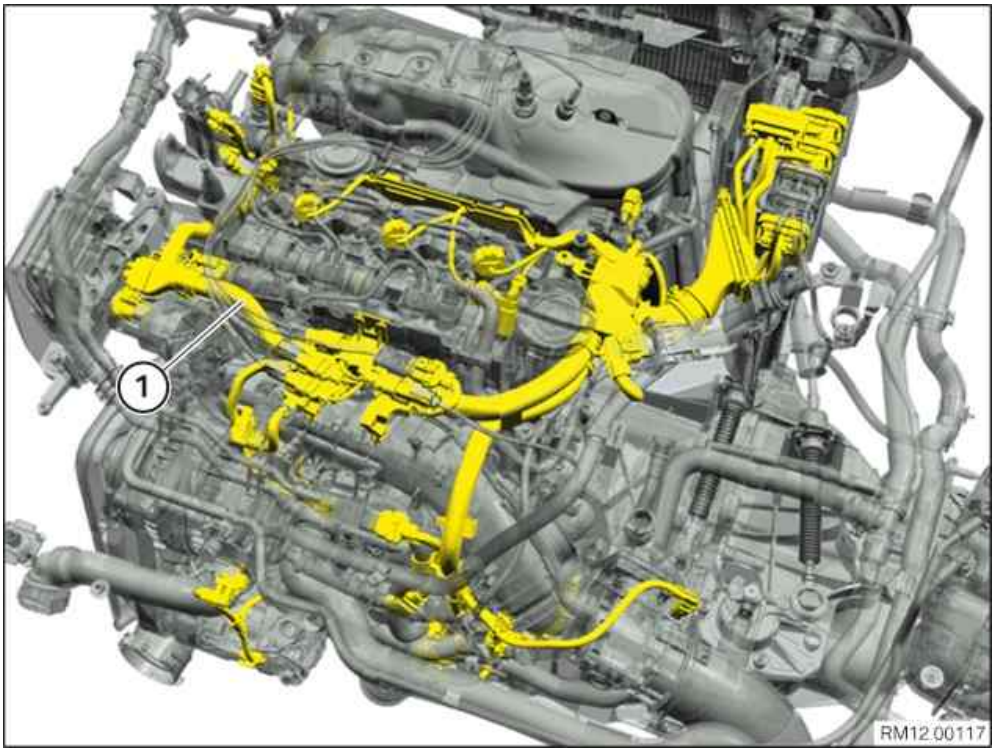
60 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

61 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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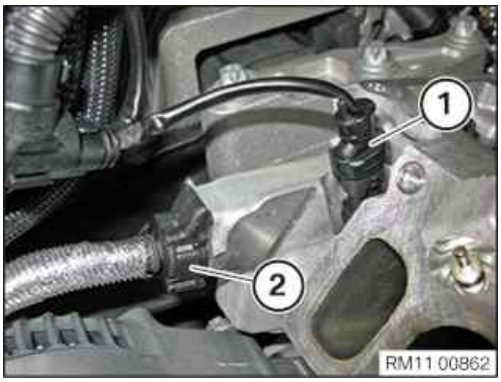
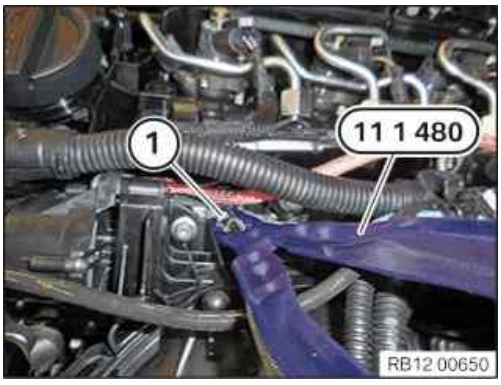
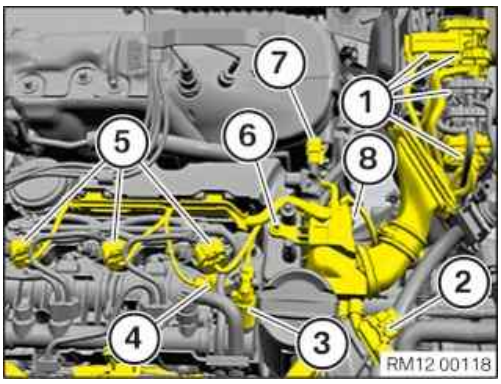


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

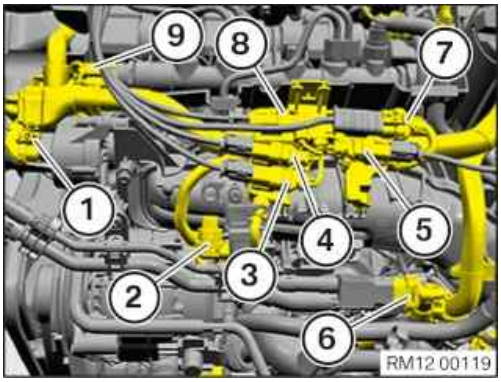


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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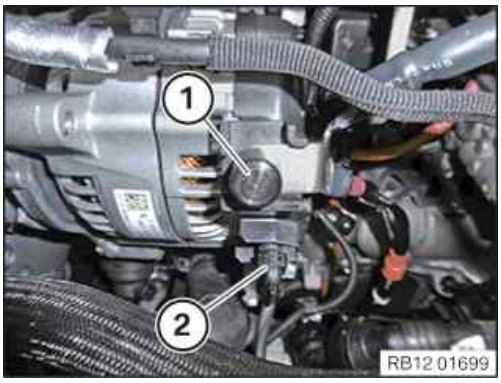
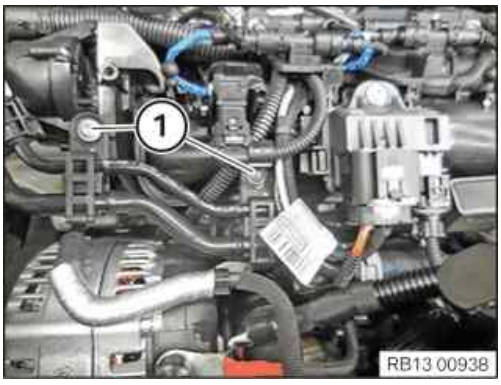


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

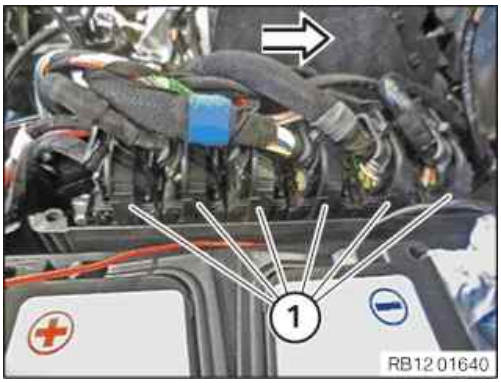


- Position fuel lines.
- Tighten the screws (1).

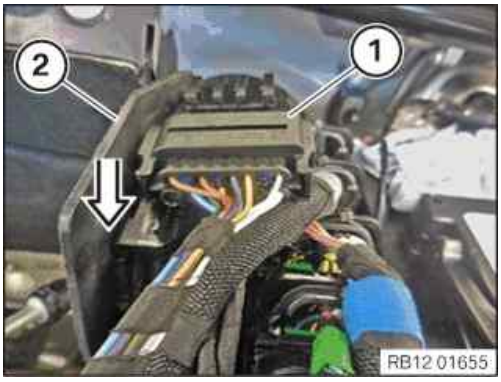
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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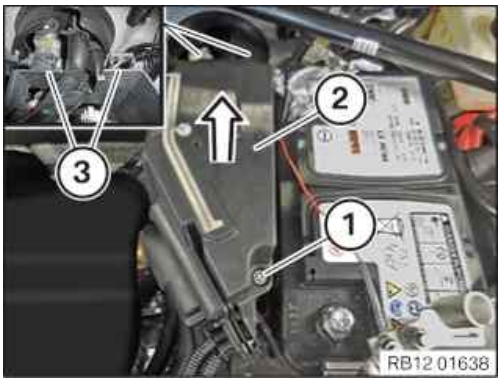
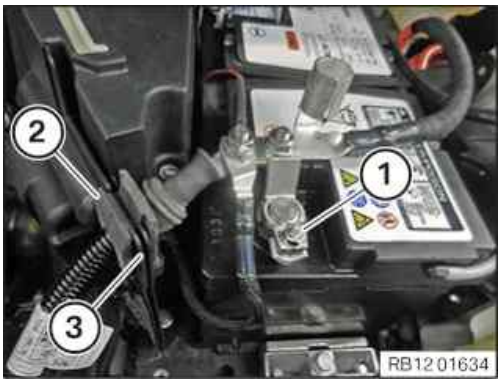


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

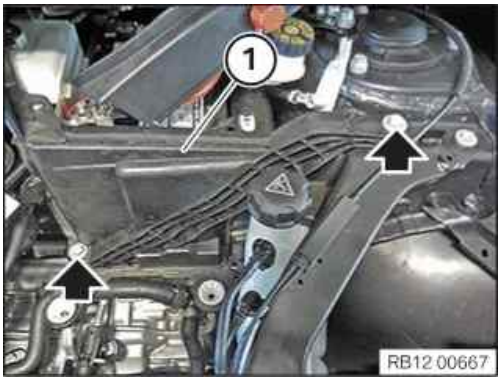
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

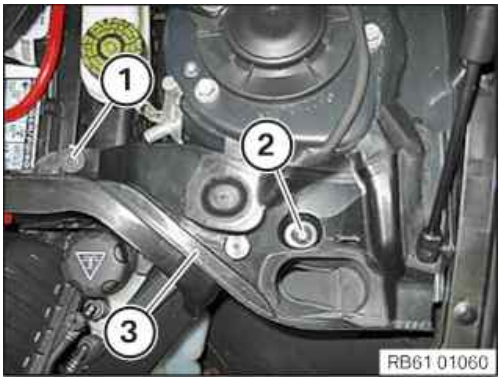
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm

62 – Partially securing clean air pipe

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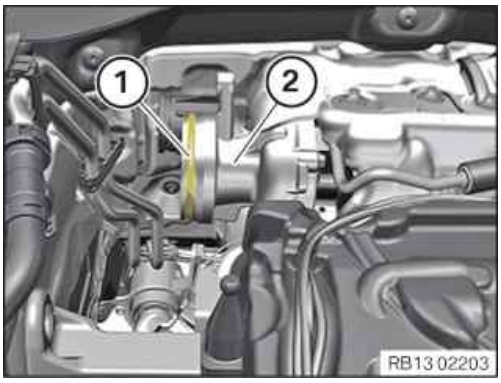
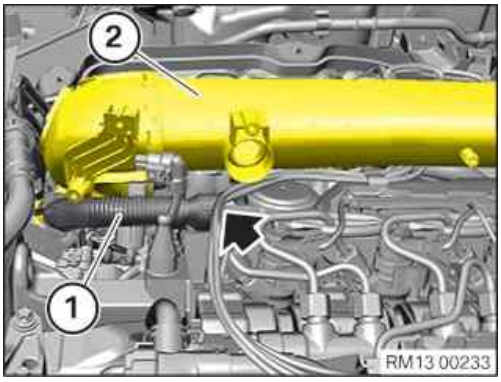
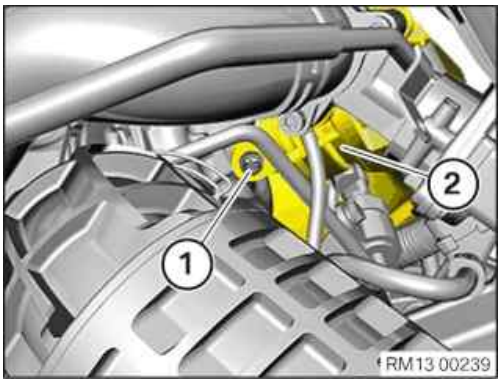


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

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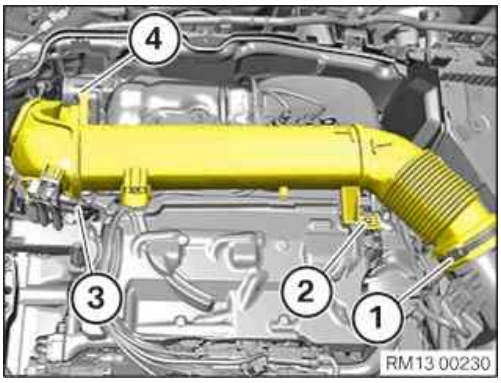


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

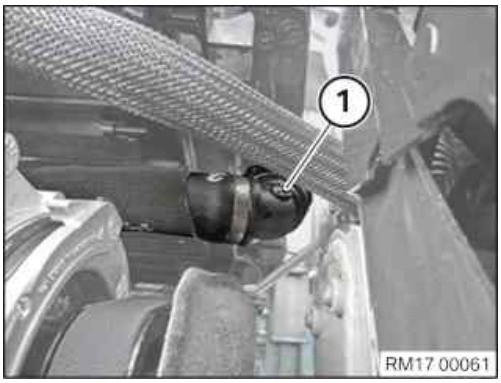
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

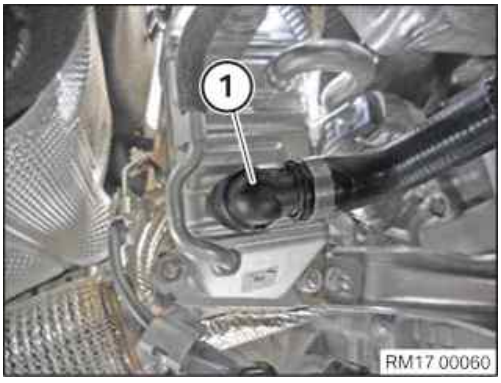
63 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

64 – Installing the front underbody protection

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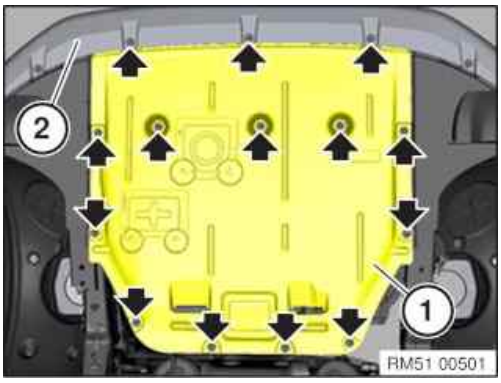
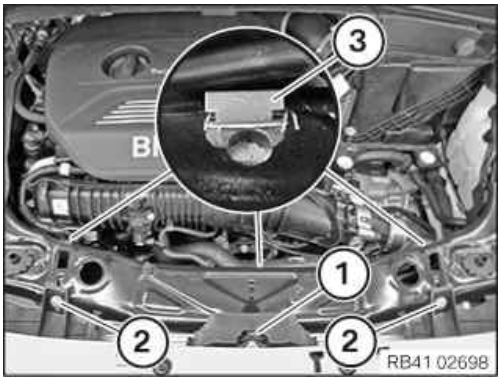


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

65 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

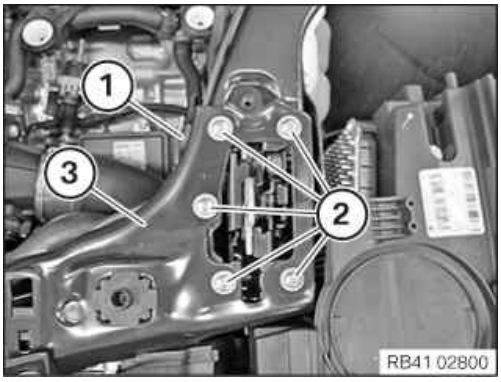
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

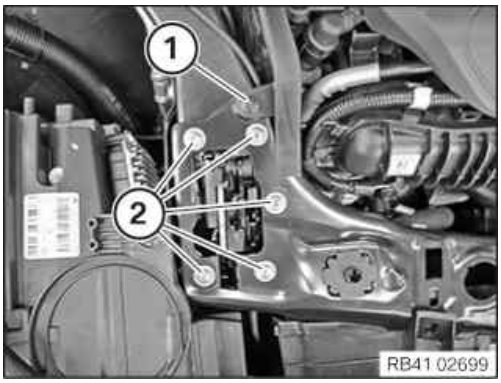


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

66 – Installing intake silencer housing

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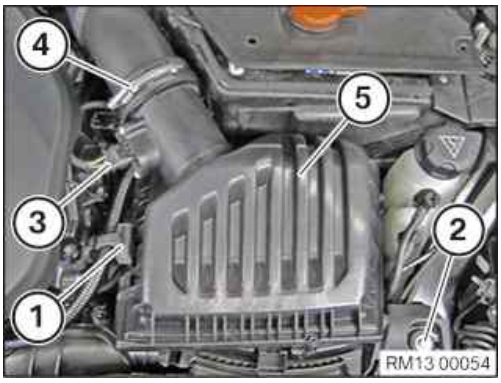


- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

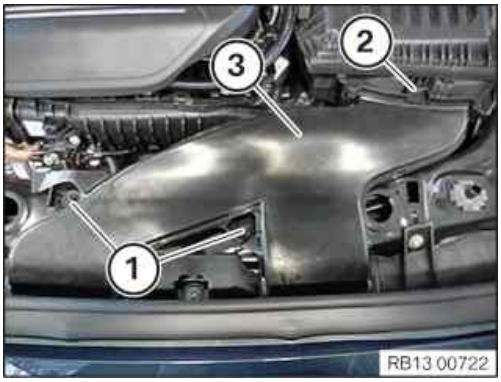
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

67 – Install the intake neck for the intake filter housing

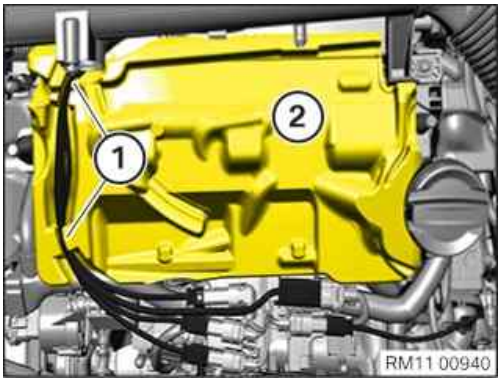


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

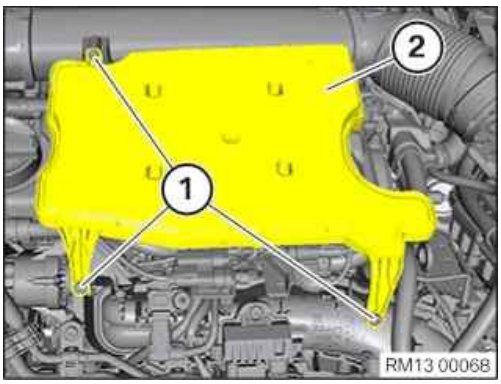
M6		Tightening torque	8 Nm

68 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

69 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

70 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

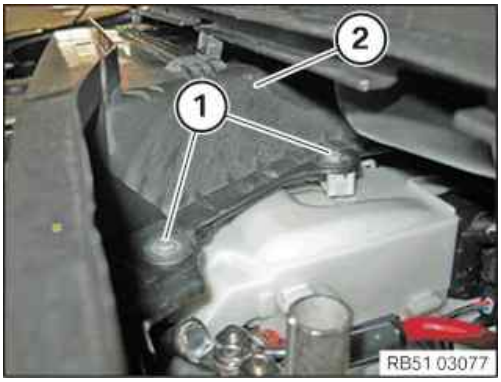
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

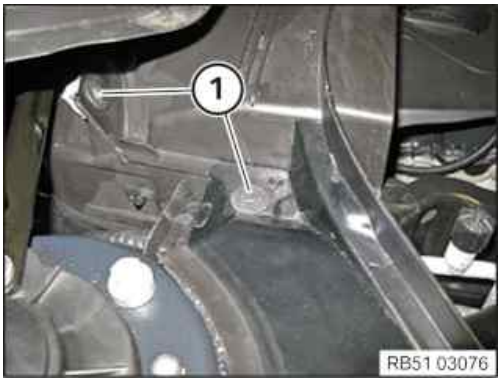
71 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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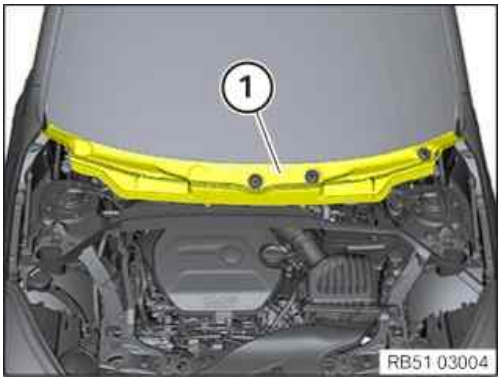
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

72 – Install the rear cowl panel cover



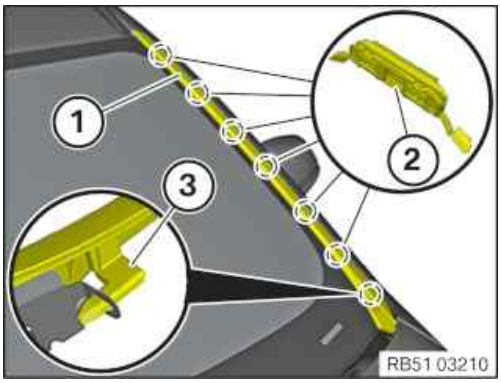
- Feed in and engage the rear cowl panel cover (1).

73 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

74 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the wiper arm**

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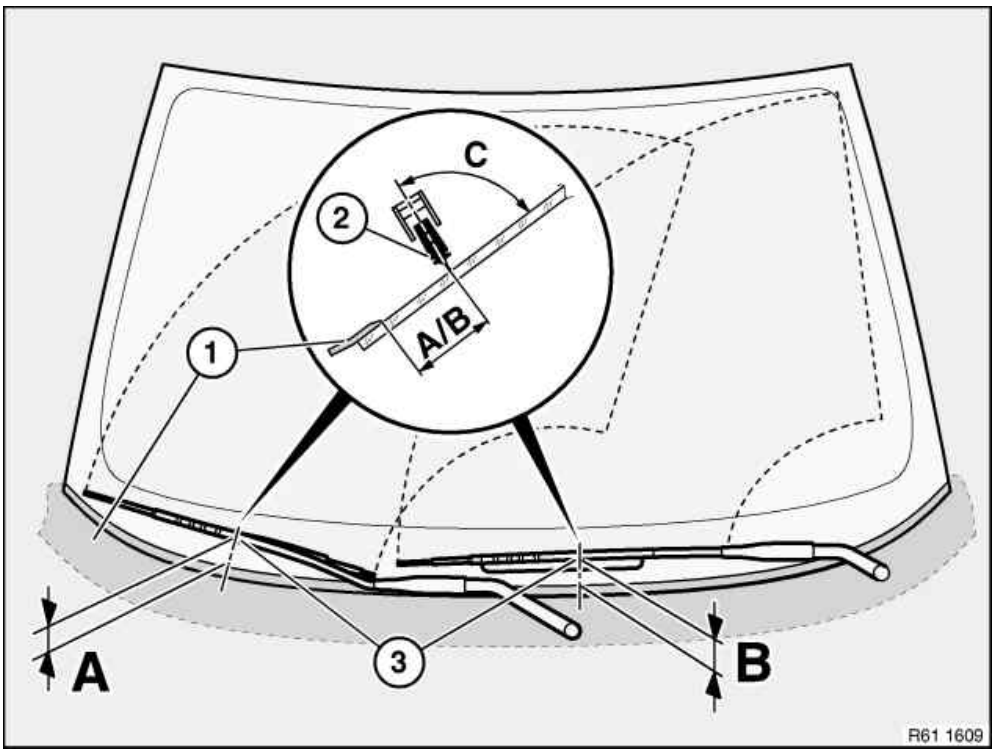
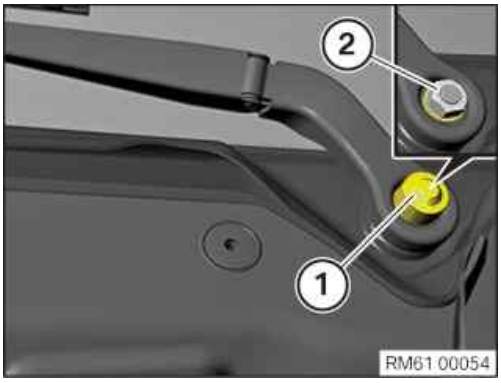
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

75 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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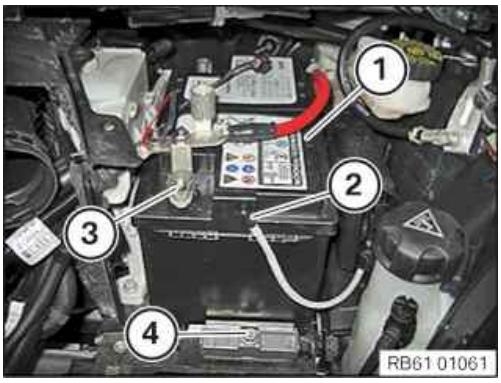


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

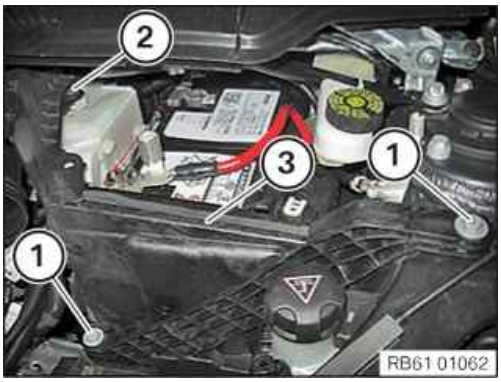
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

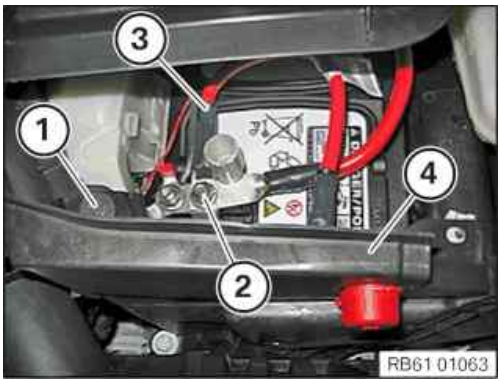
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

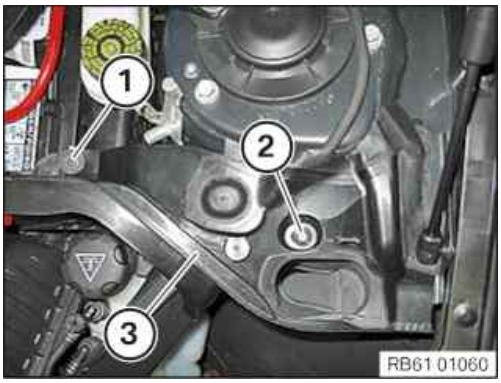
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

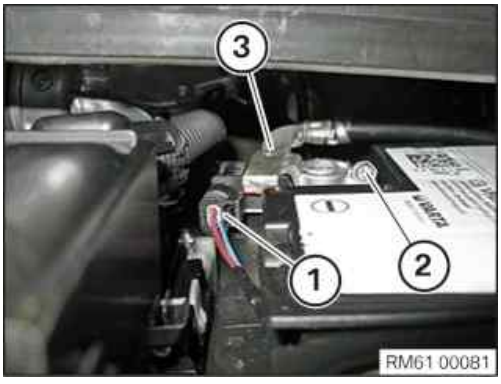
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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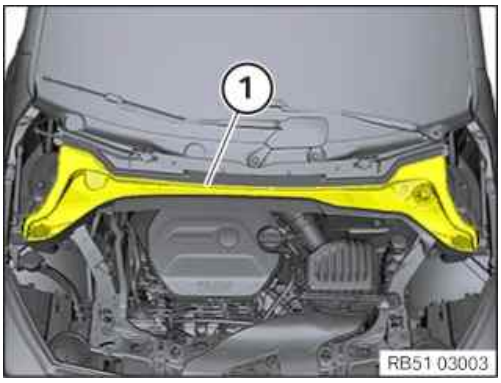
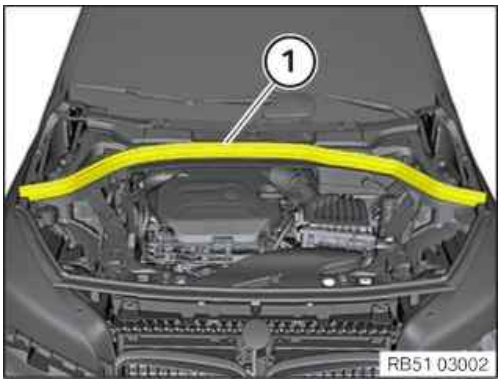


- Feed in the cowl panel cover (1).



- Press the gasket (1) in a downwards direction.

76 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

- See additional information.

Additional Information

Overview of Tightening Torques

Camshaft carrier to cylinder head			Used in step 38
M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head			Used in step 40
M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8			Used in step 40
M8		Tightening torque	19 Nm

Standard screw connection M6			Used in step 40
M6			8 Nm

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Chain tensioner piston to cylinder head

Used in step 41

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 42

M7x17.			17 Nm

Charge air line to crankcase

Used in step 47

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 47

M6		Tightening torque	8 Nm

Wheel arch cover

Used in step 48

Screw			3 Nm
Plastic nut			2,6 Nm

Cylinder head cover to cylinder head

Used in step 49

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 50

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 50

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 51

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 51

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 52

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 52 53

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 54

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 56

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 56

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 56

M8x28	Replace screws	Tightening torque	32 Nm

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Exhaust-gas recirculation cooler to cylinder head — Used in step 56

M8x20		Tightening torque	19 Nm

Battery holder to engine support — Used in step 57

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray — Used in step 58

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 58 61

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 58 61

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 58 61

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 58 61

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 58 61

		Tightening torque	3 Nm

Battery cover — Used in step 58 61 75

Screw			2,8 Nm

Intake plenum to cylinder head — Used in step 59

M6		Tightening torque	11 Nm

Positive battery cable to alternator — Used in step 61

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 61

TS6x20		Tightening torque	5 Nm

Clean air pipe to exhaust turbocharger — Used in step 62

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 62

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 62 66

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 64

			3 Nm

Bracing strut to top cross connection — Used in step 65

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 65

M6x20 screw		Tightening torque	6 Nm

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Cross connection on support for cross connection — Used in step 65

M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge — Used in step 66

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 67

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe — Used in step 69

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 71

Screw		Tightening torque	3 Nm

Windscreen wiper arm — Used in step 74

Combination hexagon nut		Tightening torque	35 Nm

Battery terminal rail to battery tray — Used in step 75

M8 screw		19 Nm

Positive battery terminal — Used in step 75

NutM6		5 Nm

Trailing link — Used in step 75

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 75

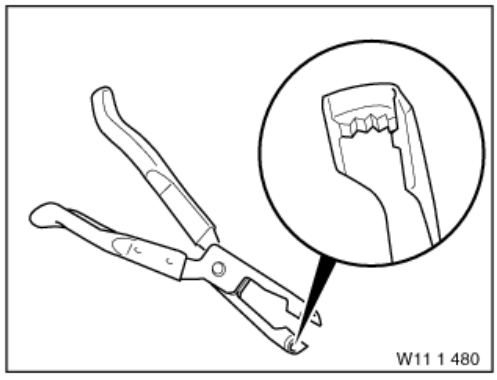
Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 75

NutM6		5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 18

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 495 910 (37 1 152) Socket wrench

Common	Used in step 22 23 24 52 53 54
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

2 413 106 Fastener

Common	Used in step 22 23 53 54
Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

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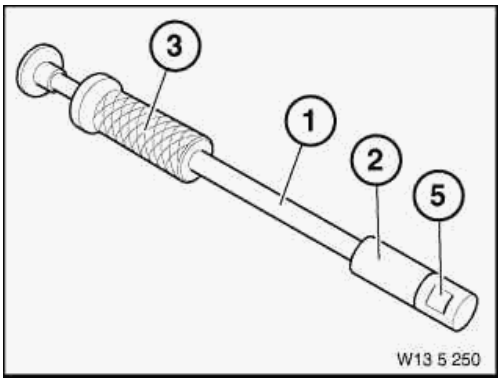
0 493 321 (13 5 250) Puller



Common

Used in step 25

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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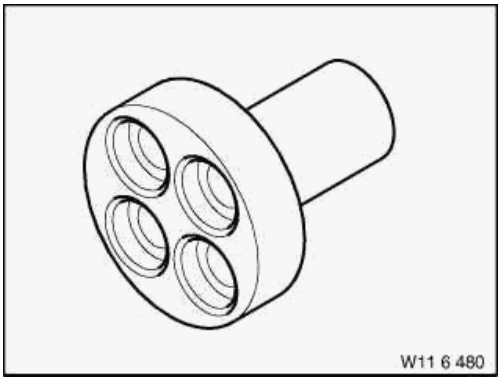
0 493 339 (13 5 252) Bush

Common	Used in step 25
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common	Used in step 25
Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common	Used in step 31 45
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 31 44 45
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge

Common

Used in step 31 43 45

Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 36

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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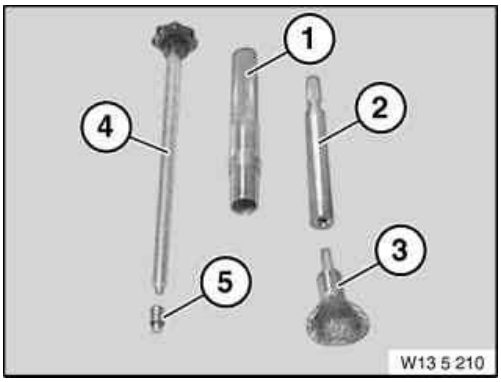
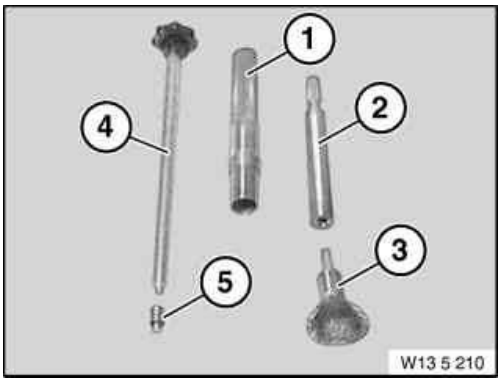
0 493 763 (13 5 215) Plug



Common	Used in step 51
Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common	Used in step 51
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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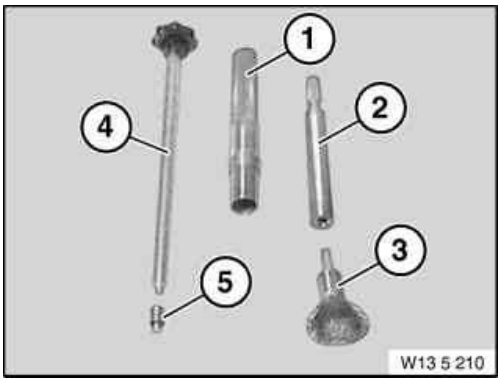
0 493 758 (13 5 210) Tool



Common

Used in step 51

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

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0 495 221 (36 1 323) Wheel stud

Common	Used in step 28
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 28
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 28
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud

Common	Used in step 28
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 28
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 28
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud

Common	Used in step 28
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 28
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	17 56
EGR controller	17 56

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 75
61 12 ... Notes on intelligent battery sensor (IBS)	1 75
61 00 ... Notes for disconnecting and connecting battery	1 75

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Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	11 25 26
17 00 008 Draining and topping up coolant for high-temperature circuit	76
17 00 008 Draining and topping up coolant for high-temperature circuit	76
17 00 008 Draining and topping up coolant for high-temperature circuit	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
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17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	76
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	76
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	76
17 00 008 Draining and topping up the high-temperature coolant circuit	76
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	76
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	76
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	76

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	41
Exhaust-gas recirculation cooler seal on exhaust manifold	56
Exhaust-gas recirculation cooler seal on intake plenum	56

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11 33 050 Removing and installing/replacing all rocker arms (B37C)

Special tools required:

- 11 6 480
- 2 288 380
- 11 4 480
- 11 8 760

Important!

Risk of damage to engine!

Adherence to notes on checking and adjusting timing is mandatory!

Necessary preliminary tasks:

- Remove front right wheel arch cover.
- Remove cylinder head cover.
- Remove exhaust-gas recirculation cooler

Removal:

Use special tool11 6 480 to turn engine to TDC firing position of cylinder 1.**Important!**

Do not crank engine in reverse direction!

Remove protective cap on oil sump.

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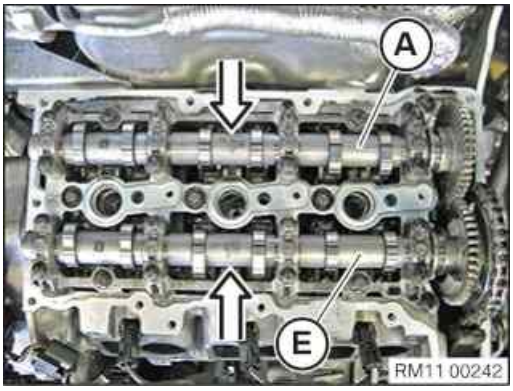
Important!

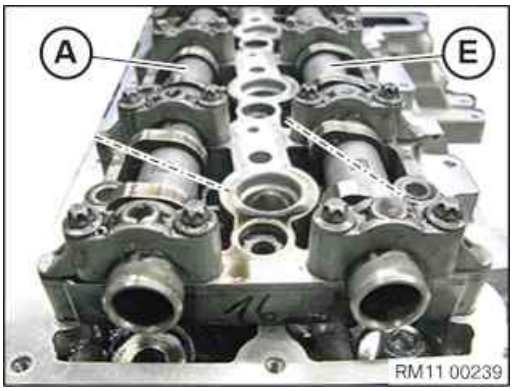
On vehicles with manual gearbox, an additional bore hole that can be confused with dowel hole is located in front of dowel hole.

It must be possible to push special tool 2 288 380 into oil sump up to throw.

Block crankshaft with cylinder no. 1 in TDC firing position with special tool2 288 380 .

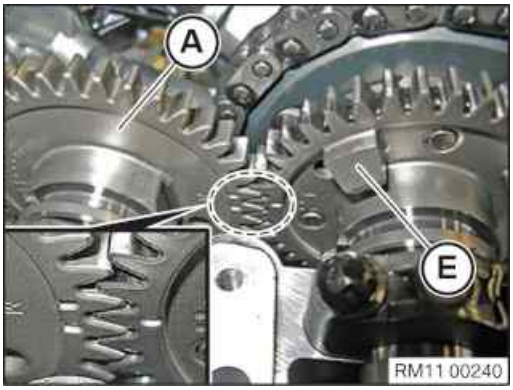


It must be possible to read the part number on the exhaust and intake camshafts (A and E) from above.*Note:*
See illustration.



The cam on the intake camshaft (E) points obliquely upwards at cylinder No. 1.

The cam on the exhaust camshaft (A) at the first cylinder points obliquely outwards to the left.



The marks on both camshafts (A and E) must match up (see graphic).

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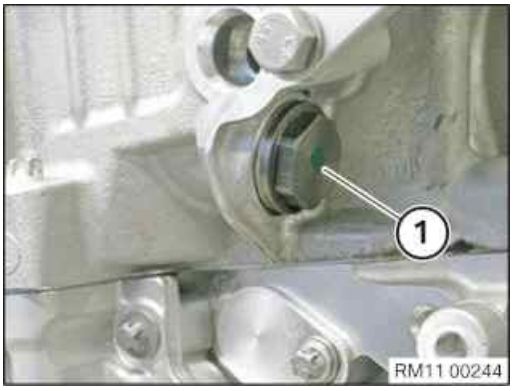
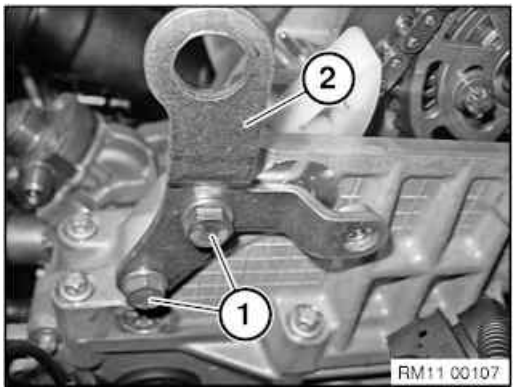


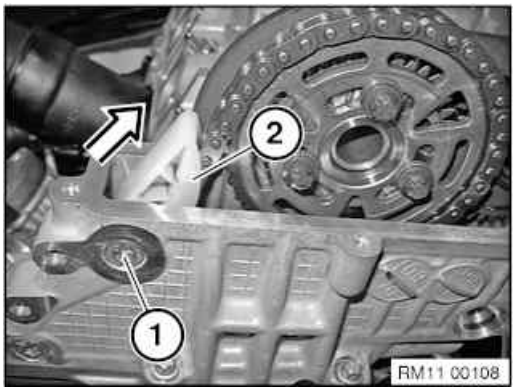
Release chain tensioner (1).



Release screws (1).

Remove suspension element (2).

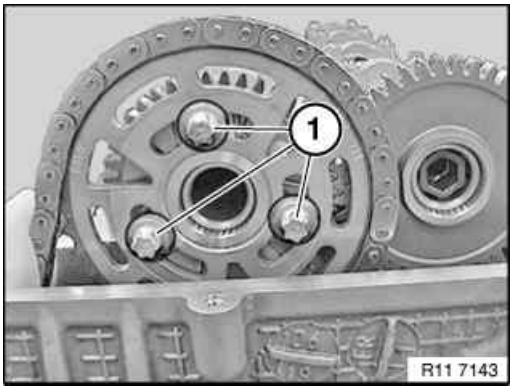
Note:
Figure N47.



Remove bearing journal (1).

Remove guide rail (2) in direction of arrow.

Note:
Figure N47.



Important!

Protect timing chain to prevent it from falling.

Risk of damage to oil spray nozzle.

Release screws (1) on camshaft sprocket.

Remove camshaft sprocket from intake camshaft.

Pull camshaft sprocket out of timing chain and place it neatly on the special tool 11 4 480 .

Place timing chain at the cylinder head.

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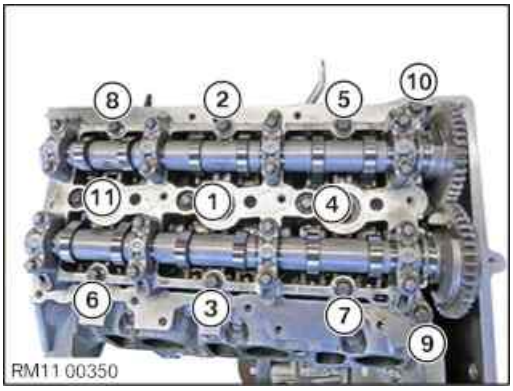
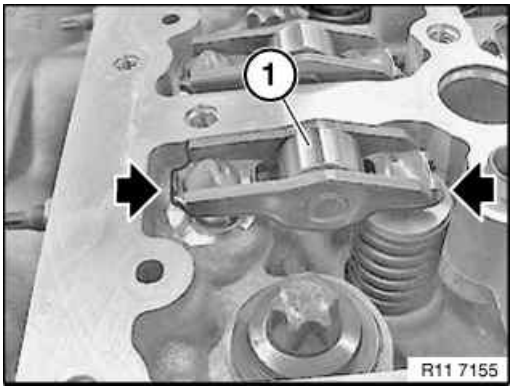


Note:
Both camshafts can be removed with the camshaft carrier.

Release all screws (see graphic) in the sequence **11 - 1** in multiple steps.

Take off camshaft carrier by lifting it upwards.

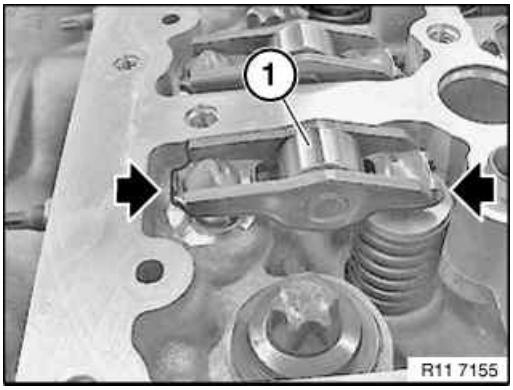


Note:
Already used rocker arms may be refitted only in the same position.

Set down all rocker arms (1) on special tool 11 4 480 in neat order.

Lift off rocker arm.

Installation:



Installation note:
Already used rocker arms may be refitted only in the same position.

Make sure roller cam followers are in correct installation positions.

Install rocker arm (1).

Remove special tool 2 288 380 .

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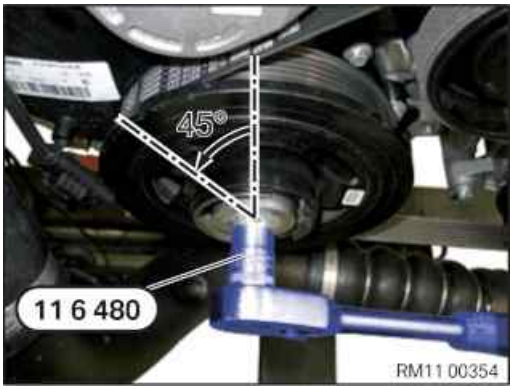
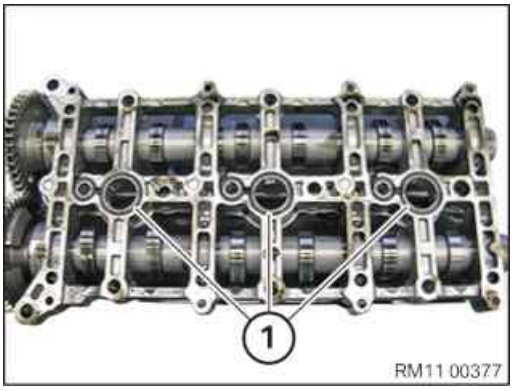


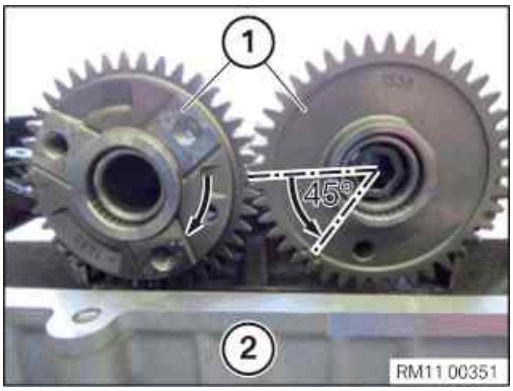
Important!

Note starting point of cylinder 1 TDC firing position.

Crank engine a maximum of 45° counter to the direction of engine rotation using special tool 11 6 480 .



Parts: Replace gaskets (1).

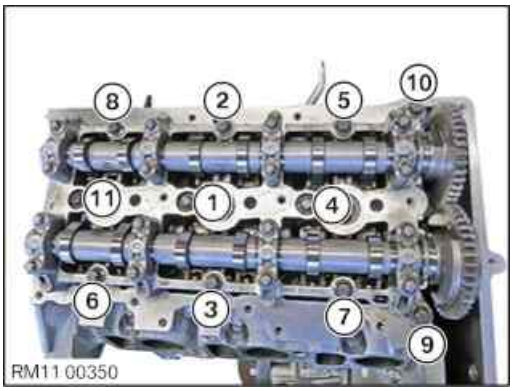


Important!

Note starting point of cylinder 1 TDC firing position.

Rotate camshafts maximum 45° against direction of engine rotation.

Mount camshaft carrier on cylinder head as shown.



Tighten screws in the sequence **1** to **11** in multiple steps.

Tightening torque: 11 31 3AZ.

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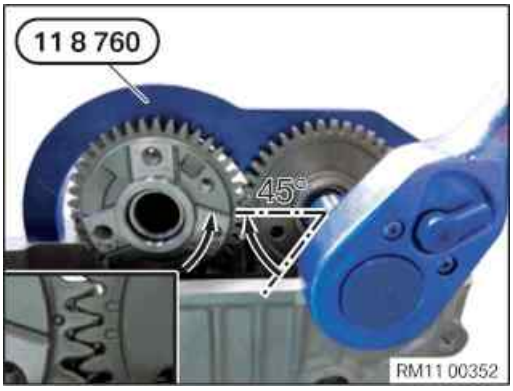


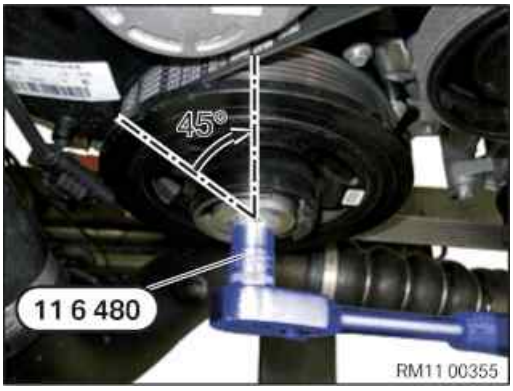
Rotate camshafts 45° in direction of engine rotation.

The marks on both camshafts must match up (see small figure).

Position special tool 11 8 760 without play and block camshafts.

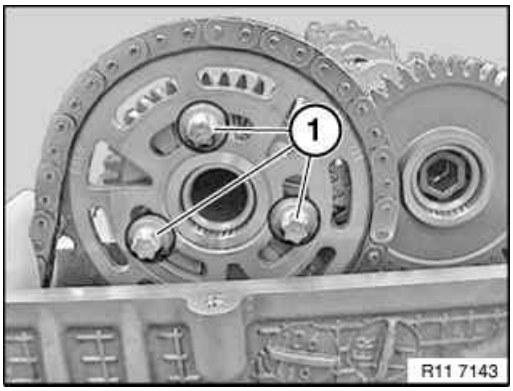
Note:
Special tool 11 8 760 must lie flush on cylinder head.

The exhaust camshaft must be removed if the marks do not match up (are not aligned).



Crank engine 45° in direction of engine rotation with special tool 11 6 480 .

Block crankshaft with cylinder no. 1 in TDC firing position with special tool2 288 380 .



Place the camshaft sprocket with timing chain on the intake camshaft such that bolts (1) are located in the centre of the elongated holes.

Insert bolts (1).

Tighten bolts (1) to 10 Nm.

Release bolts (1) again by a 90° turn.

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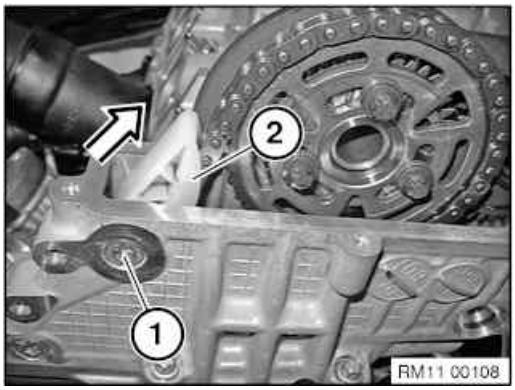
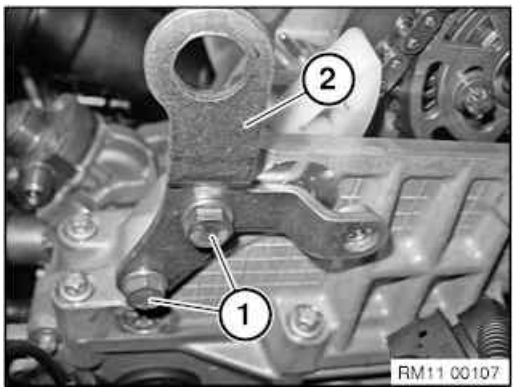
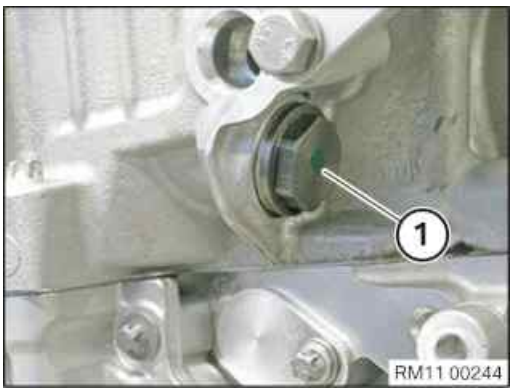


Note:
Parts: Replace bearing journal.

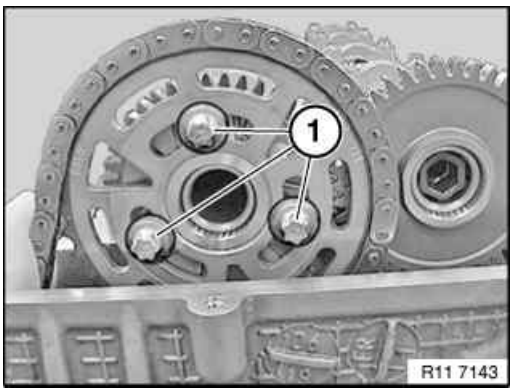
Install guide rail (2) against direction of arrow.
Screw in bearing journals (1).
Tightening torque: 11 12 6AZ.



Install suspension element (2).
Tighten down screws (1).
Tightening torque: 11 00 4AZ.



Install chain tensioner (1) and tighten down.
Parts:
Replace sealing ring.
Tightening torque: 11 12 5AZ.



Tighten down screws (1).
Tightening torque: 11 31 1AZ.

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Crank engine with special tool 11 6 480 twice in direction of rotation.

Check timing.

Important!

Do not crank engine in reverse direction.

Important!

2 288 380 Remove special tool before starting engine.

Required follow-up work:

- Install exhaust-gas recirculation cooler.
- Install cylinder head cover.
- Install front right wheel arch cover.

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11 33 062 Replacing all hydraulic valve clearance compensating elements

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

1 – Remove vehicle battery

WARNING

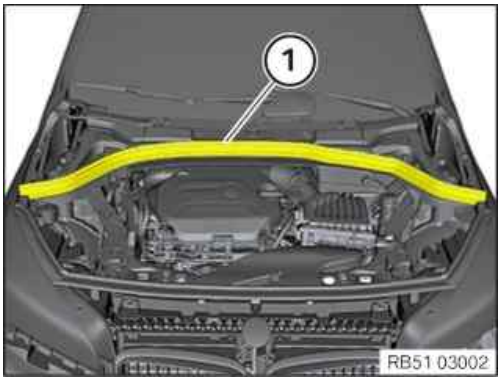
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

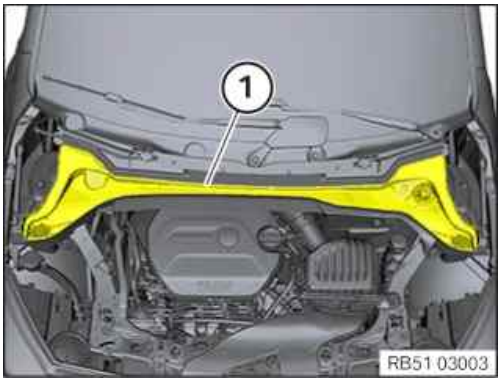
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.

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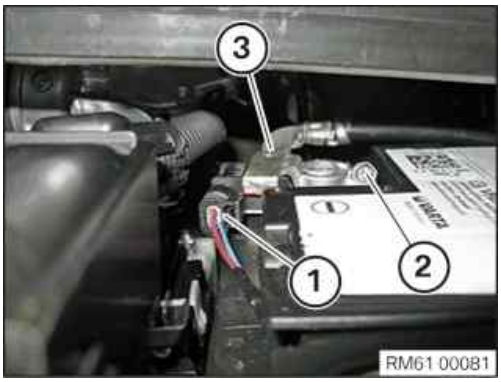
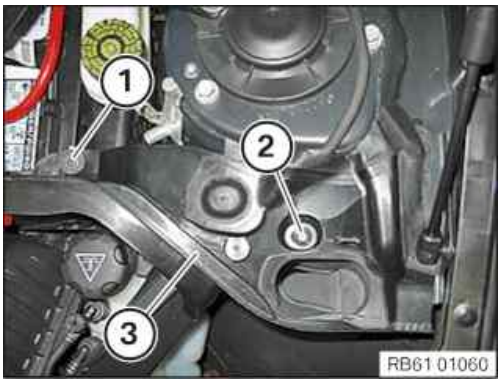
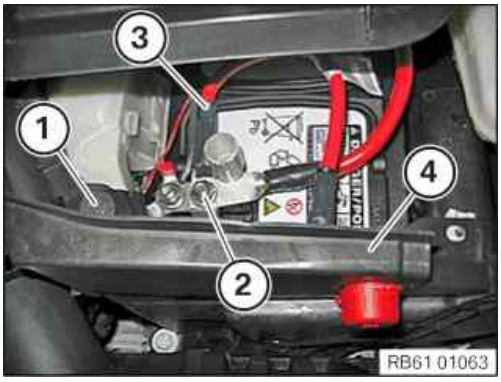


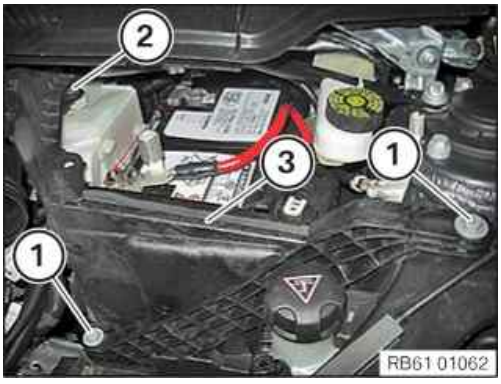
- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



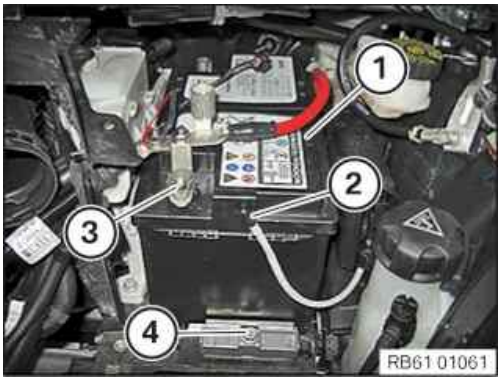
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Remove left and right wiper arm

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NOTICE

Description is for left component only. Procedure on the right side is identical.

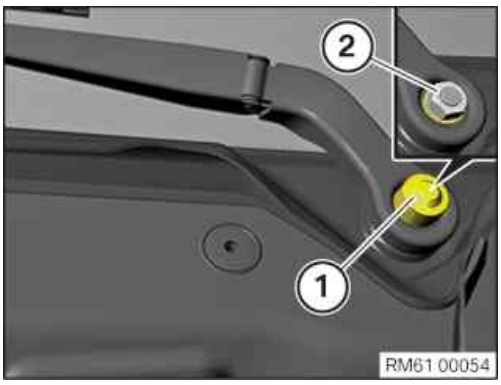
▶ **Remove the wiper arm**

RISK OF DAMAGE

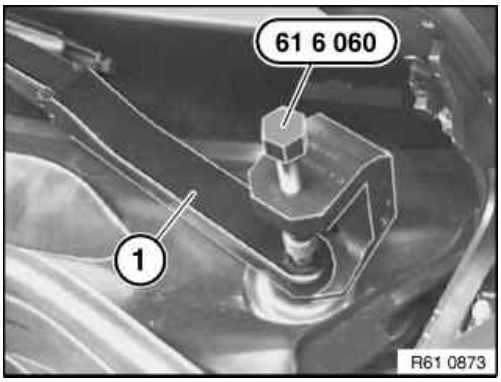
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

3 – Remove the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**

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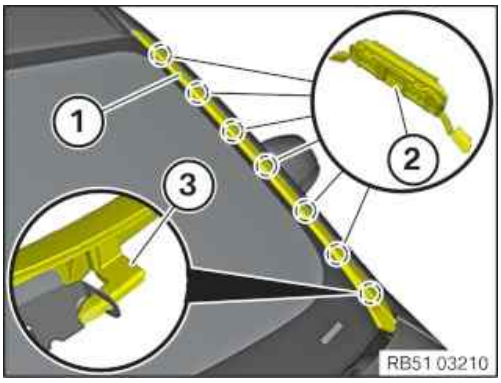
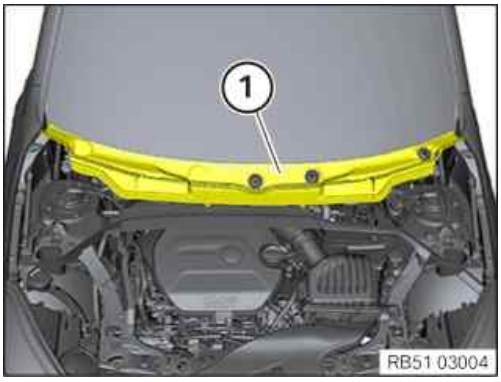


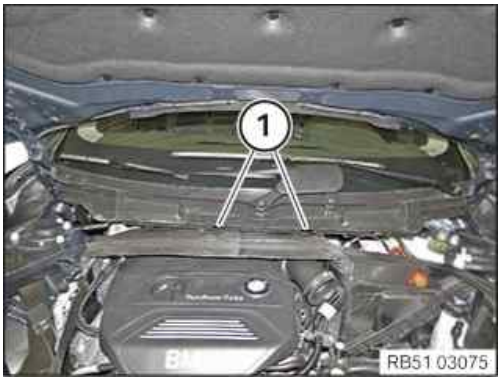
- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

4 – Remove the rear cowl panel cover

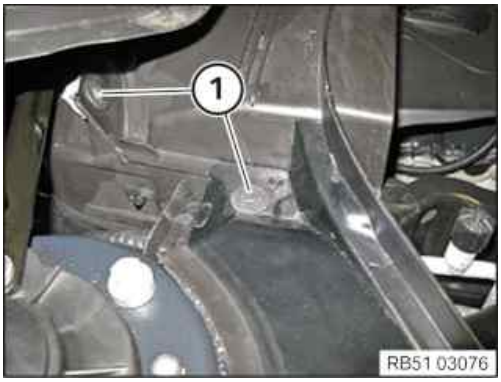


- Disengage and guide out the rear cowl panel cover (1) towards the top.

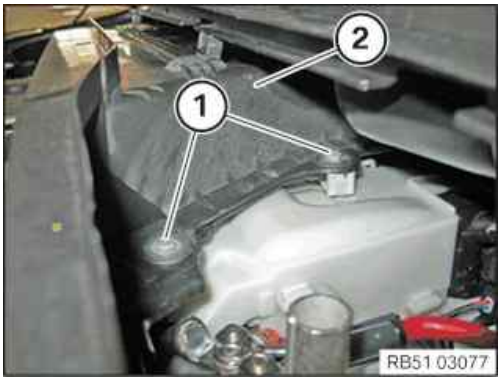
5 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

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6 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

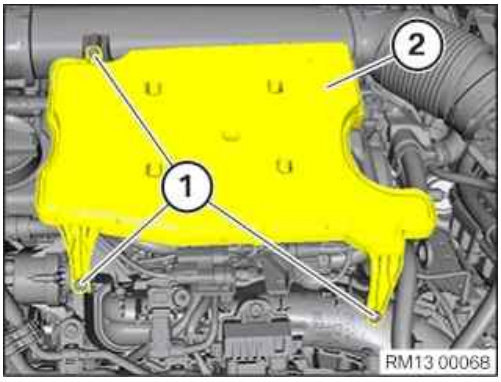
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

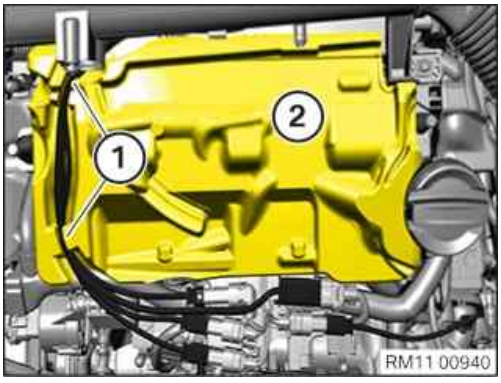
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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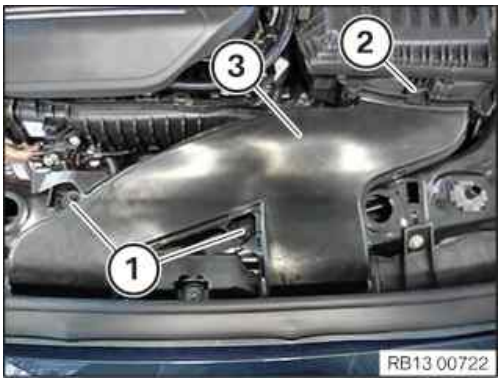
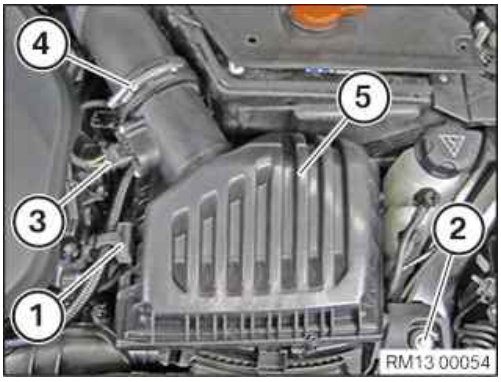


- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

11 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

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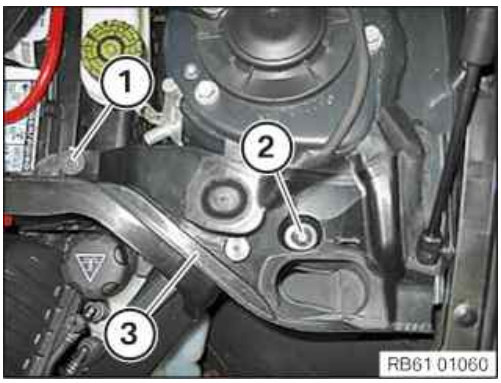
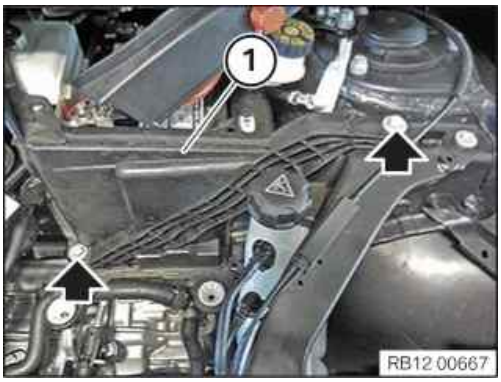
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

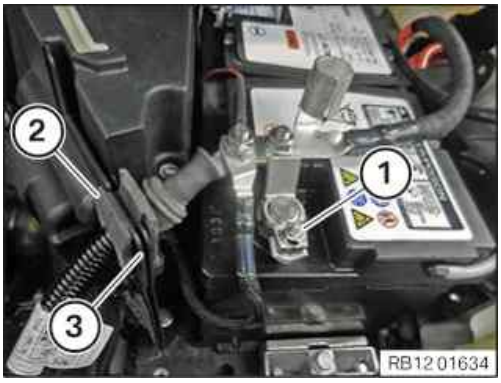


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.

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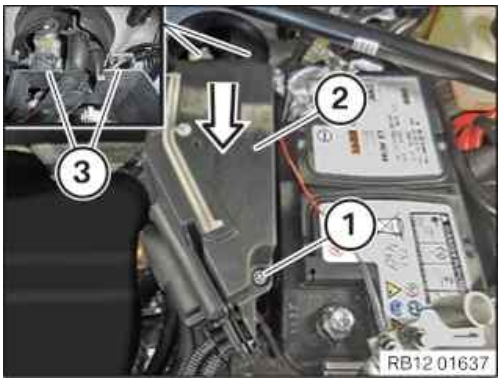
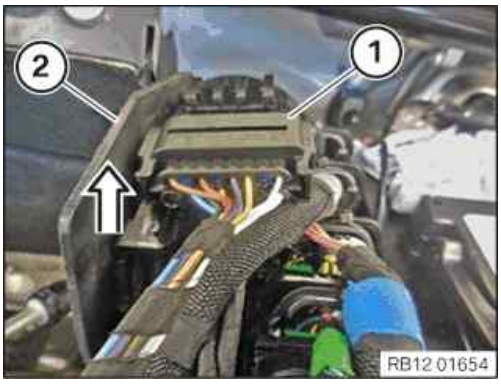
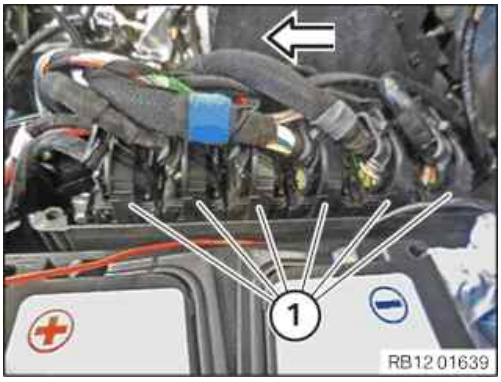


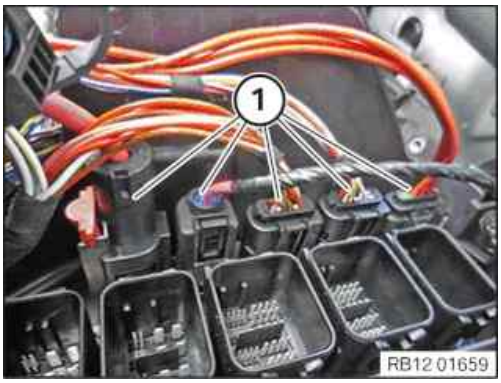
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



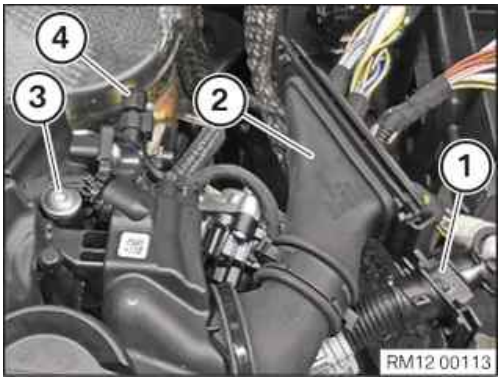
- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.

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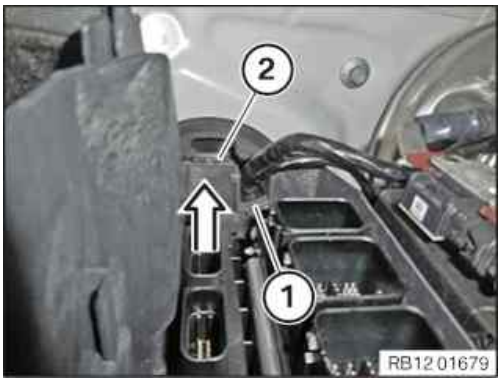
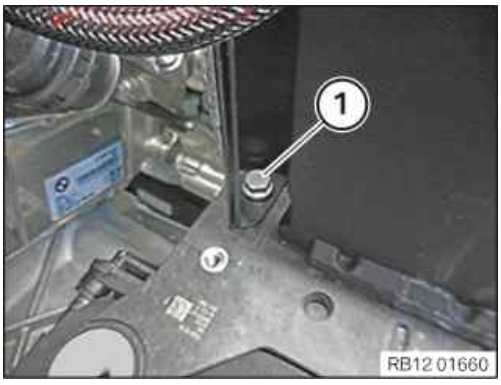
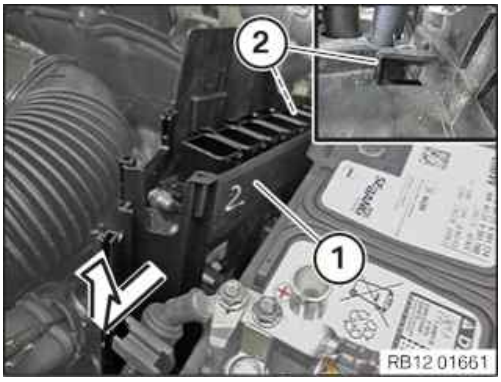


- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

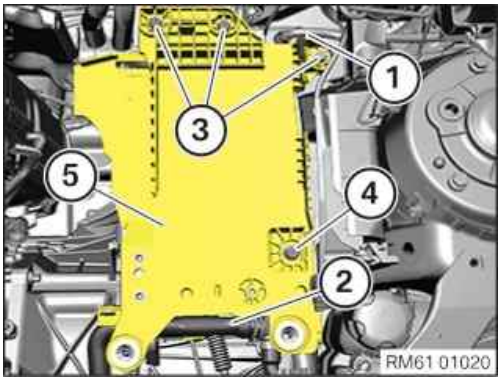


- Loosen screw (1).



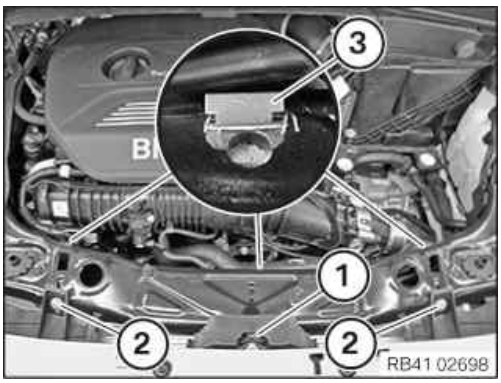
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

12 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

13 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.

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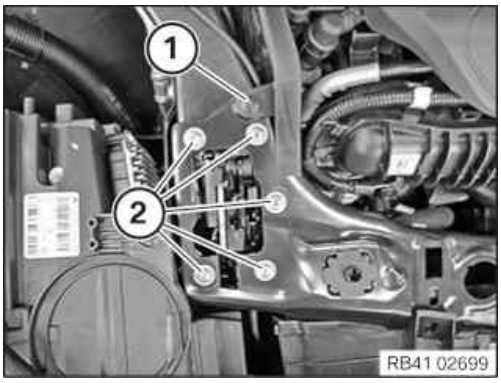
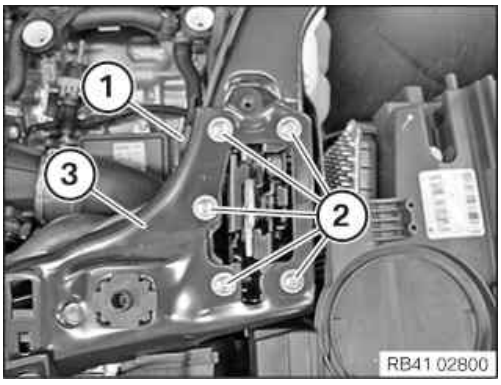
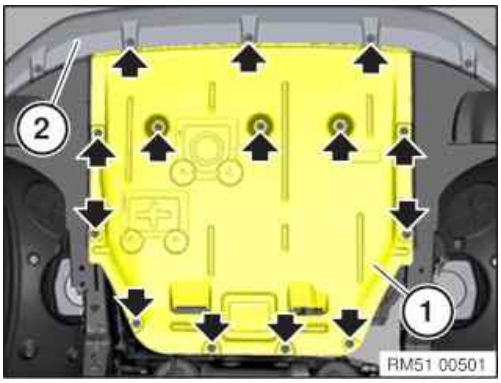


- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

14 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

15 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

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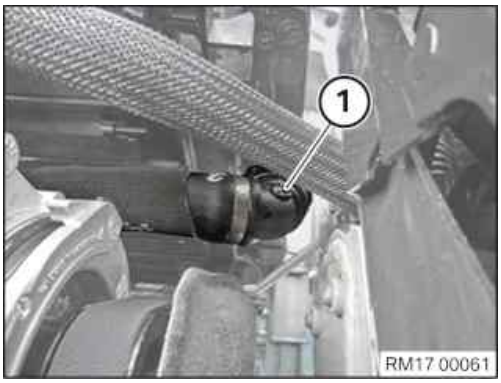
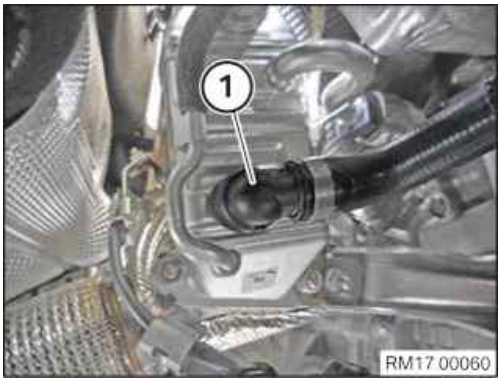
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

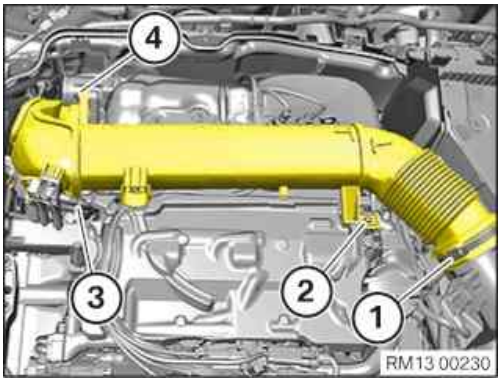


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

16 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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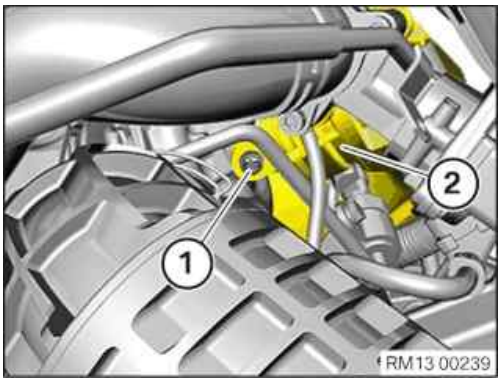
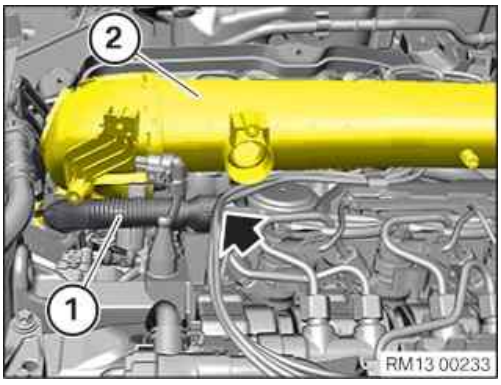


- Unscrew the screw (1) from the clean air pipe (2).



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

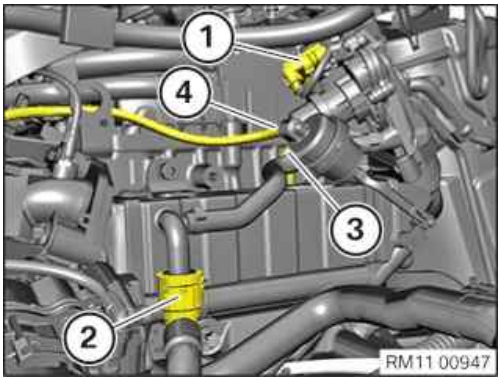
17 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.

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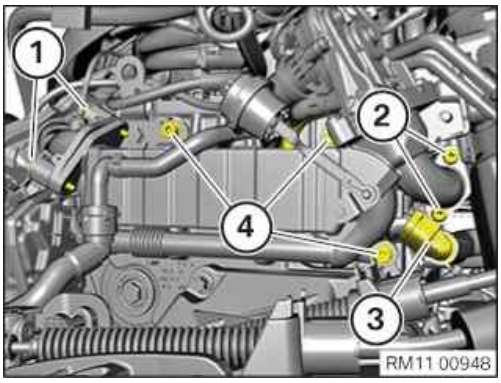
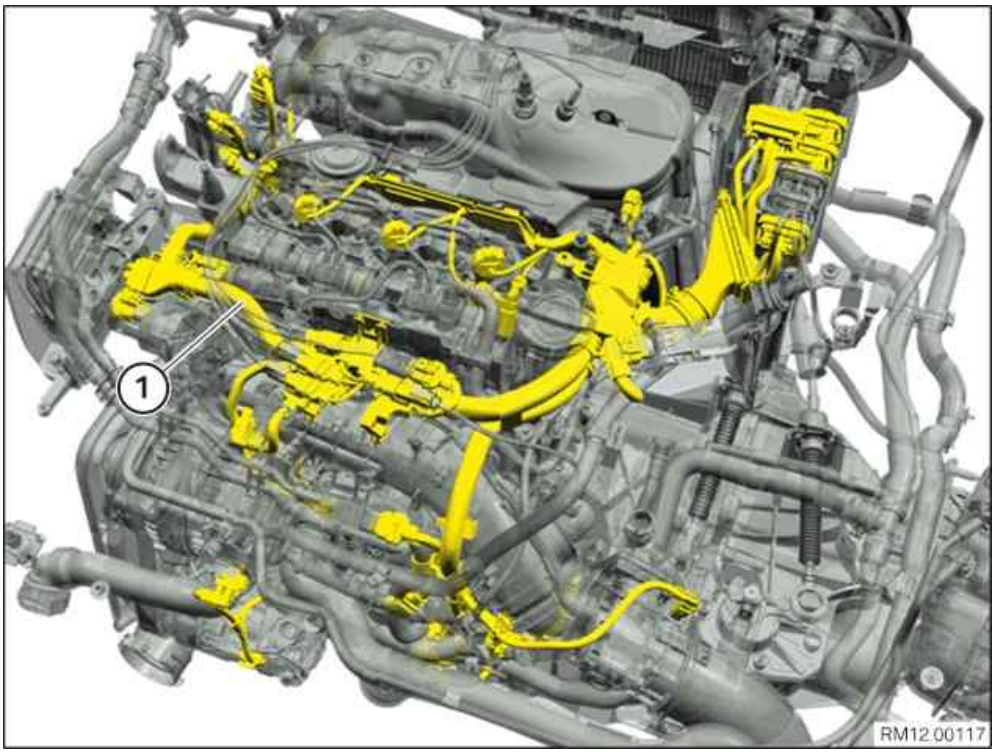


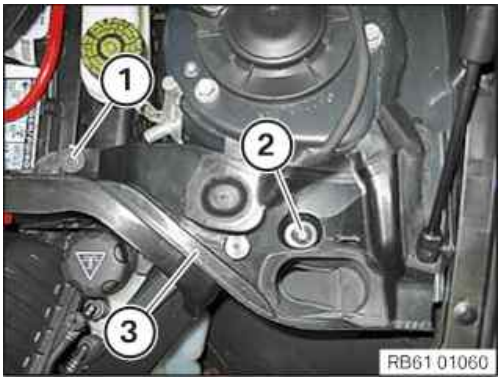
- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

18 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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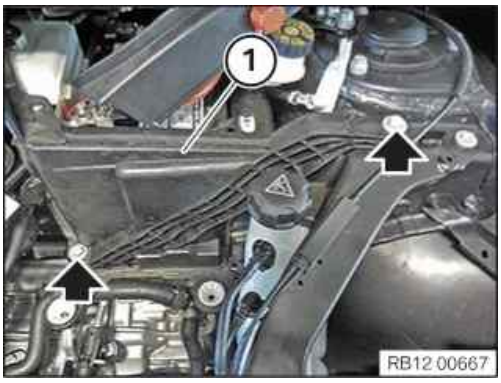
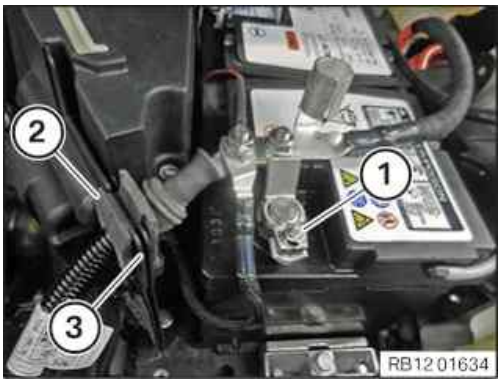
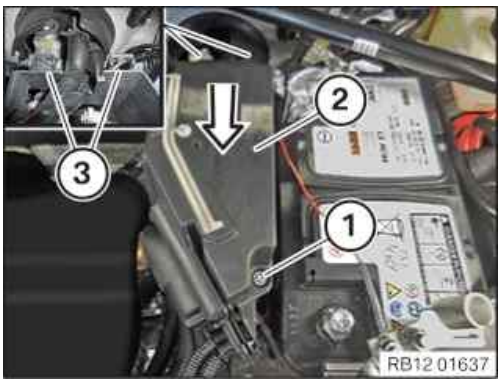


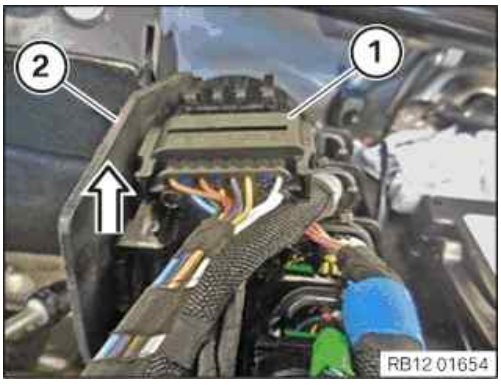
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



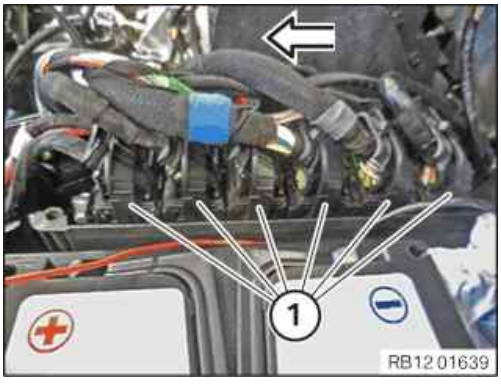
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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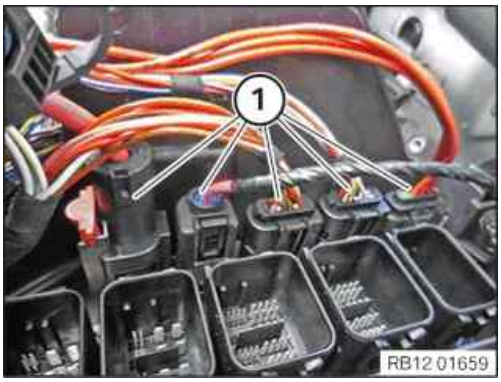
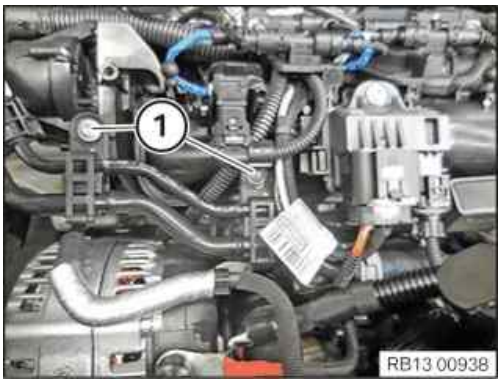
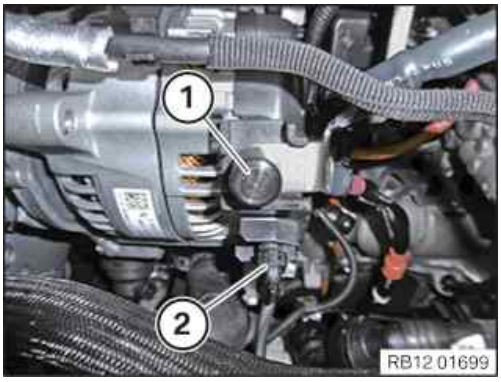


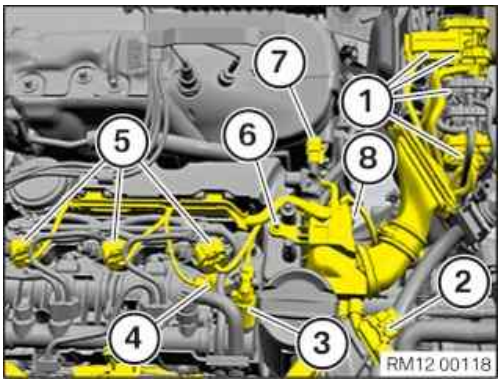
- Unlock and loosen connector (1).



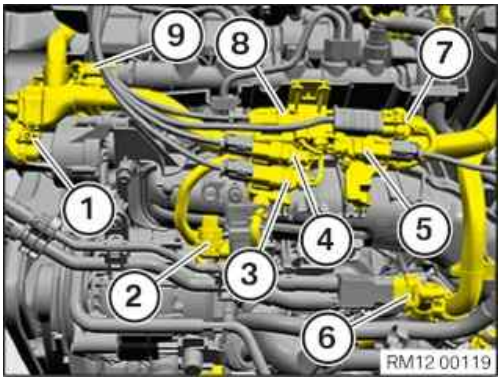
- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.

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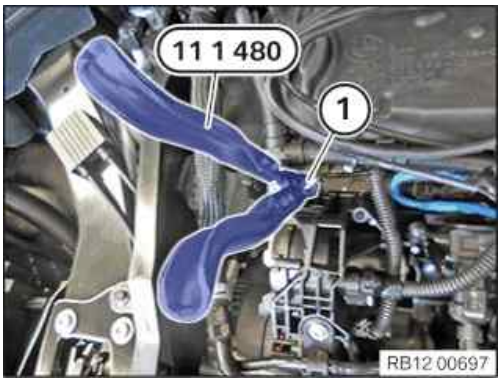
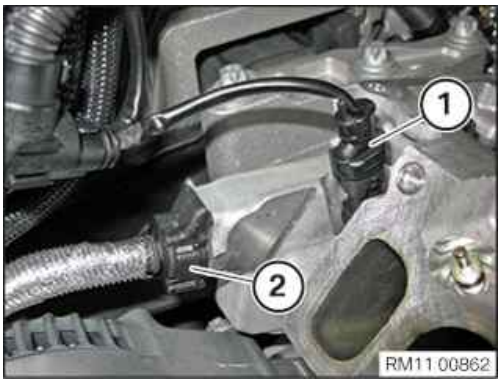
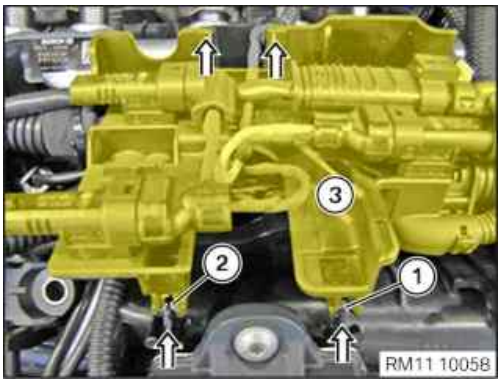


- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

19 – Removing the cable clips from the intake plenum



- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

20 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).

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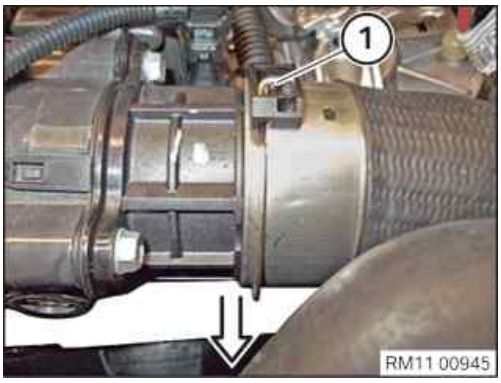
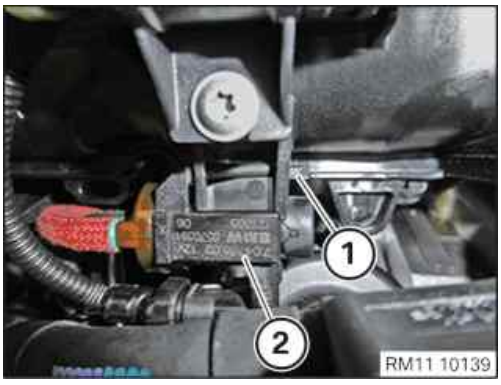
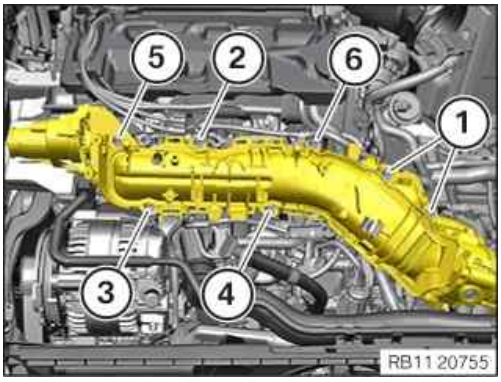


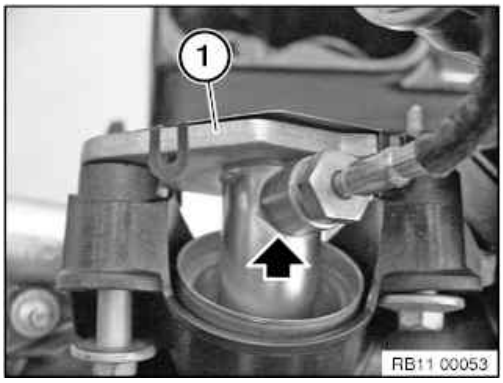
- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

21 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

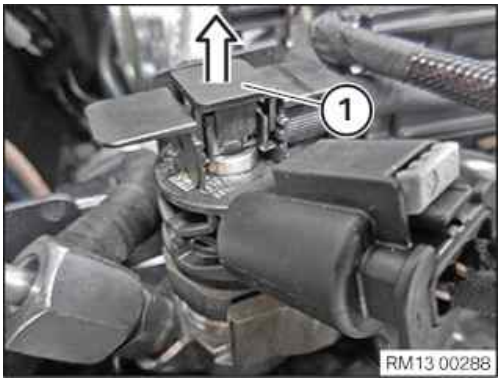
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

22 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

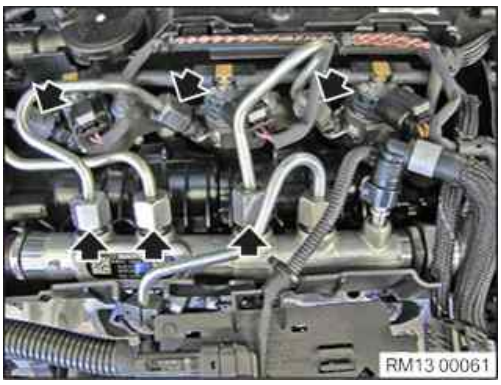
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

23 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

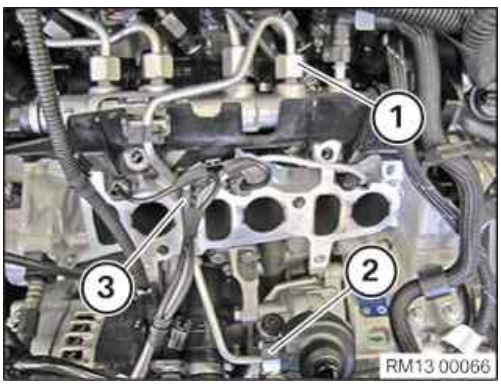
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

24 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

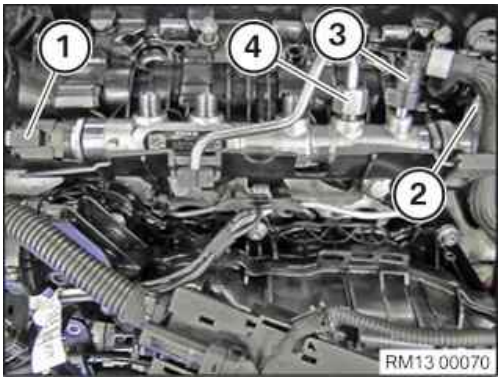
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

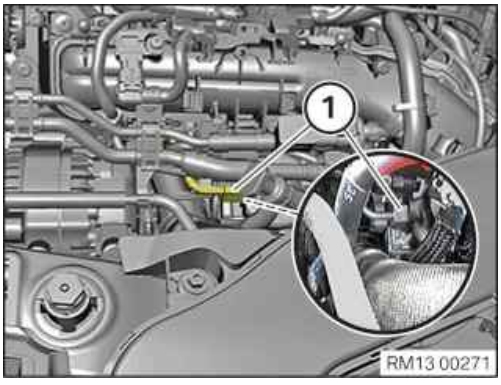
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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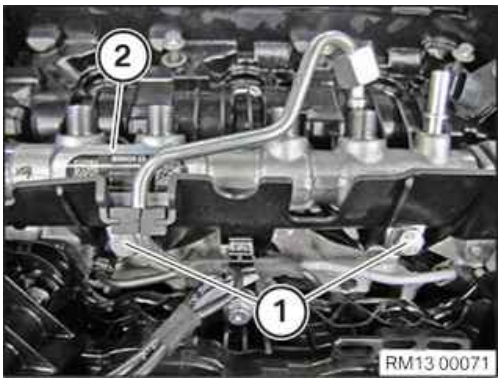

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

25 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

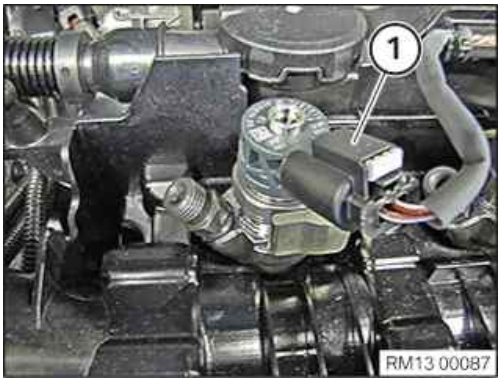
Electrostatic discharge.

Damage to or destruction of electrical components.

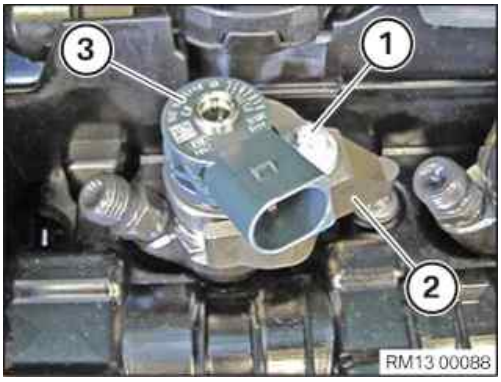
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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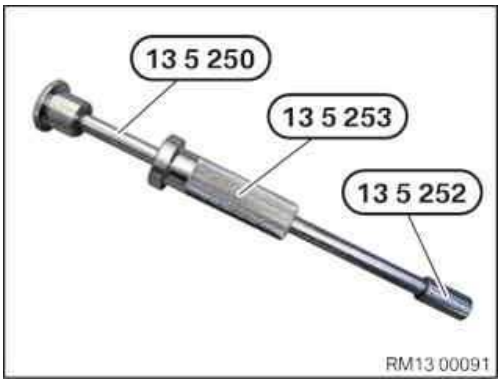
RISK OF DAMAGE

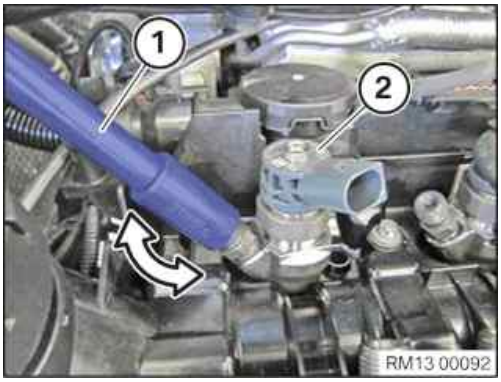
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

26 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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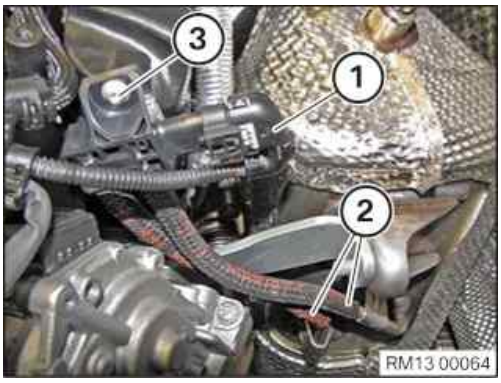
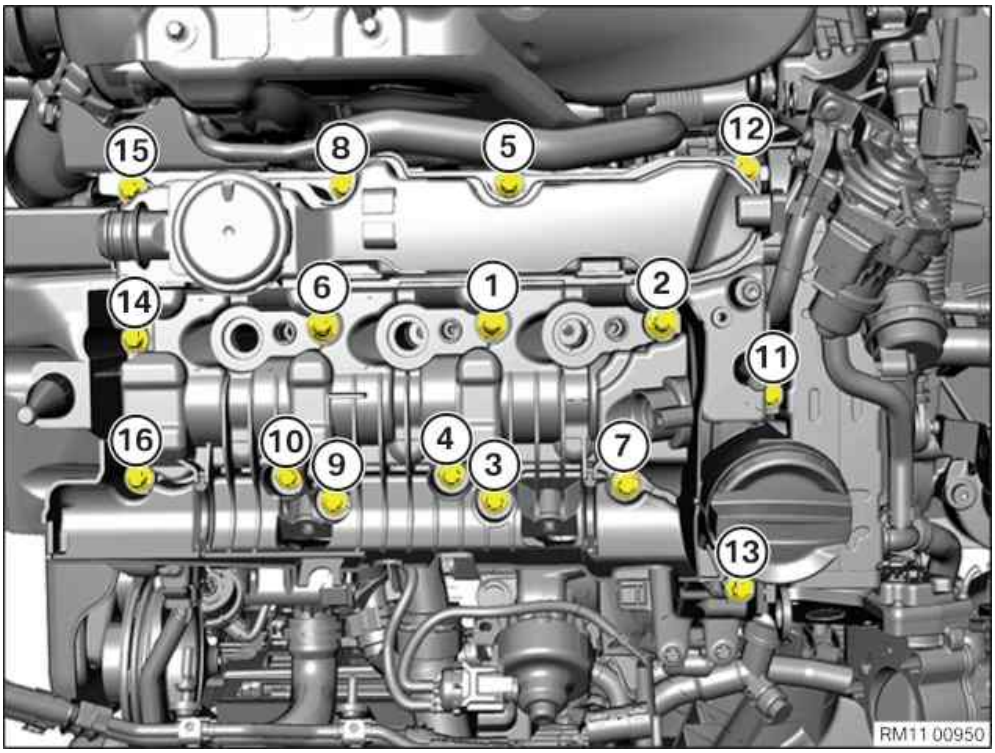


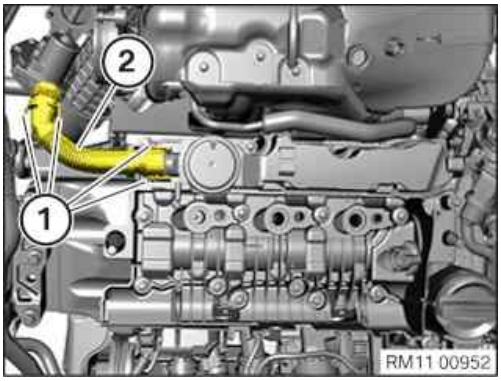
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

27 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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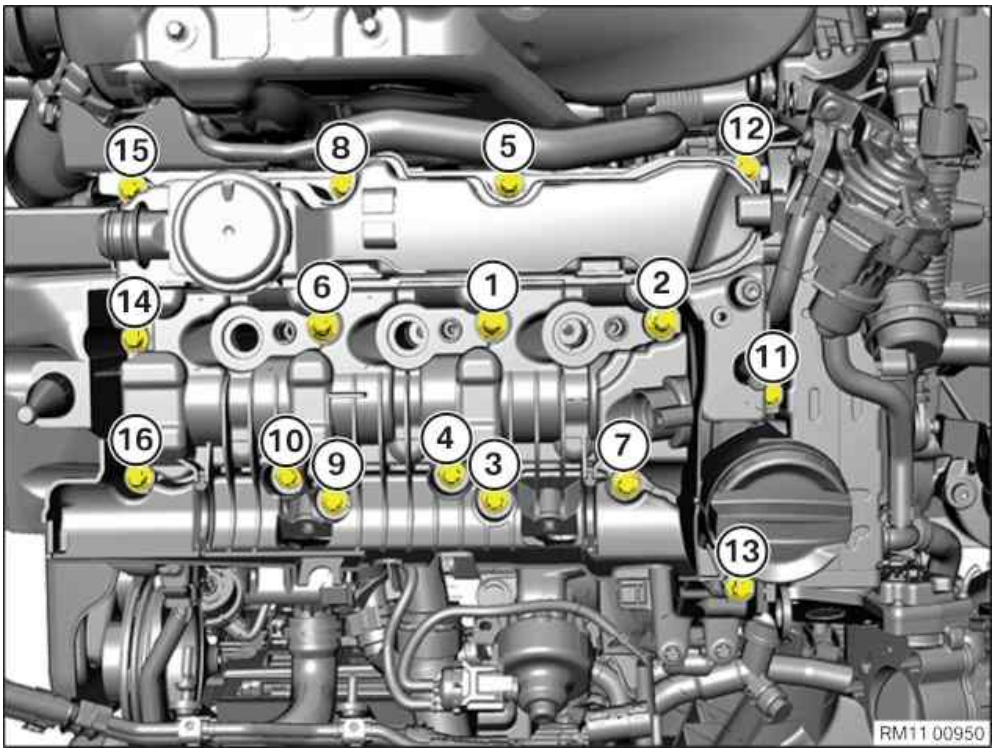

- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

28 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

29 – Remove right charge-air line

- Release charge air duct screws (1) on oil sump.

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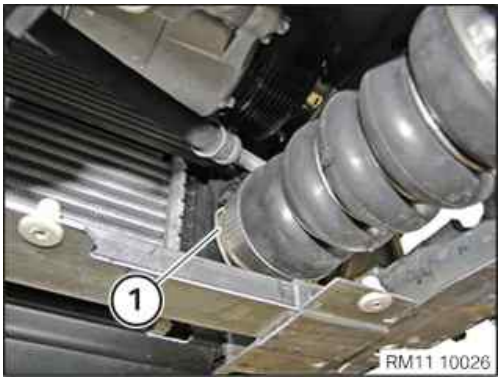
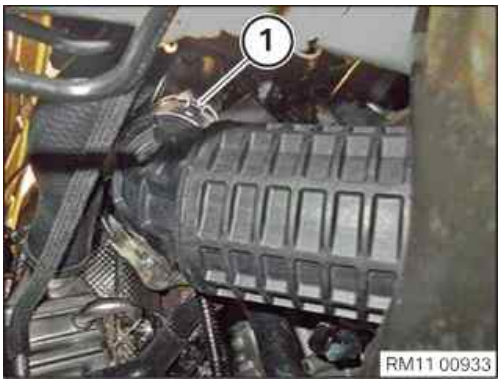
- Detach charge air duct screw connection (1) on crankcase.

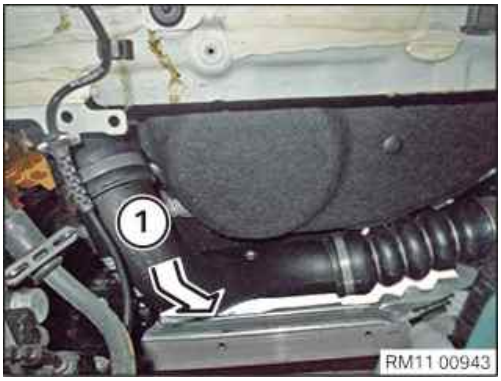
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

30 – Removing the acoustic cover for the engine at the front

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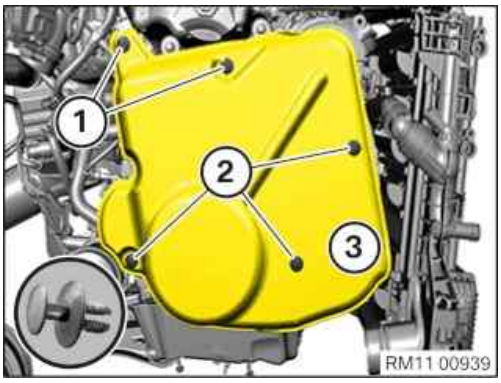


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

31 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

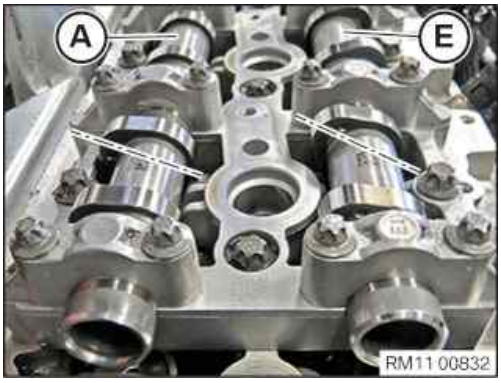
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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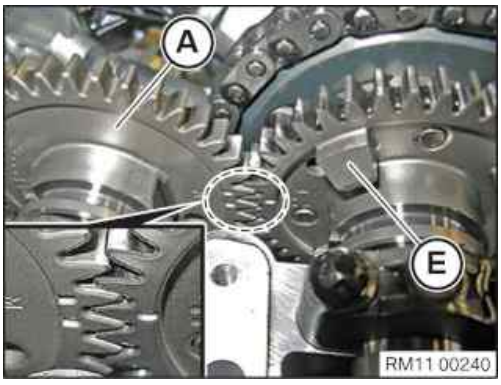
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

32 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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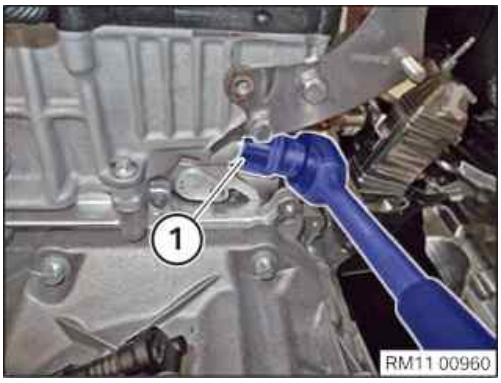
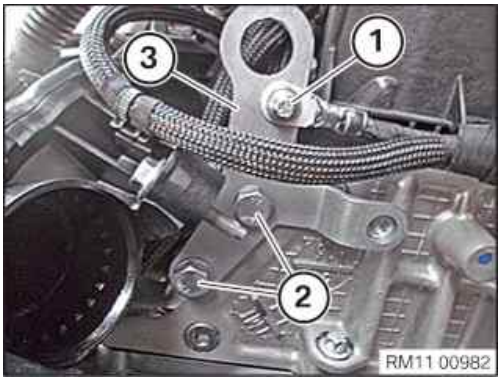


TECHNICAL INFORMATION

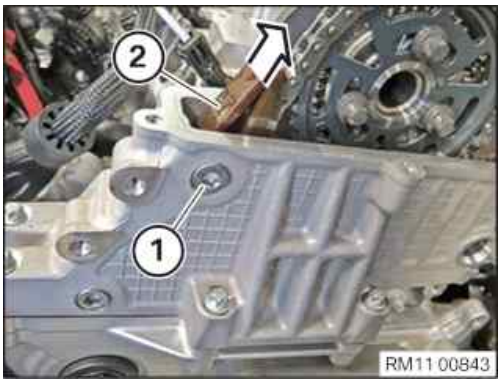
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

33 – Remove the timing chain guide rail

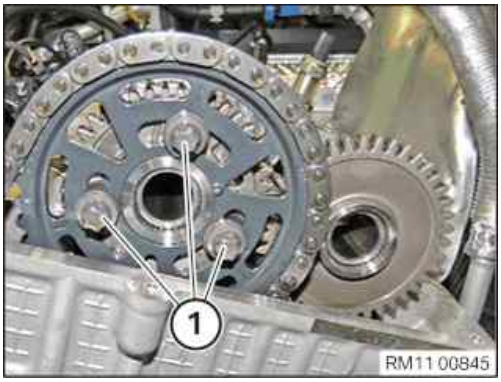


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

34 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

35 – Removing the camshaft support

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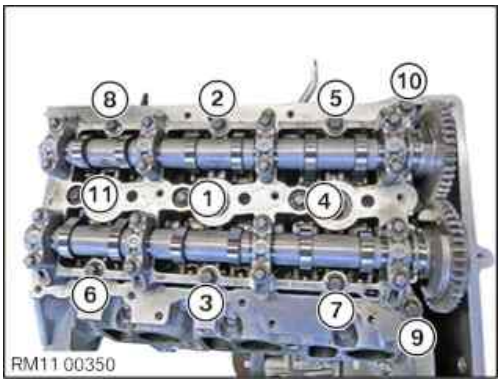
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

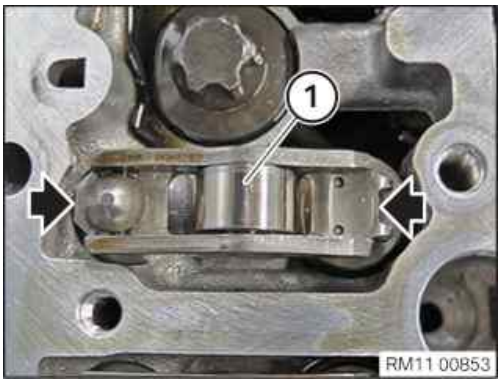
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

36 – Remove roller cam followers



- Guide out and remove all roller cam followers (1) (arrows).
- Place all roller cam followers (1) in order in special tool **0 495 105 (11 4 480)**.

  Roller cam followers that have already been used must be installed in same position again.

MAIN WORK

37 – Removing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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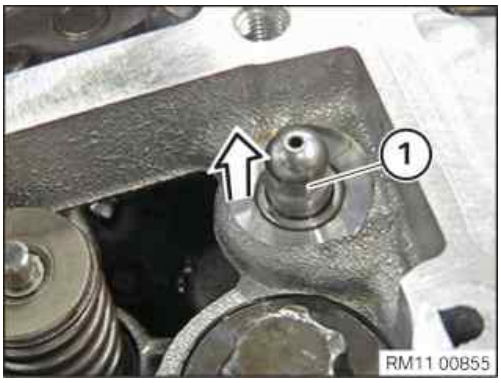


- Remove the hydraulic valve clearance compensating element (1) in the direction of the arrow and place on the special tool **0 495 105 (11 4 480)**.
- Repeat the process on all hydraulic valve clearance compensating elements.

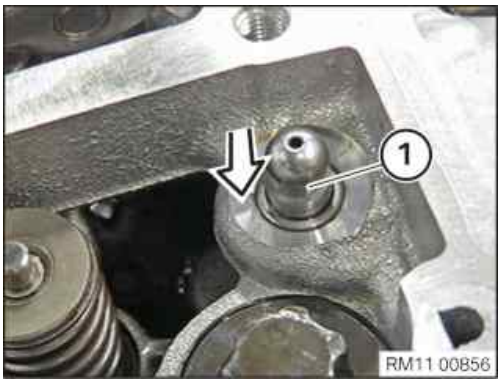
38 – Installing the hydraulic valve clearance compensating element

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



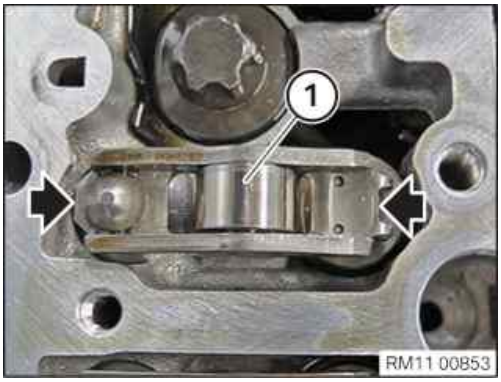
- Install the hydraulic valve clearance compensating element (1) in the direction of the arrow.
- Repeat the process on all hydraulic valve clearance compensating elements.

POSTPROCESSES

39 – Install the roller cam followers

TECHNICAL INFORMATION

- Note the installation position of the component. The component may be installed in various installation positions.



- Check all roller cam followers (1) for damage and replace if necessary.

  Parts: Roller cam followers
- Insert and install all roller cam followers (1).

  Roller cam followers (1) that have already been used must be installed in the same place.
- Note the mounting orientation of the roller cam followers (1).
- Oil all roller cam followers (1).

40 – Installing the camshaft support

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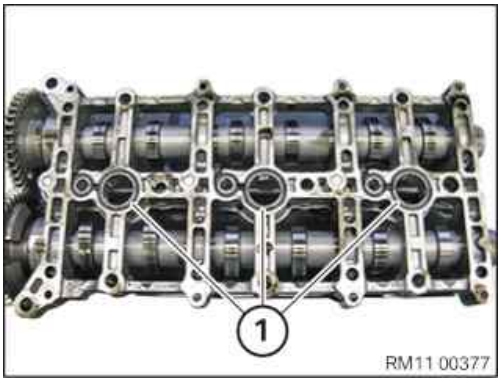
RISK OF DAMAGE

Damage of the engine and mounted parts.

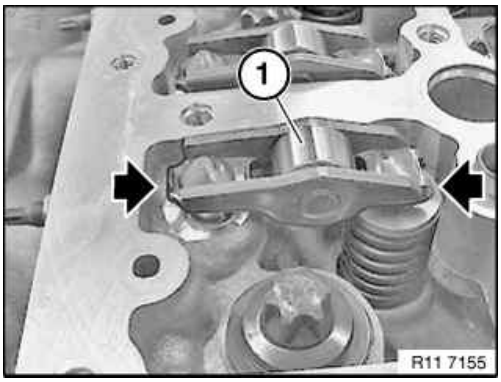
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

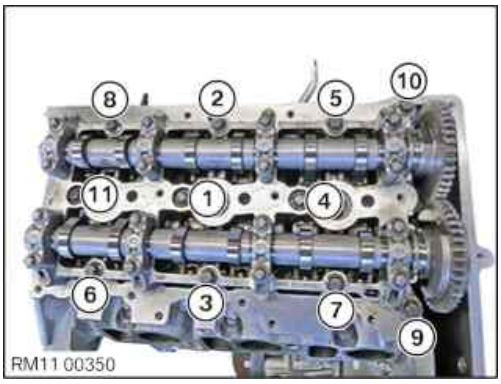


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.

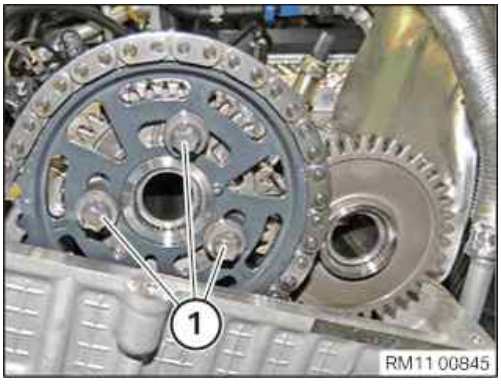


- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

41 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

42 – Install the timing chain guide rail

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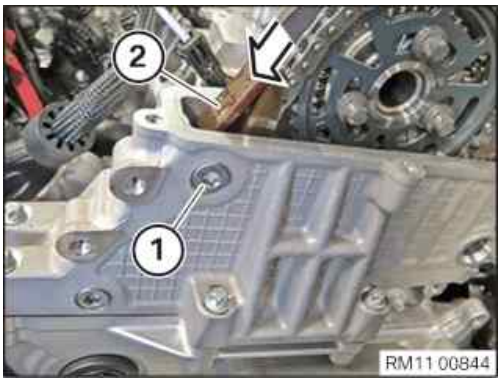


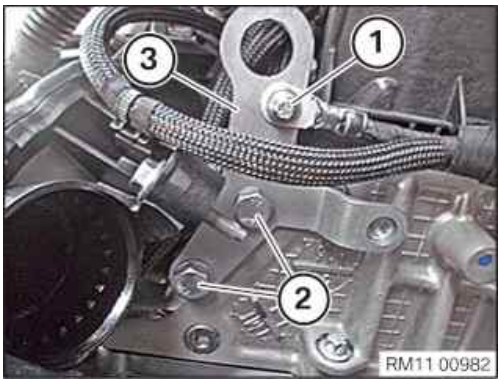
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

43 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

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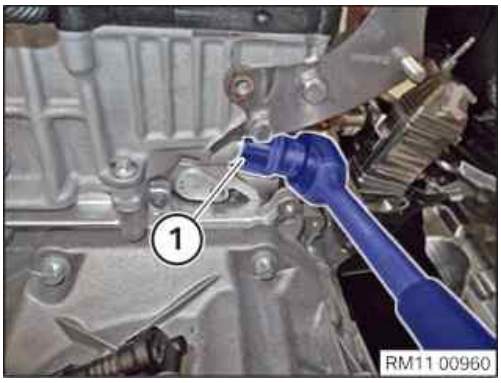
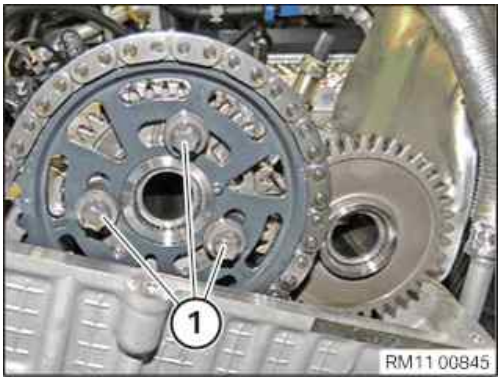


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

44 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

45 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

46 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

47 – Checking camshaft timing

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- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

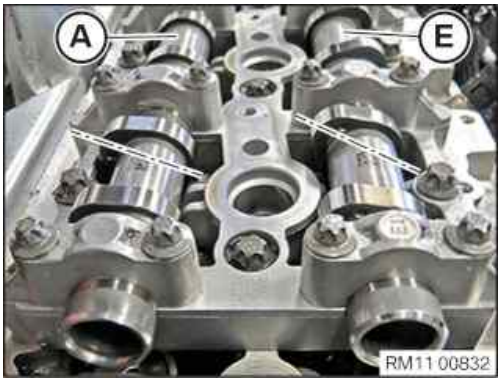
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.

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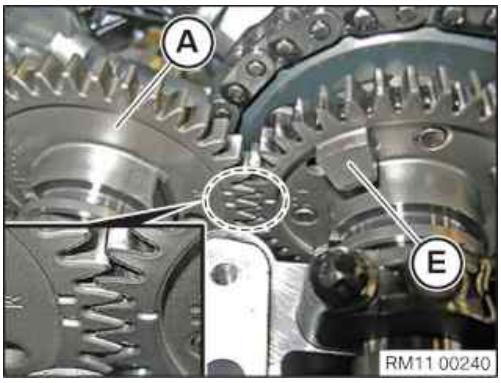


- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

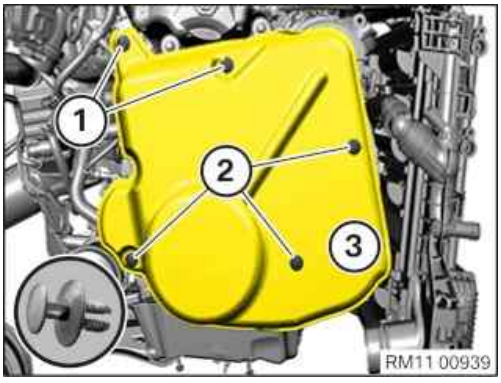
TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

48 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

49 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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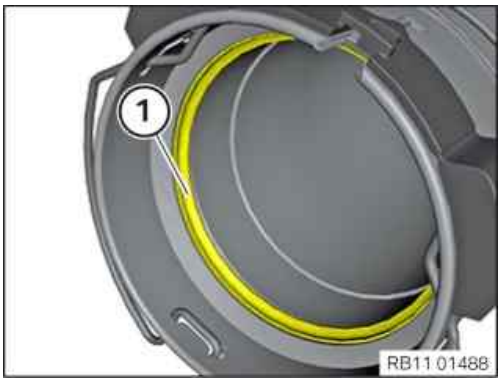
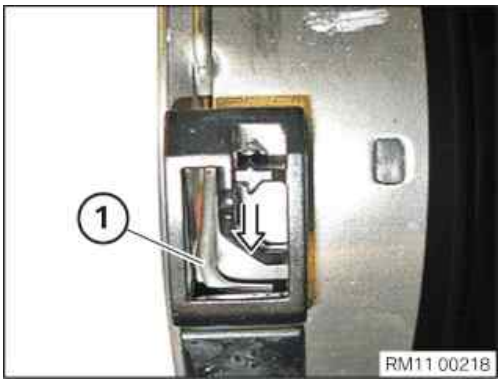
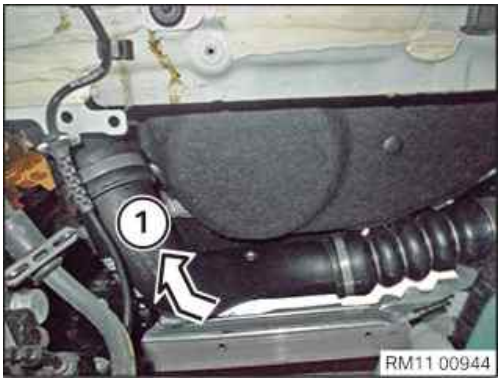


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

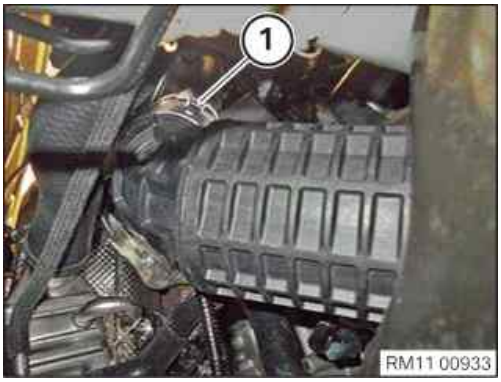
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

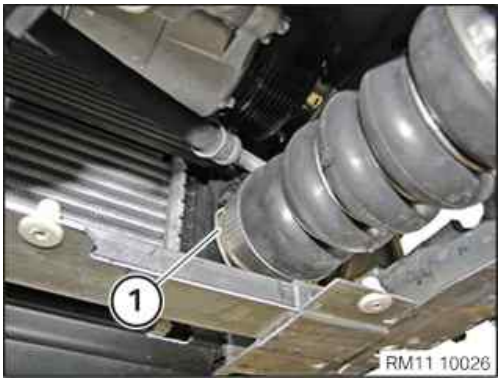


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

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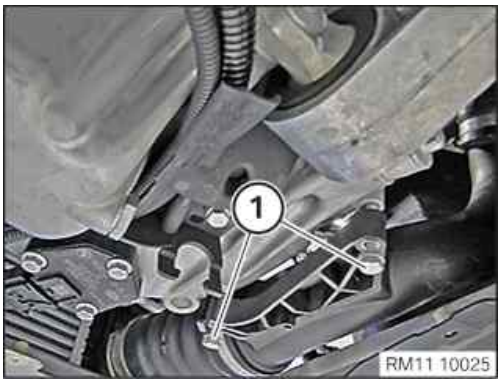
- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

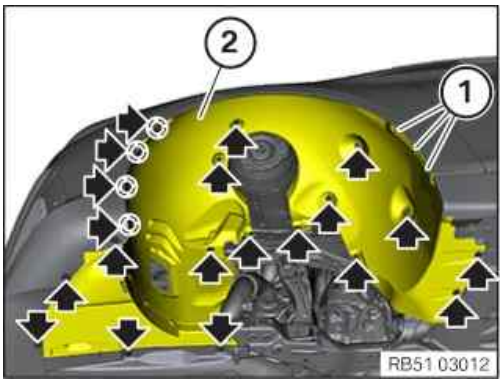


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

50 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

51 – Installing cylinder head cover

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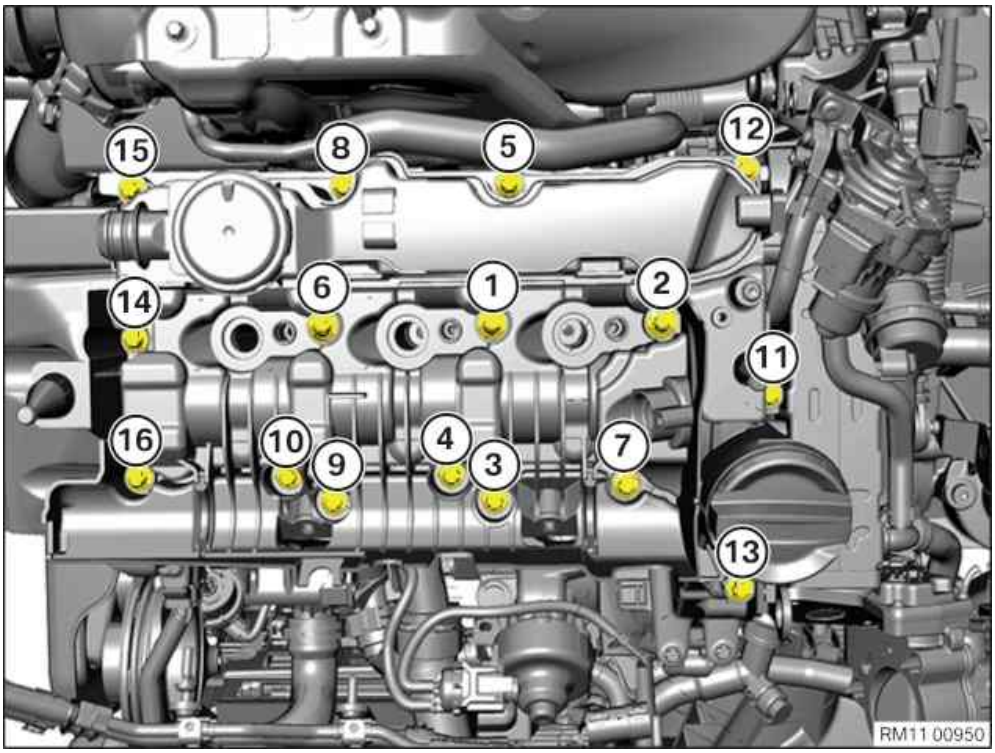
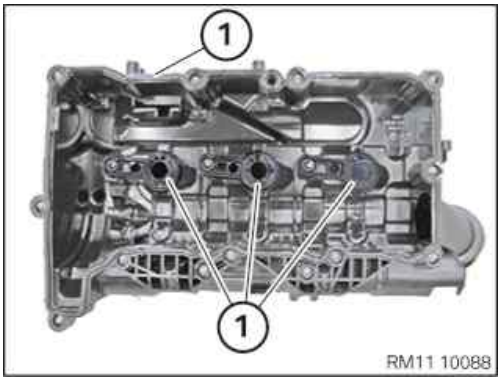
Overview: Screw connection of the cylinder head cover

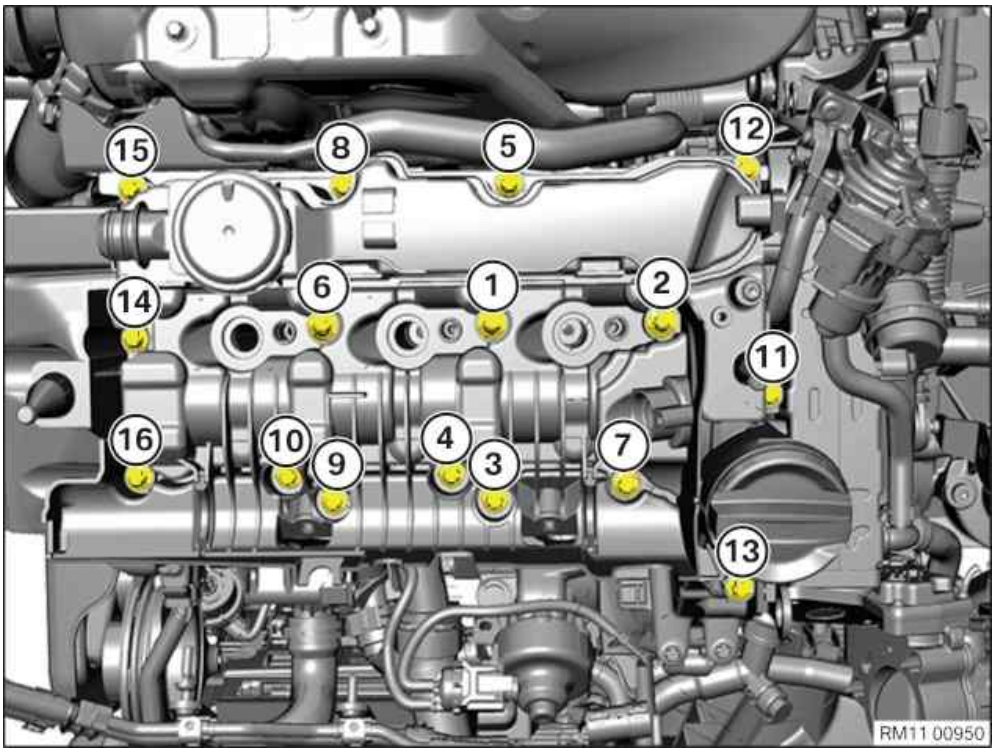


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nm

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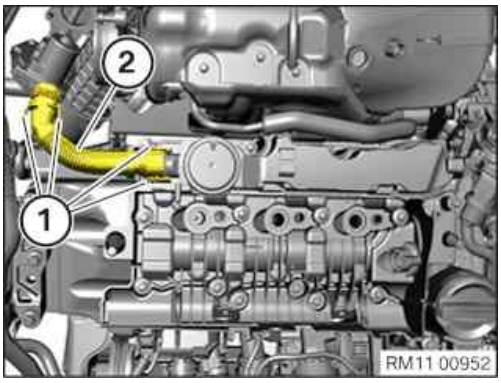
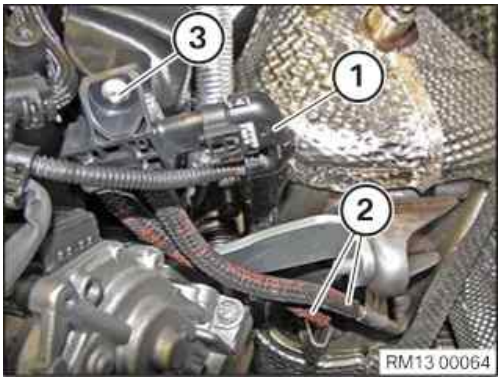


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

52 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

53 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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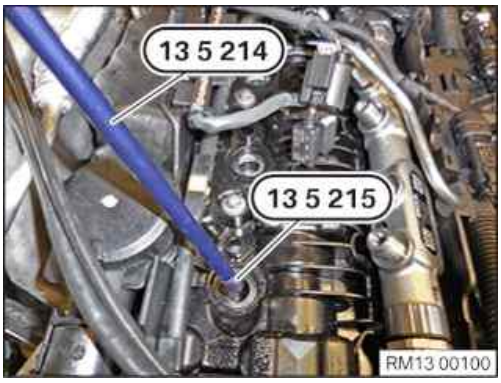
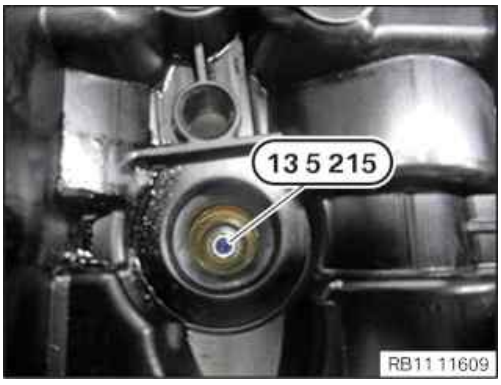


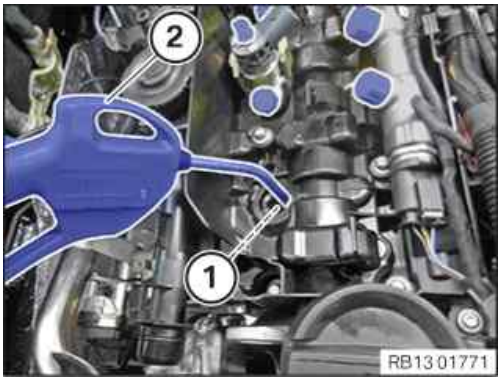
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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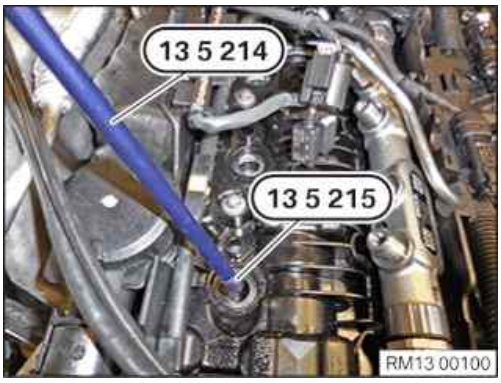


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

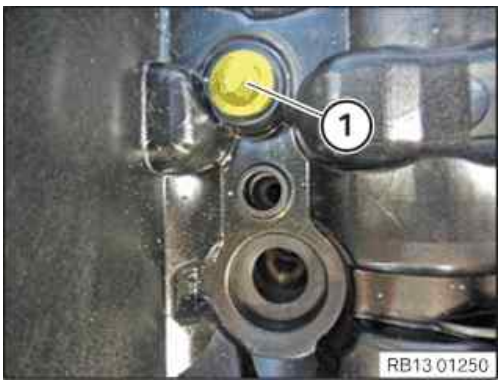
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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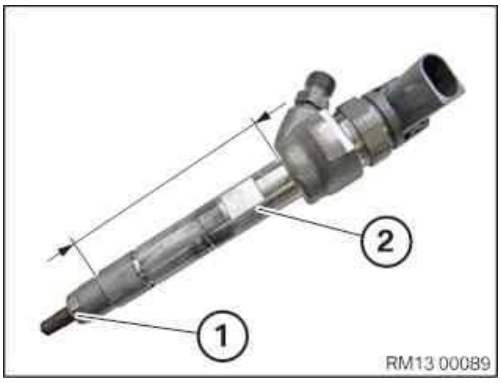


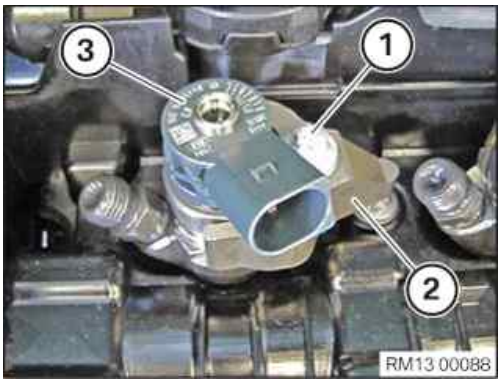
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

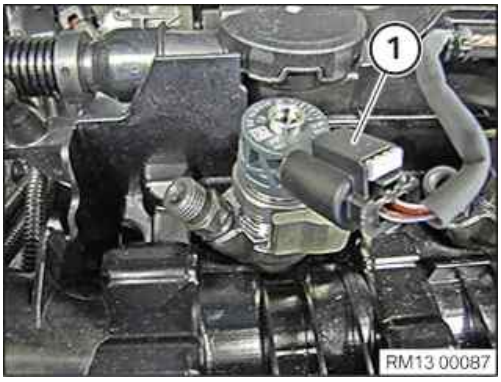
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

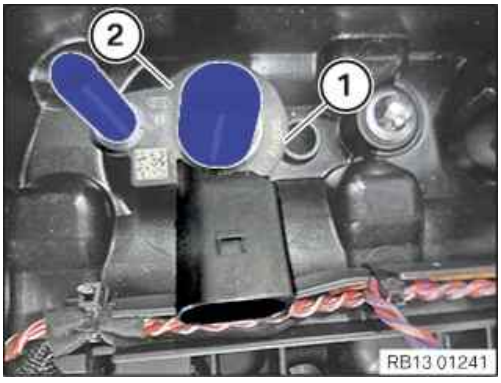
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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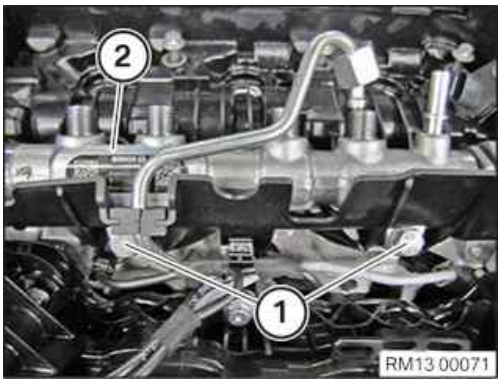
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

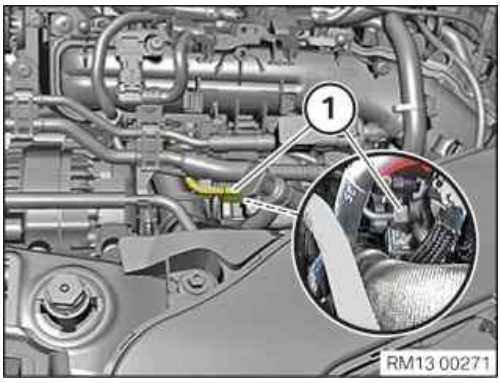
54 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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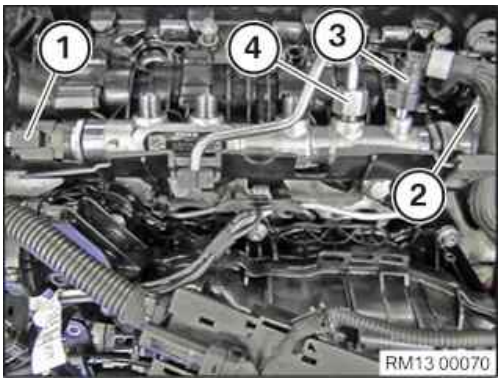

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

55 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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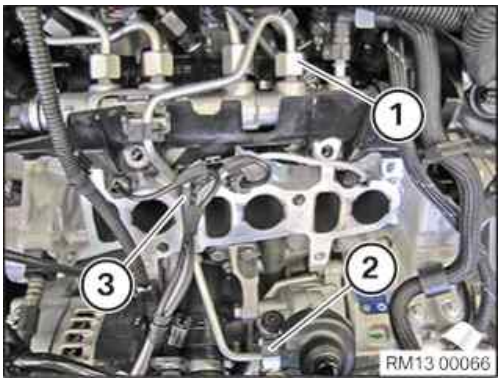

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

56 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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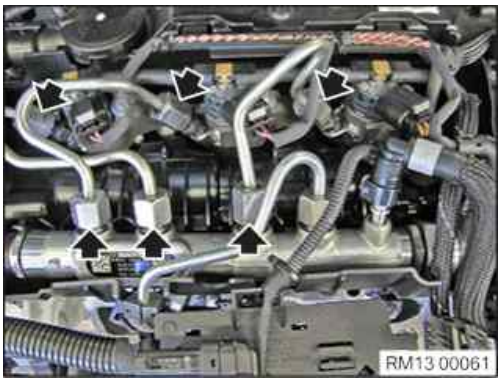

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

57 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

58 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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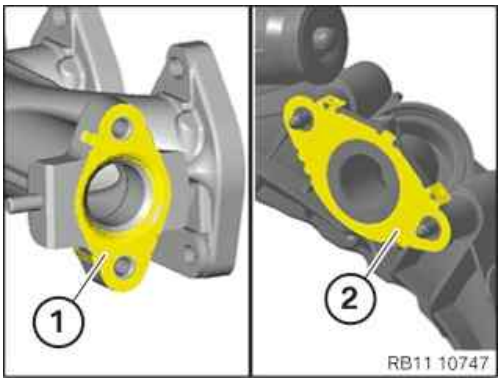
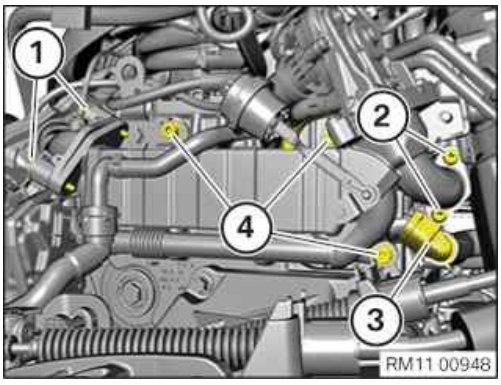


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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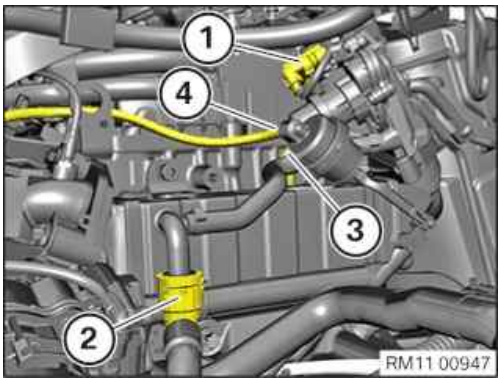


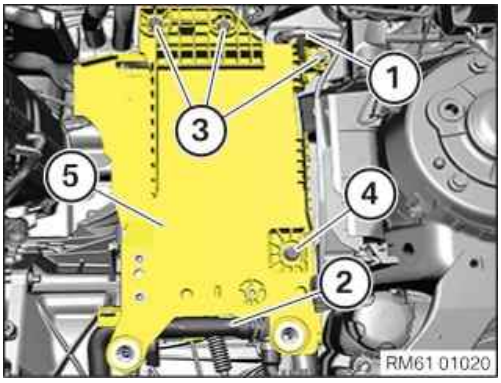
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

59 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

60 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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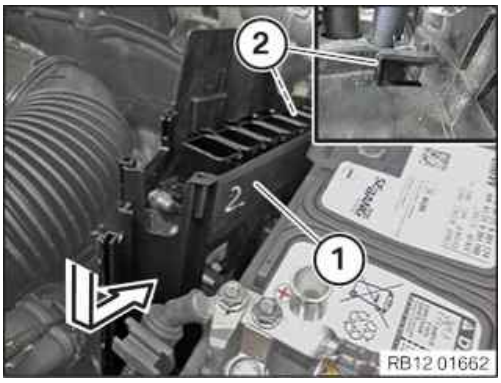
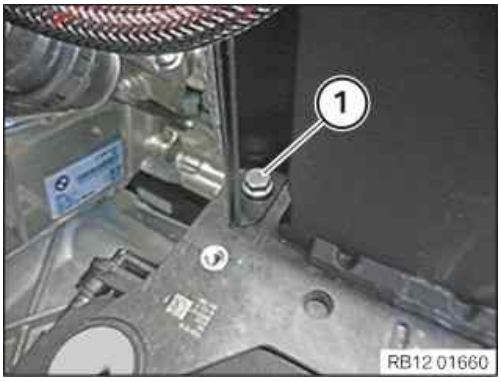


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

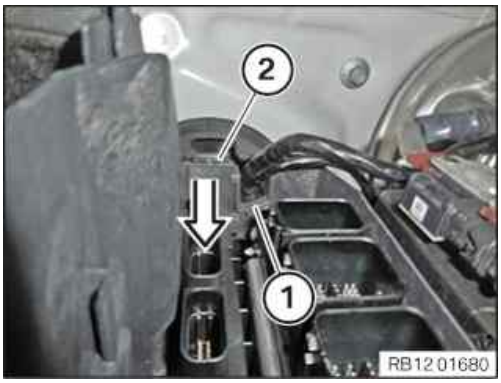
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



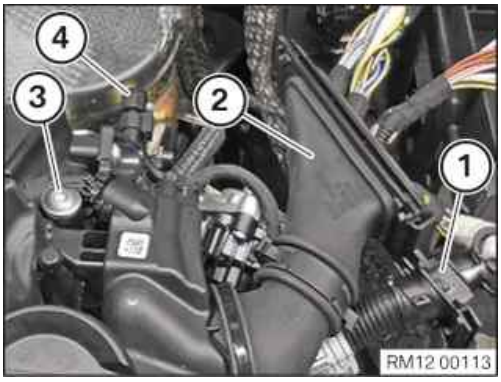
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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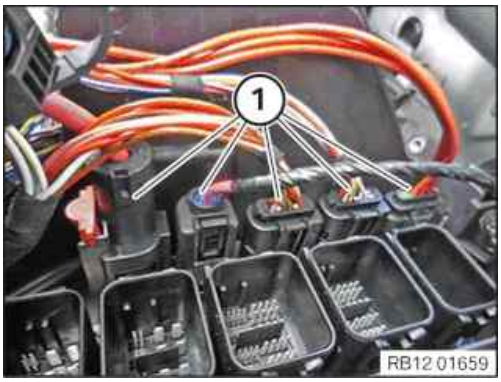
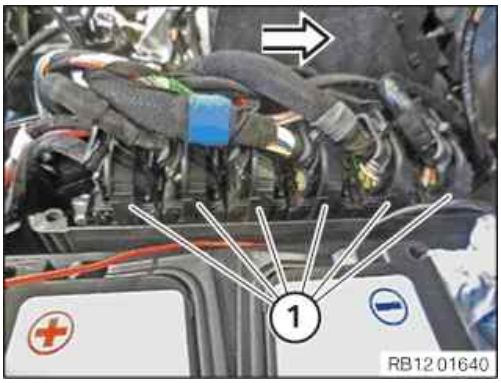
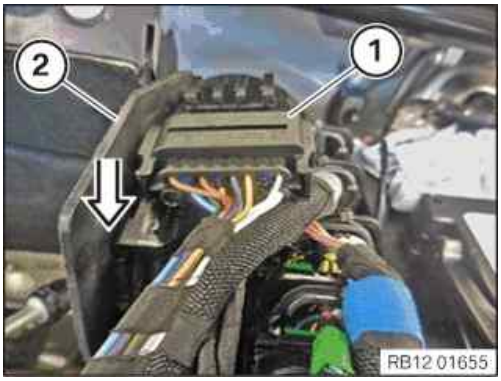


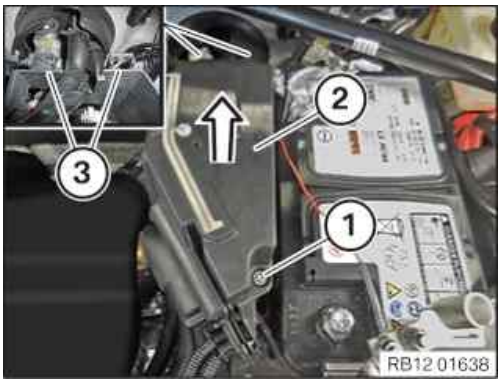
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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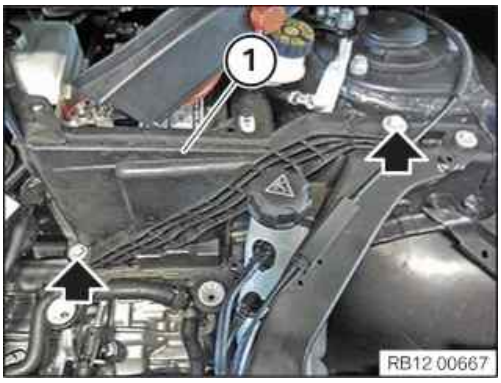


- Feed in and install tension strut (1).
- Tighten screws (arrows).

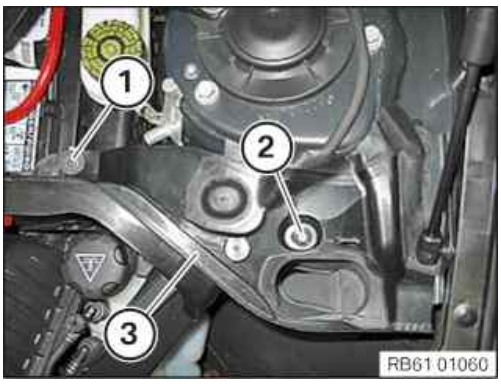
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

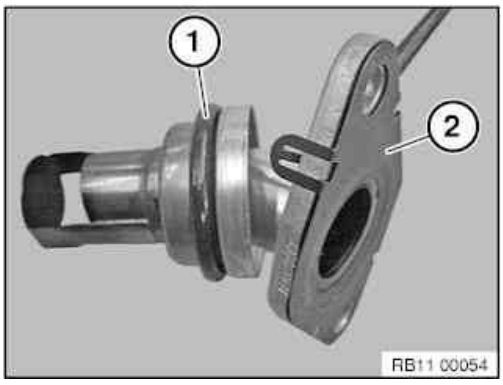


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

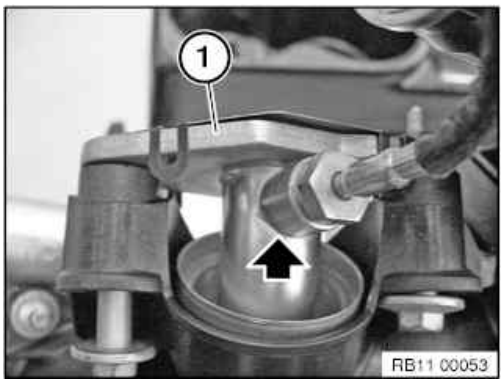
61 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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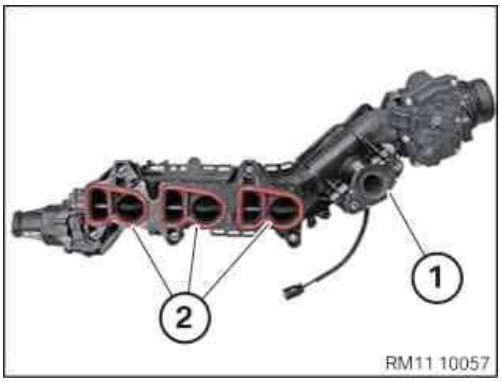
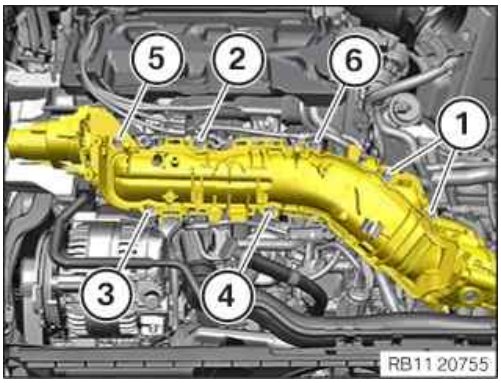


- Renew gaskets (2).

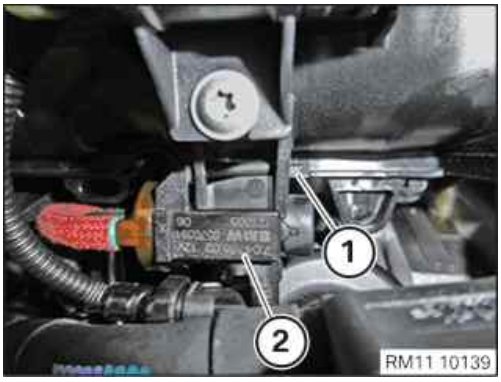
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



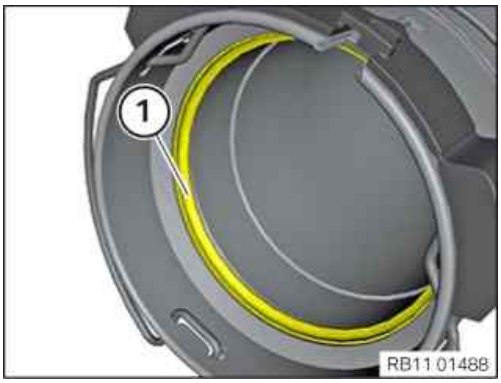
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

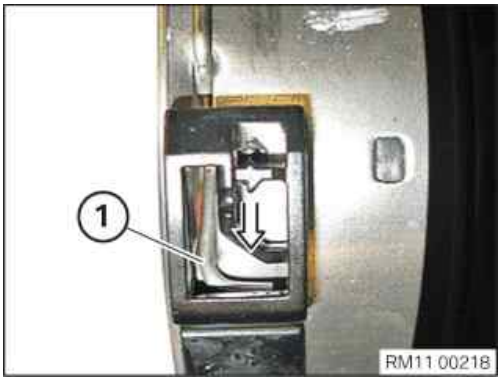


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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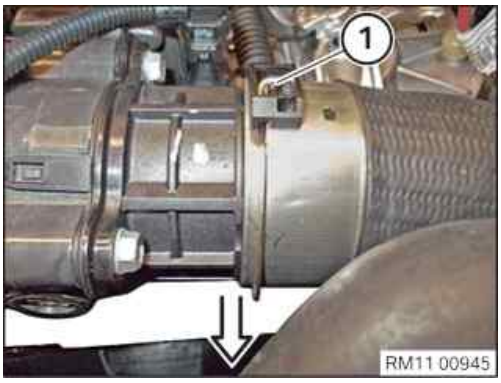
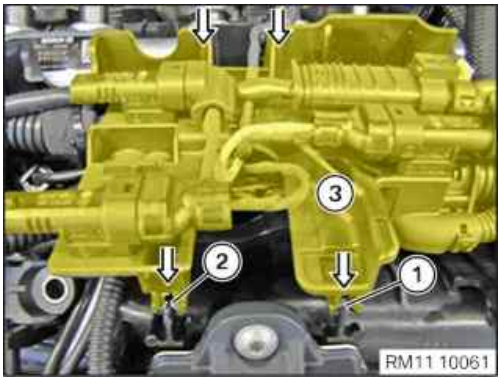


- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

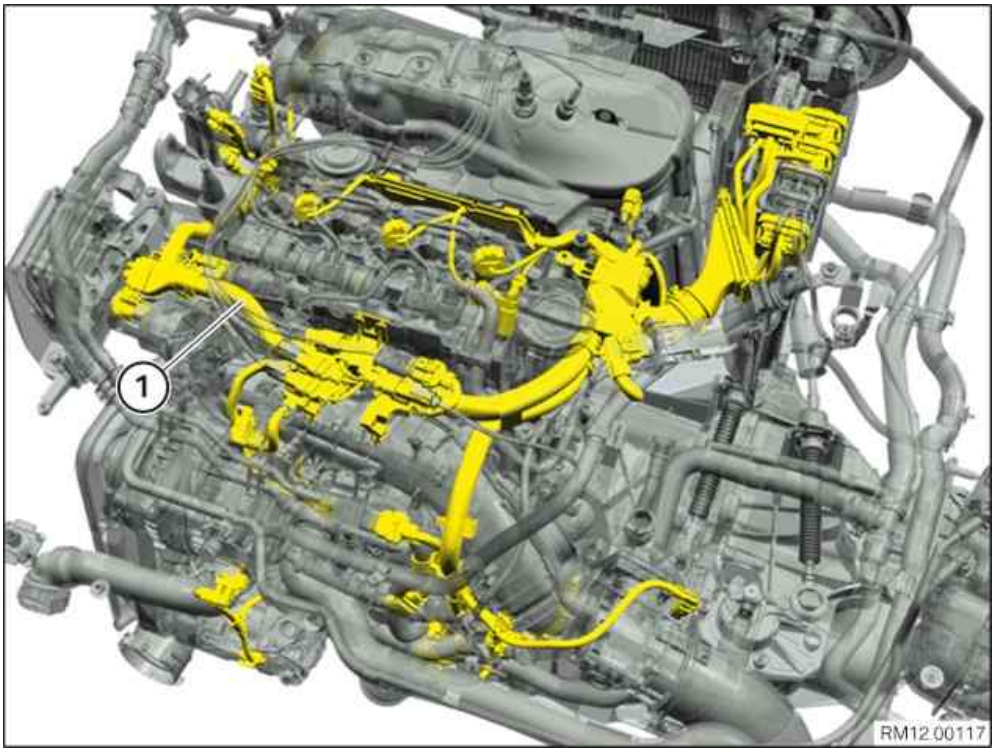
62 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

63 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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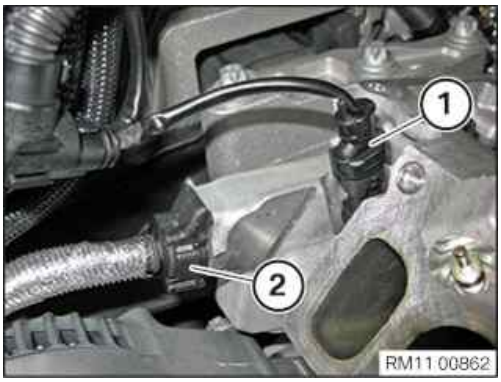
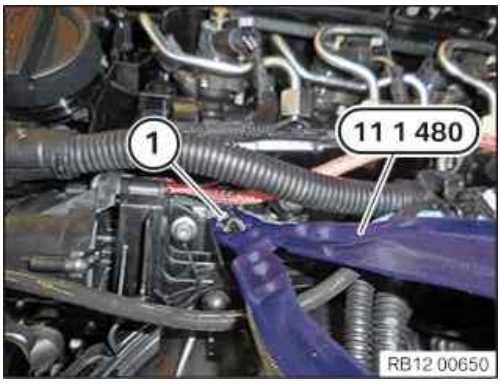
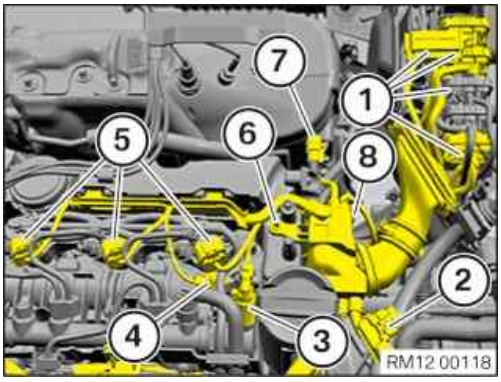


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

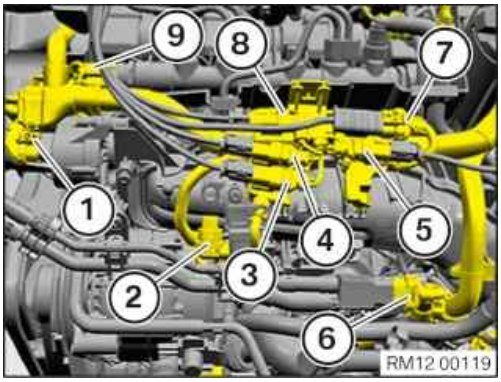


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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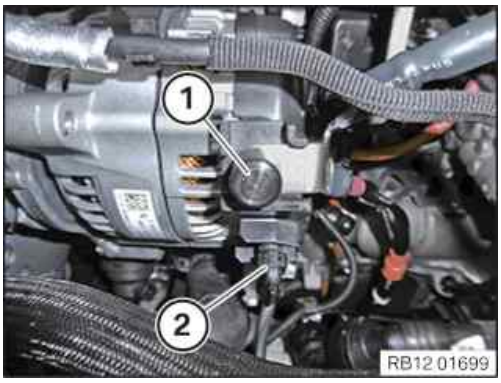
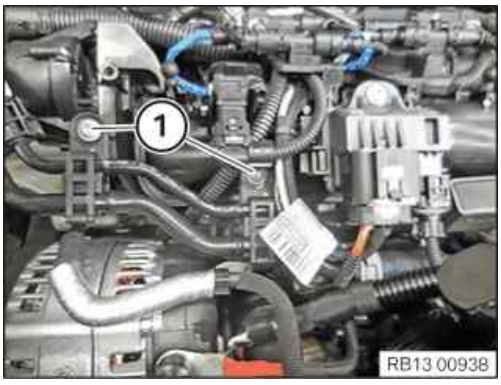


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

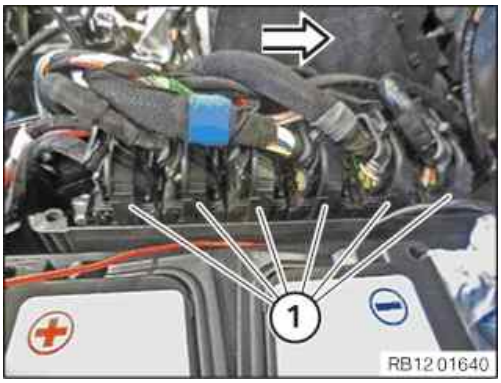


- Position fuel lines.
- Tighten the screws (1).

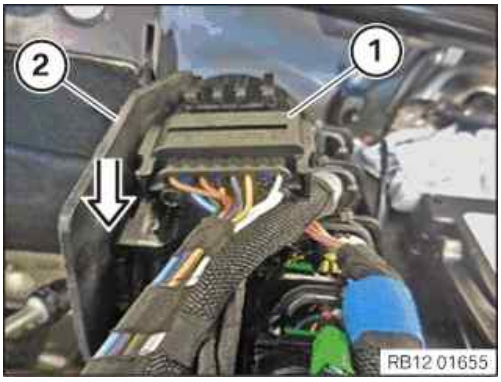
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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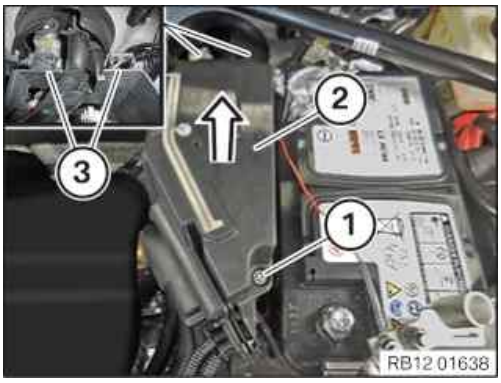
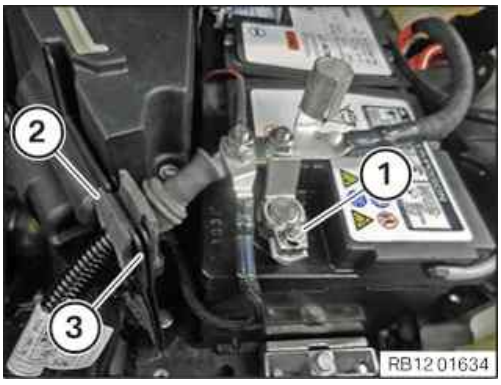


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

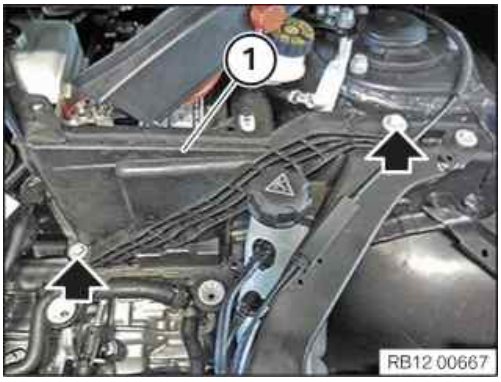
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

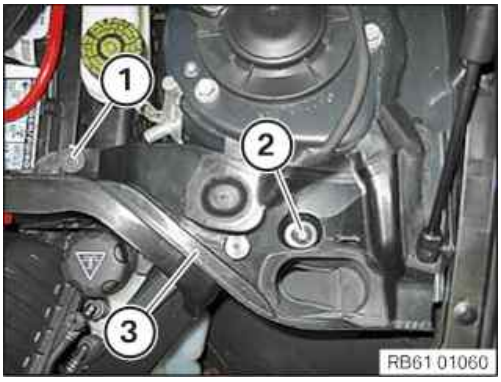
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm

64 – Partially securing clean air pipe

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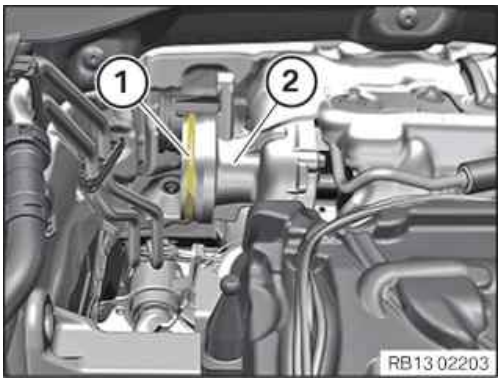
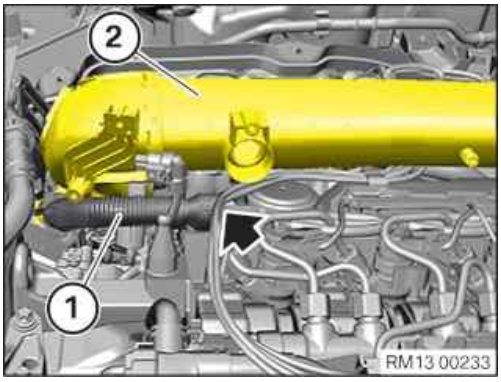
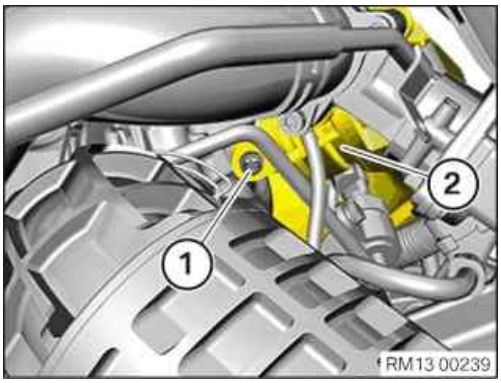


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

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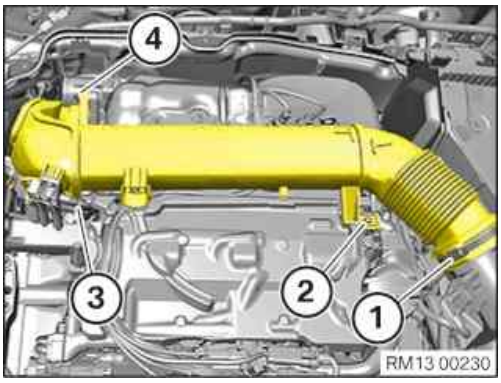


- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

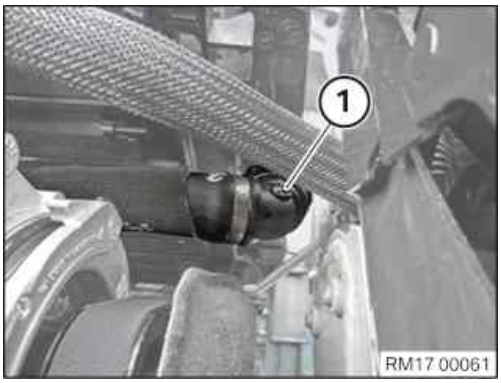
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

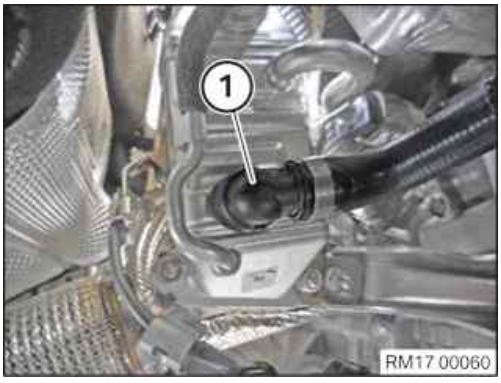
65 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

66 – Installing the front underbody protection

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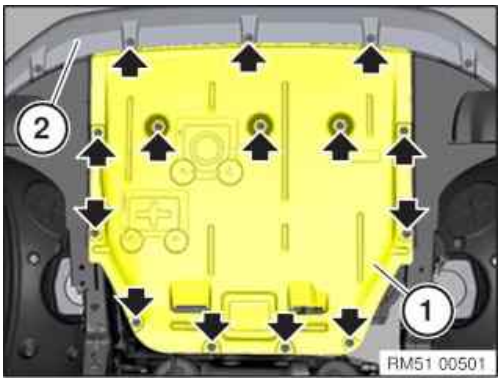
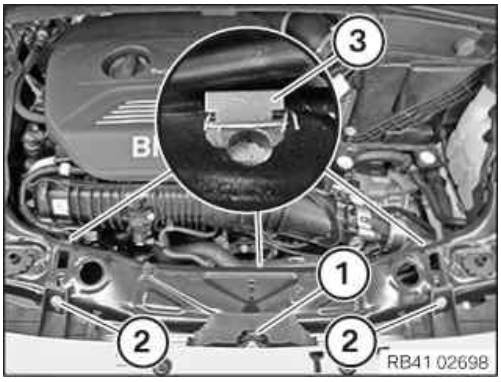


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

67 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

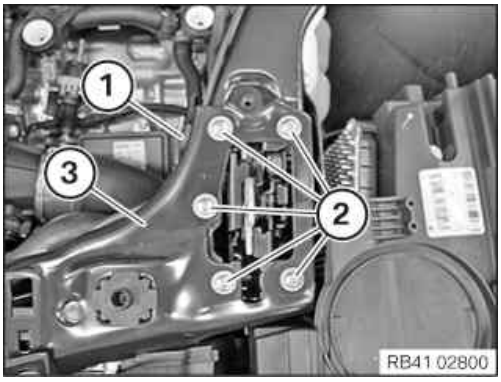
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

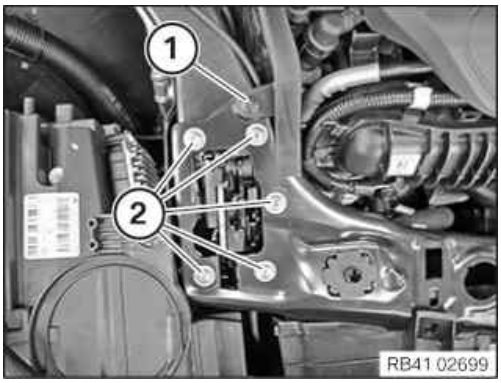


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

68 – Installing intake silencer housing

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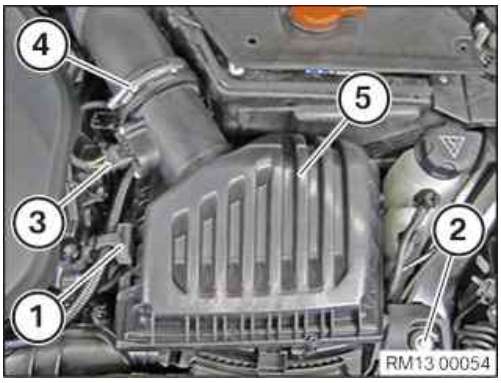


- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

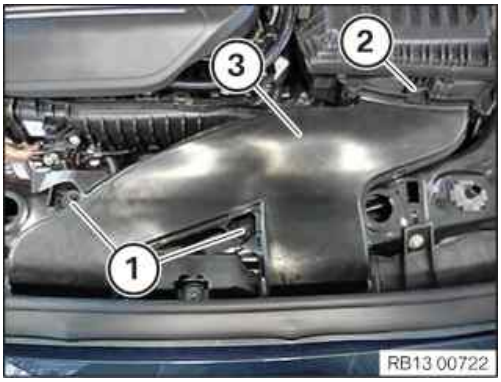
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

69 – Install the intake neck for the intake filter housing

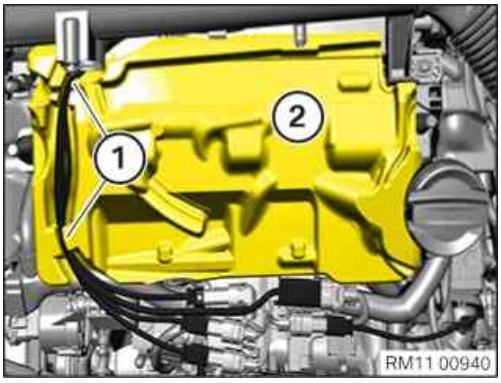


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

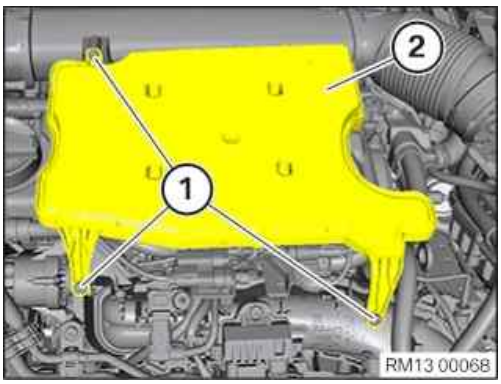
M6		Tightening torque	8 Nm

70 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

71 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).
  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

72 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

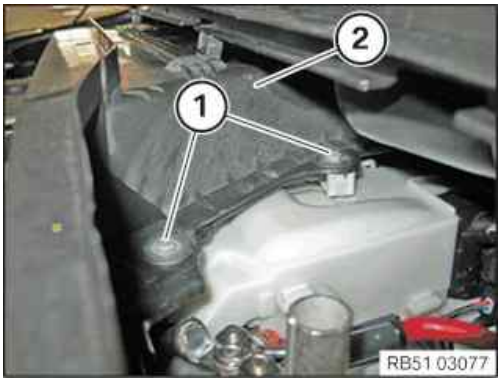
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

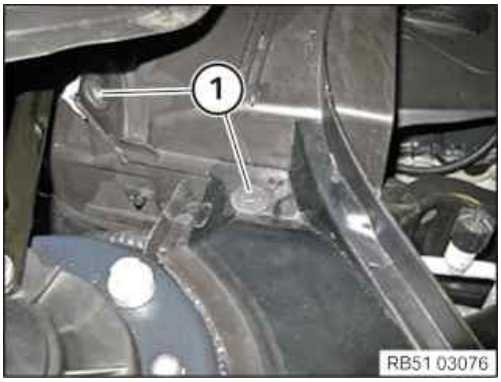
73 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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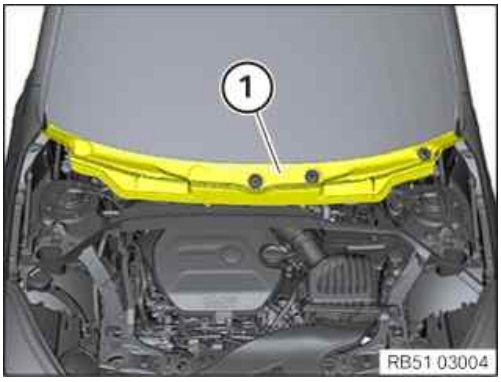
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

74 – Install the rear cowl panel cover



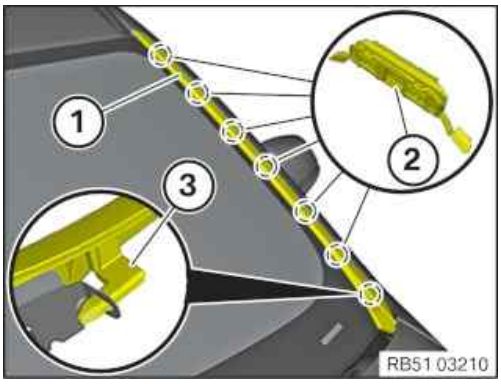
- Feed in and engage the rear cowl panel cover (1).

75 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

76 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the wiper arm**

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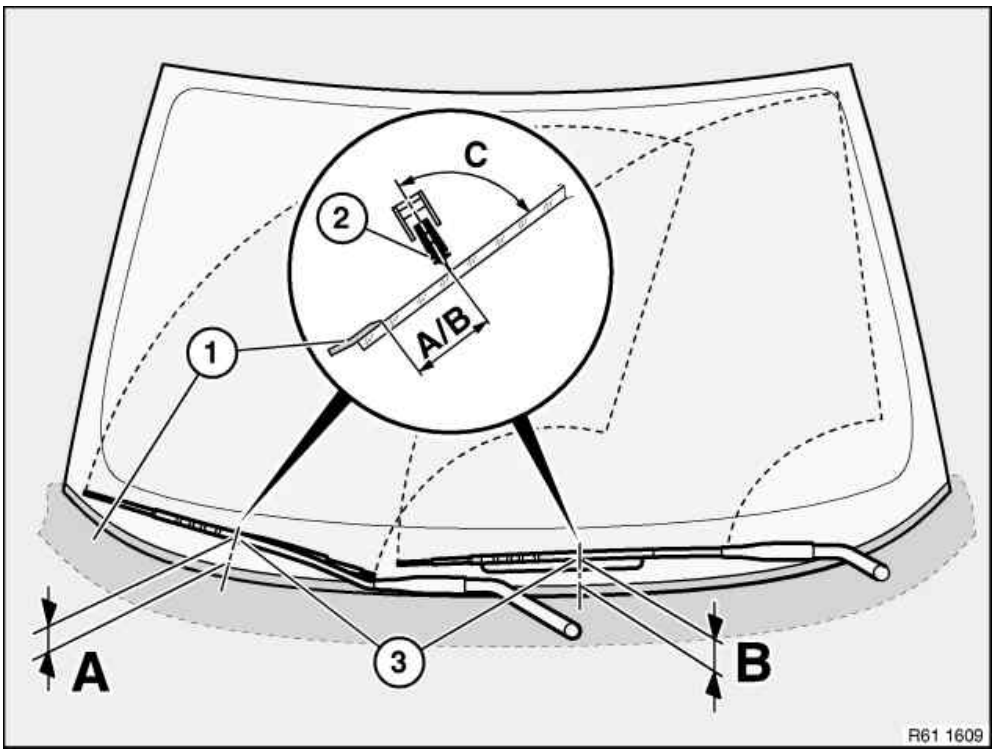
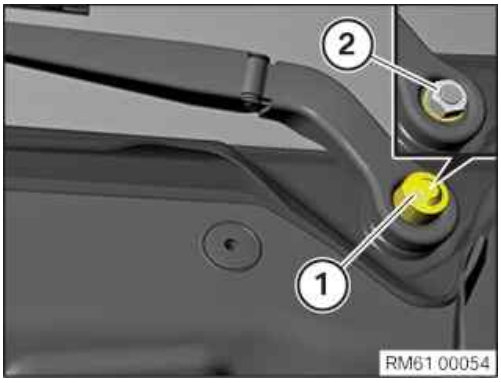
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

77 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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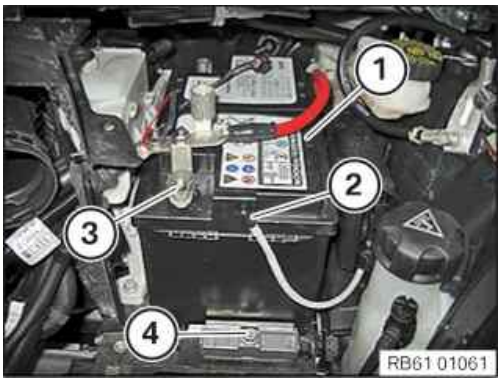


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

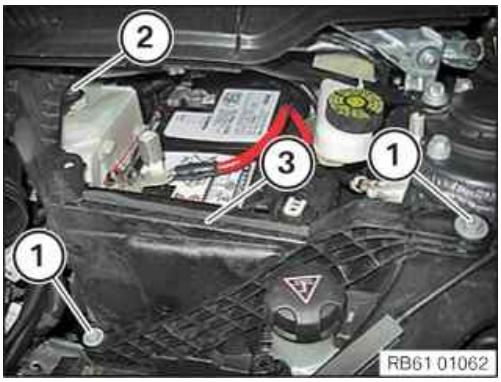
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

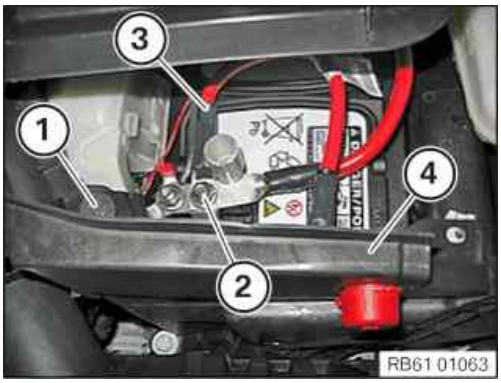
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

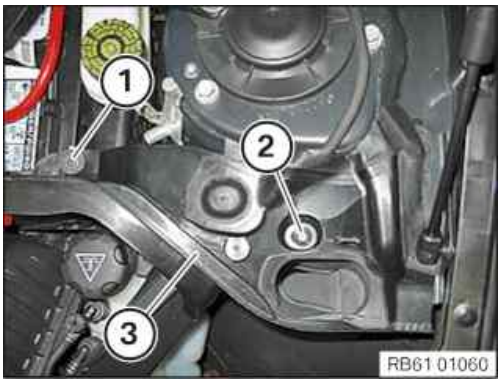
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

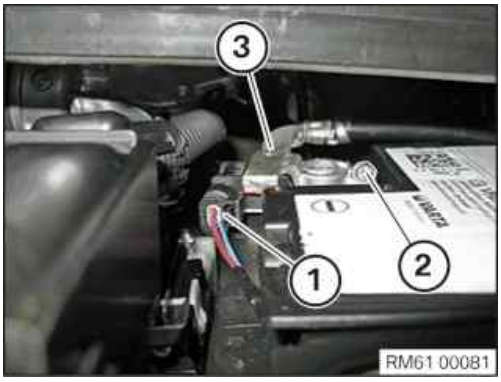
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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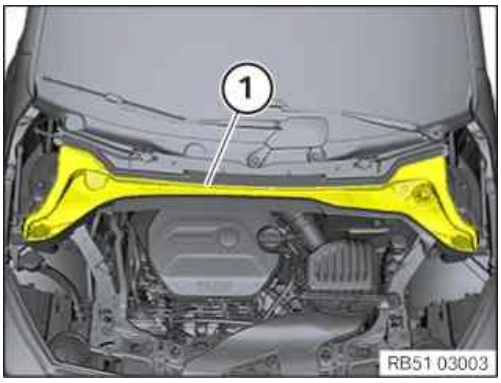
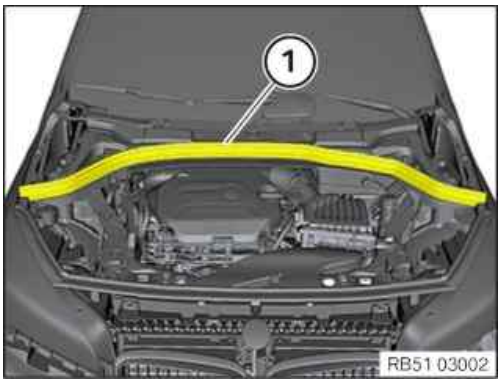


- Feed in the cowl panel cover (1).



- Press the gasket (1) in a downwards direction.

78 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

- See additional information.

Additional Information

Overview of Tightening Torques

Camshaft carrier to cylinder head			Used in step 40
M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head			Used in step 42
M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8			Used in step 42
M8		Tightening torque	19 Nm

Standard screw connection M6			Used in step 42
M6			8 Nm

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Chain tensioner piston to cylinder head

Used in step 43

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 44

M7x17.			17 Nm

Charge air line to crankcase

Used in step 49

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 49

M6		Tightening torque	8 Nm

Wheel arch cover

Used in step 50

Screw			3 Nm
Plastic nut			2,6 Nm

Cylinder head cover to cylinder head

Used in step 51

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 52

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 52

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 53

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 53

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °

Rail on cylinder head cover

Used in step 54

Torx screw M8x25		Tightening torque	19 Nm

High pressure line between high pressure pump and rail

Used in step 54 55

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 56

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 58

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 58

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 58

M8x28	Replace screws	Tightening torque	32 Nm

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Exhaust-gas recirculation cooler to cylinder head — Used in step 58

M8x20		Tightening torque	19 Nm

Battery holder to engine support — Used in step 59

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray — Used in step 60

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 60 63

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 60 63

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 60 63

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 60 63

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 60 63

		Tightening torque	3 Nm

Battery cover — Used in step 60 63 77

Screw			2,8 Nm

Intake plenum to cylinder head — Used in step 61

M6		Tightening torque	11 Nm

Positive battery cable to alternator — Used in step 63

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 63

TS6x20		Tightening torque	5 Nm

Clean air pipe to exhaust turbocharger — Used in step 64

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 64

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 64 68

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 66

			3 Nm

Bracing strut to top cross connection — Used in step 67

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 67

M6x20 screw		Tightening torque	6 Nm

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Cross connection on support for cross connection — Used in step 67

M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge — Used in step 68

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 69

M6		Tightening torque	8 Nm

Resonator to manifold and clean air pipe — Used in step 71

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 73

Screw		Tightening torque	3 Nm

Windscreen wiper arm — Used in step 76

Combination hexagon nut		Tightening torque	35 Nm

Battery terminal rail to battery tray — Used in step 77

M8 screw		19 Nm

Positive battery terminal — Used in step 77

NutM6		5 Nm

Trailing link — Used in step 77

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 77

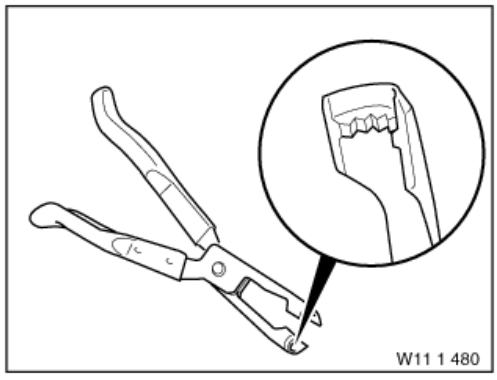
Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 77

NutM6		5 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 18

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

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0 495 910 (37 1 152) Socket wrench

Common Used in step 22 23 24 54 55 56

Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

2 413 106 Fastener

Common Used in step 22 23 55 56

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

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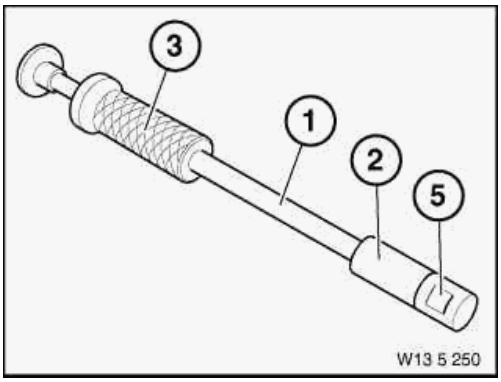
0 493 321 (13 5 250) Puller



Common

Used in step 25

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

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0 493 339 (13 5 252) Bush

Common Used in step 25

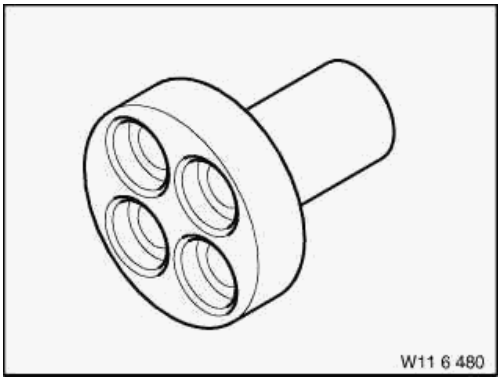
Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common Used in step 25

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 380 (11 6 480) Connector



Common Used in step 31 47

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common Used in step 31 46 47

Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge

Common	Used in step 31 45 47
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 36 37

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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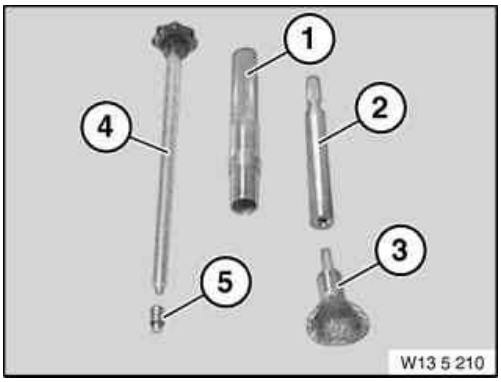
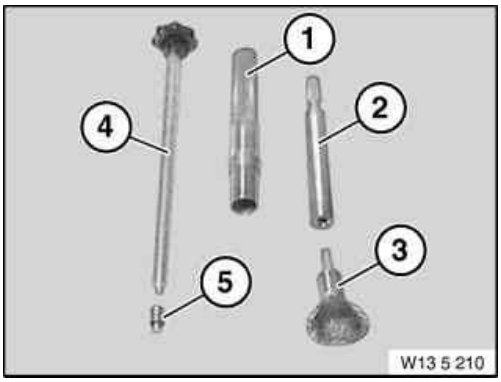
0 493 763 (13 5 215) Plug



Common Used in step 53

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 762 (13 5 214) Rod



Common Used in step 53

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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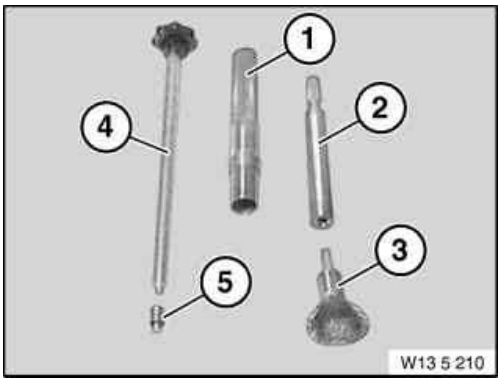
0 493 758 (13 5 210) Tool



Common Used in step 53

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

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0 495 221 (36 1 323) Wheel stud

Common	Used in step 28
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 28
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 28
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud

Common	Used in step 28
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 28
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 28
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud

Common	Used in step 28
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 28
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	17 58
EGR controller	17 58

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 77
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Repair instructions	Used in step
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	78
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Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	43
Exhaust-gas recirculation cooler seal on exhaust manifold	58
Exhaust-gas recirculation cooler seal on intake plenum	58

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11 34 552 Removing and installing or replacing all valves - cylinder head removed (B37C)

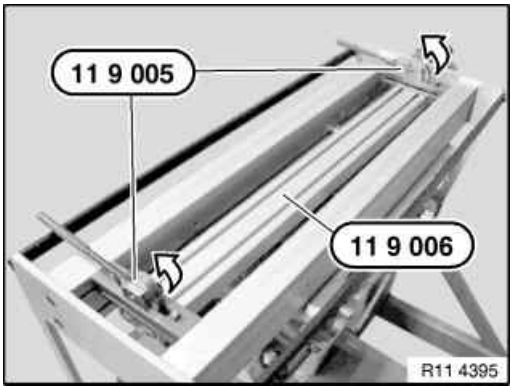
Special tools required:

- 11 9 000
- 11 9 005
- 11 9 006
- 11 9 008
- 11 4 480
- 11 9 007

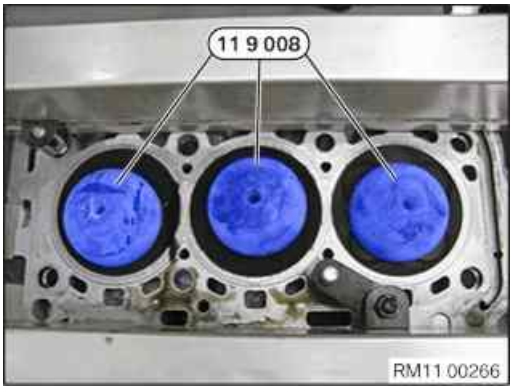
Necessary preliminary tasks:

- Remove valve stem seals

Removal:



Turing the cylinder head with the special tool 11 9 000 .
Unlocking the special tool 11 9 005 .
Remove special tool 11 9 006 .



Remove special tool 11 9 008 if necessary.

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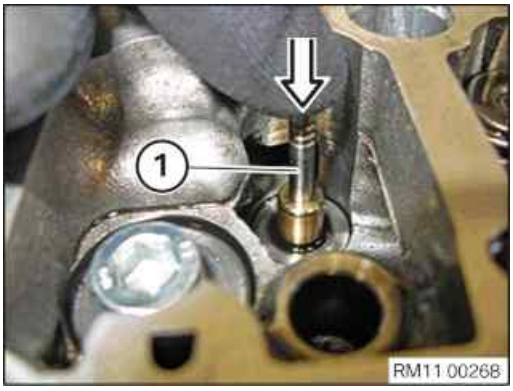
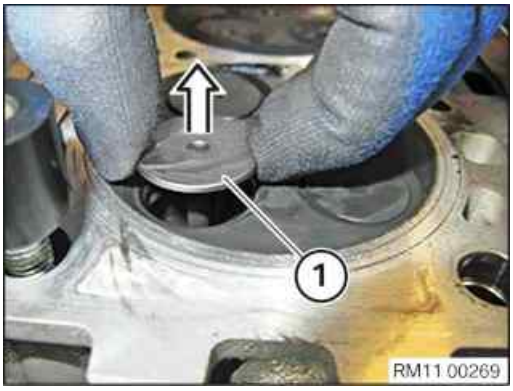
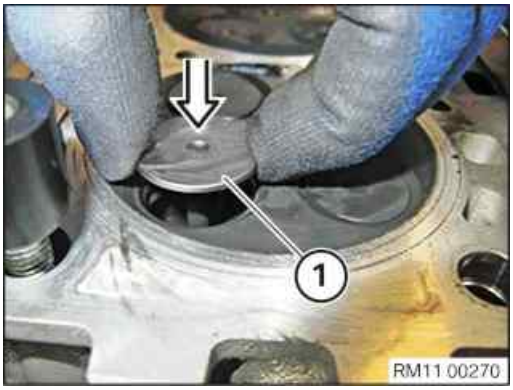


Push valve stem (1) into the cylinder head.

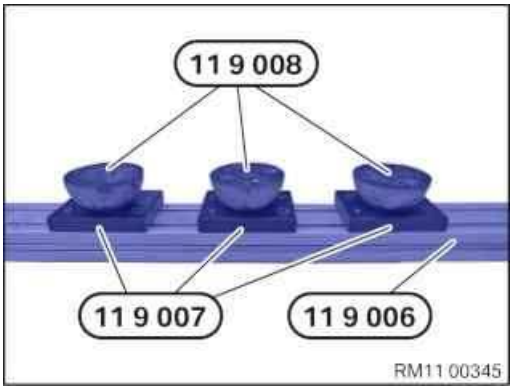


Removing the valve (1) and placing on the special tool 11 4 480 in an orderly fashion.

Installation:



Installing the valve (1).



Prepare the special tools 11 9 006 , 11 9 007 and 11 9 008 as shown.

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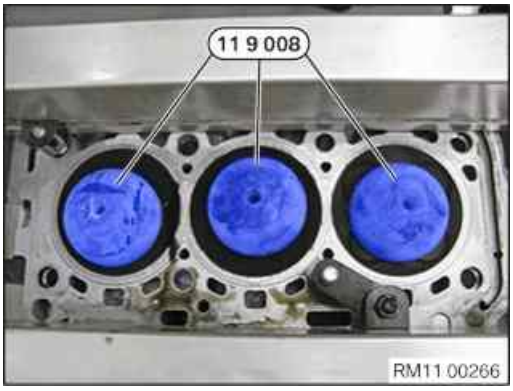
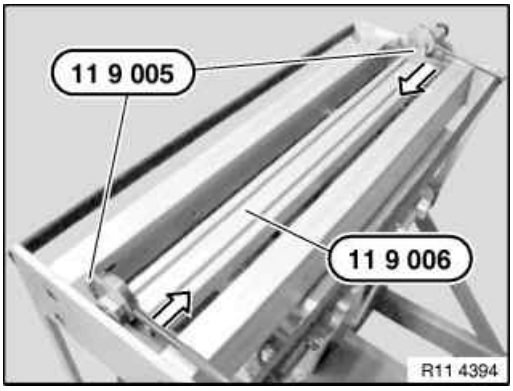
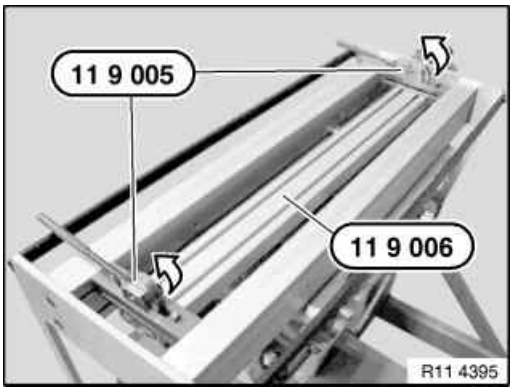


Note:
The special tools 11 9 008 must be set up accordingly in the next operation.



Turn round special tool 11 9 006 and insert as shown.

Lock special tool 11 9 005 in direction of arrow.



Lock special tool 11 9 005 in direction of arrow.

Rotate cylinder head, using special tool 11 9 000 , 180° into installation position.

Required follow-up work:

- Installing and, if necessary, replacing the valve stem seals
- Assemble engine

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11 34 552 Removing and installing/replacing all valves

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Maintain conditions of absolute cleanliness.

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1 – Remove vehicle battery

WARNING

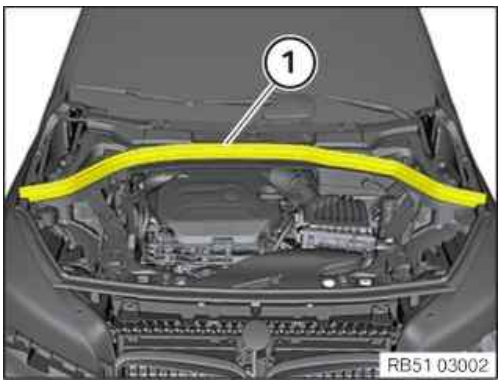
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

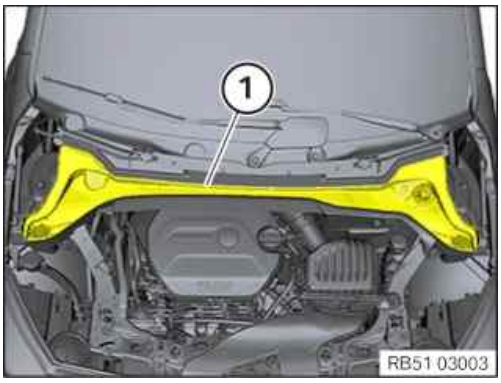
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

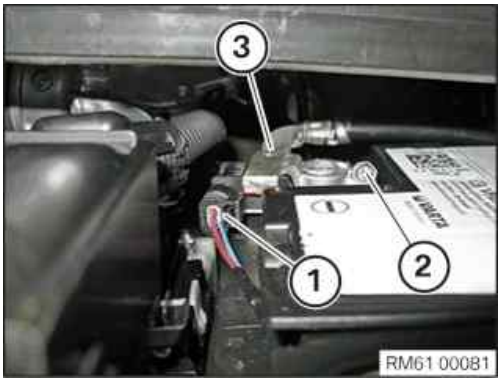
For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).

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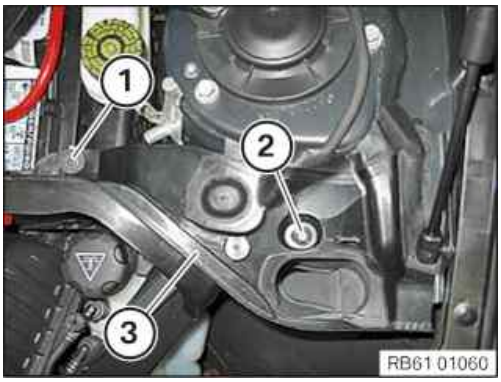
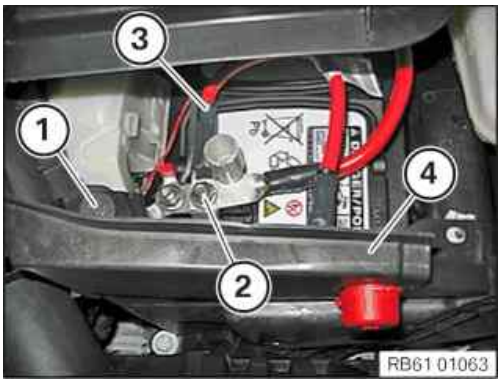
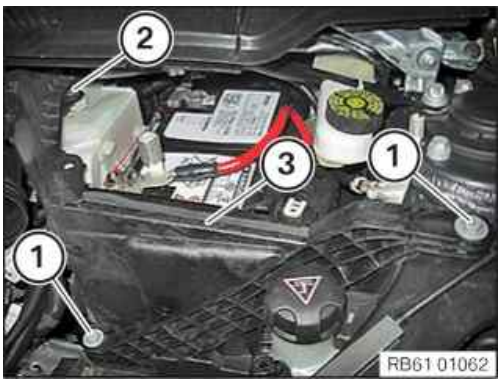


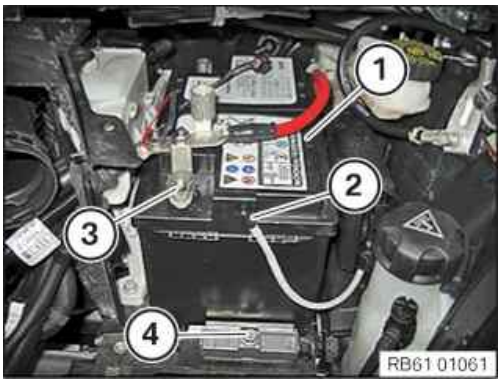
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Removing the upper bulkhead cover

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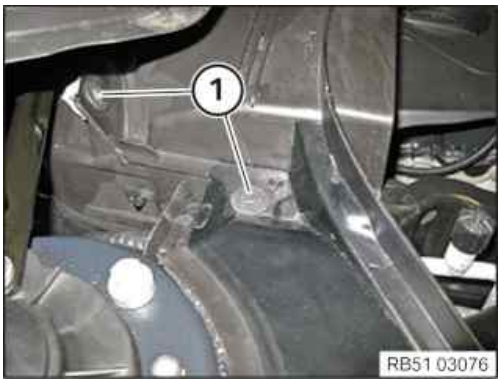
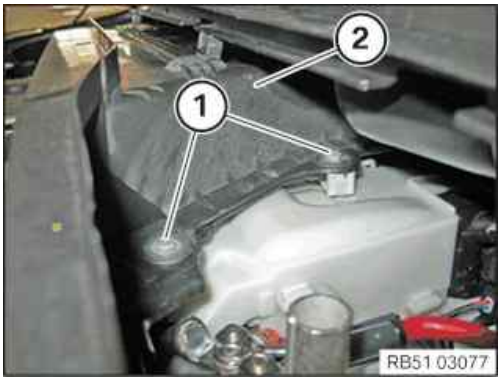
- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

3 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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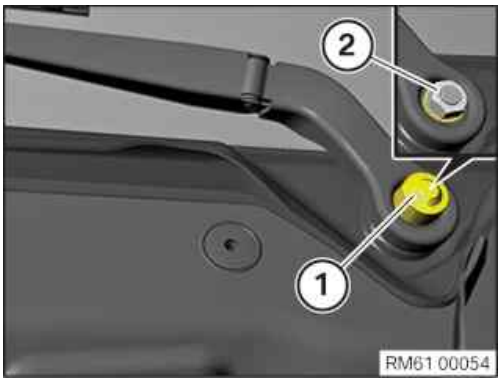
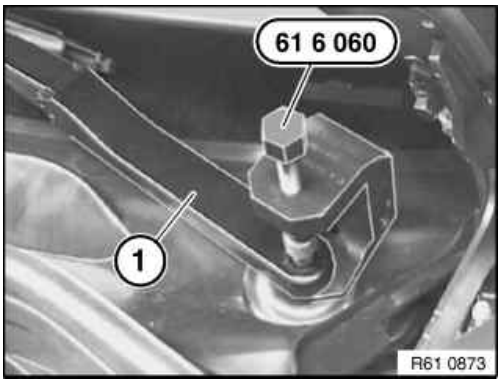


- Remove the protective cap (1).
- Loosen nut (2).



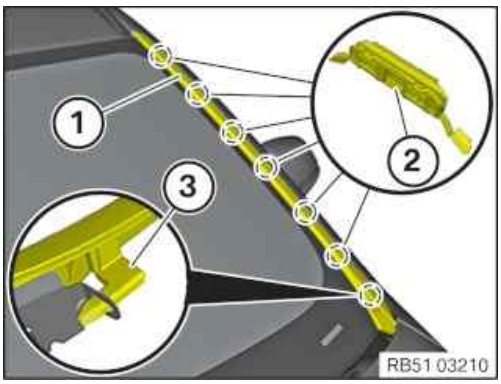
- Pull off the wiper arm (1) using special tool .

4 – Remove the gutter strip on the windscreen on the left and right

NOTICE

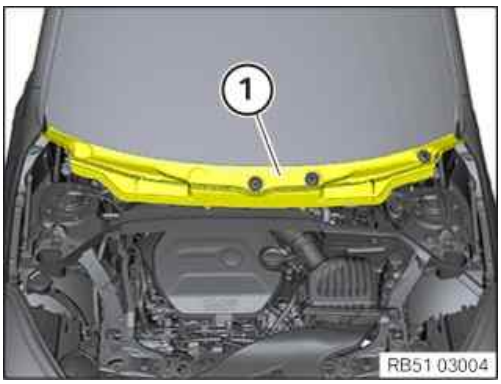
Description is for left component only. Procedure on the right side is identical.

▶ Remove the gutter strip on the windscreen



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

5 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

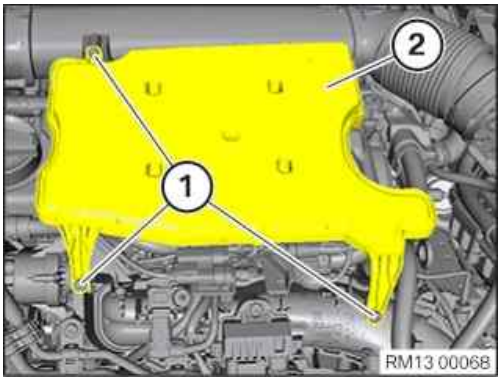
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

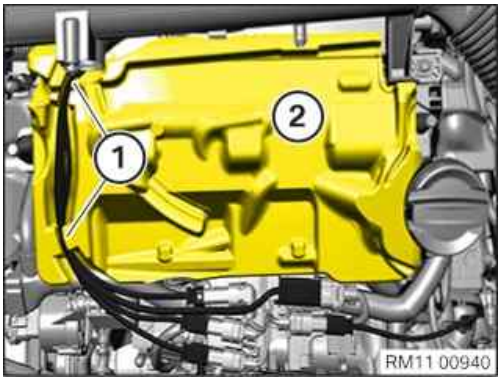
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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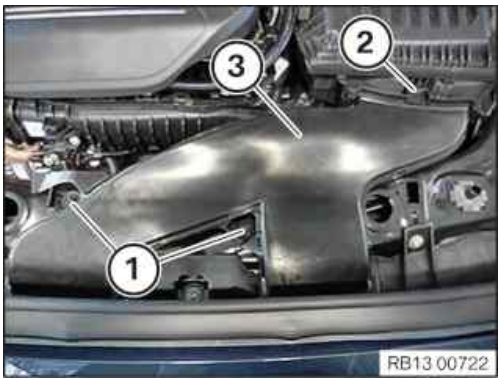
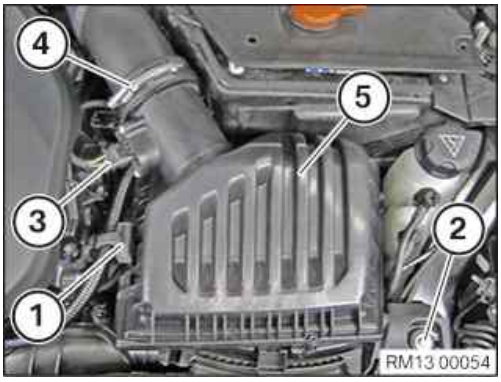


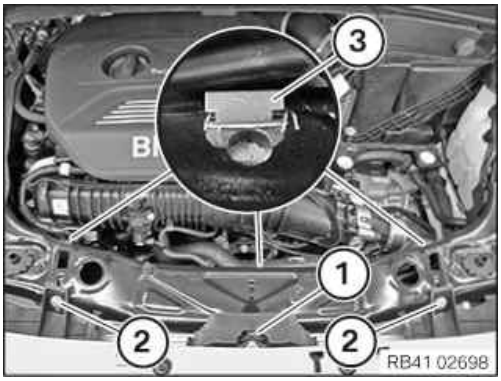
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

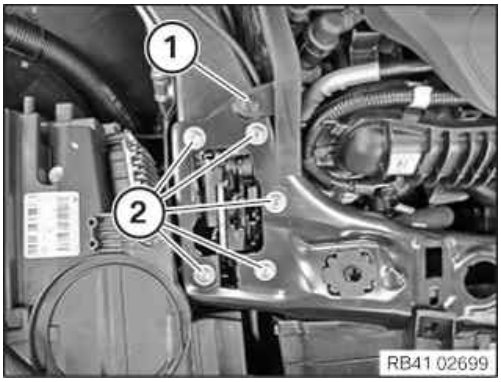


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

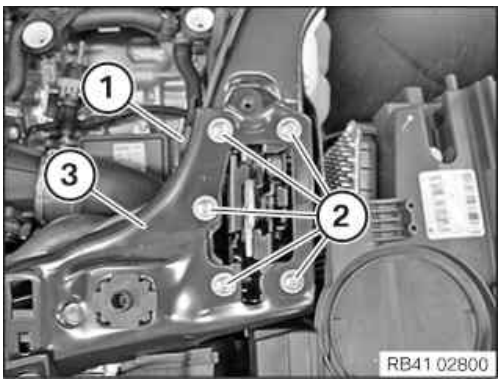
11 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

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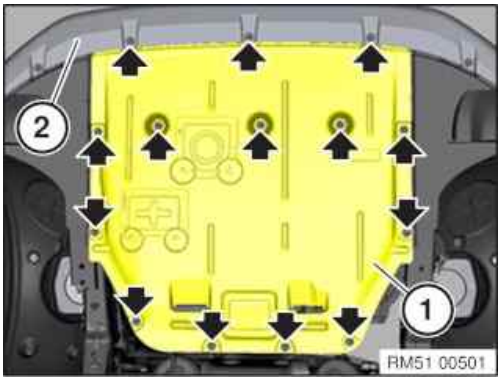
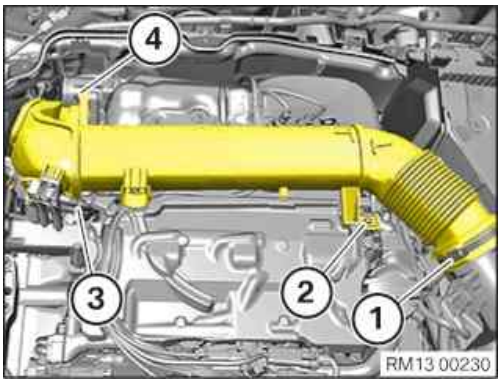
12 – Removing the front underbody protection

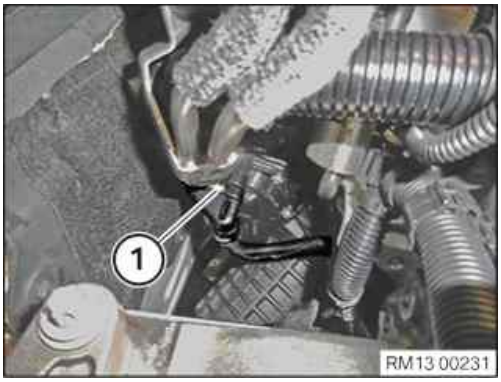


- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

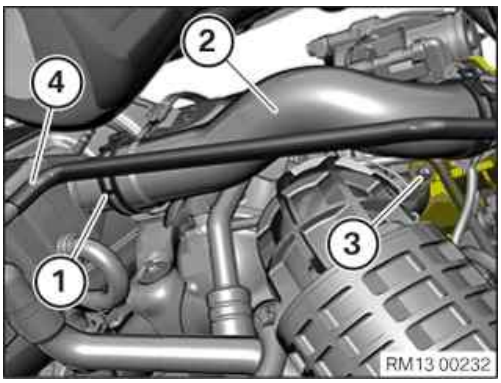
13 – Removing clean air pipe



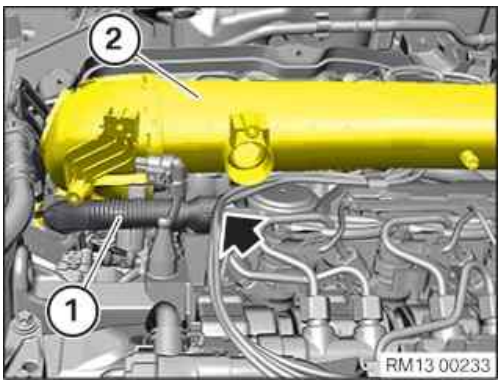
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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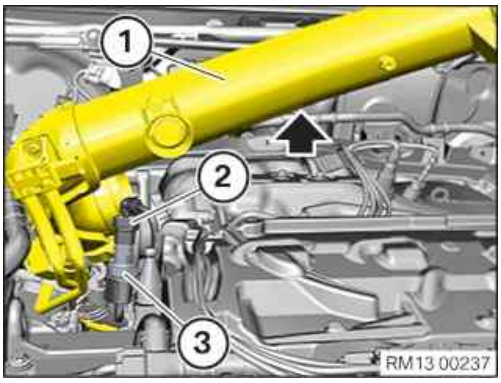

- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

14 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

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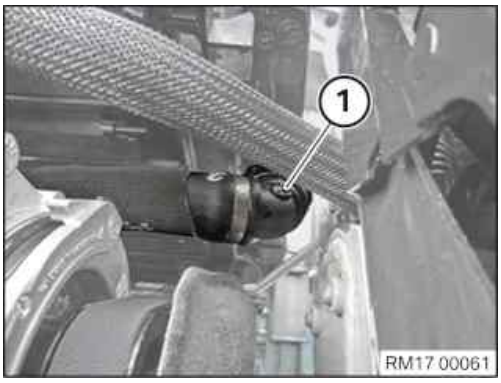
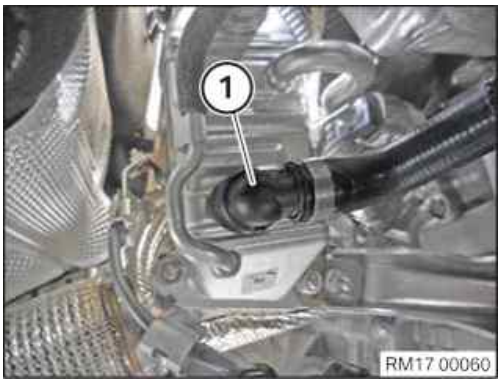


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

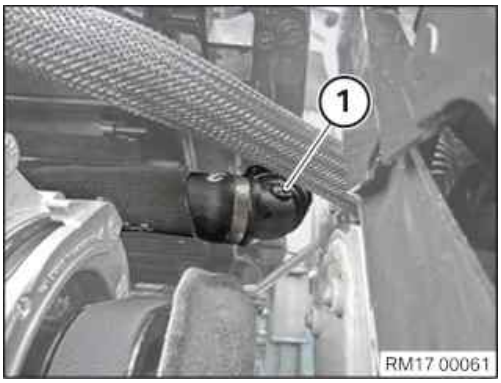


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

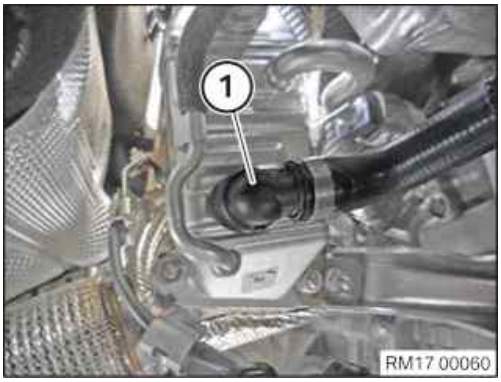
15 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

16 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

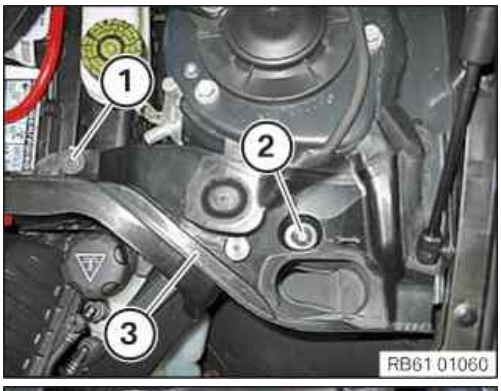
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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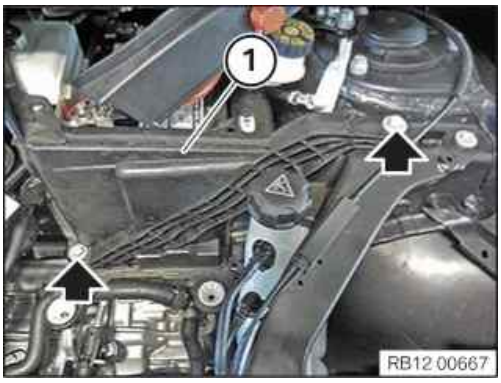
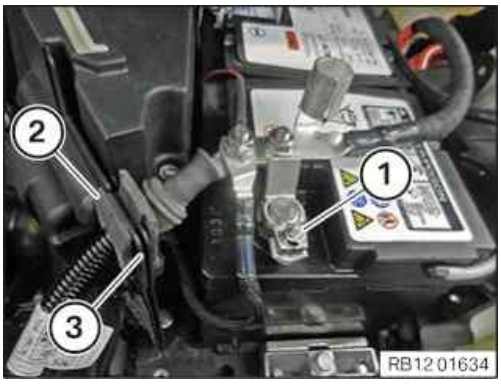
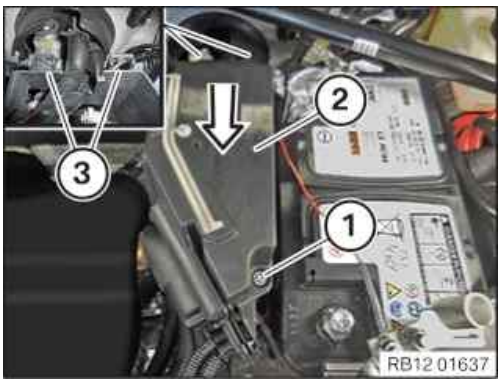


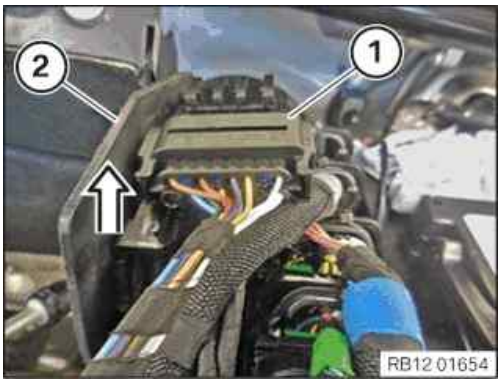
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



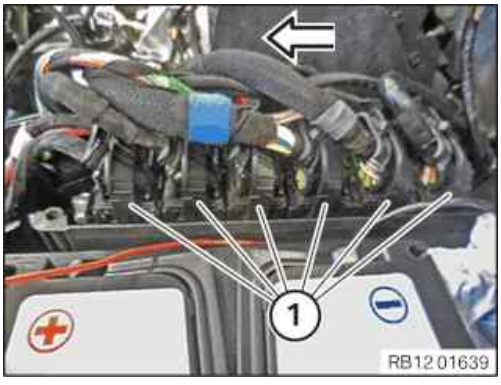
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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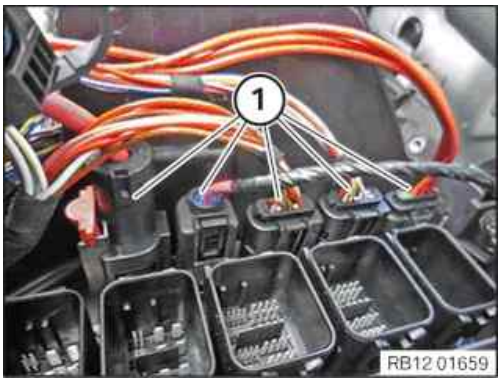
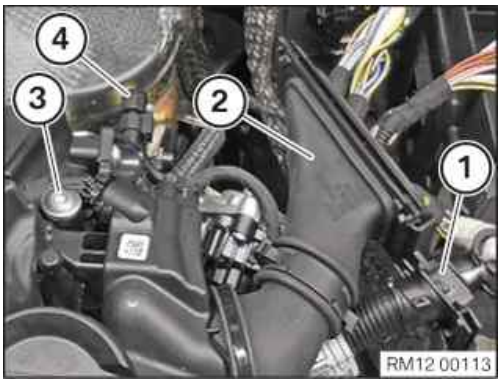
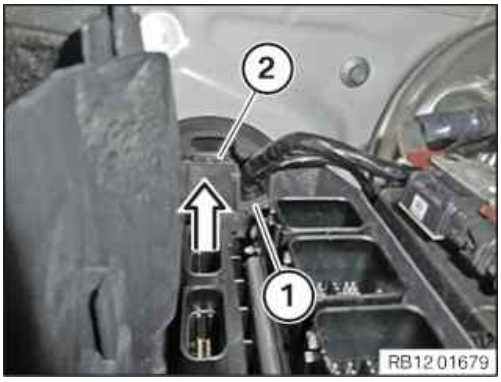


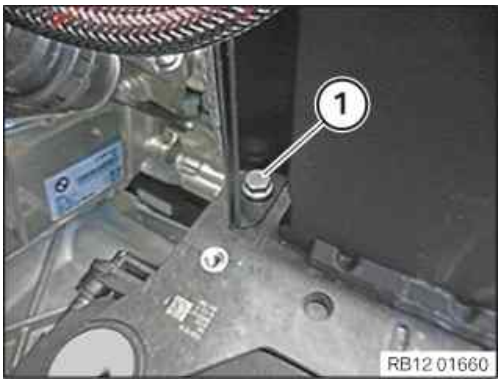
- Unlock and loosen connector (1).



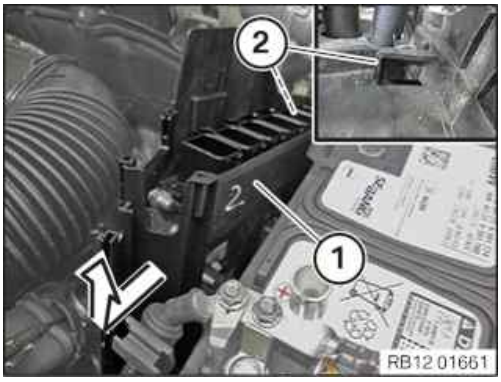
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

17 – Remove battery holder

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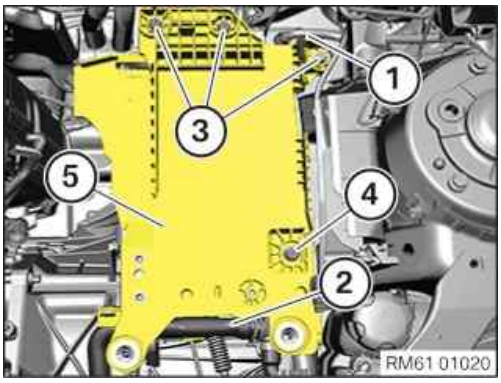
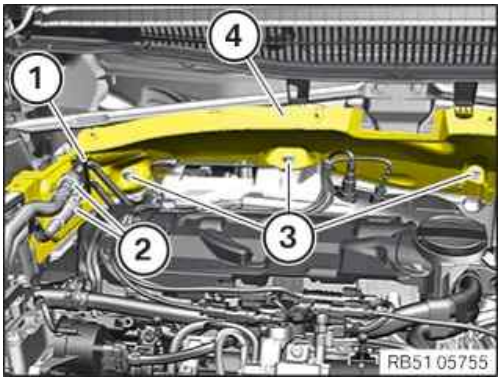


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

18 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

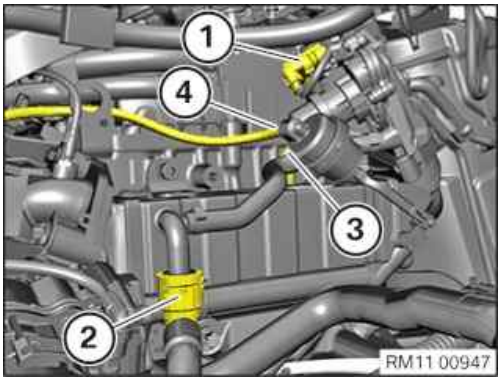
19 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

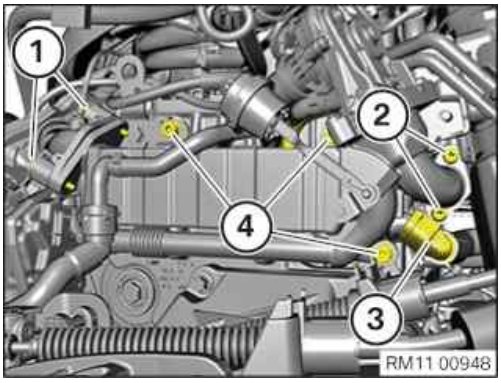
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

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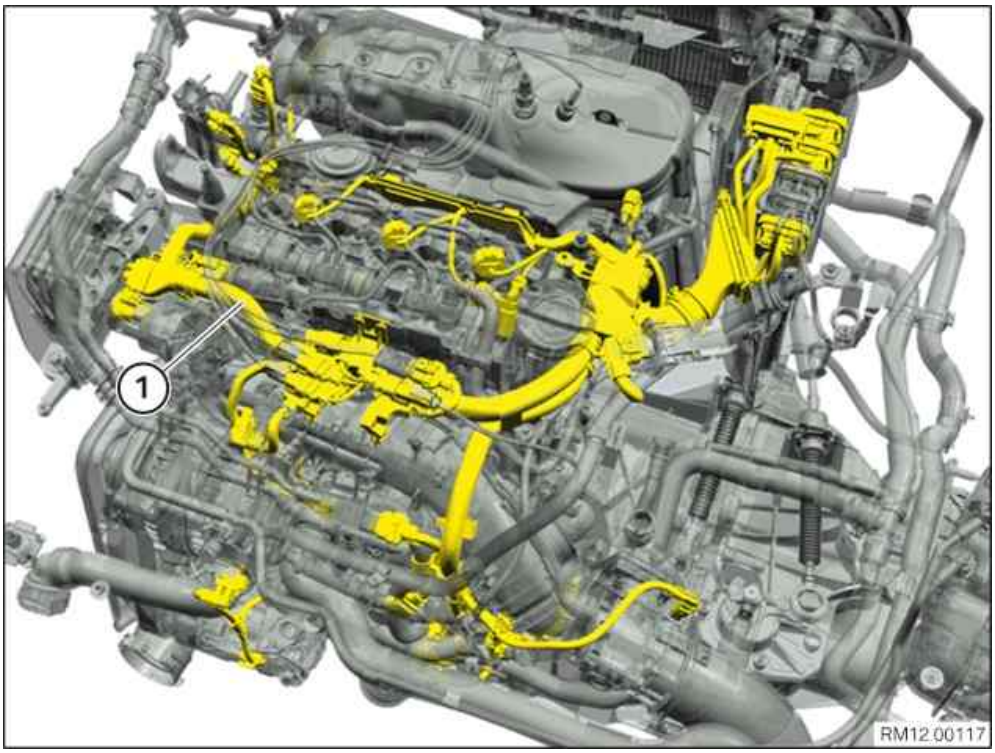
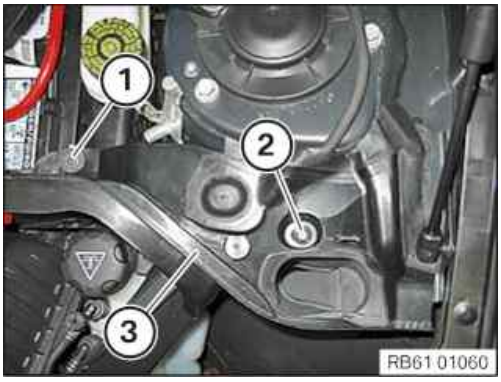
20 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine

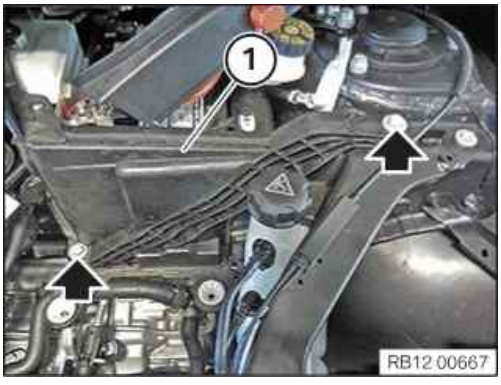


1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.

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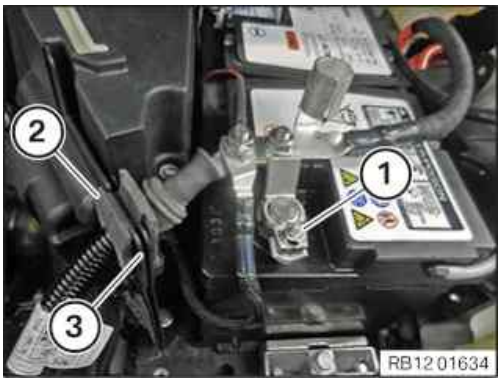
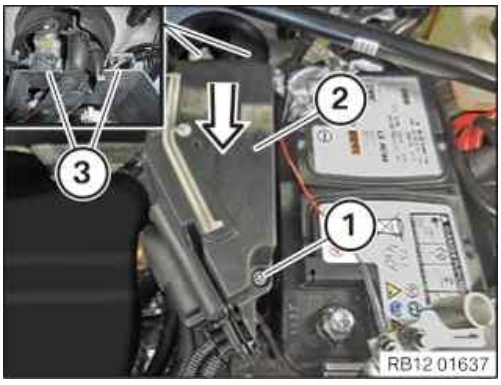
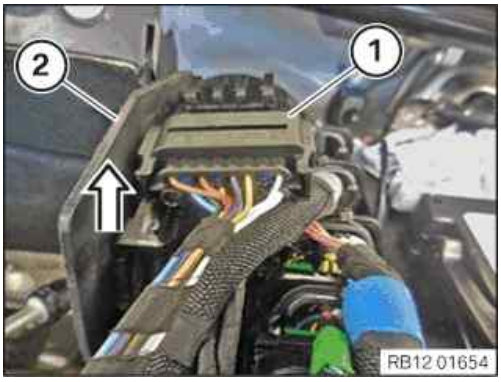


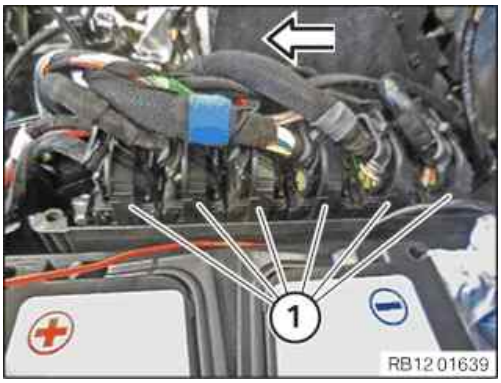
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).

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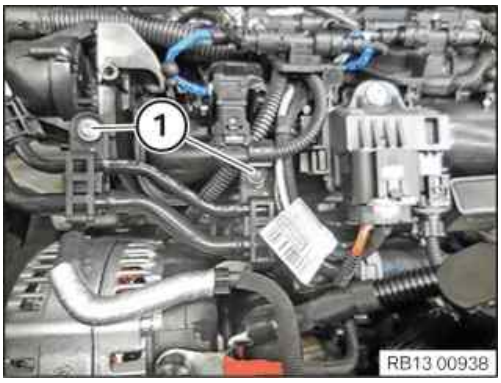
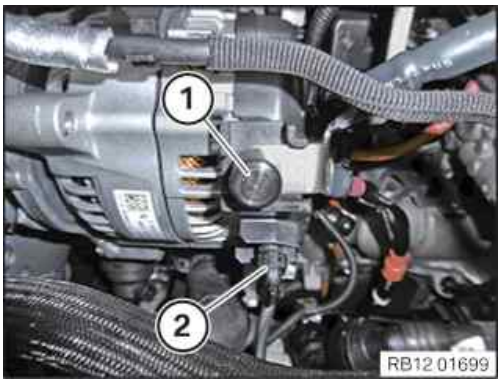
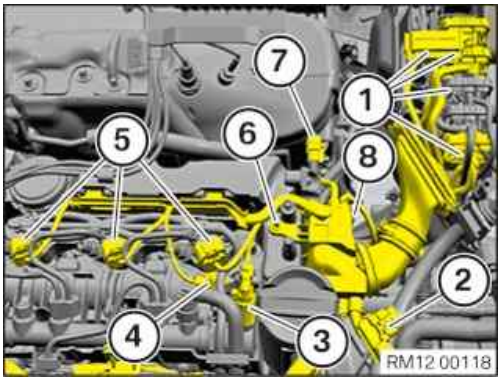


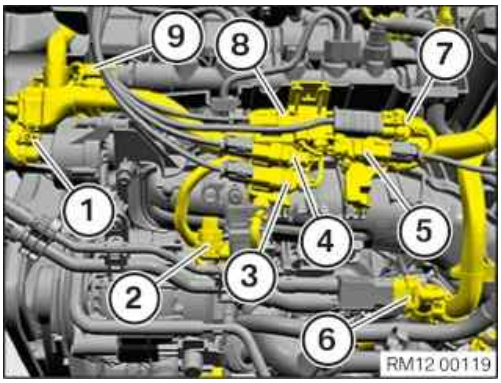
- Loosen screws (1).



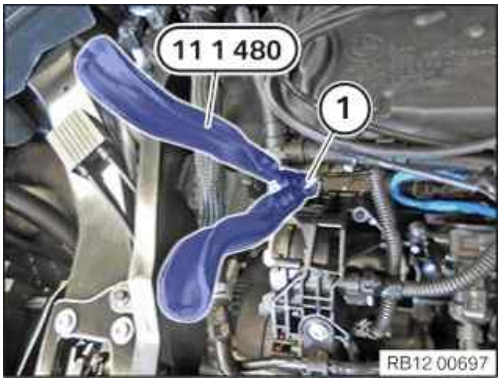
- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.



- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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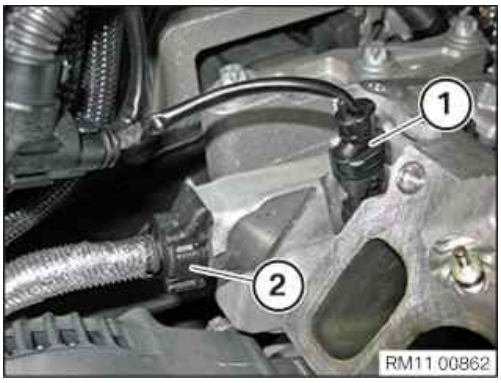
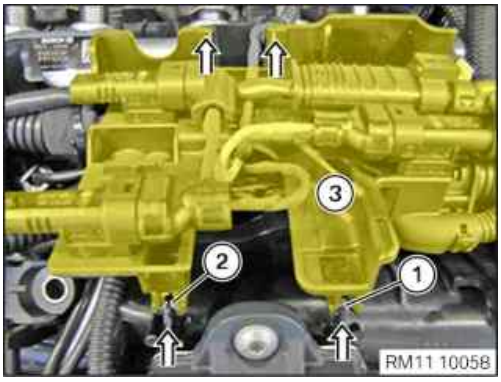


- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

21 – Removing the cable clips from the intake plenum



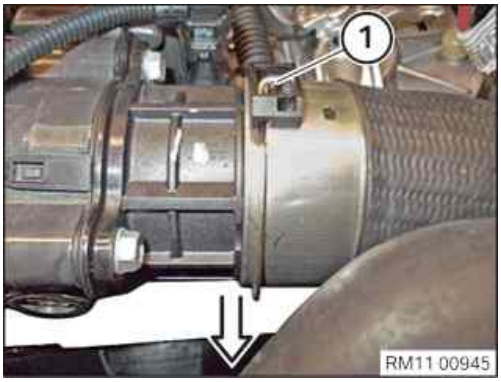
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

22 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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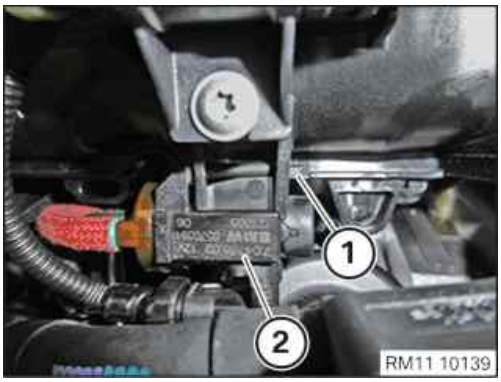
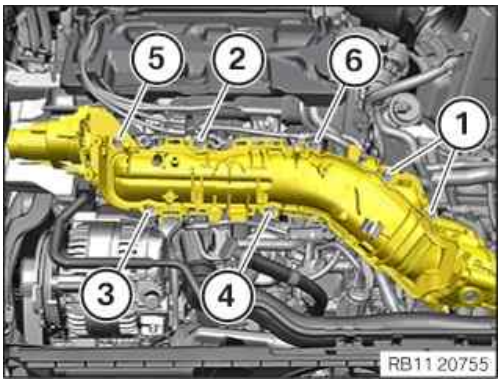
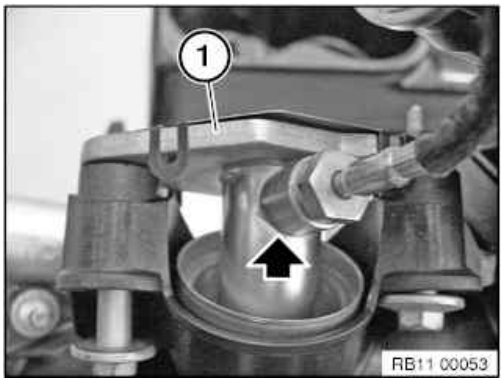


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

23 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

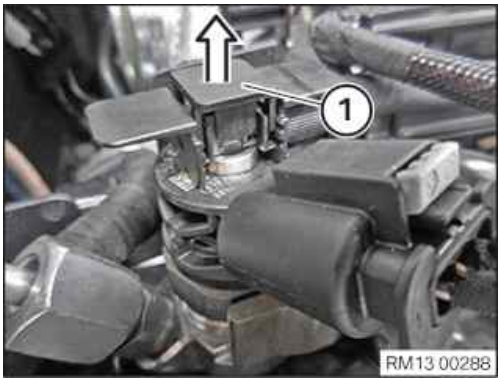
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

24 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

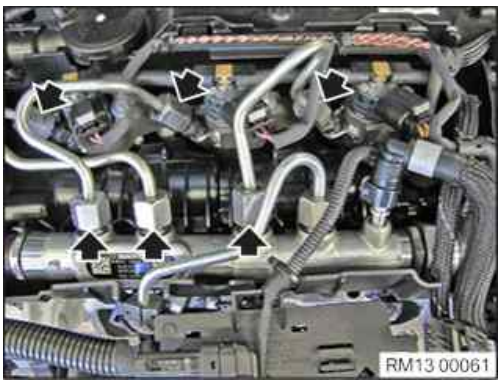
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

25 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

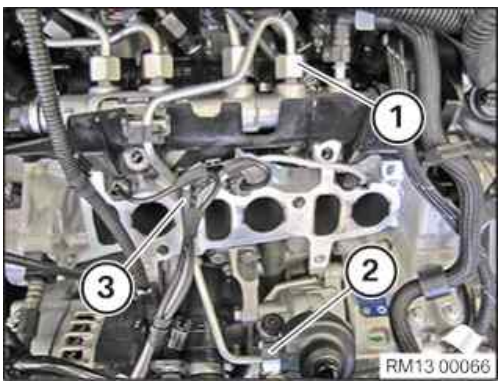
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

26 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

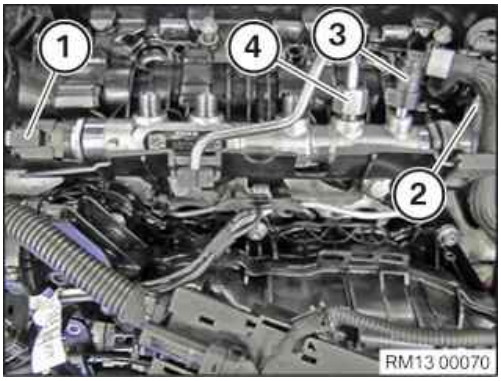
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

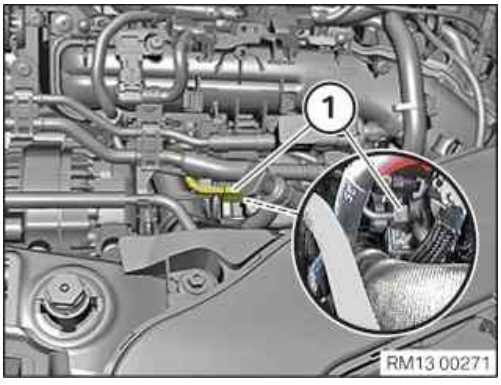
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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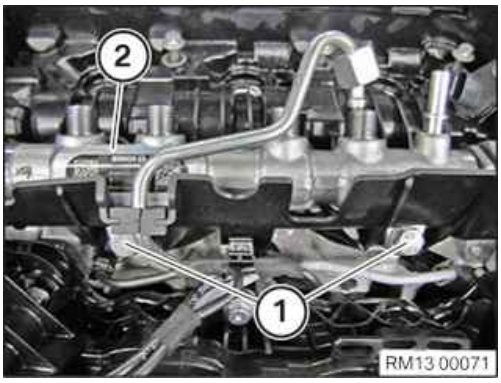

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

27 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

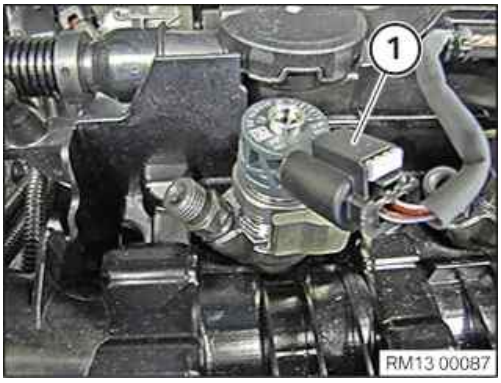
Electrostatic discharge.

Damage to or destruction of electrical components.

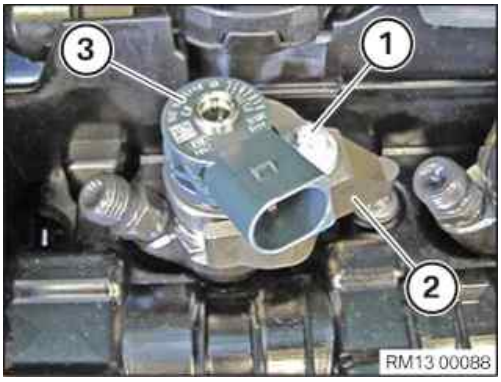
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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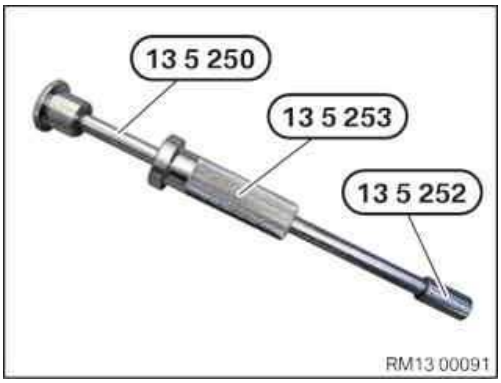
RISK OF DAMAGE

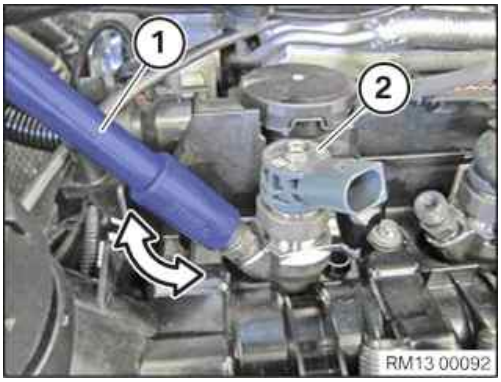
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

28 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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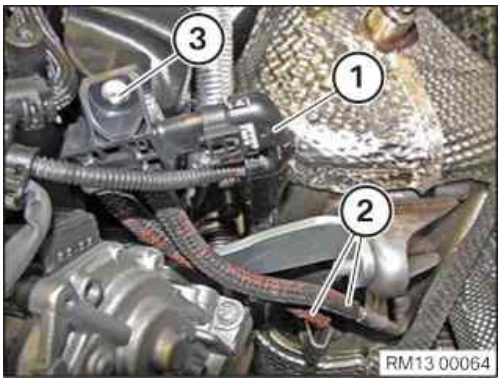
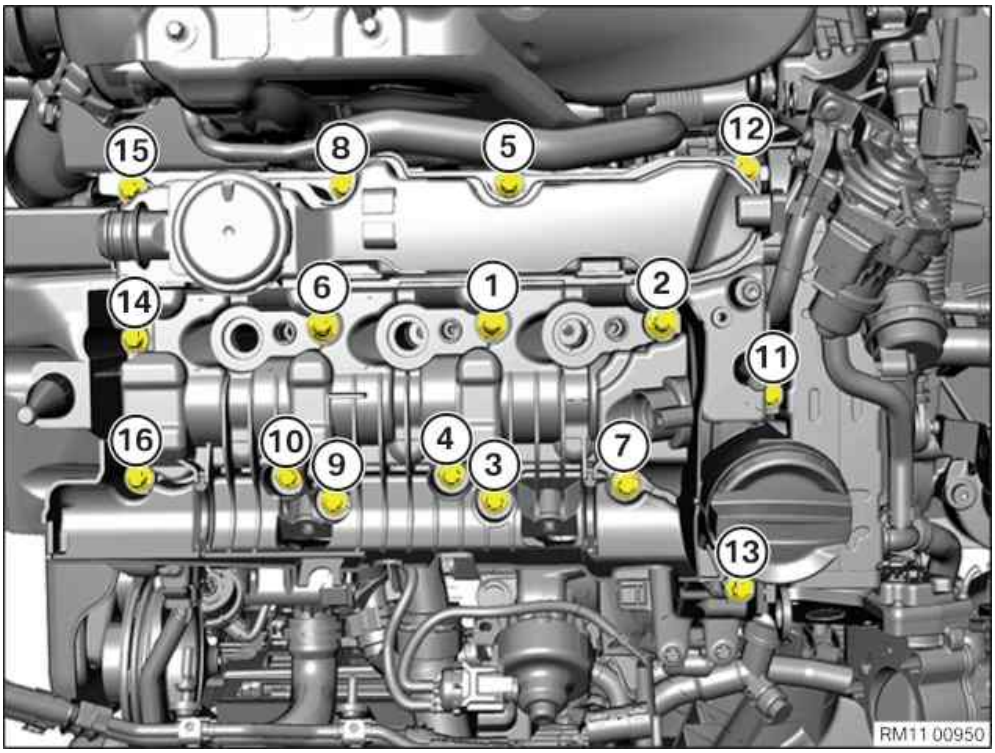


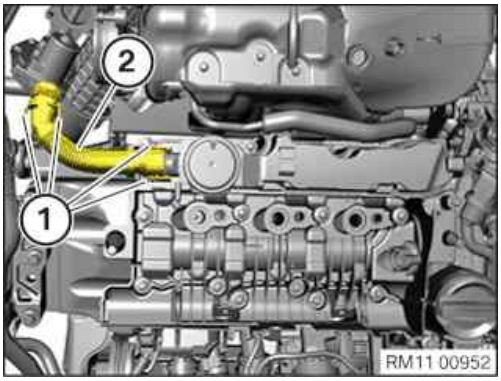
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

29 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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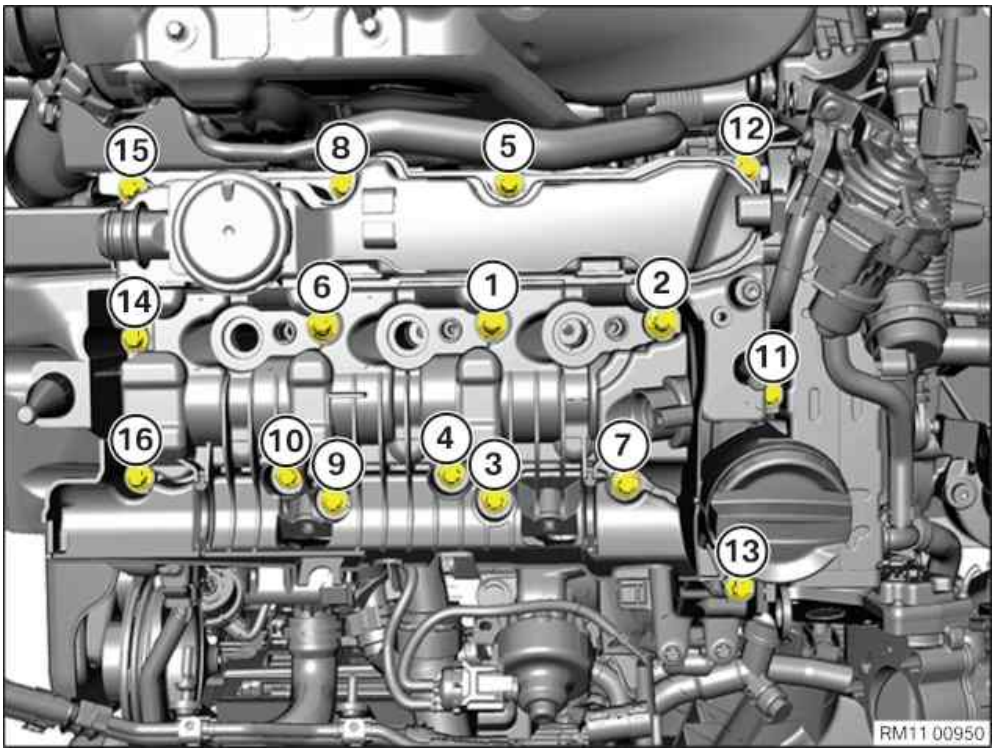


- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

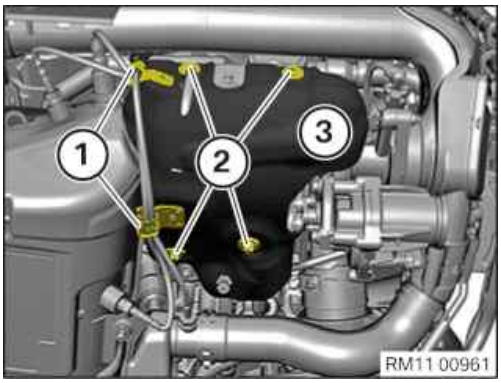
30 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

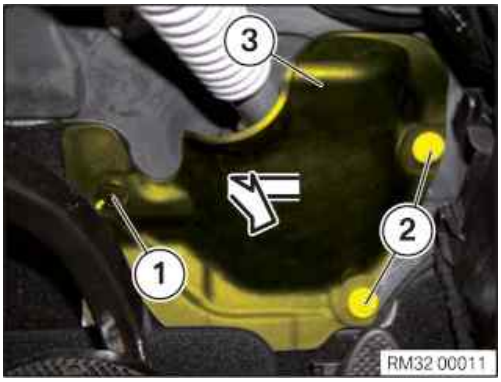
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).

31 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!

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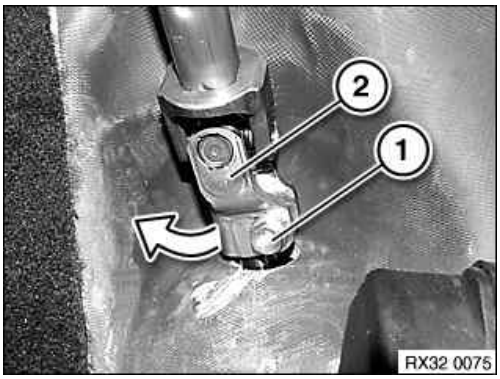
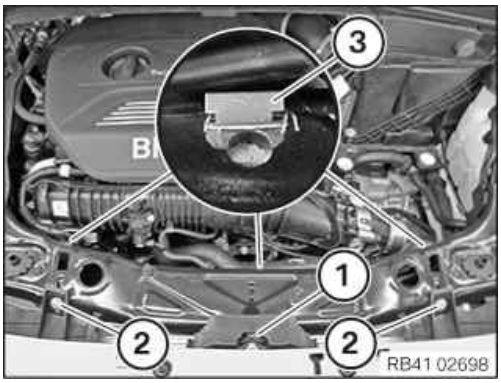


- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

32 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

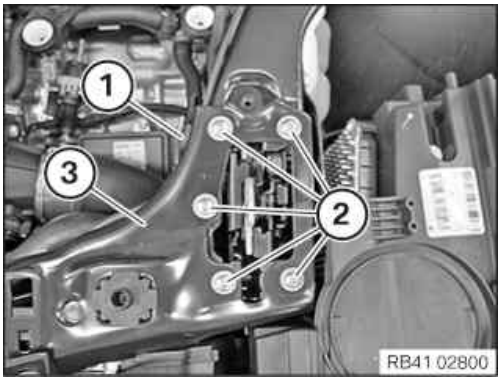
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

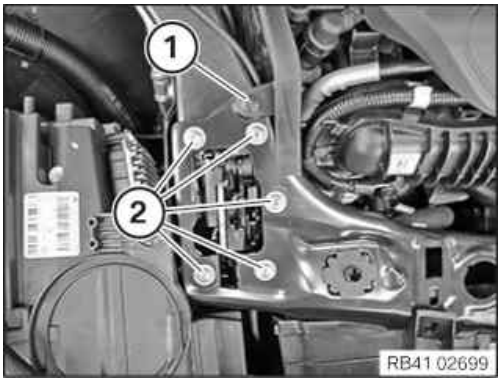


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

33 – Securing radiator on left and right

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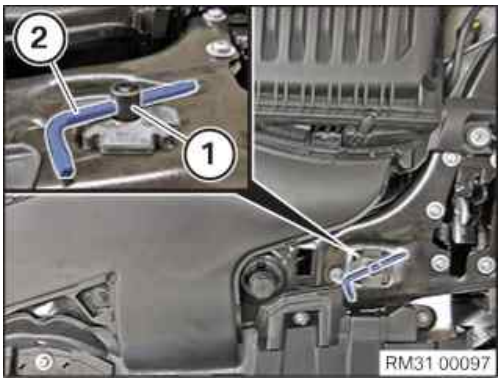


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

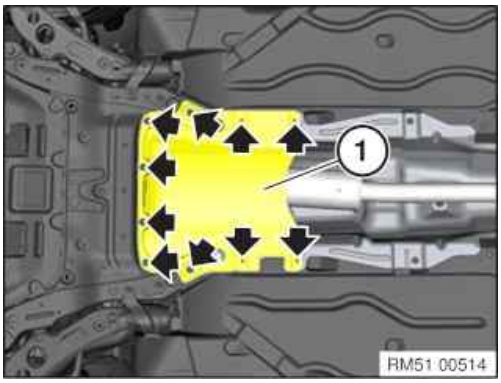
34 – Remove the front left and right wheel

▶ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

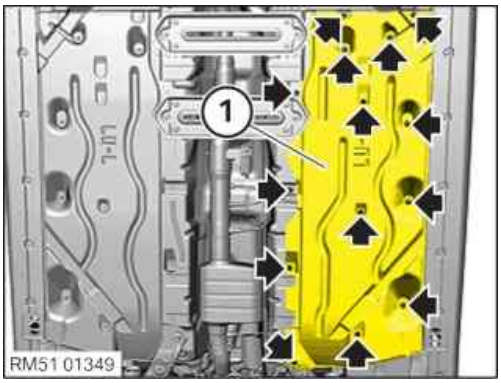
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

35 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

36 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

37 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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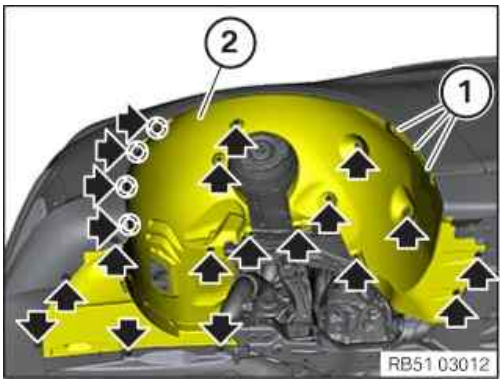
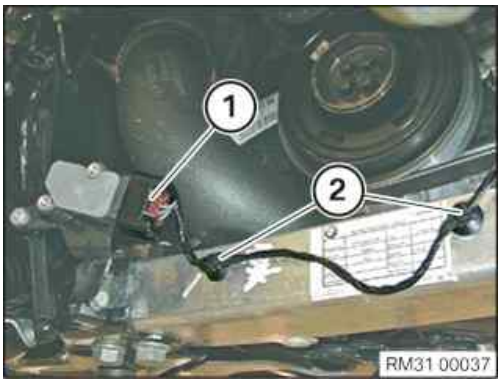
▶ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

38 – With right installation: Detaching ride height sensor cable



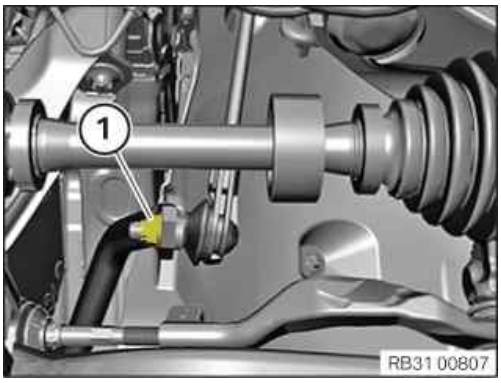
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

39 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

40 – Detaching rubber mount from front axle support

- Spray rubber mount (1) with lubricant and release from holder on front axle support.

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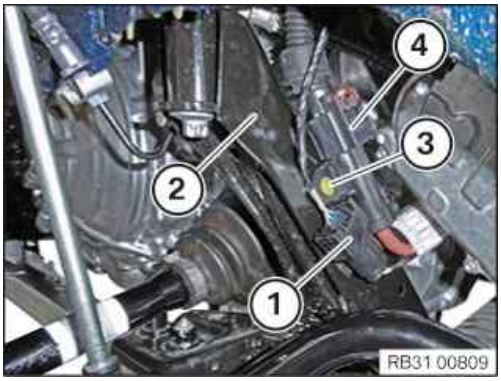
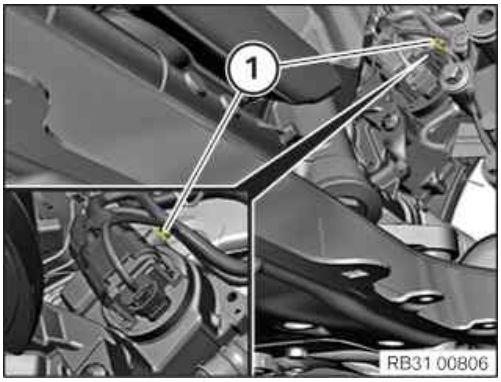
41 – Disconnecting plug connections from steering gear

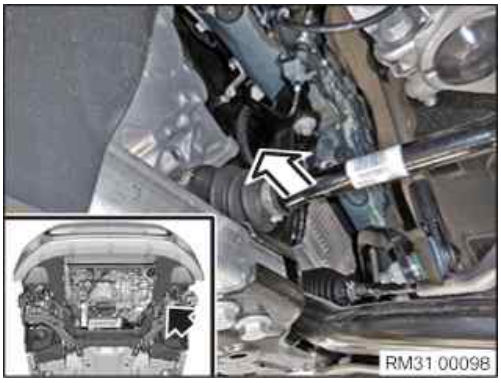
▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

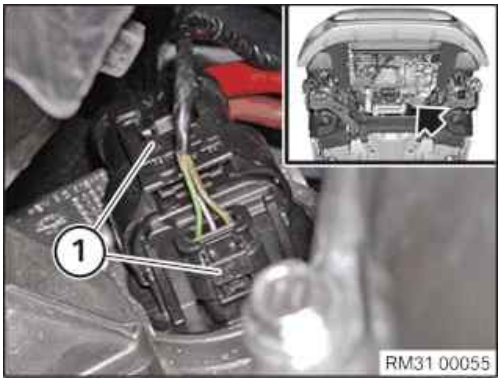


- Disconnect wiring harness (1) from steering gear.



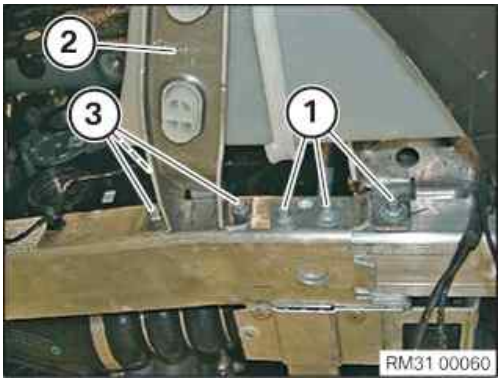
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

42 – Releasing the mounted part from the front axle support



- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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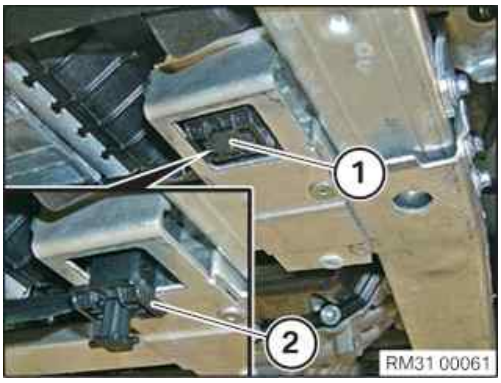
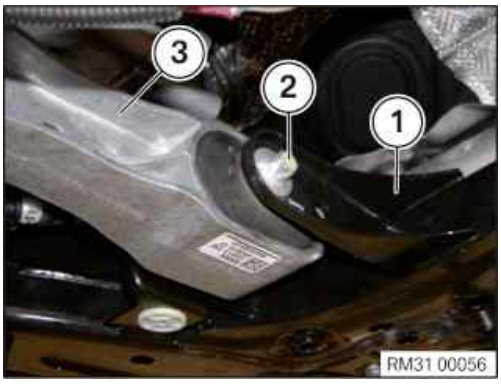


NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



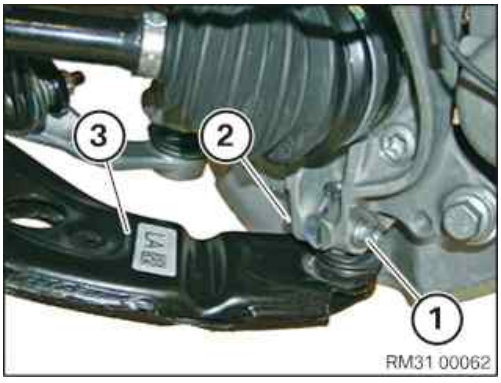
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

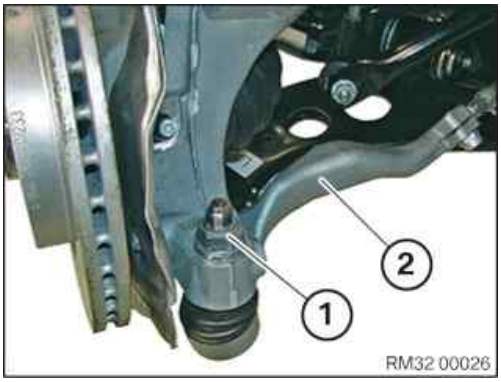
43 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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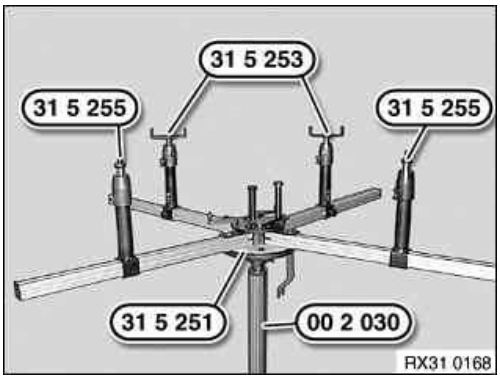
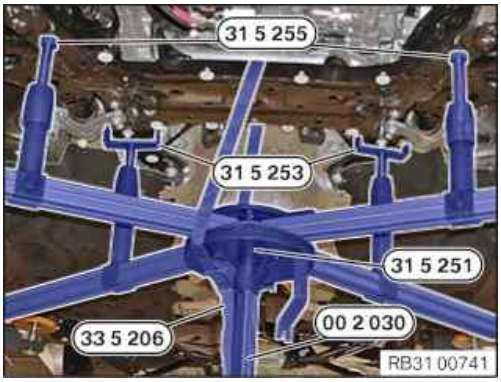


- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

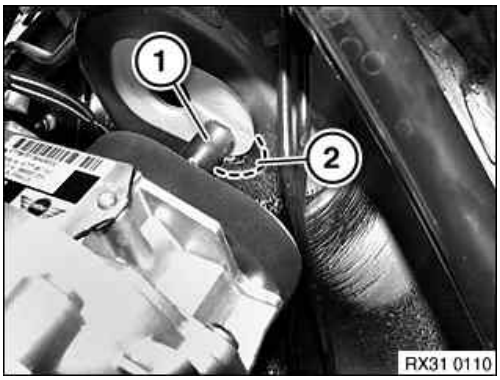
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

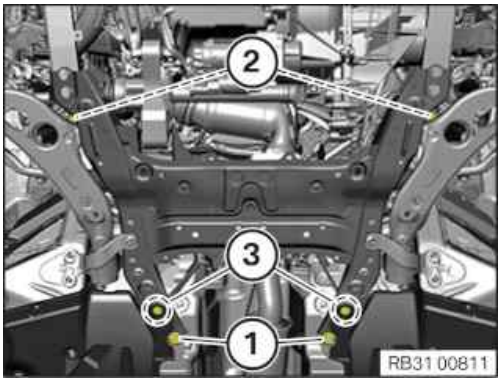


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.

For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

44 – Removing the connecting support from the tunnel in front and back

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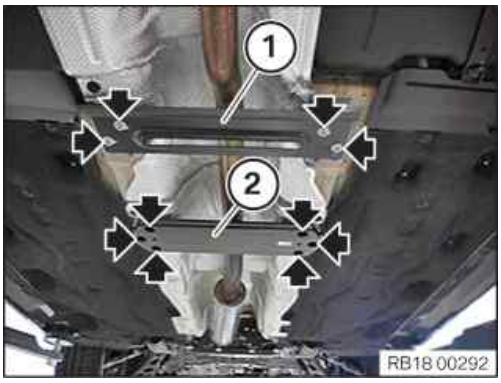
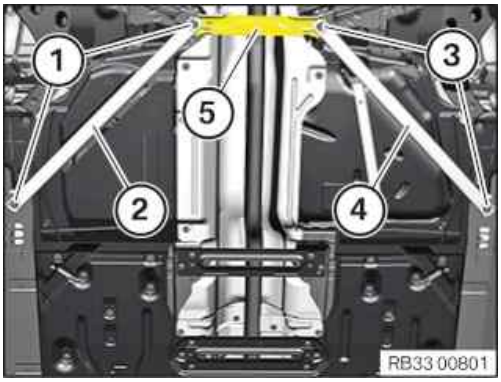


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

45 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

46 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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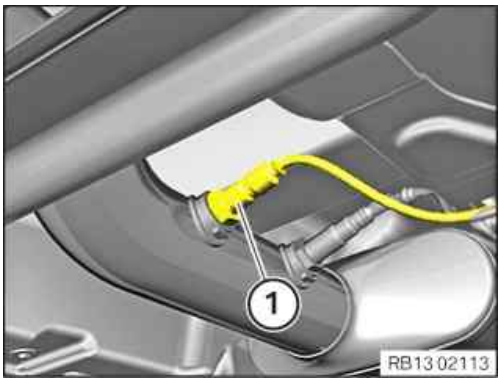
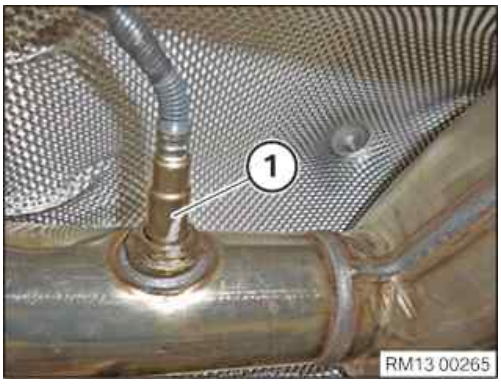
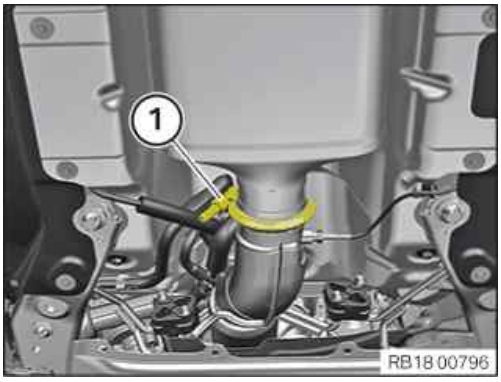


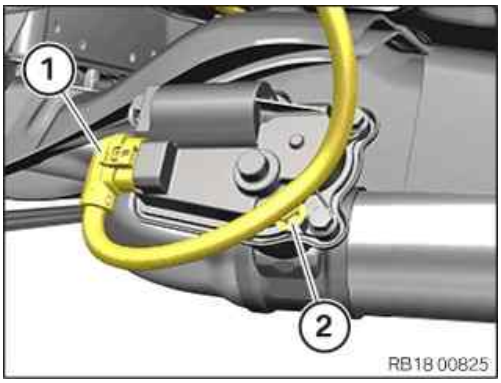
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



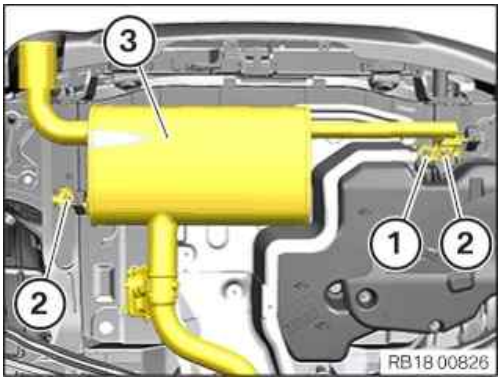
- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Unlock and disconnect connector (1).
- Loosen clamp (2).



- Loosen screw (1).
- Loosen nuts (2).
- Lower the exhaust system (3) with an auxiliary person, guide out and remove.

47 – Removing starter motor

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

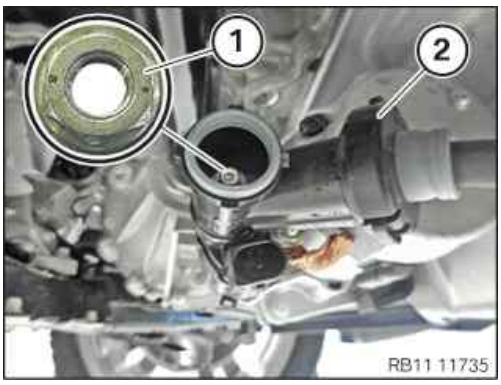
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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- Loosen screws (1).
- Feed out starter motor and remove.

48 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

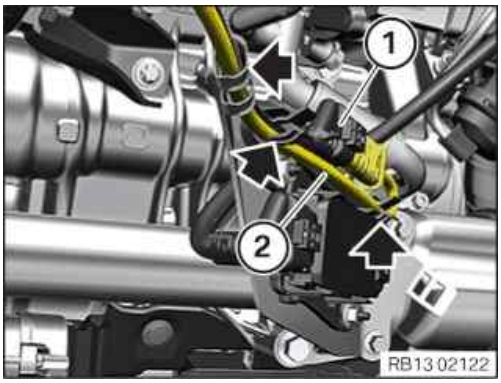
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

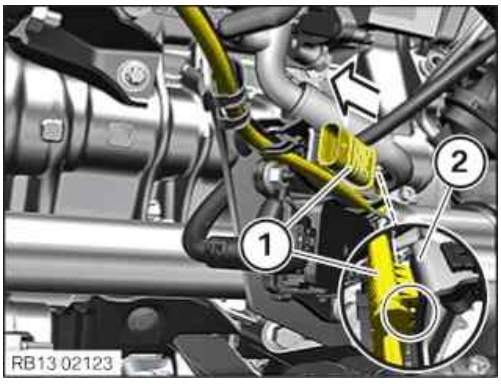
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.

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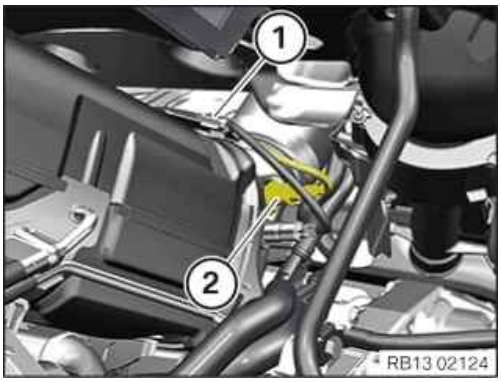


- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

49 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

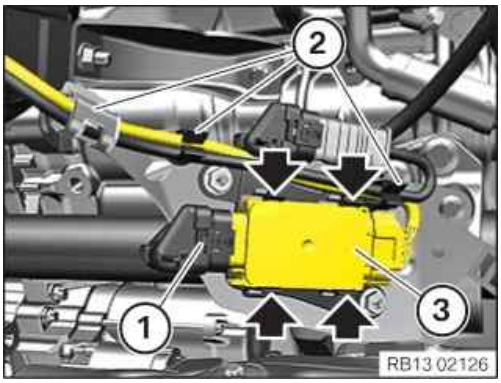
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

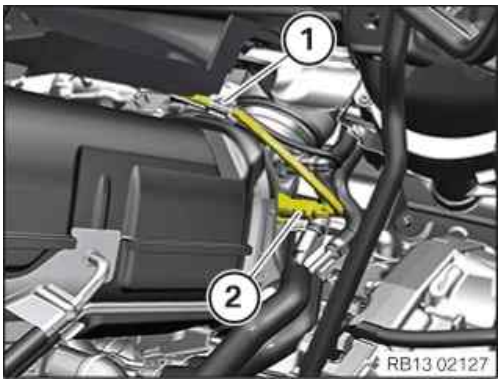
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

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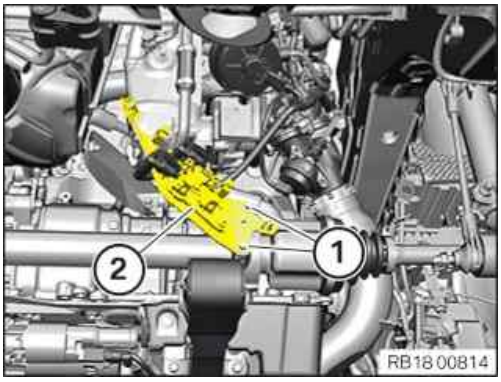
50 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

51 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

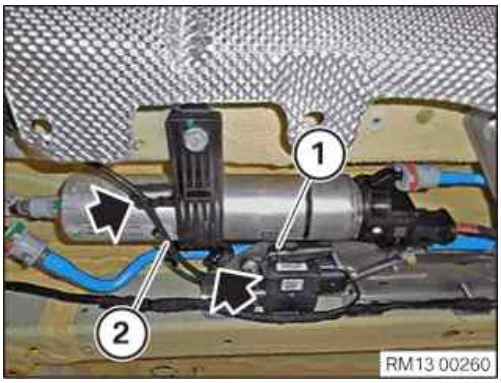
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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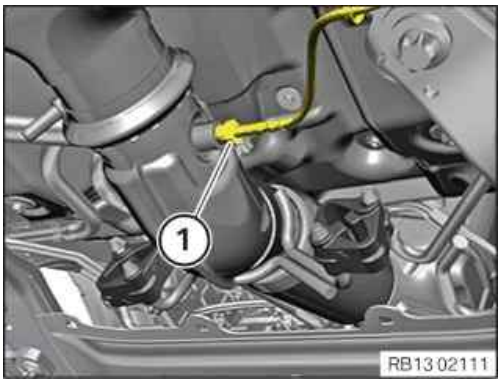
- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

52 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

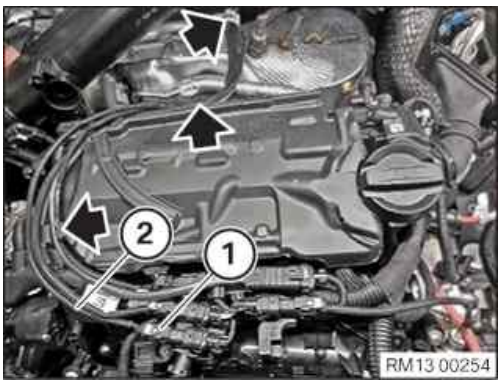
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Feed the cable (2) from the temperature sensor out of the clamps (arrows) and remove it.

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- Release the exhaust temperature sensor (1) with conventional tools (2).

- Feed out and remove exhaust temperature sensor (1).

53 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and disconnect the plug connection (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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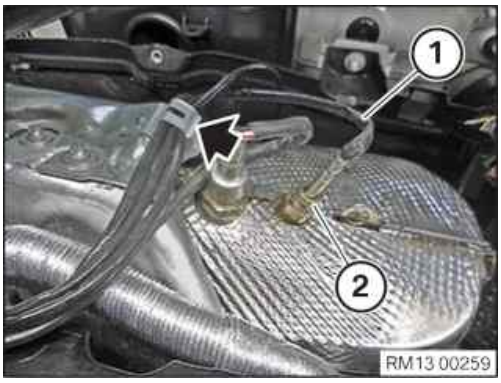


- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

54 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

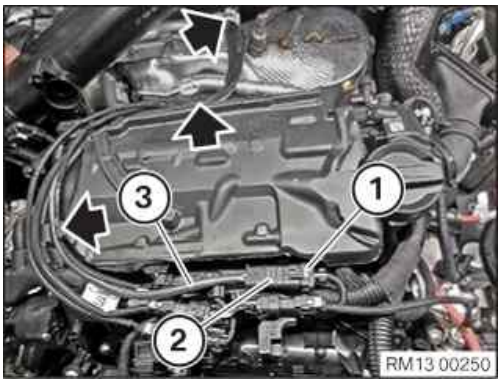
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

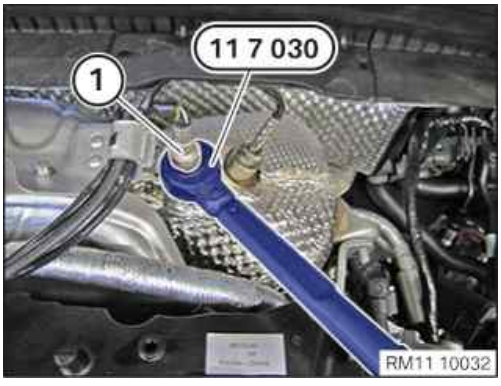
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Detach the connector (2) from the holder .
- Feed out and remove cable (3) out of the oxygen control sensor from the clamps (arrows).



- Release the front oxygen control sensor (1) using special tool **0 491 075 (11 7 030)** .
- Feed out and remove the control sensor (1).

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55 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

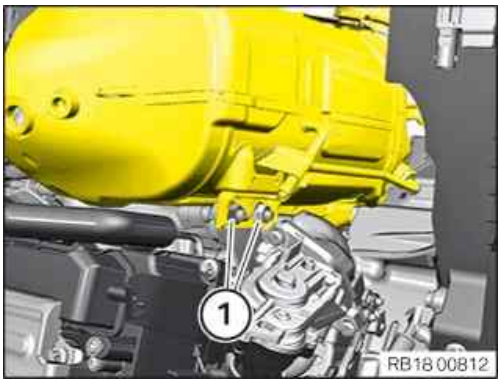
CAUTION

Heavy component.

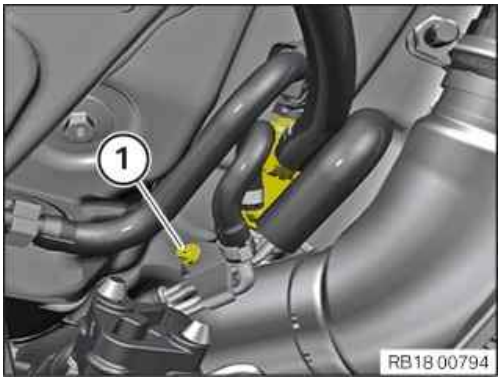
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen nuts (1).



- Loosen screw (1).

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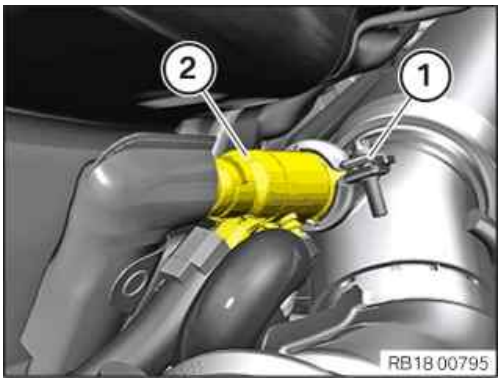
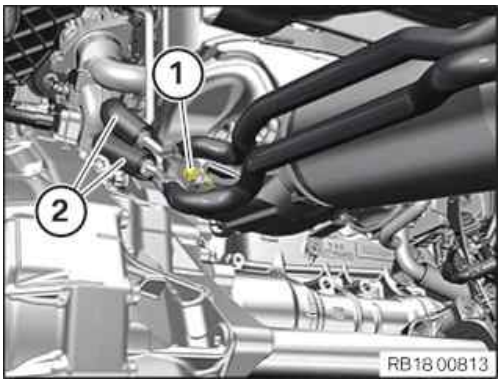
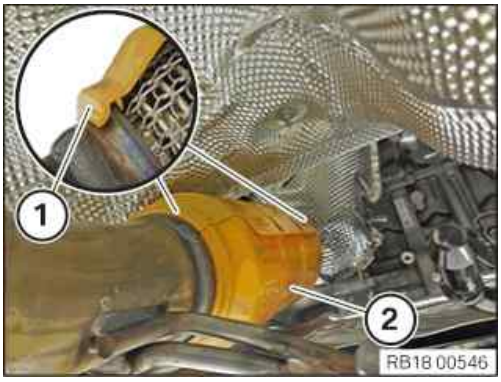


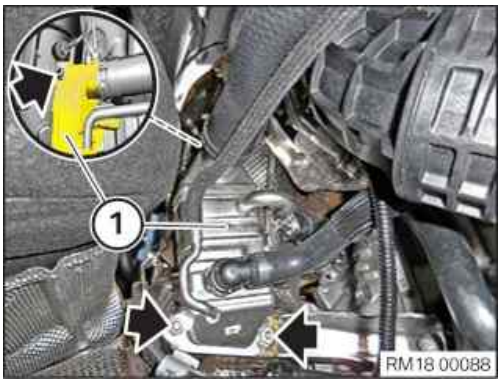
- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



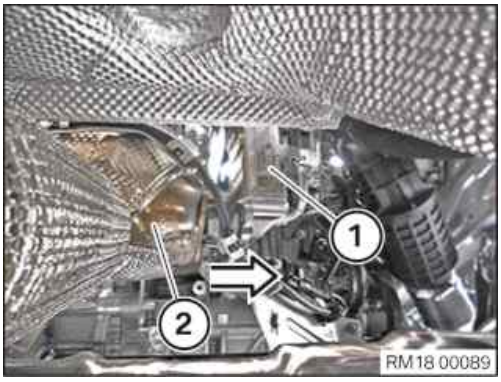
- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Detach nuts (arrows) from low pressure exhaust-gas recirculation cooler (1).



- Feed out low pressure exhaust-gas recirculation cooler (1) from diesel particulate filter (2) in direction of arrow and set aside.

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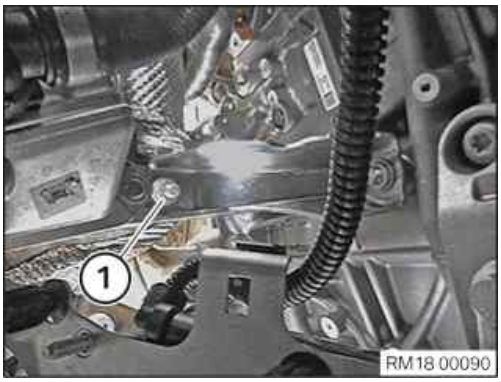
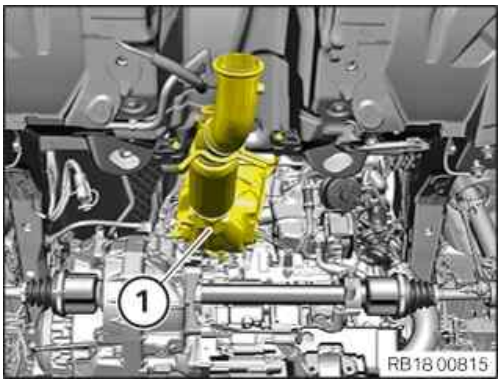


- Unfasten nut (1).



- Feed out diesel particulate filter (1) toward the bottom and remove.

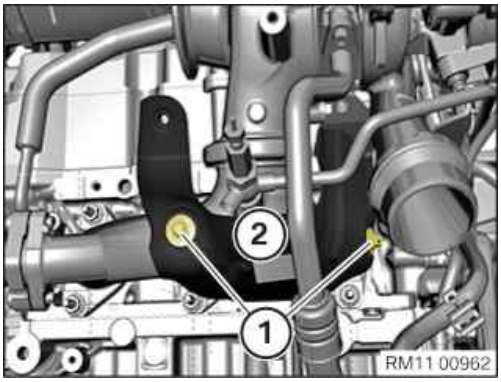
56 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

57 – Removing heat shield from rear exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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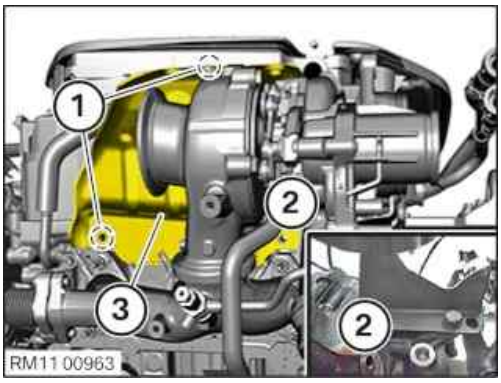
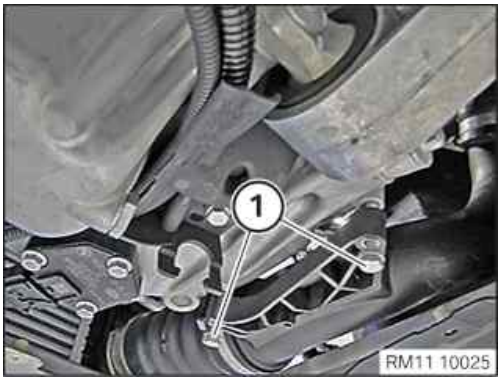


- Loosen screws (1).
- Loosen screw (2).

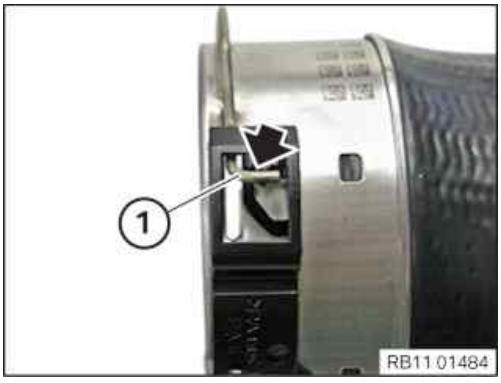
  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

58 – Remove right charge-air line

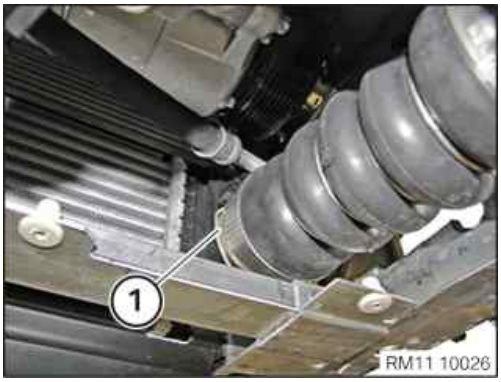


- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.



- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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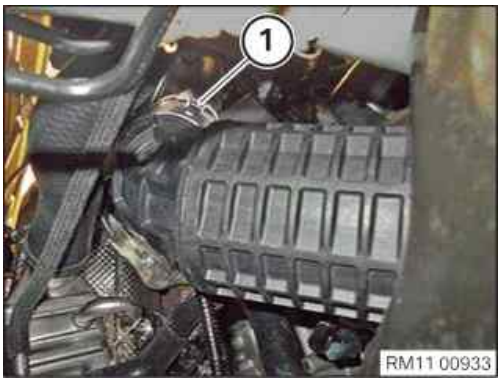

- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

59 – Remove exhaust turbocharger

- Release screw (1) from beneath with a long extension.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).
- Disconnect the oil return line (2) toward the bottom and set it aside.

- Release banjo bolt (1) of oil feed line from exhaust turbocharger and place to one side.

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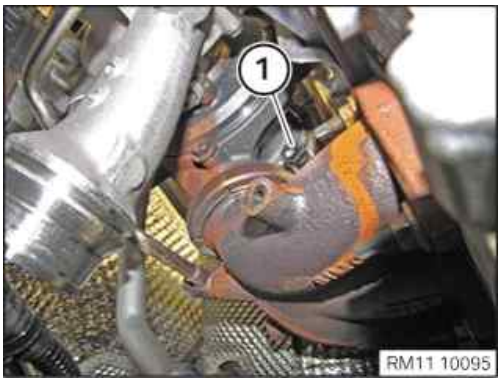


- Release screw (1) and remove V-clip.
- Pull exhaust turbocharger up and remove.
- Remove seal between exhaust turbocharger and exhaust manifold.

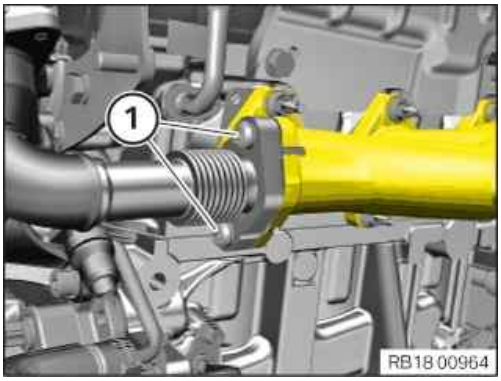
60 – Remove exhaust manifold

WARNING

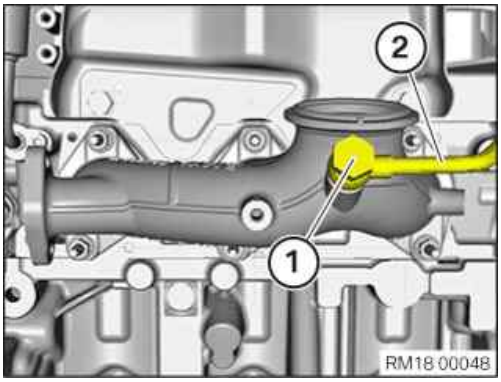
Hot surfaces.

Risk of burning!

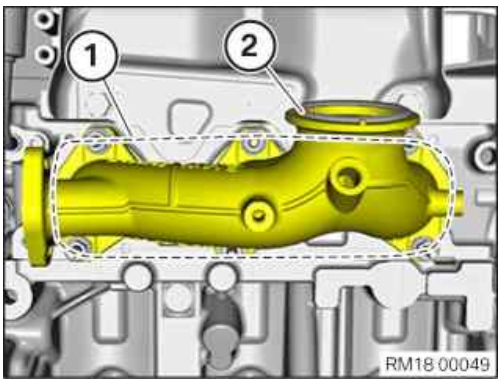
- Perform all work only on components that have cooled down.



- Loosen screws (1).



- Unscrew the banjo bolt (1).
- Feed out exhaust gas pressure pipe (2) and place to one side.



- Evenly release nuts along the dashed line (1) from outer to inner side.
- Feed out exhaust manifold (2) and remove.

61 – Removing the acoustic cover for the engine at the front

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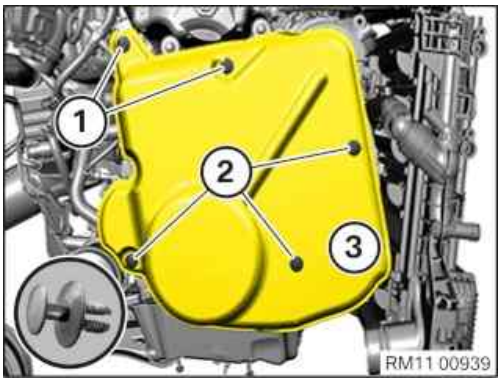


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

62 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

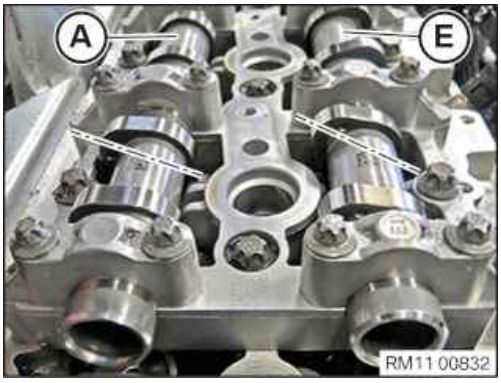
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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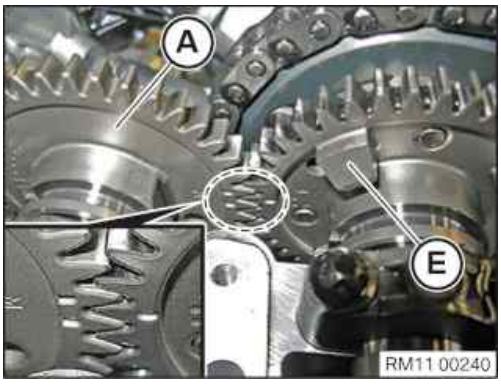
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

63 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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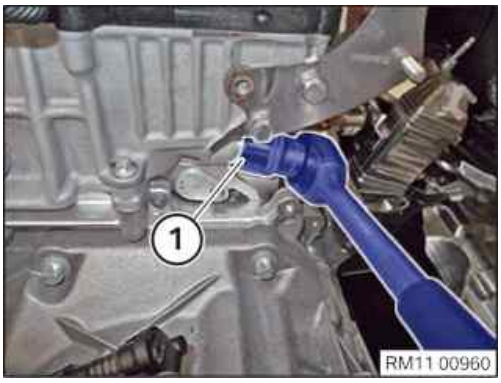
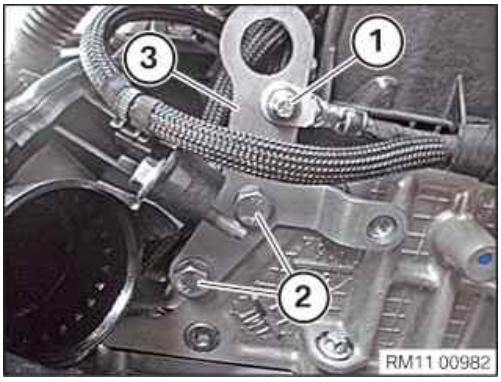


TECHNICAL INFORMATION

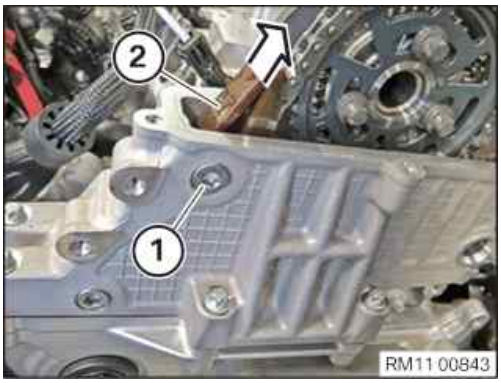
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

64 – Remove the timing chain guide rail

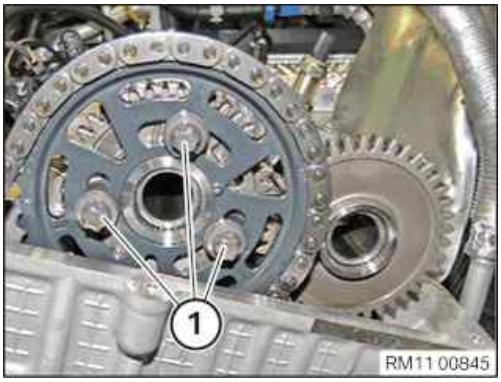


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

65 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

66 – Removing the camshaft support

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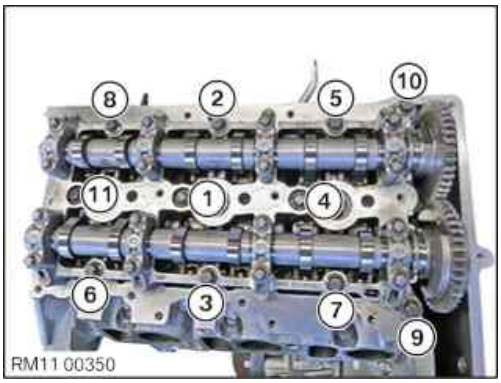
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

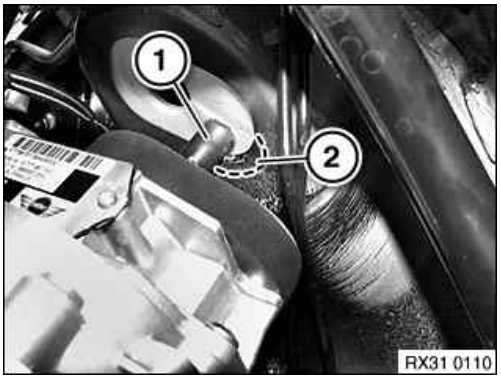
67 – Remove cylinder head.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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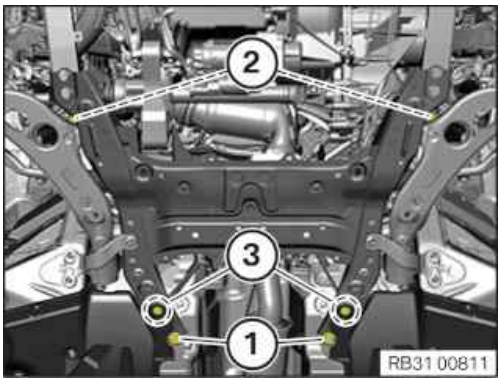


- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

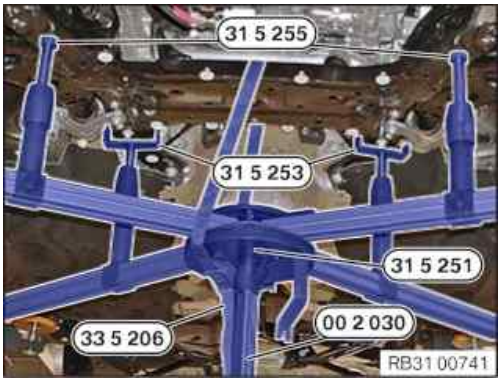
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

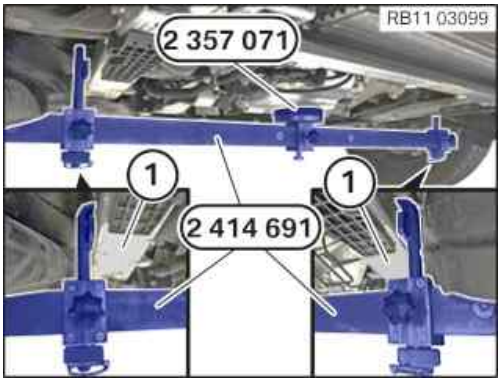
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and set it aside.



- Prepare special tool **2 414 691** together with the special tool **2 357 071**.
- Attach special tool **2 414 691** to front axle support and correctly align the special tool **2 357 071** under the oil sump and tighten.
- Turn special tool **2 414 691** at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools**2 414 691** and **2 357 071**.

- Remove all glow elements with special tool **0 491 068 (11 6 050)** or a standard tool.

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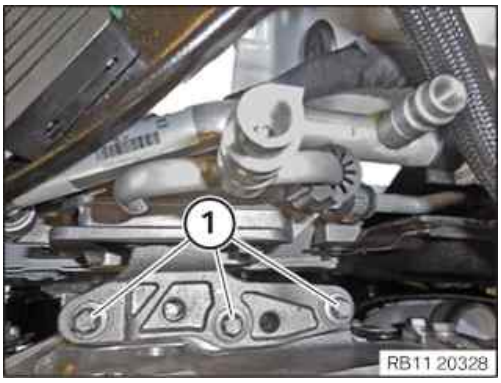
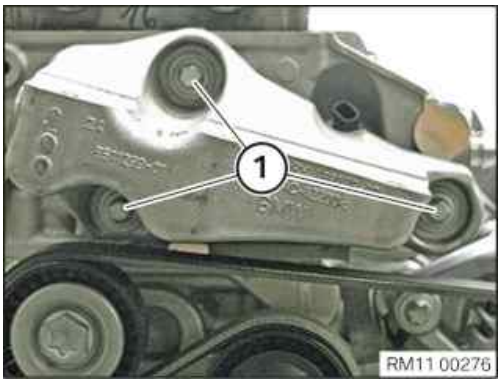


- Loosen screws (1).

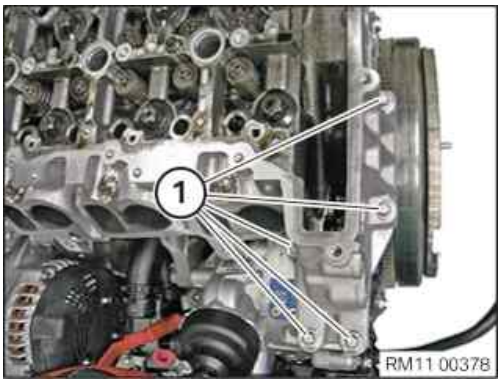


- Loosen screws (1).

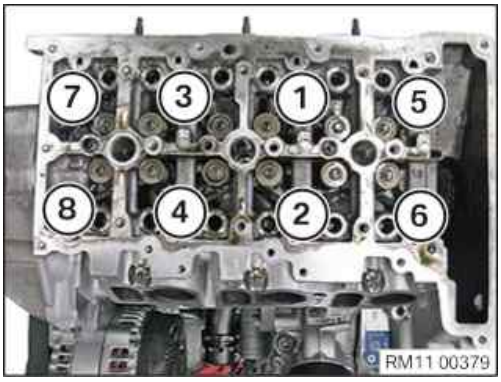
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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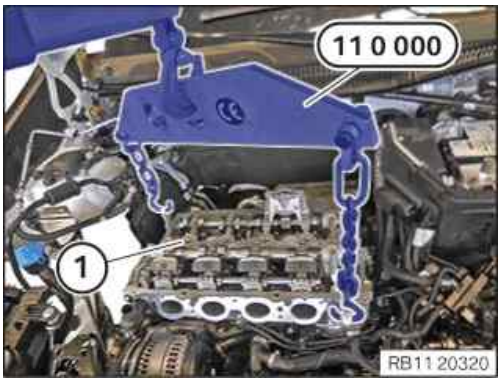


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

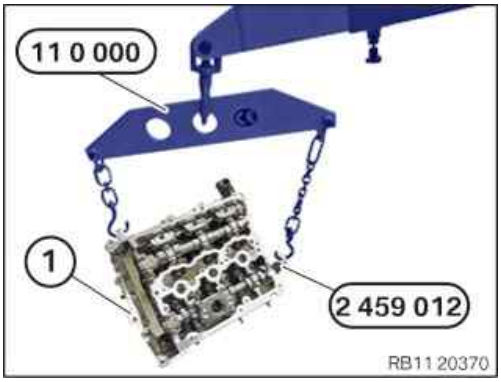
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

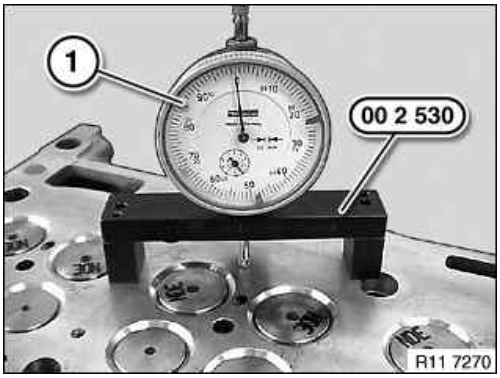
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.

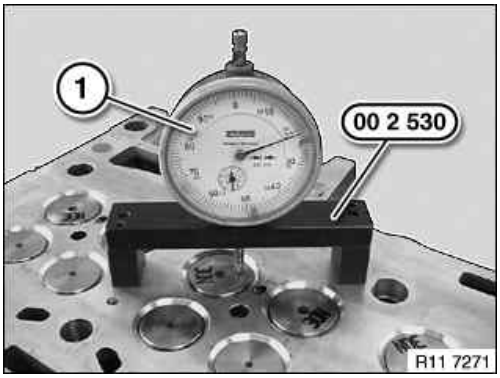


- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

68 – Checking the valve underprotrusion



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

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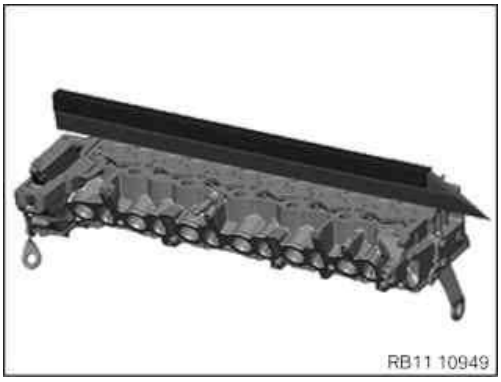
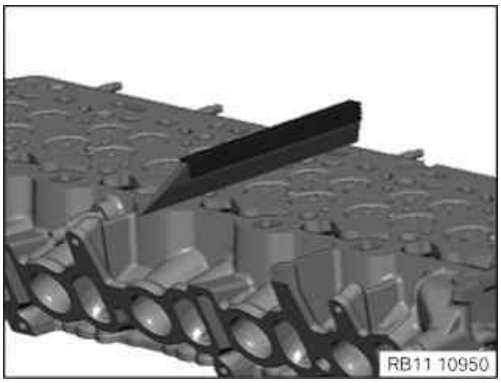
69 – Check the flatness of the cylinder head



- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm



- Check the flatness of the cylinder head crosswise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

70 – Remove all valve springs

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

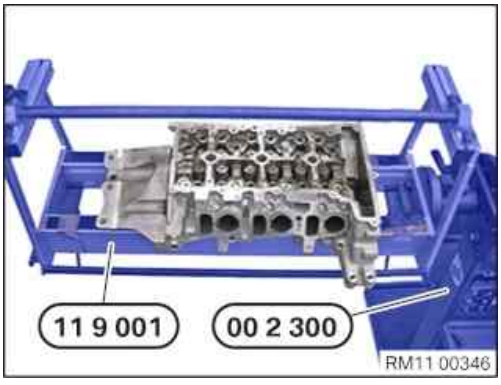
- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Mount and bolt special tool **0 494 366 (11 9 001)** on special tool **0 495 187 (00 2 300)**.
- Mount and bolt the cylinder head to the special tool **0 494 366 (11 9 001)**.

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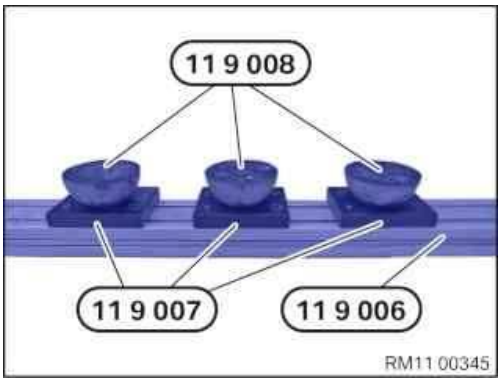
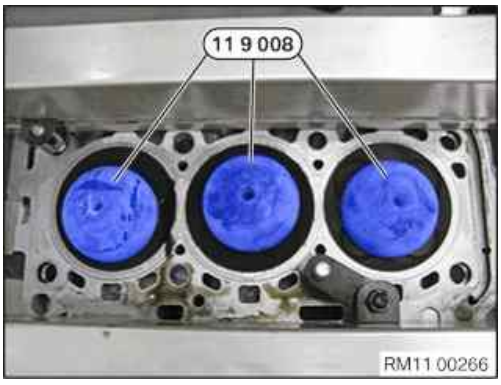
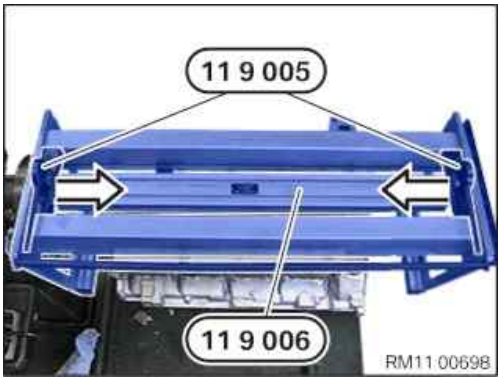


- Prepare special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.

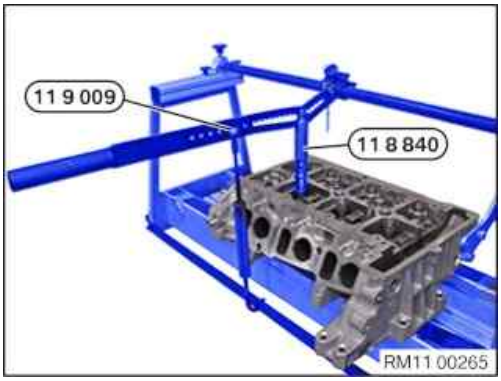


- Make sure that the special tools **0 494 373 (11 9 008)** are positioned as shown in the next operation.



- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Slide the special tool **0 494 370 (11 9 005)** in the direction of the arrow.

- Lock special tool 1**0 494 370 (11 9 005)** in the direction of the arrow.
- Rotate the cylinder head with the special tool **0 494 362 (11 9 000)** by 180° into the installation position.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.

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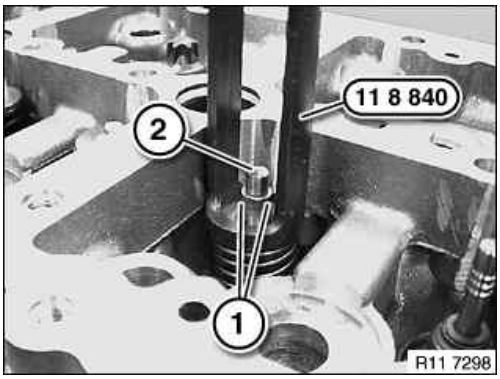
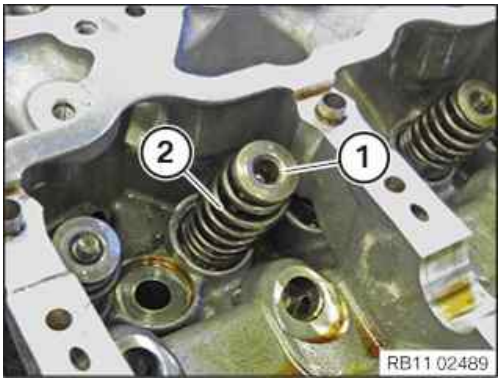


- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Remove the valve shims (1) with a magnet from the valve (2).
- Carefully relieve the valve spring.



- Set the spring cup (1) and the valve spring (2) down in the special tool **0 495 105 (11 4 480)** in order.

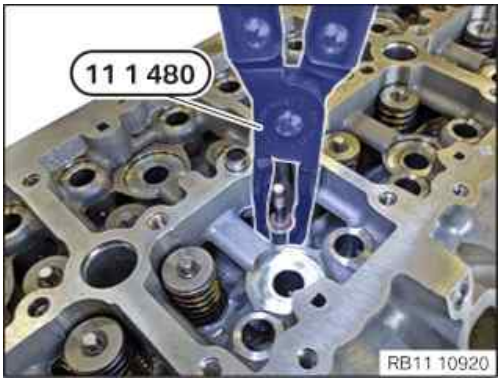
71 – Remove valve stem seals

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.



- Disassemble the valve stem seal (1) using the special tool **0 490 796 (11 1 480)**.

MAIN WORK

72 – Remove all valves

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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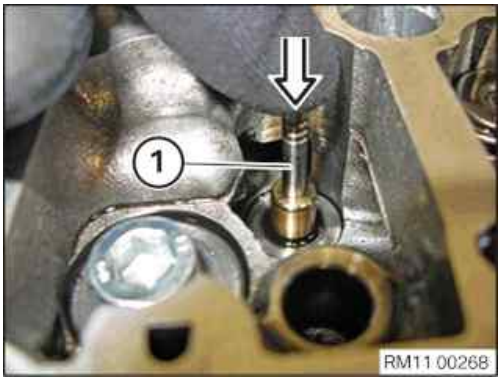
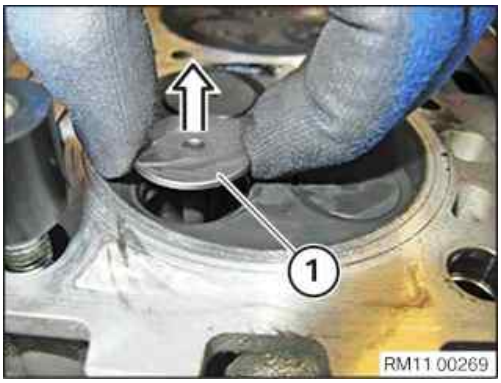
- Turn the cylinder head with the special tool **0 494 362 (11 9 000)**.
- Unlock the special tool **0 494 370 (11 9 005)** in the direction of the arrow.
- Remove special tool **0 494 371 (11 9 006)**.

- Remove special tool **0 494 373 (11 9 008)** if necessary.



- Push the valve stem (1) into the cylinder head in the direction of the arrow.



- Remove the valve (1) in the direction of arrow and store it properly in the special tool **0 495 105 (11 4 480)**.

73 – Install all valves

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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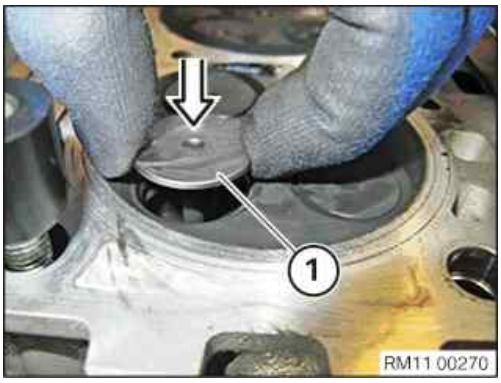
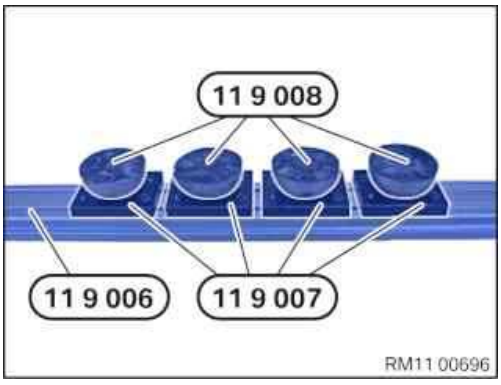
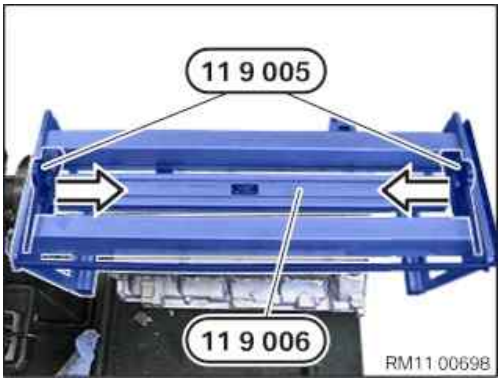


- Insert and install the valve (1) in the direction of the arrow.



- Prepare the special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.

- The special tools **0 494 373 (11 9 008)** must be set up accordingly in the next operation.



- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.

- Lock special tool **0 494 370 (11 9 005)**in direction of arrow.
- Use the special tool **0 494 362 (11 9 000)** to bring the cylinder head into the installation position by 180º.

POSTPROCESSES

74 – Installing valve stem seals

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

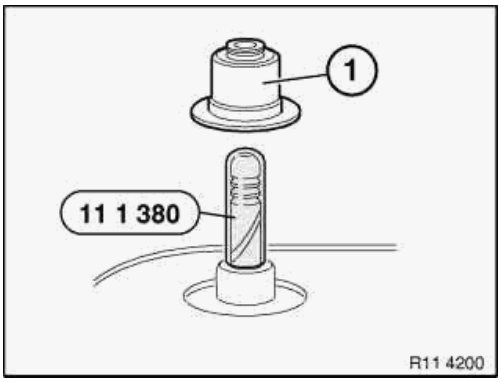
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

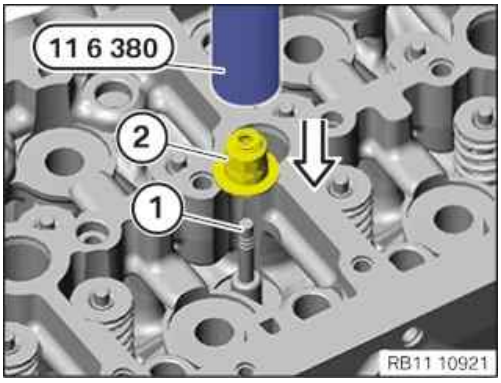
- Do not use any metal-cutting tools.

- Clean the contact surfaces (1).



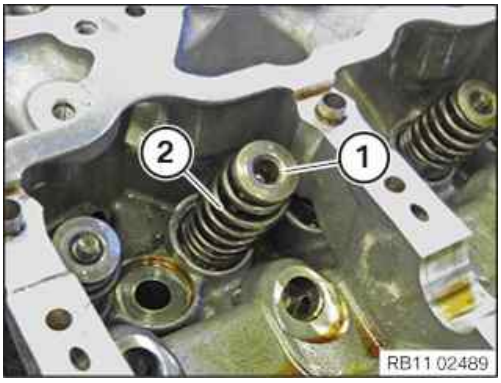
- Fit special tool **0 490 746 (11 1 380)**.
- Oil the valve stem seal (1) and install it.

  Parts: Valve stem seal



- Position the valve stem seals (2) on the valve (1).
- Use special tool **0 493 249 (11 6 380)** to press down the valve stem seal (2) until they are in contact with the cylinder head.

75 – Install all valve springs



- The mounting orientation of the valve springs (2) can be freely chosen.
- Install the valve spring (2) and spring cup (1).

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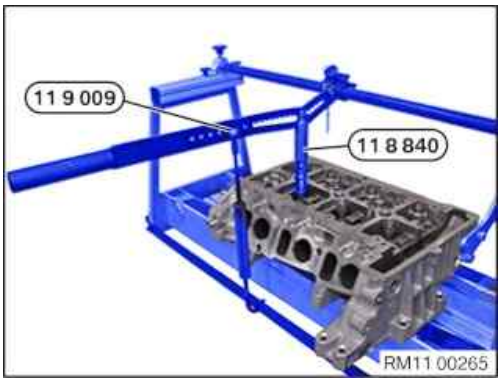


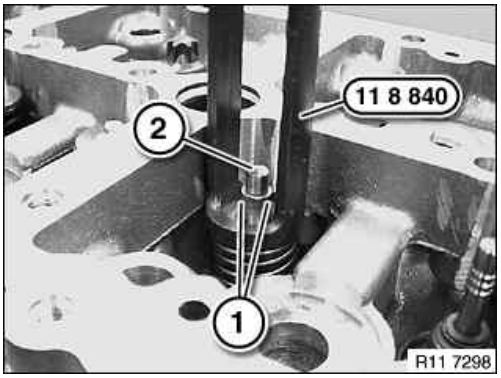
CAUTION

Component with preload.

Danger of injury!

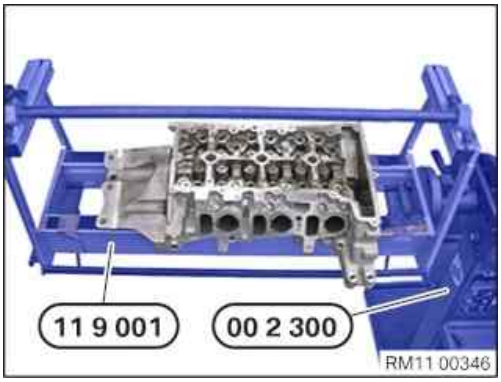
- Reduce preload as far as possible before disassembly. Relieve component.

- Align special tool in direction of valve axis.
- Select the corresponding groove using special tool **0 496 143 (11 8 840)**.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Install the valve shims (1) of the valve (2) with a magnet.
- Relieve load on valve spring.

- Unlock special tool **0 494 370 (11 9 005)** in the direction of arrow and remove.



- Remove cylinder head from special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

76 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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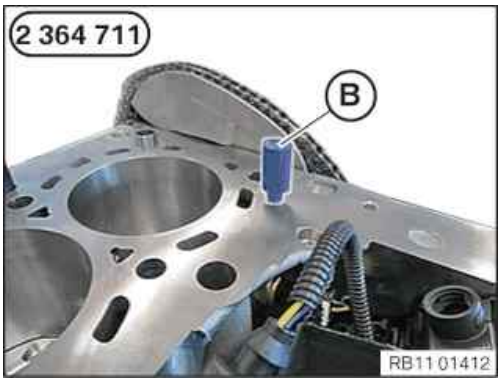


- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

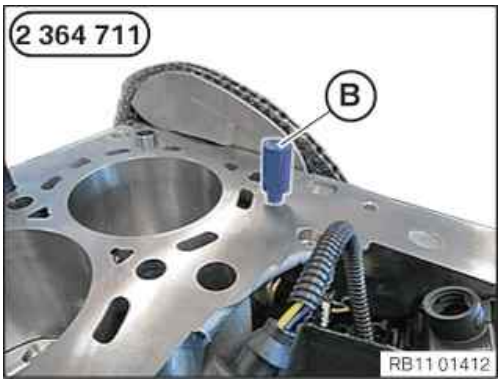
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

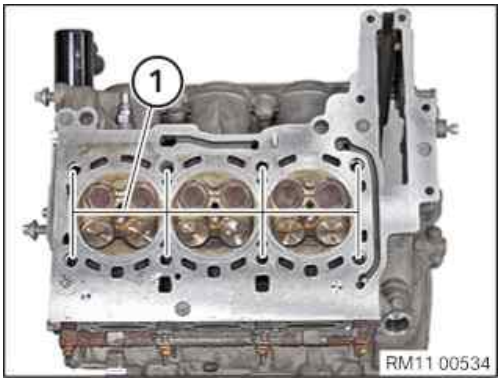
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

77 – Renewing the cylinder head gasket



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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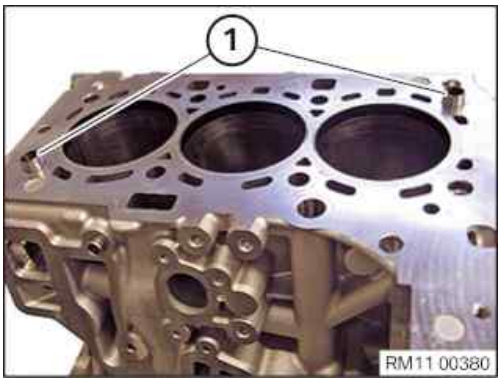
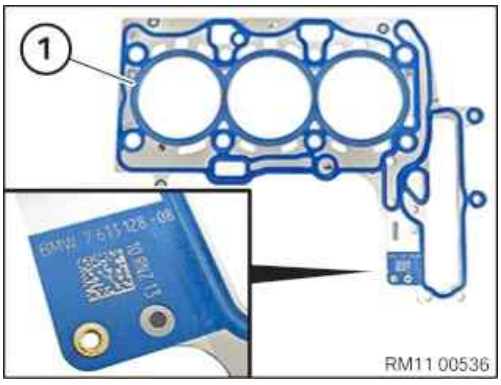
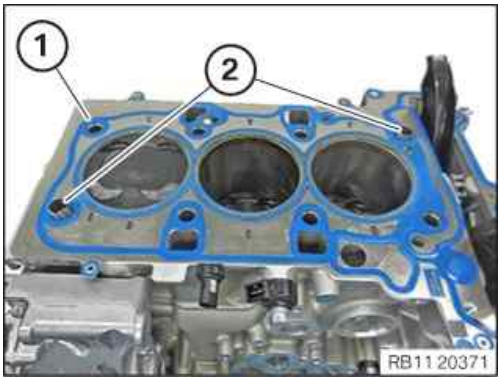


- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

78 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

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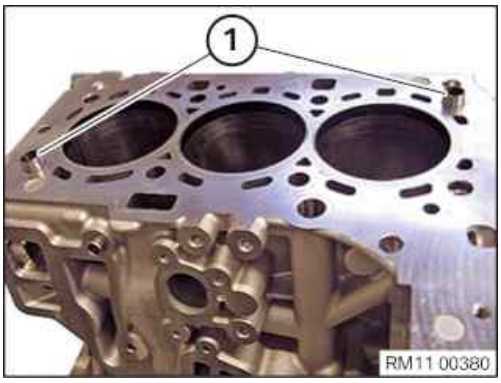
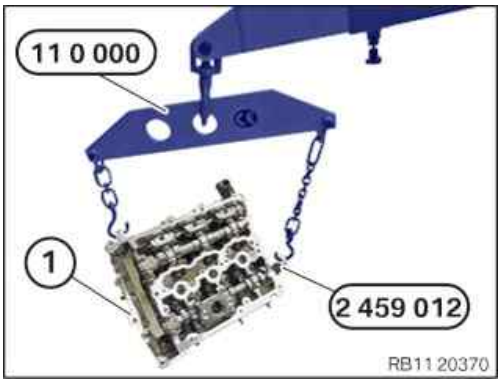


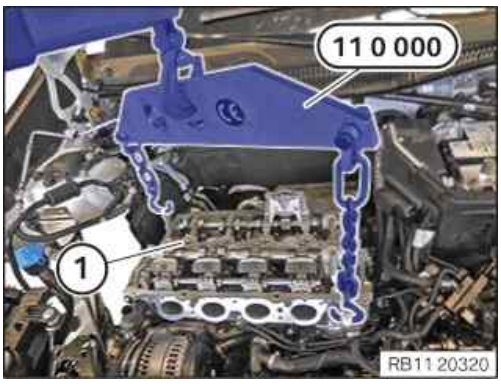
- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.

- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



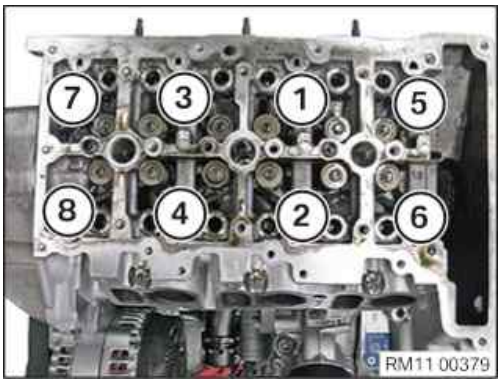
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Fit new cylinder head bolts.

  Parts: Cylinder head bolts

- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).

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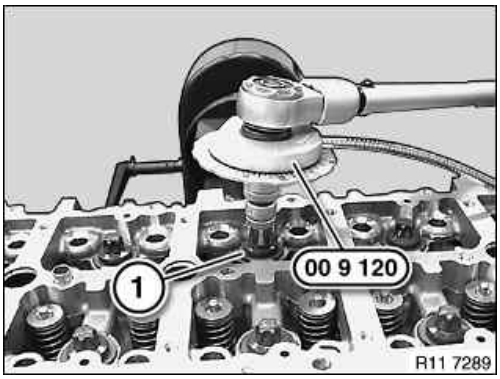
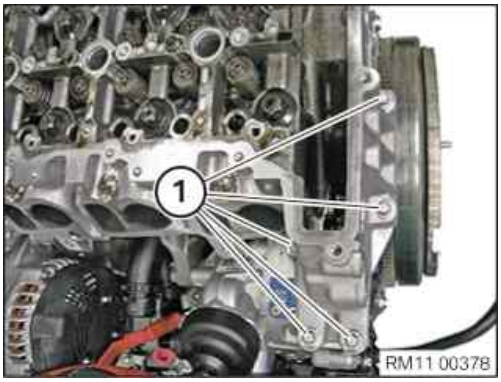


- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

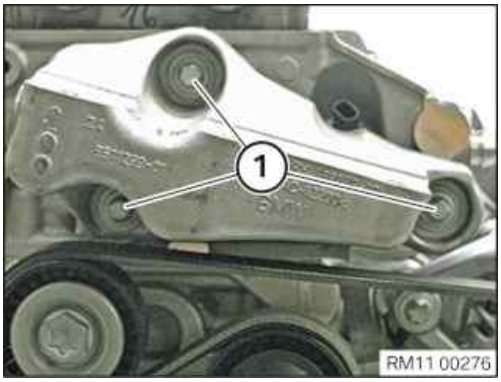


- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

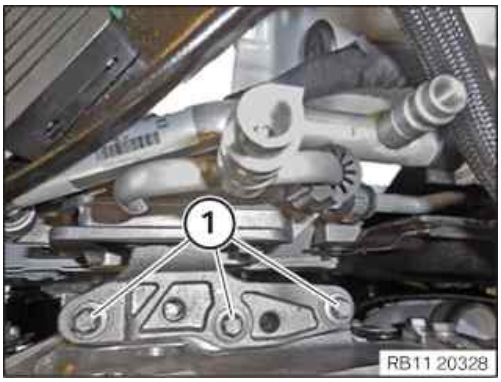
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.



- Tighten the screws (1).

Engine support to cylinder head

M10X45		Tightening torque	41 Nm



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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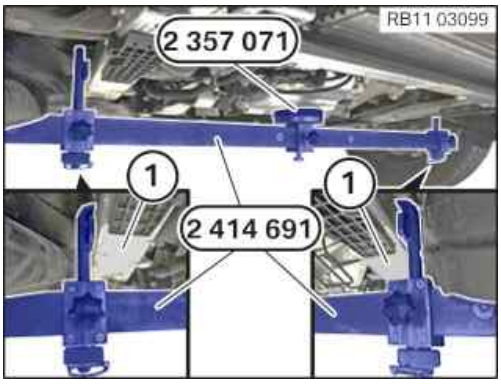
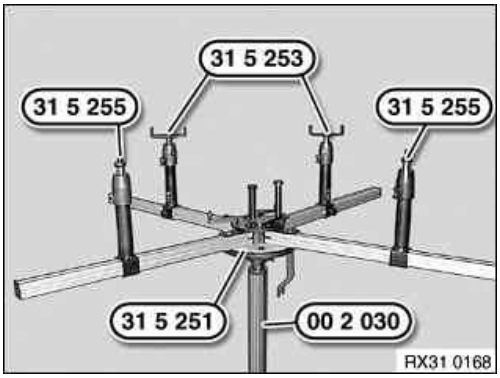
- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

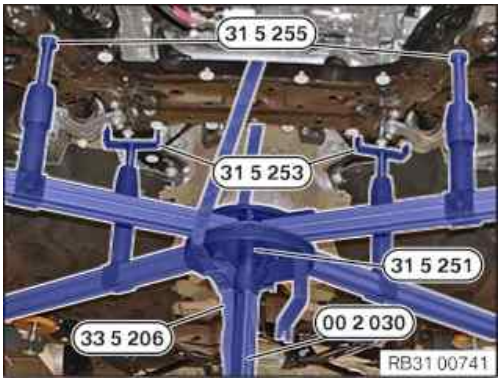


- Disassemble special tool **2 414 691** using special tool **2 357 071**.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

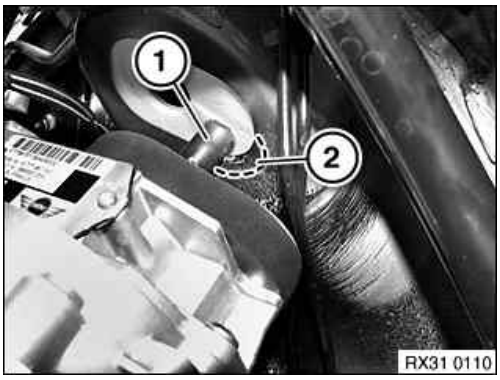
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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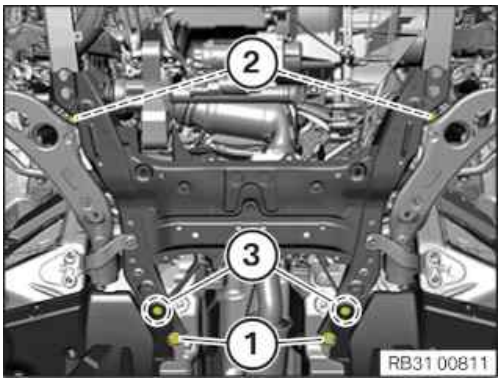


- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

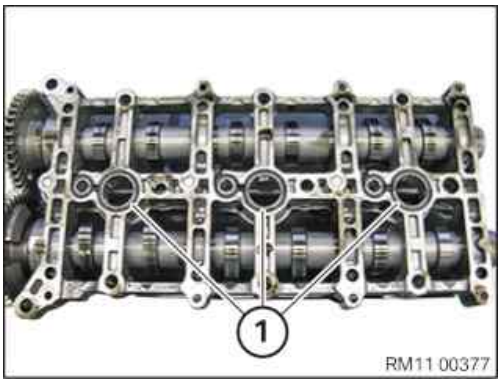
79 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

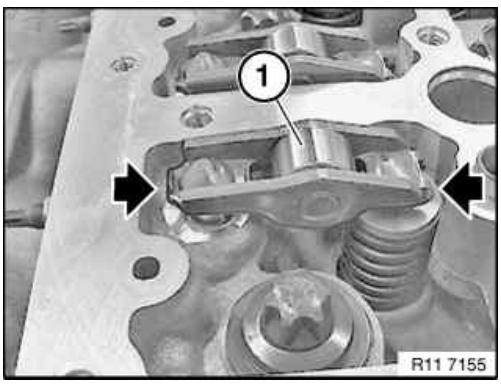
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

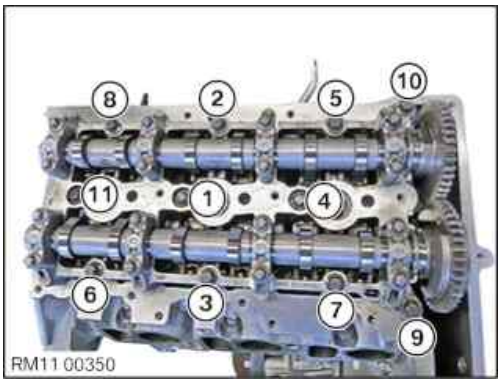


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

80 – Installing the camshaft sprocket on the intake camshaft

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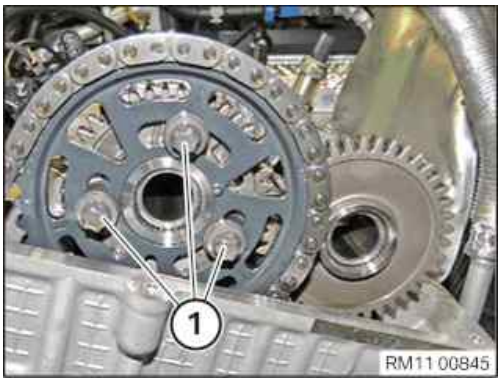
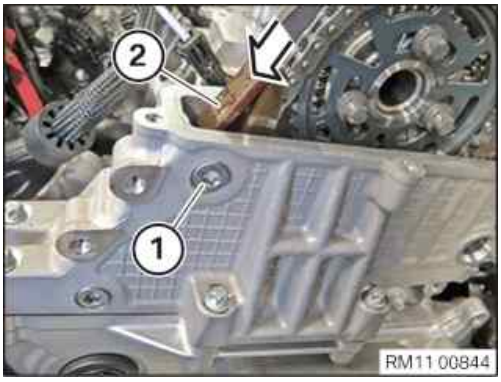


- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

81 – Install the timing chain guide rail



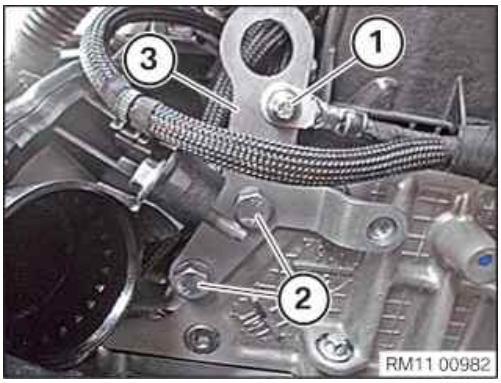
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

82 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

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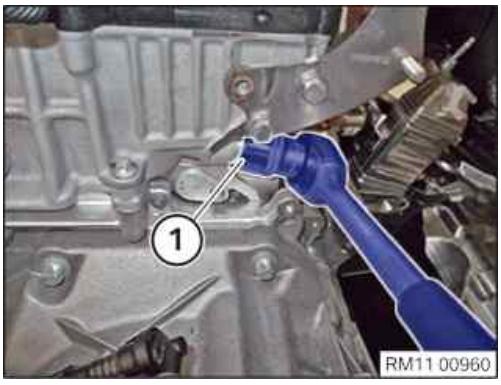
TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

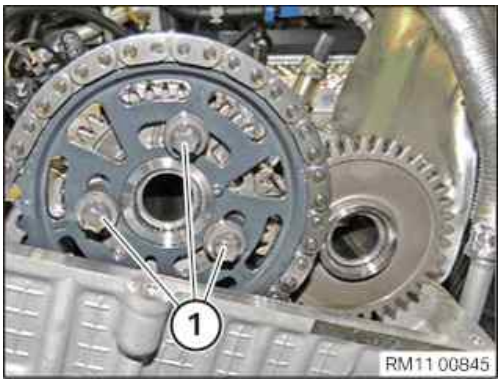


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

83 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

84 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

85 – Remove special tool to disconnect the crank shaft

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- Remove special tool **2 288 380**.

86 – Checking camshaft timing

- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

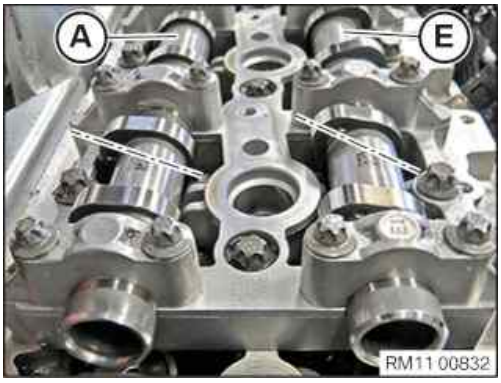
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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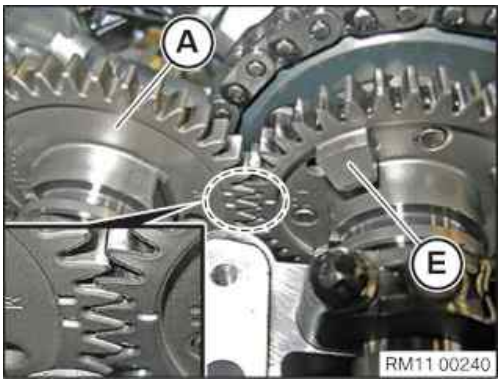
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

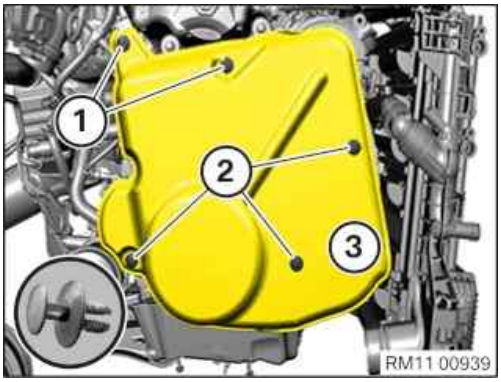
TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

87 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

88 – Installing exhaust manifold

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

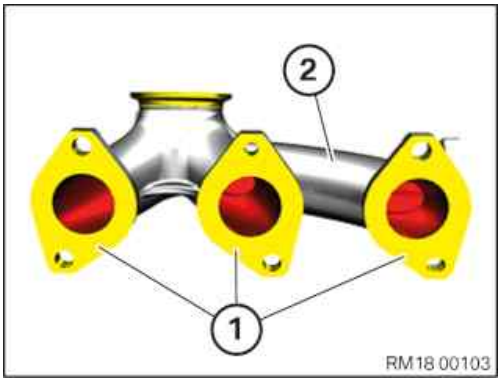
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

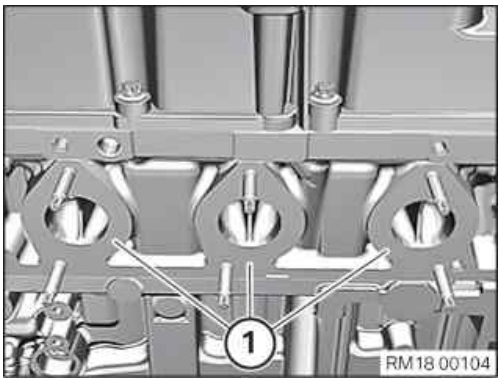
- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

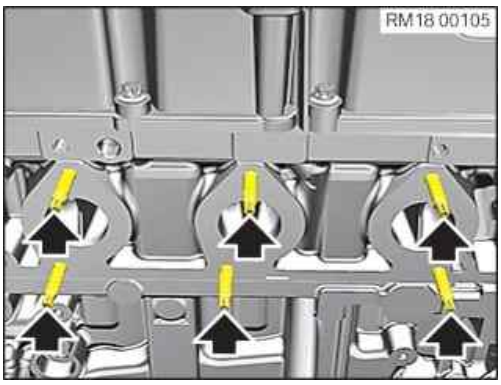
The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean the connection points (1) on the exhaust manifold (2) with the special tool **0 495 102 (11 4 470)**.



- Clean the connection points (1) on the cylinder head with the special tool **0 495 102 (11 4 470)**.



- Check the stud bolts (arrows) on the cylinder head for **correct** fit.

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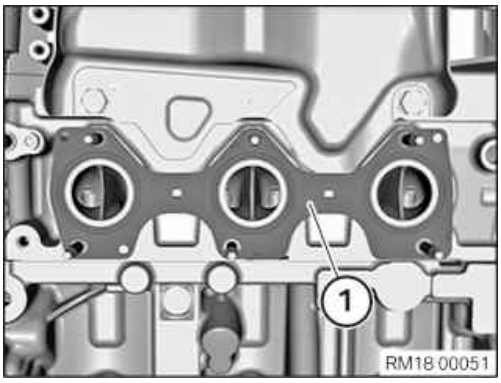
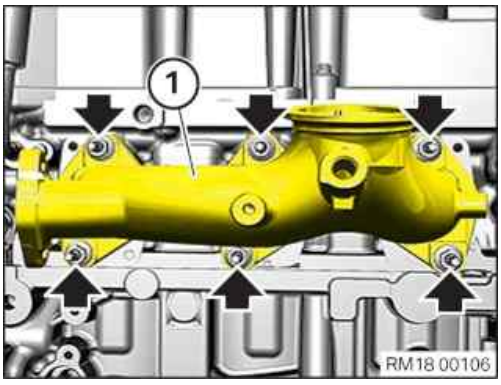


TECHNICAL INFORMATION

The **coated side of the** seal must be mounted facing towards the exhaust manifold.

- Renew the gasket (1).

  Parts: Gasket
- Insert and install the gasket (1).

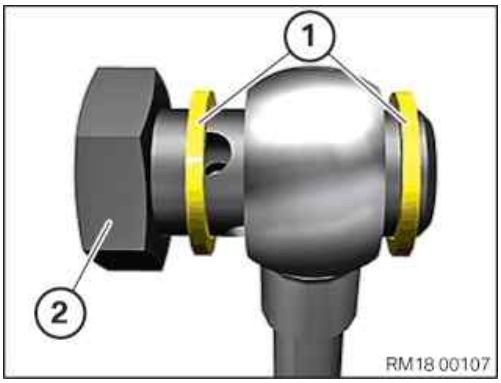


- Insert and install the exhaust manifold (1).
- Renew the nuts (arrows).

  Parts: Nuts
- Hand-tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.
- Tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.

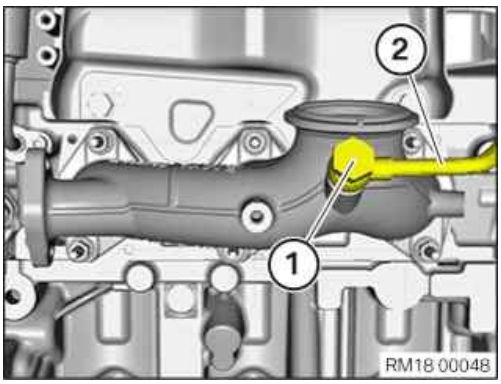
Exhaust manifold to cylinder head

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm



- Renew the sealing rings (1) from the banjo bolt (2).

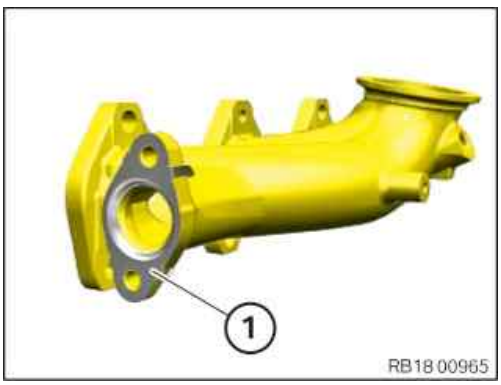
  Parts: Sealing ring



- Insert and install the exhaust gas pressure pipe (2).
- Tighten the banjo bolt (1).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt		Renew sealing rings.	30 Nm



- Renew seal (1) between exhaust-gas recirculation cooler and exhaust manifold.

  Parts: Gasket

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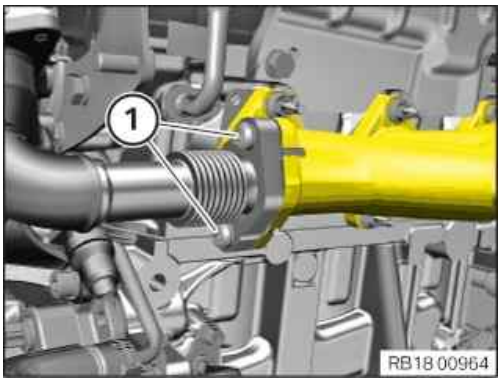

- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

89 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

90 – Installing exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the exhaust turbocharger

Inadequate initial filling of exhaust turbocharger leads to dry running.

- Make sure the initial filling is correct when replacing exhaust turbocharger.
- Fill the exhaust turbocharger with the suitable additive (see electronic Parts Catalogue).

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TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

TECHNICAL INFORMATION

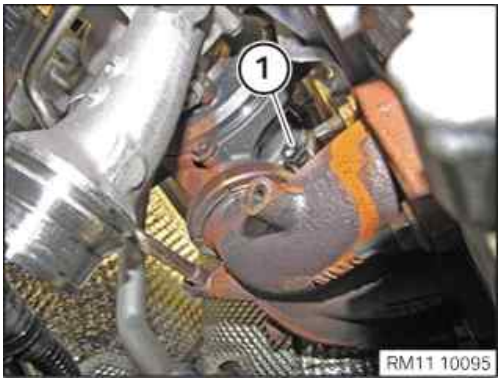
For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger



- Renew gasket.

  Parts: Gasket
- Position seal on exhaust manifold.
- Guide the exhaust turbocharger in from the top and position it.
- **Ensure that gasket is correctly seated.**
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Renew sealing rings.

  Parts: Sealing ring
- Position oil feed line with banjo bolt (1) and sealing rings and tighten hand-tight.

  There are 2 sealing rings fitted on the banjo bolt (1).
- Align oil feed line and tighten banjo bolt (1).

  The oil feed line must not sit on the exhaust turbocharger.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

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- Renew gasket.

  Parts: Gasket
- Position oil return line (2) with **seal** on exhaust turbocharger.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Feed in and tighten screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

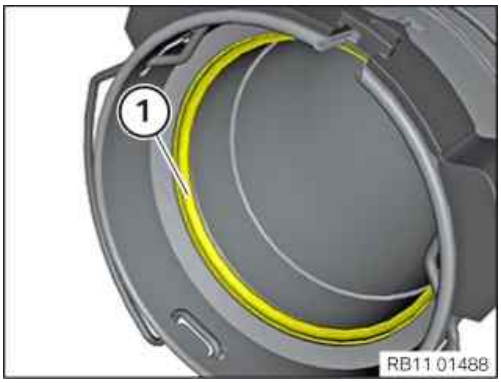
91 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

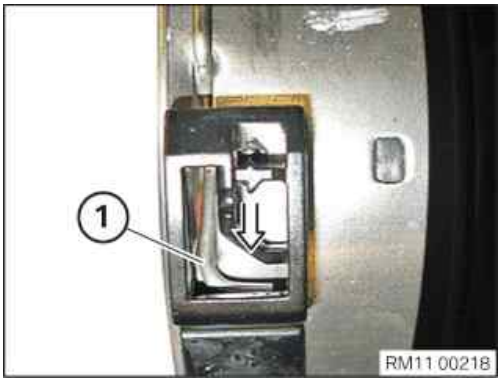
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

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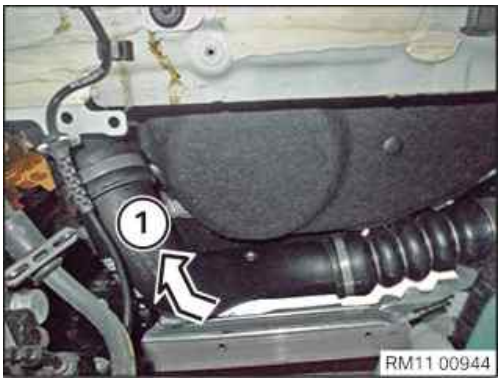
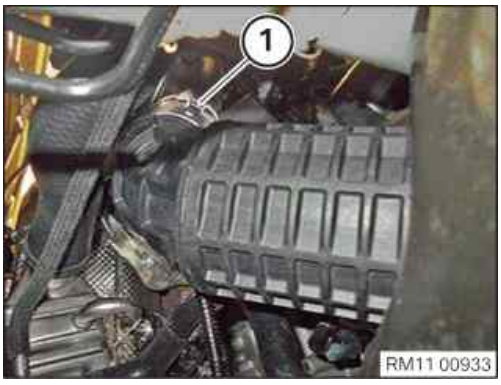
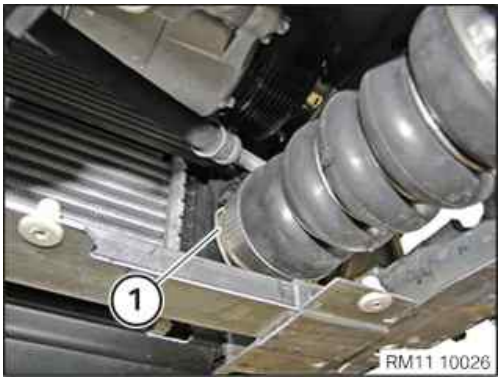


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



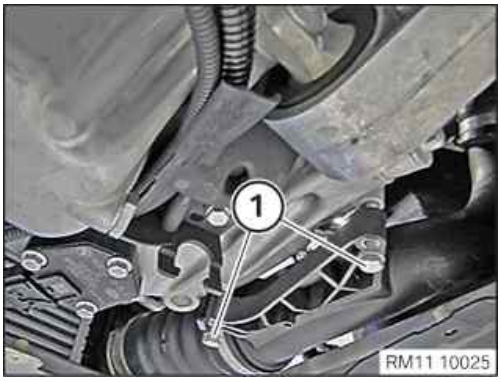
- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm



- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

92 – Installing heat shield on exhaust turbocharger at the rear

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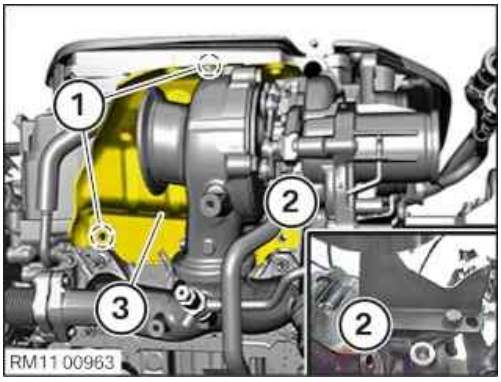
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

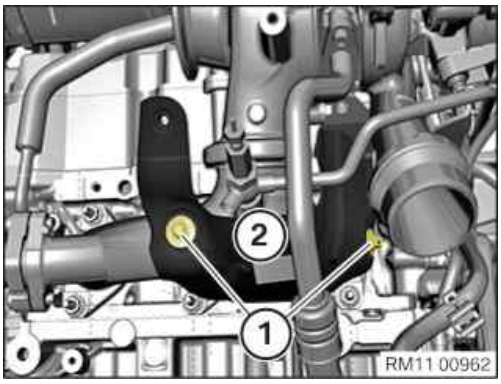
93 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

94 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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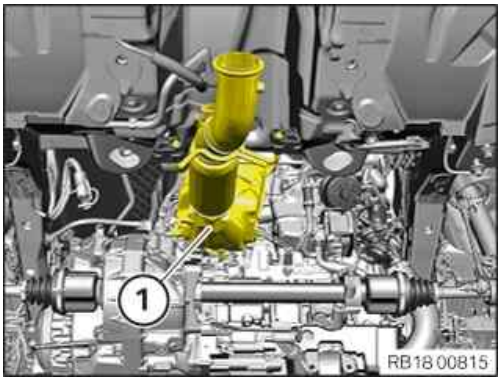
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

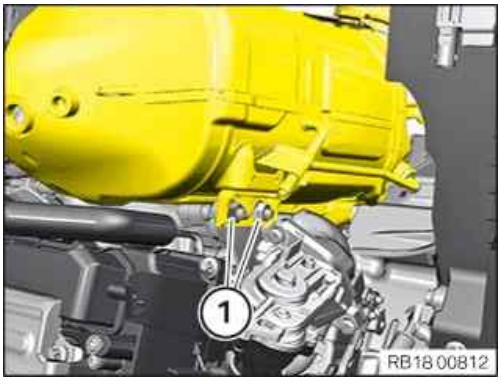
  Parts: Gasket

- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.

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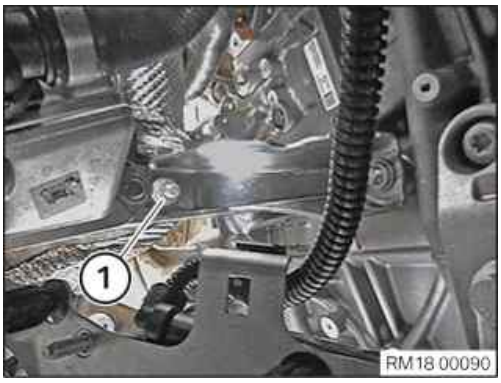


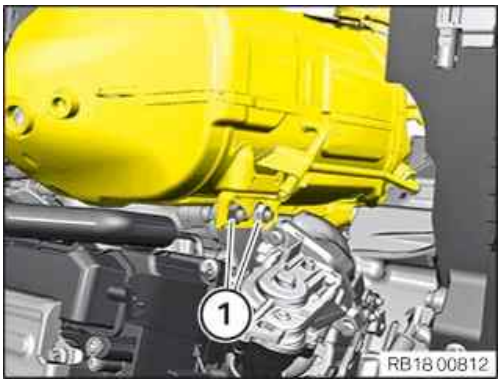
- Tighten the nut (1) hand-tight.

- Remove fitting aid (1) for the flexible tube.

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

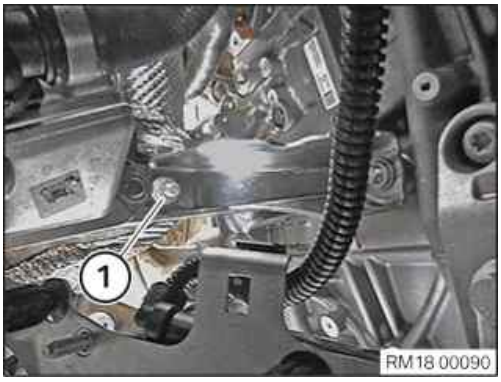
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten nut (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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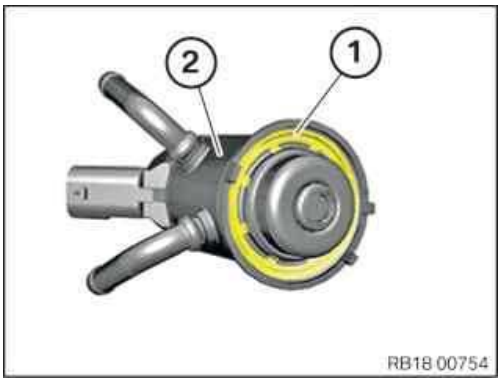
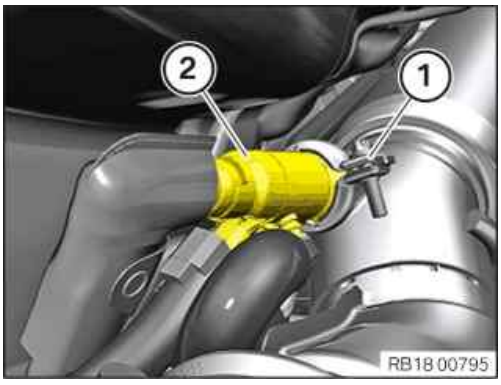


- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

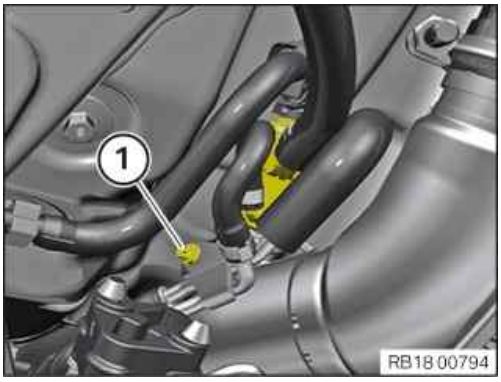


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

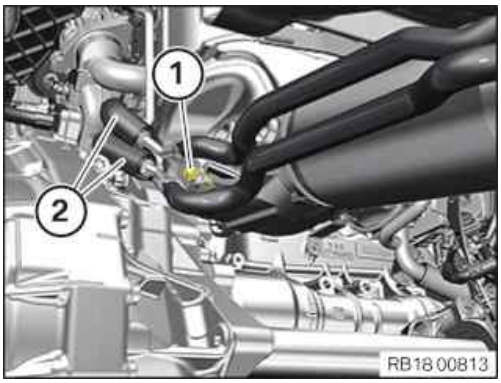
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

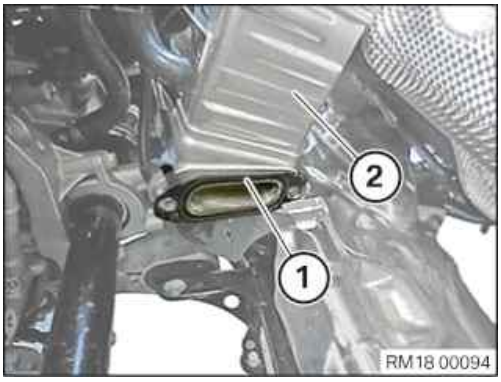
Torx bolt BM6x16		Tightening torque	8 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm



- Replace seal (1) of the low pressure exhaust-gas recirculation cooler (2).

  Parts: Gasket

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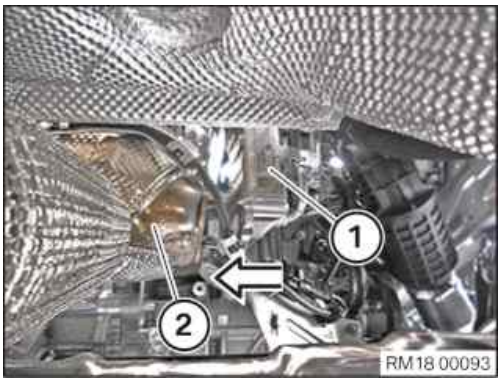
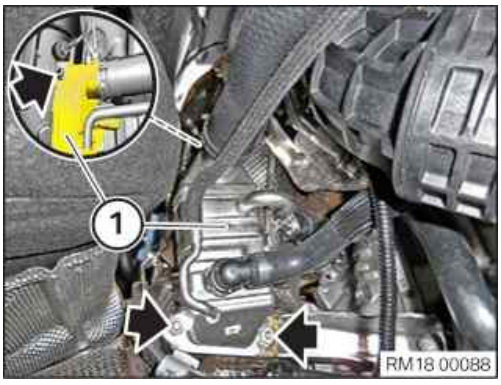


- Feed in and install the low pressure exhaust-gas recirculation cooler (1) in at the diesel particulate filter (2) in the direction of arrow.



- Tighten nuts (arrows) of the low pressure exhaust-gas recirculation coolers (1).

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

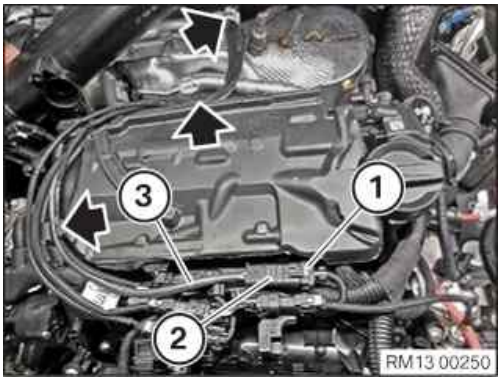
Flange nutM8		Tightening torque	19 Nm

95 – Install the control sensor

- Feed in front oxygen sensor (1) and install.
- Tighten the front oxygen sensor (1) with the special tool **0 491 075 (11 7 030)**.

Control sensor

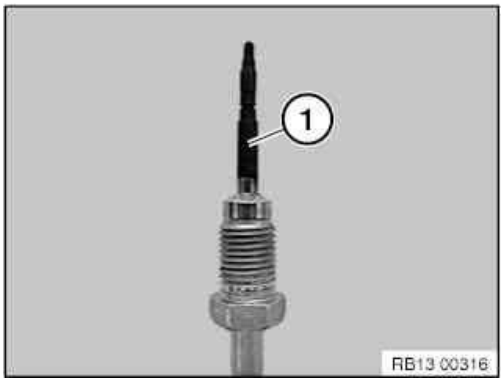
Control sensor		Tightening torque	50 Nm



- Feed in and install cable (3) from the oxygen control sensor into the clamps (arrows).
- Secure connector (2) on holder.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

96 – Install the exhaust-gas temperature sensor on the diesel particulate filter



RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.
- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.

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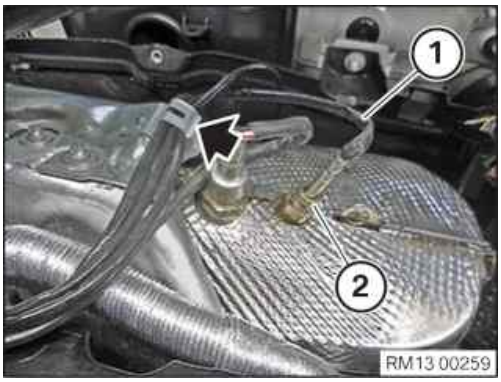


- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

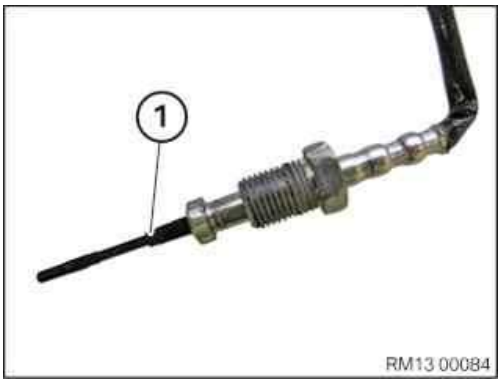
97 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

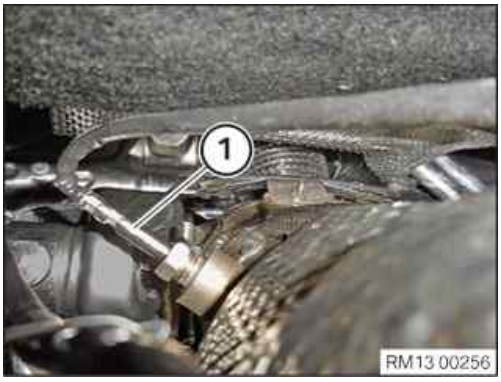
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.



- Feed in and install the exhaust temperature sensor (1).

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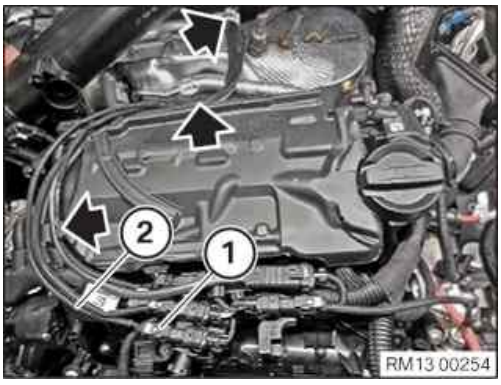
- Tighten the exhaust temperature sensor (1) with conventional tools (2).

Exhaust temperature sensor to diesel particulate filter

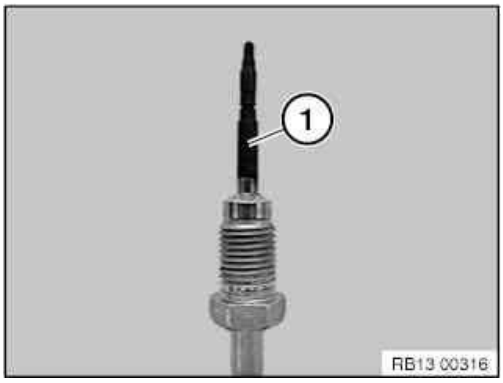
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

98 – Installing exhaust temperature sensor on catalytic converter



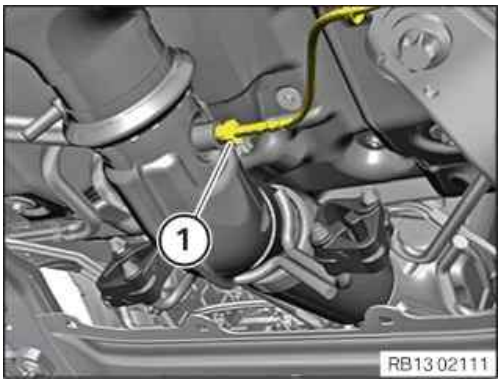
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Secure the cable clips (1).

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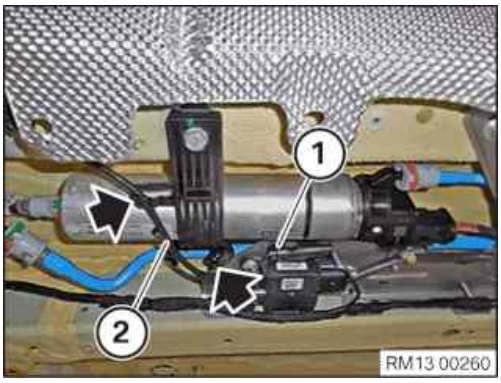
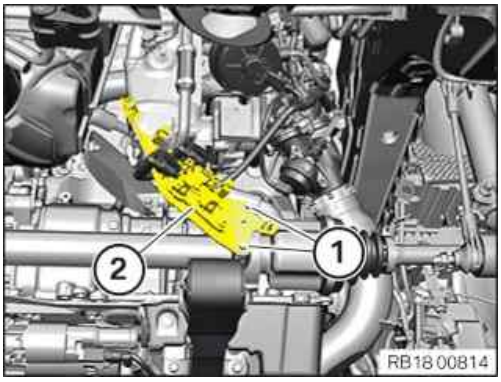


- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

99 – Install holder for oxygen sensor

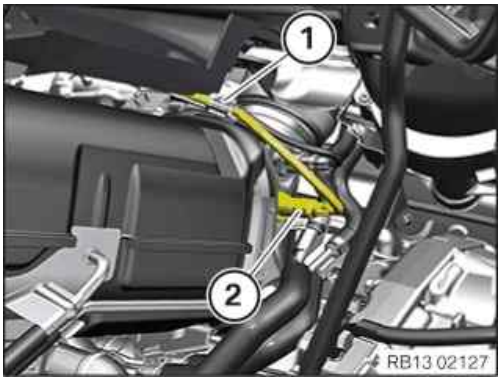


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

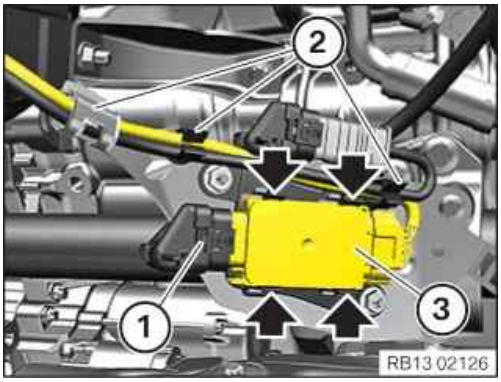
100 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

101 – Install the monitoring sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

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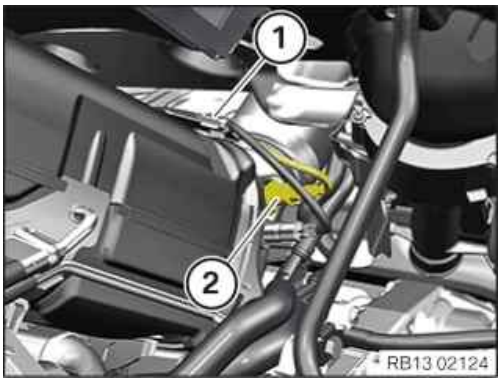
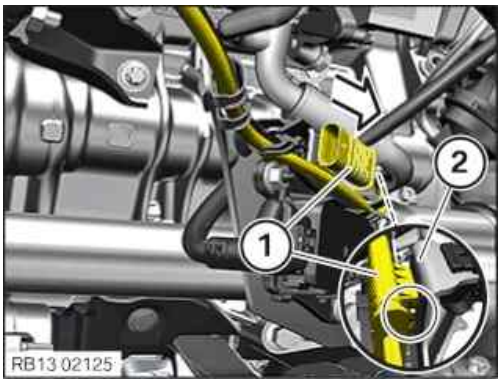


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

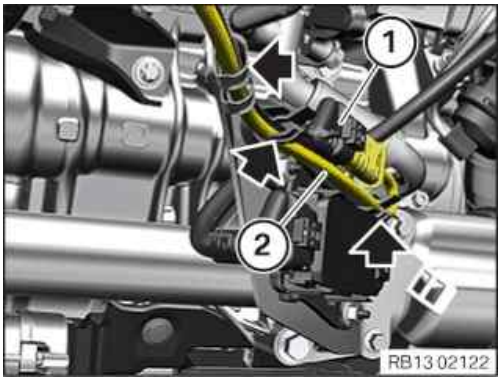
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

102 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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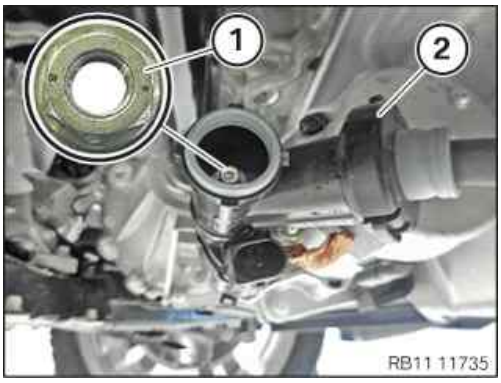


- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

103 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

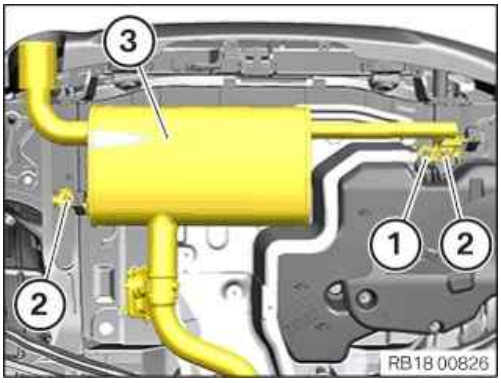
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert and install the exhaust system (3) with the help of another person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

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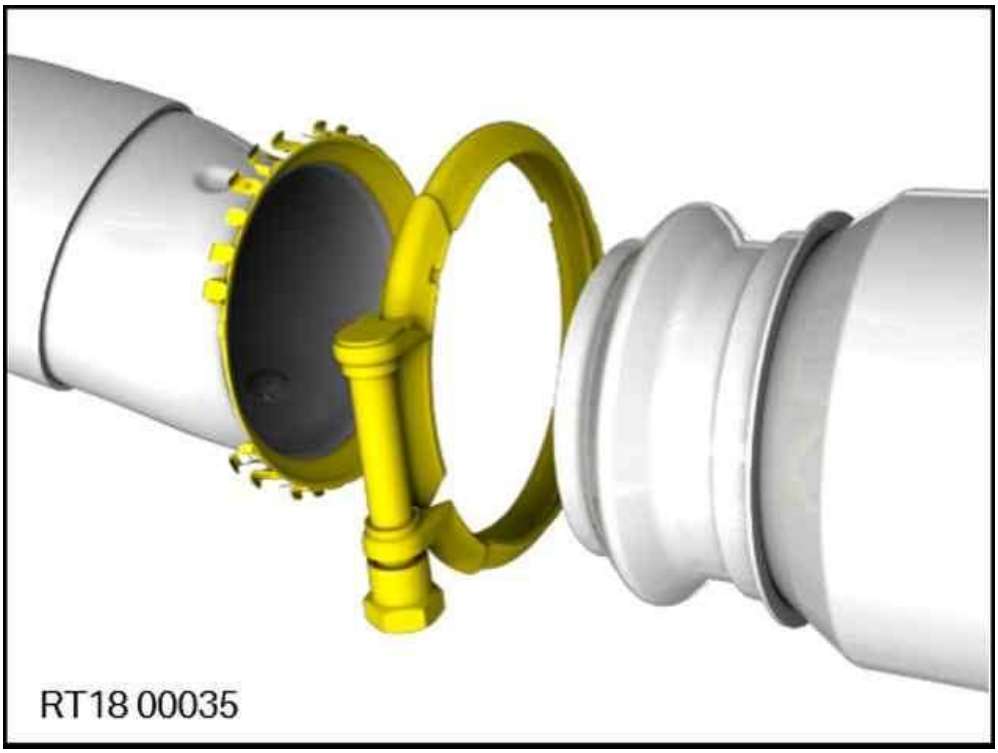
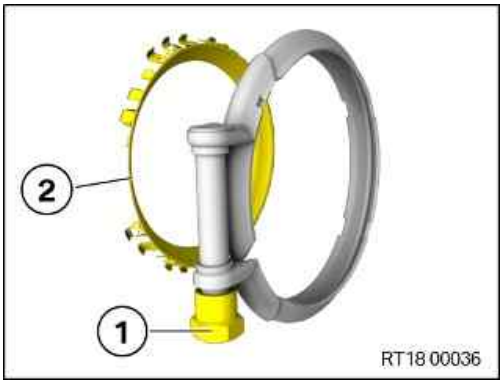
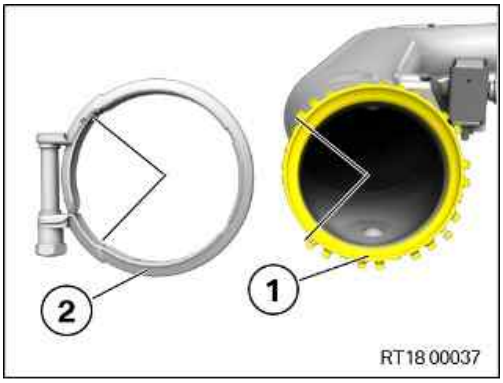
▶ **Install the V-clip**

V-band clamp



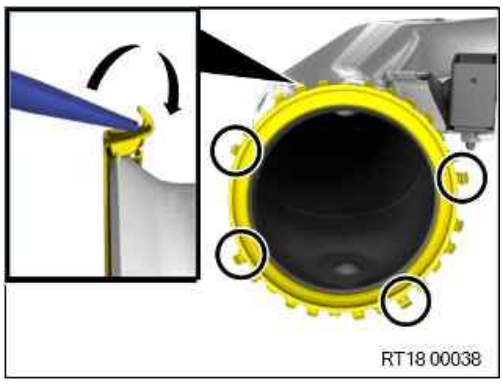


- Unscrew the nut (1) and remove the sealing ring (2).



- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

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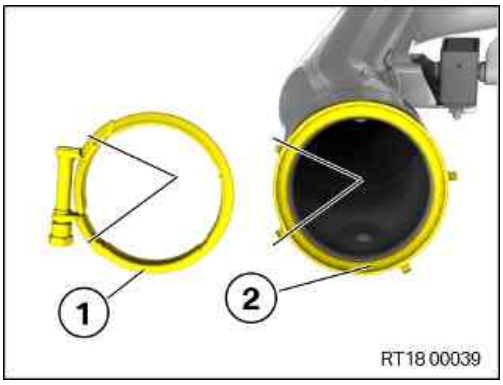
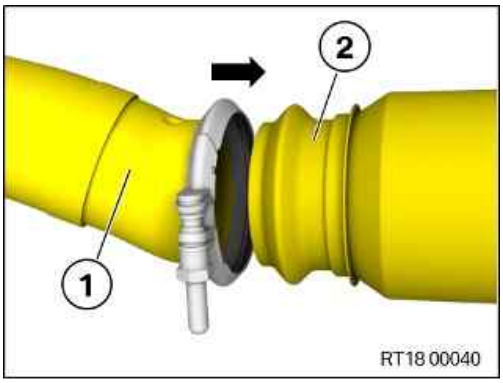
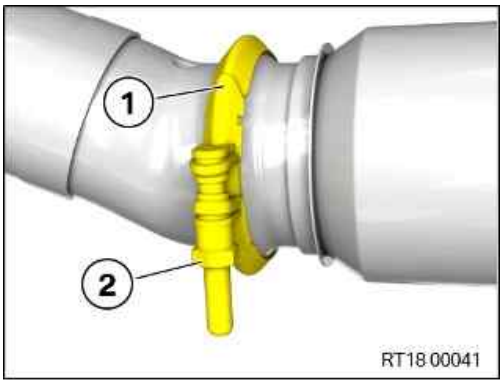


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



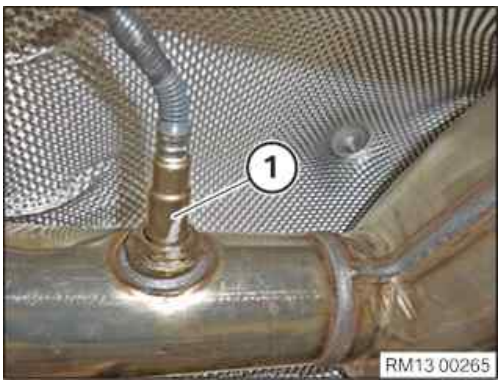
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Guide in, position and tighten the diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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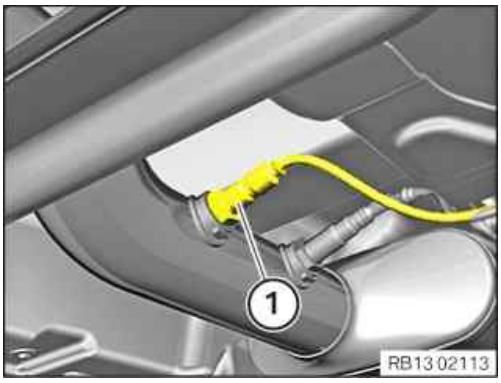
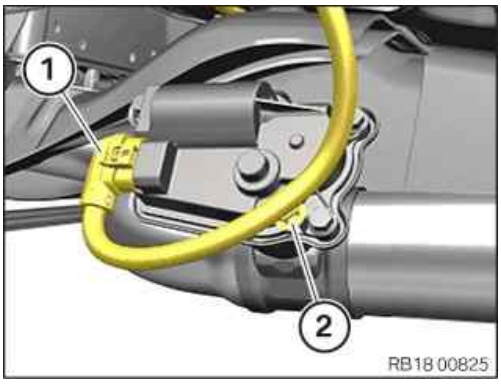


- Guide in, position and tighten the nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

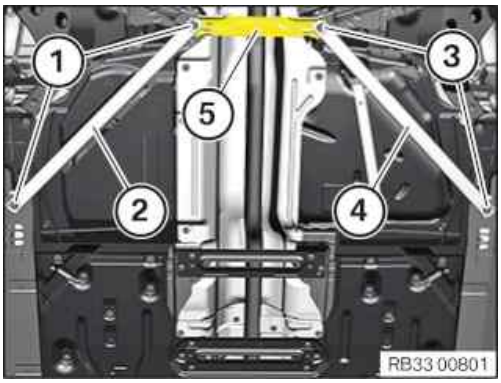
Sensor		Tightening torque	50 Nm



- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

104 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

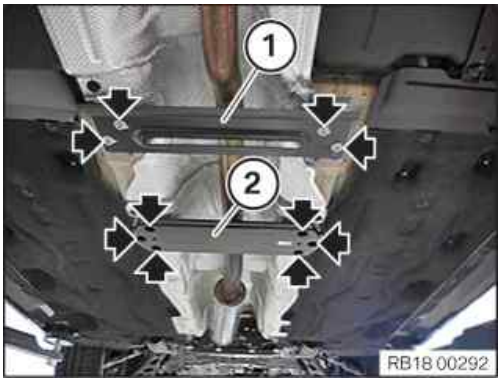
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

105 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

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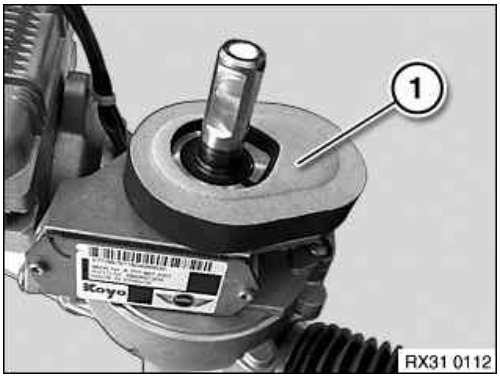
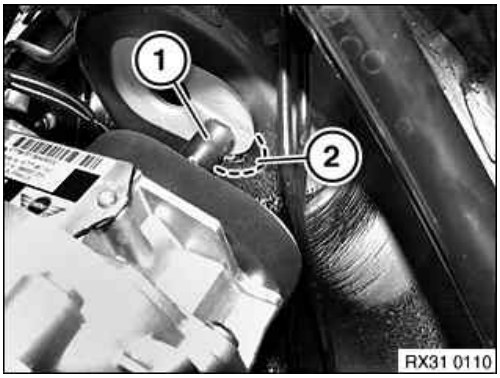
106 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

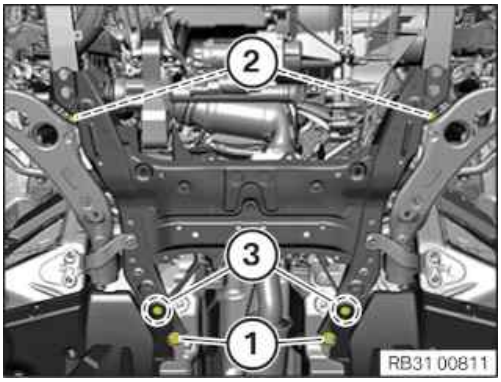


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

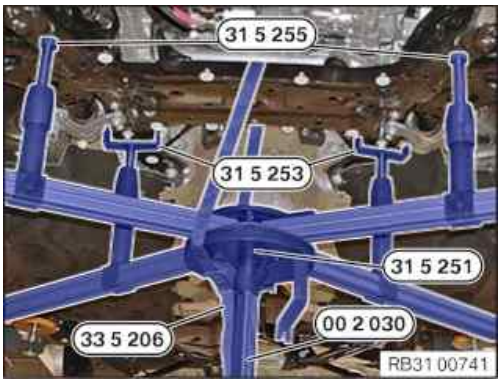
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.

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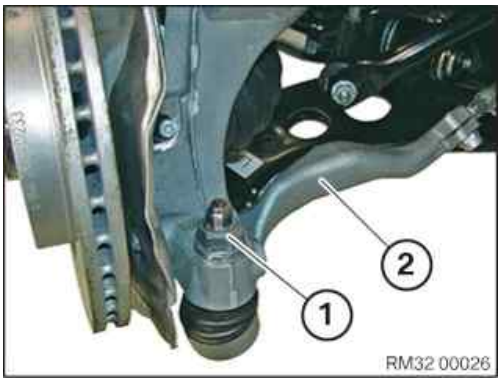


NOTICE

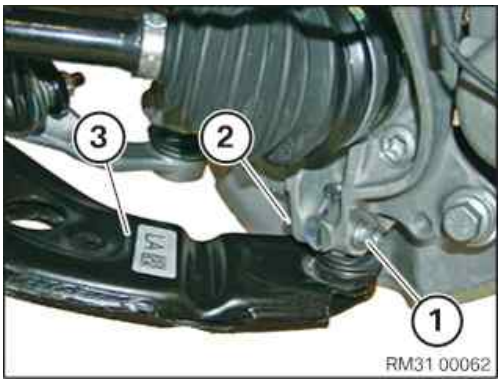
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

107 – Install the mounted parts on the front axle support

NOTICE

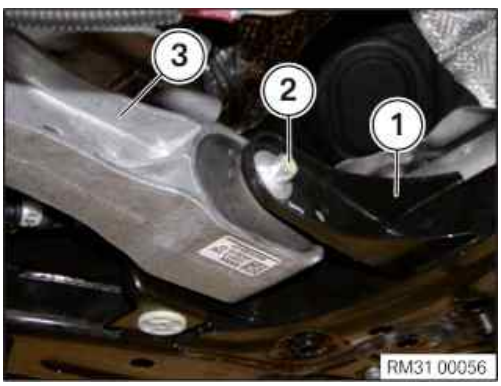
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

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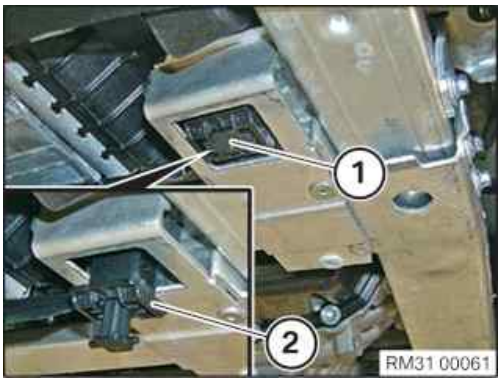
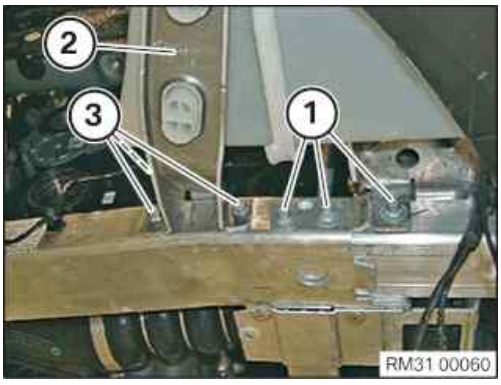


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

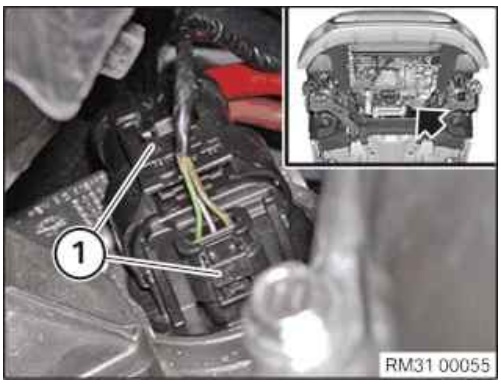
Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

108 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.

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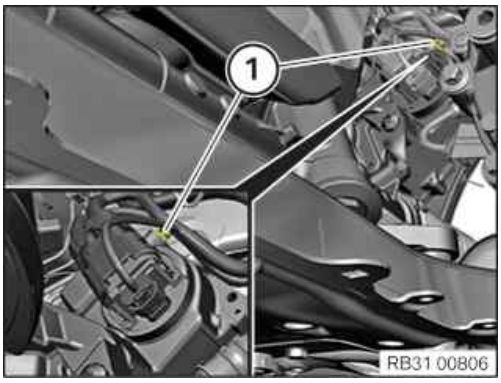
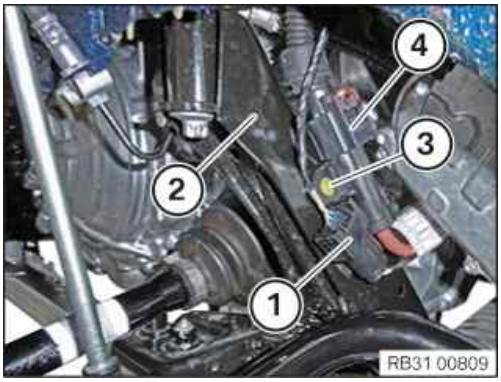


- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

109 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

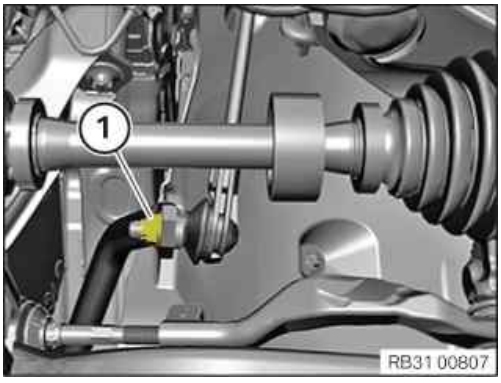
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

110 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

111 – With right installation: Securing the cable for the ride height sensor

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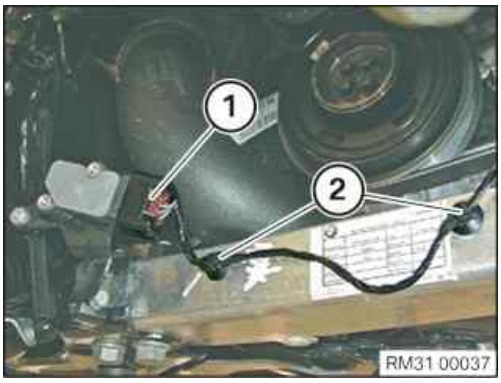


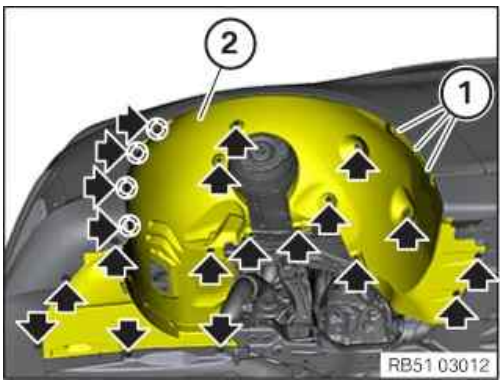
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

112 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▶ Installing the front wheel arch cover



- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

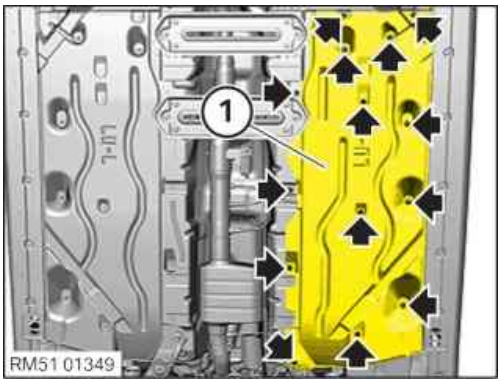
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

113 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

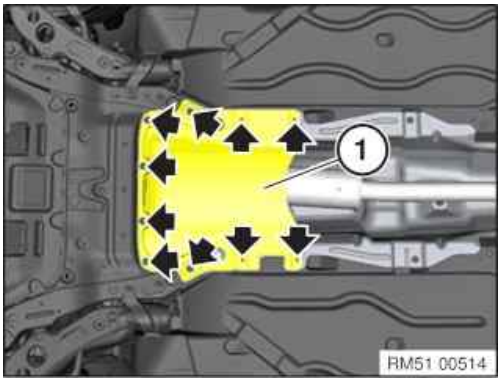
Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

114 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

115 – Mount the front left and right wheels

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▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

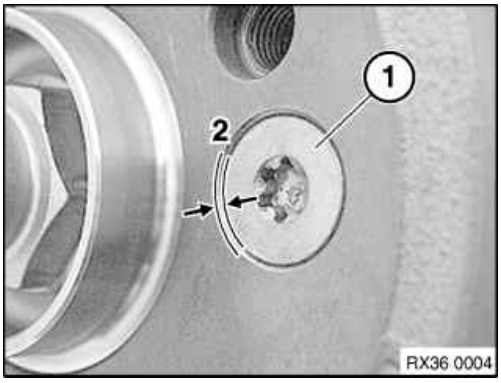
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

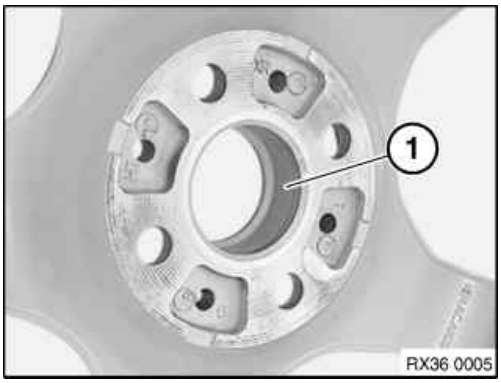
  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

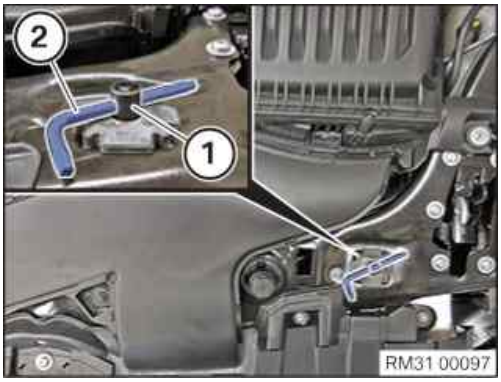
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

116 – Removing fastener for left and right radiator



NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

117 – Secure the steering shaft at the bottom on the steering gear

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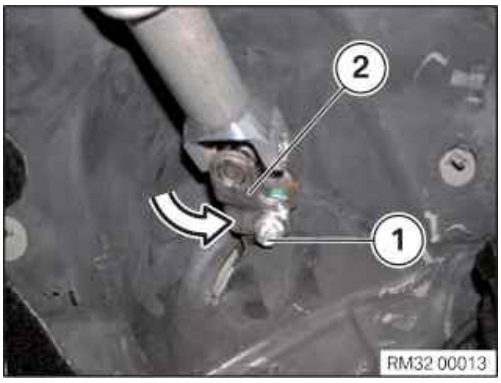
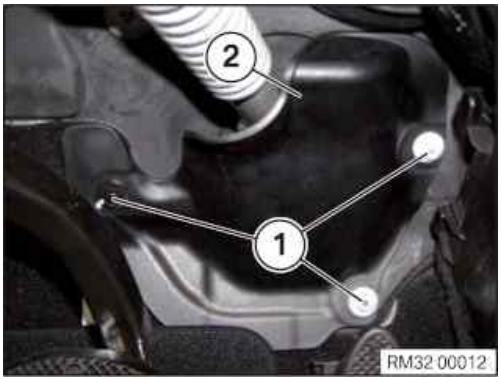


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

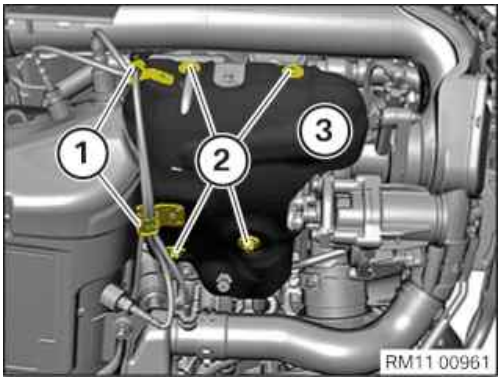
118 – Install the heat shield on the exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



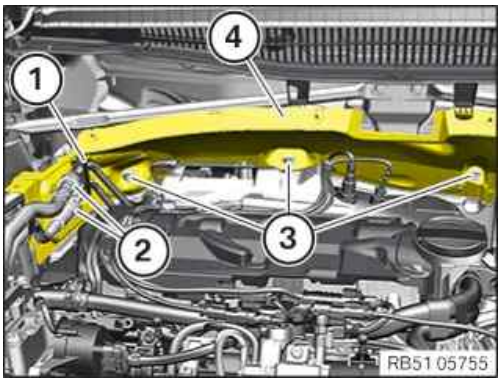
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

119 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

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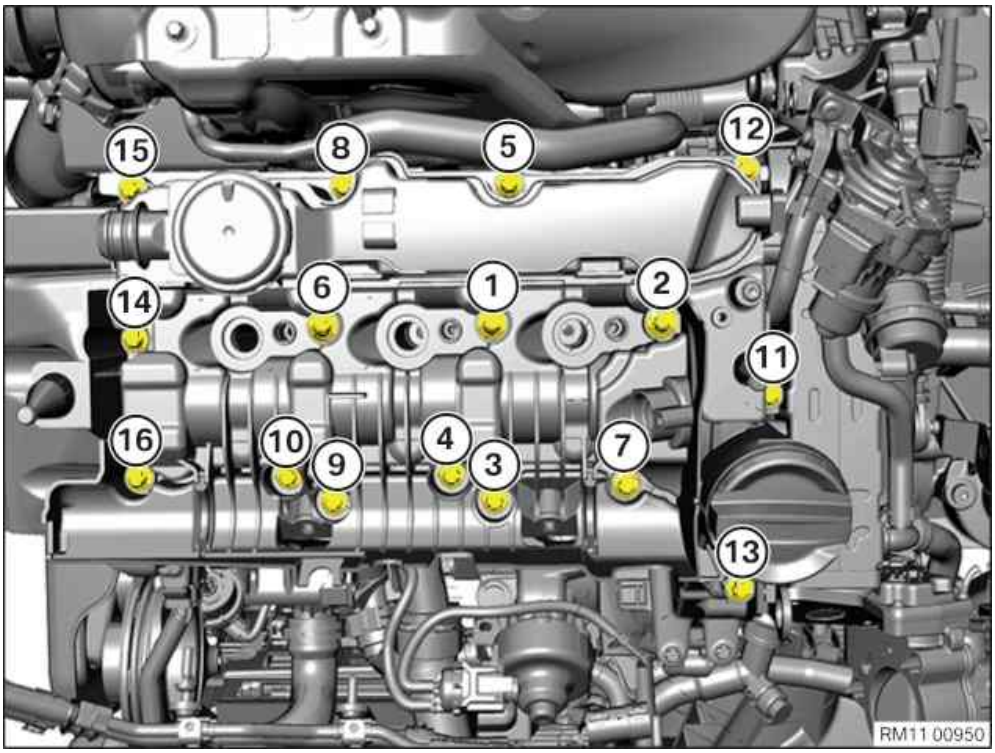
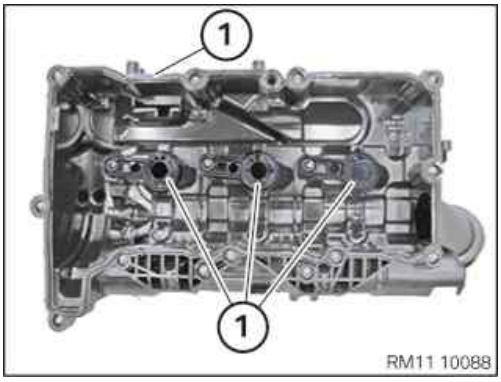
120 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover

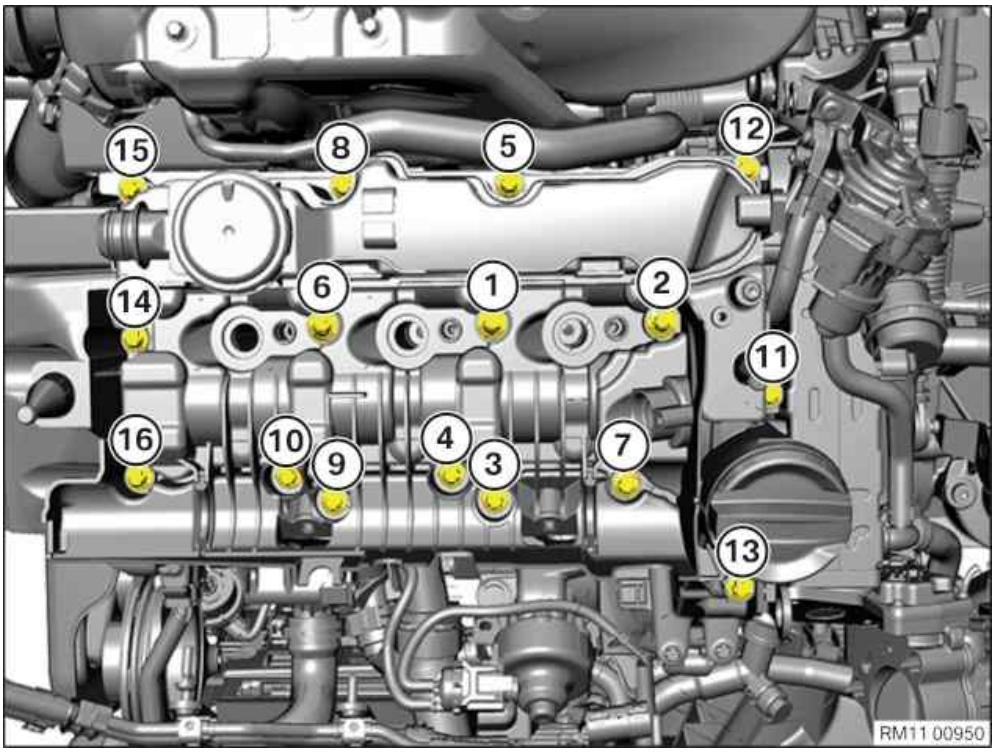


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm

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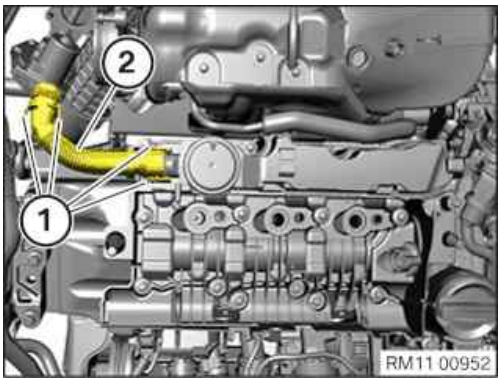
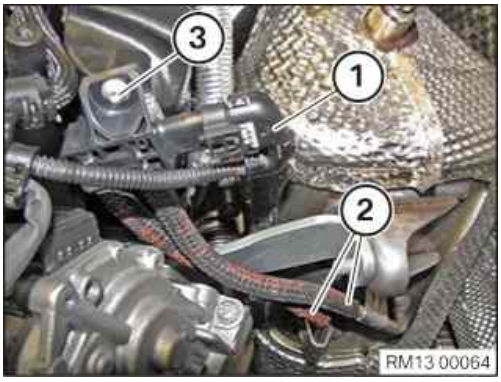


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

121 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

122 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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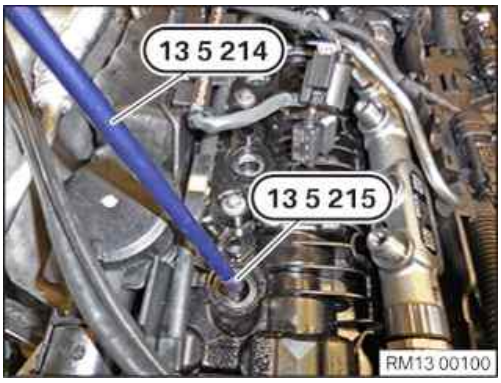
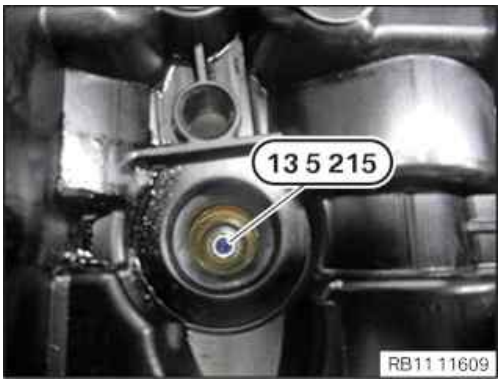


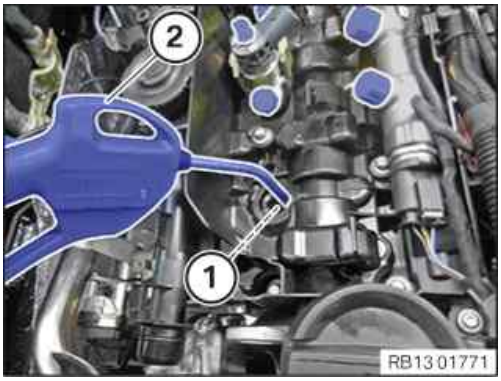
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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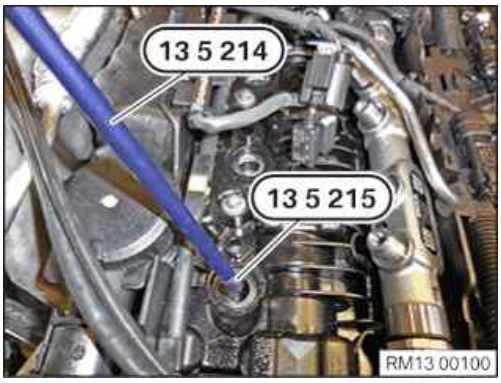


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

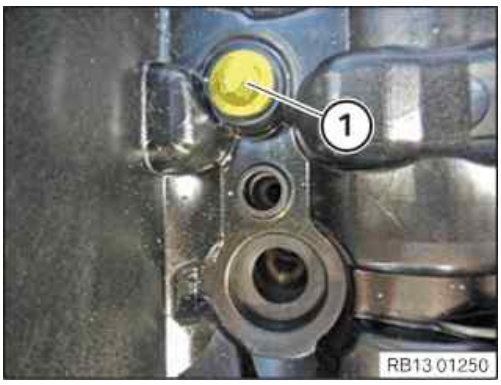
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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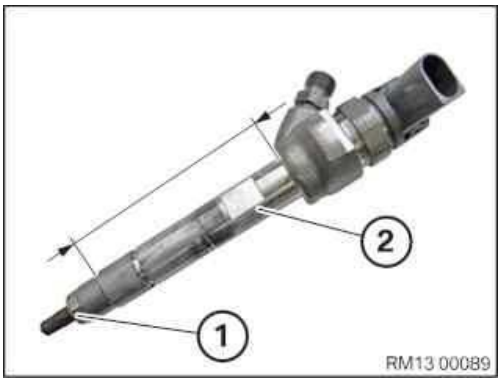


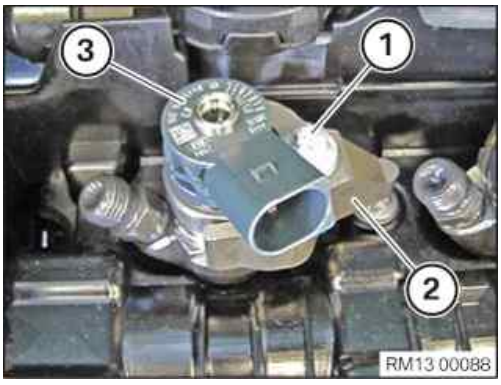
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

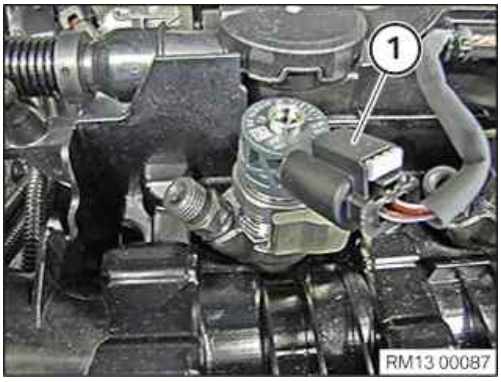
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

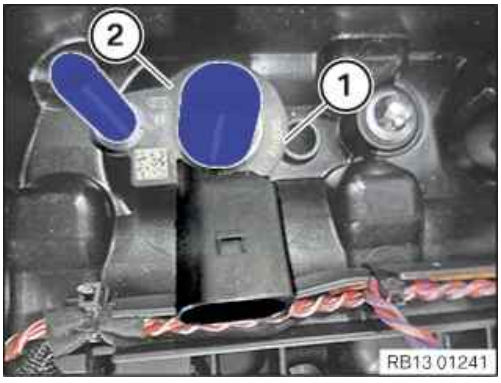
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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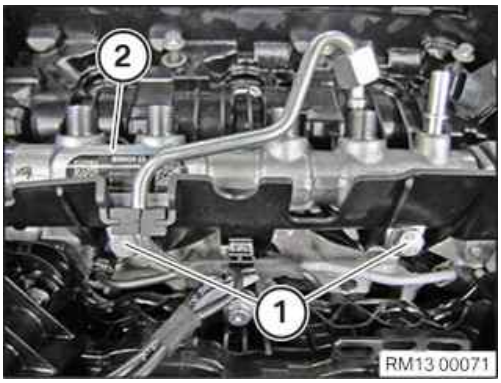
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

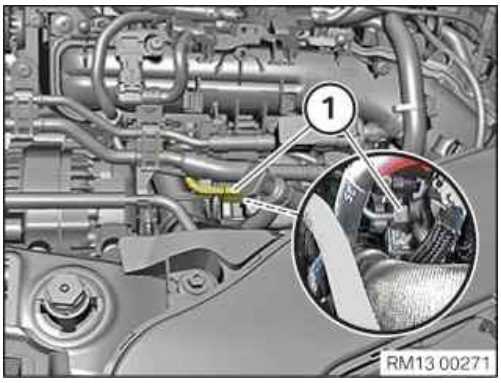
123 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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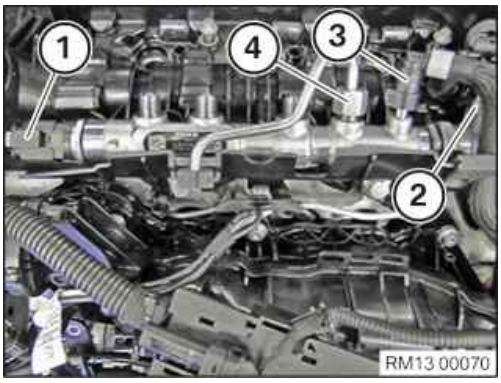

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

124 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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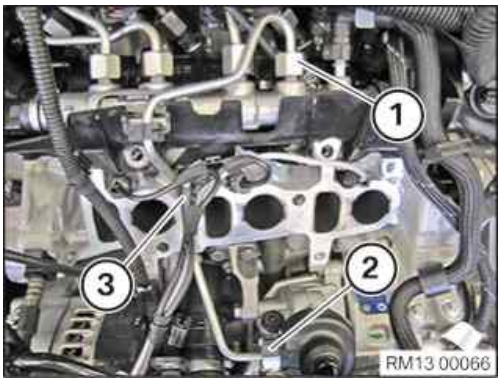

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

125 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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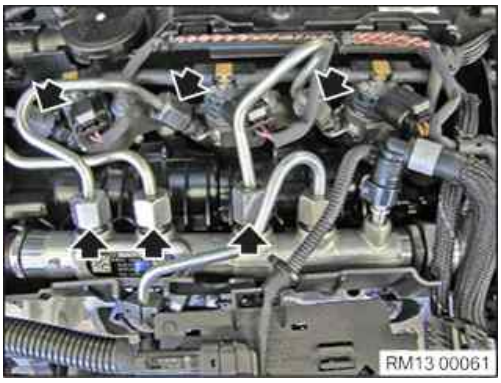

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

126 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

127 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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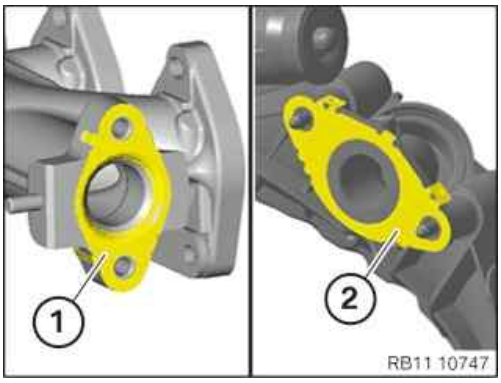
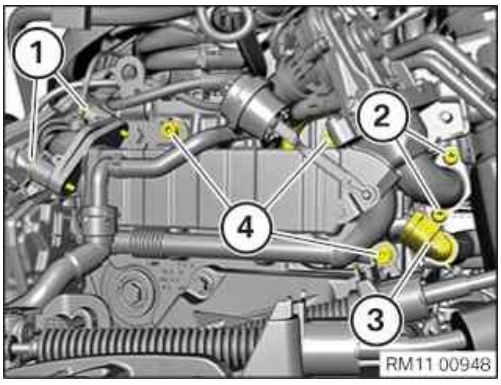


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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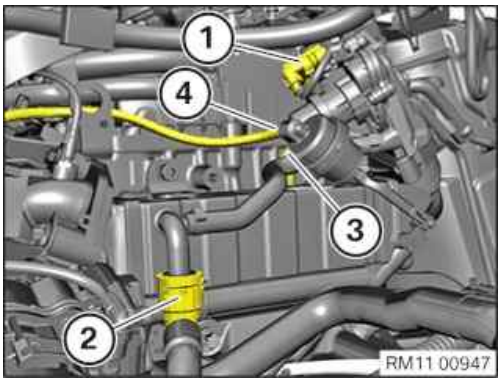


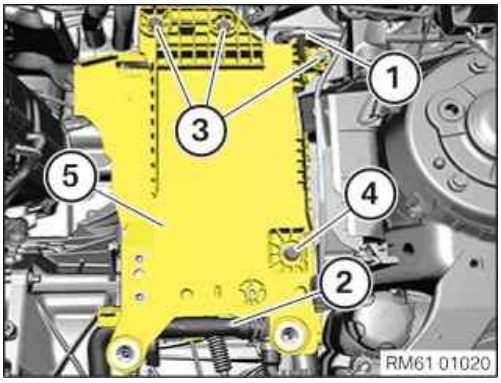
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

128 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

129 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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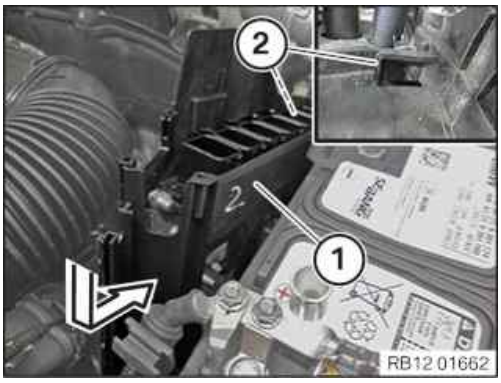
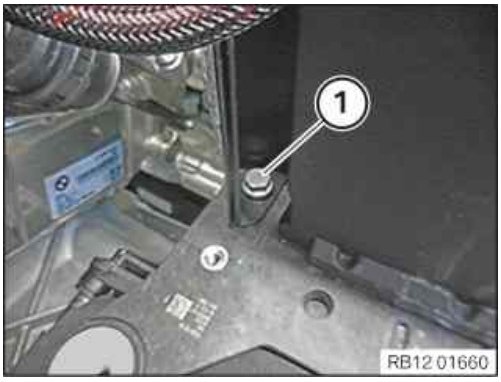


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

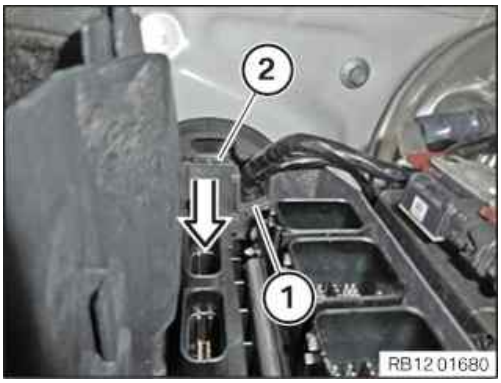
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



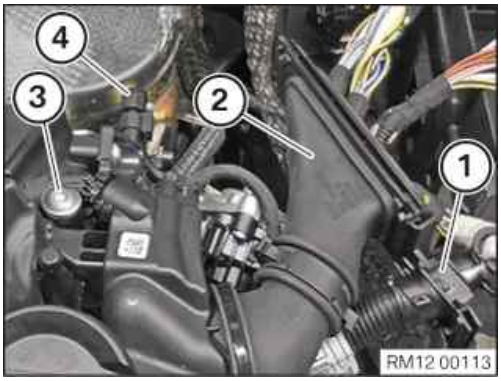
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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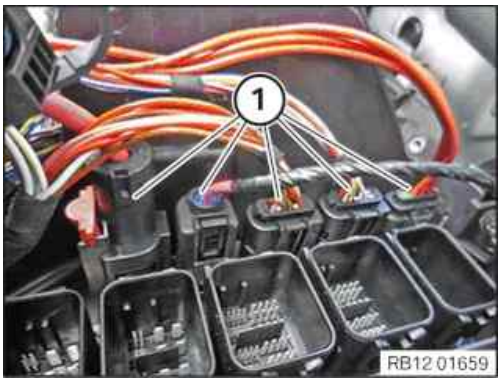
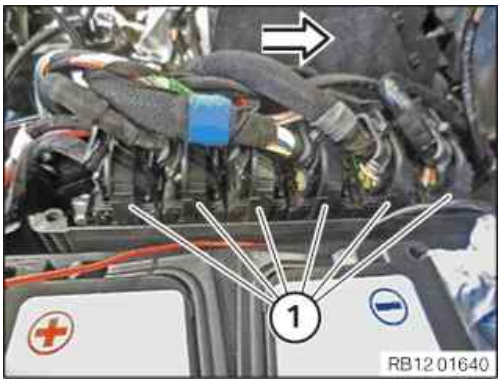
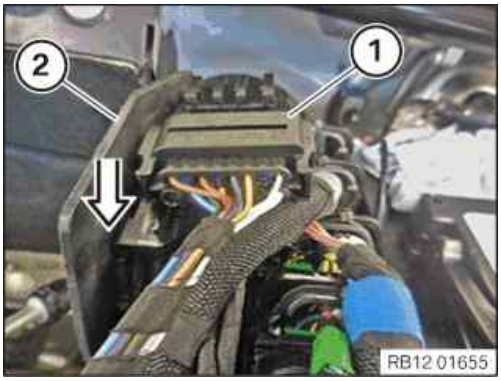


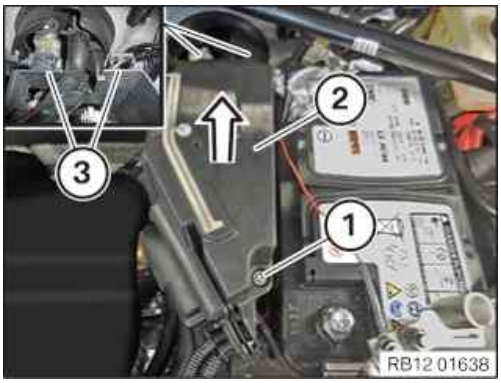
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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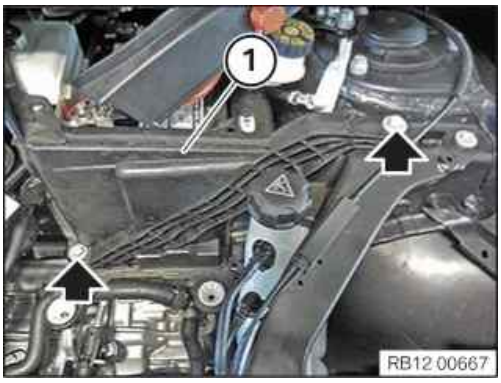


- Feed in and install tension strut (1).
- Tighten screws (arrows).

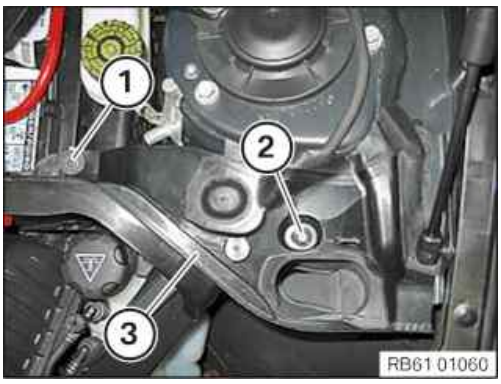
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

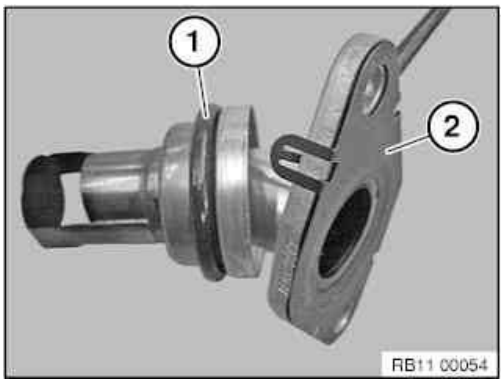


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

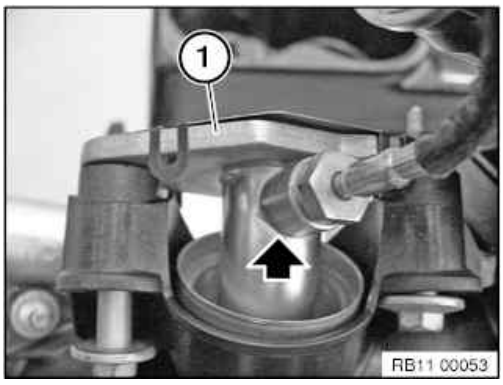
130 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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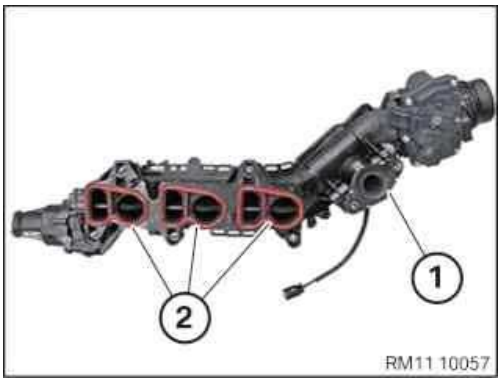
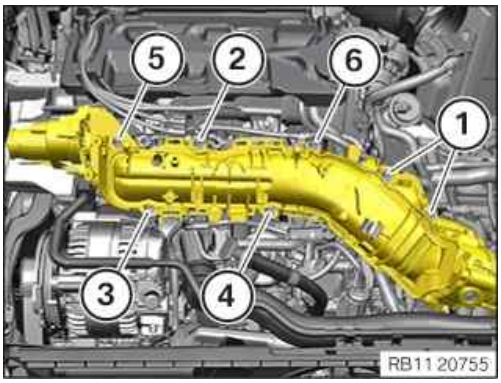


- Renew gaskets (2).

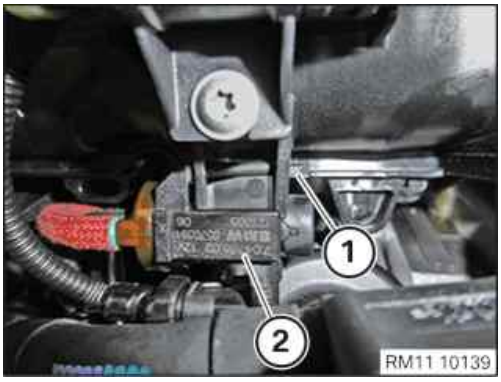
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



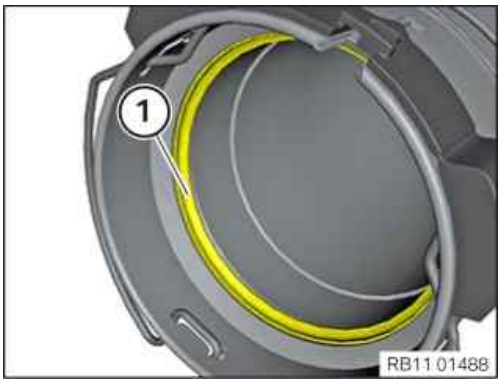
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

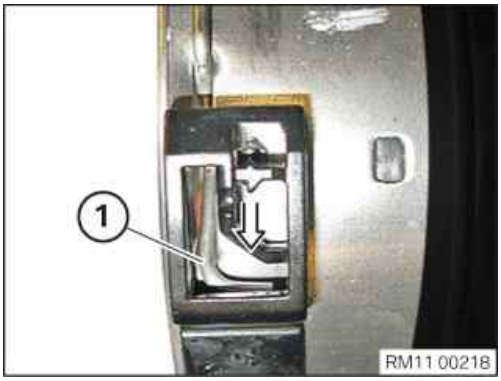


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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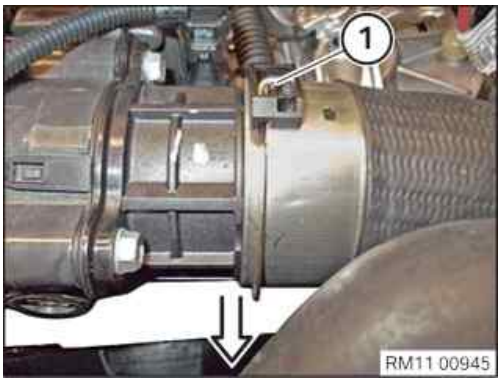
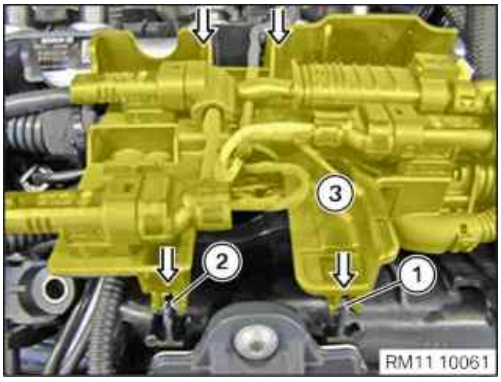


- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

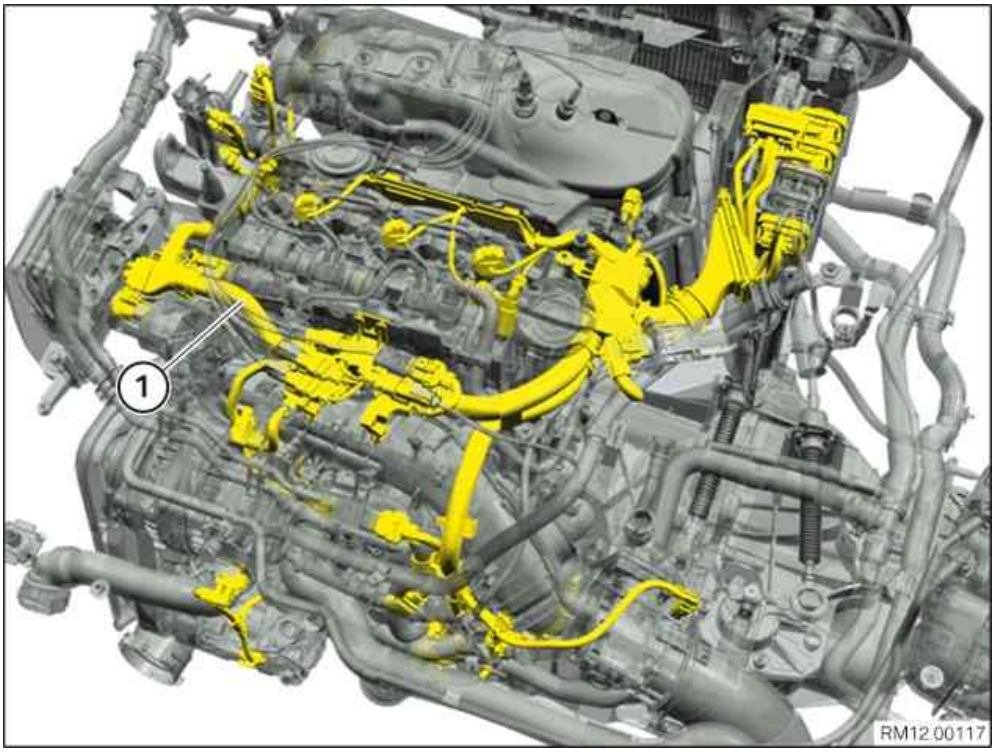
131 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

132 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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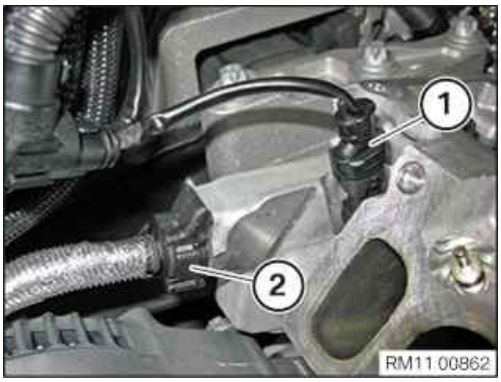
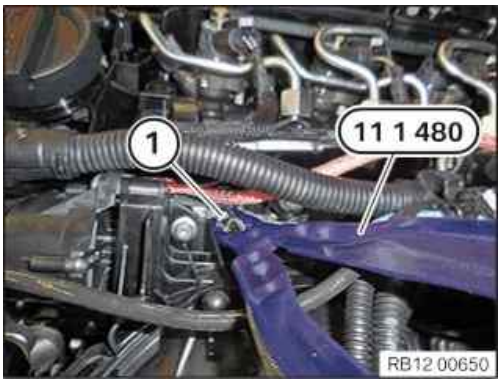
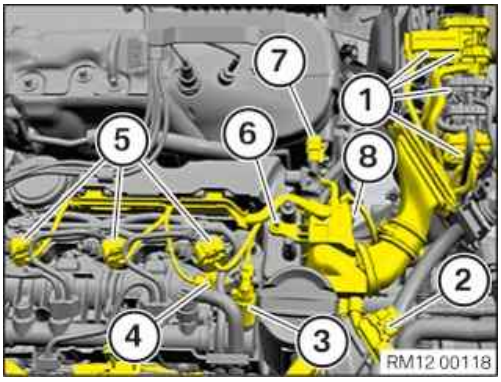


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

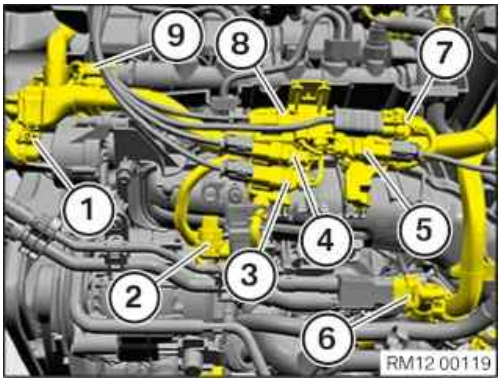


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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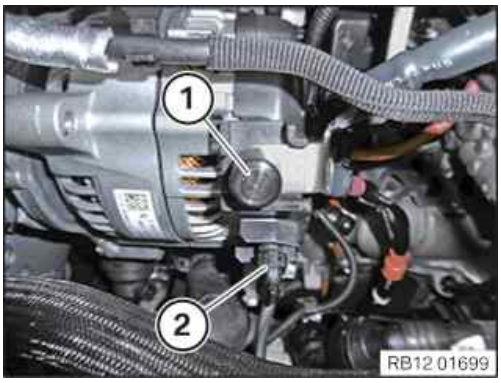
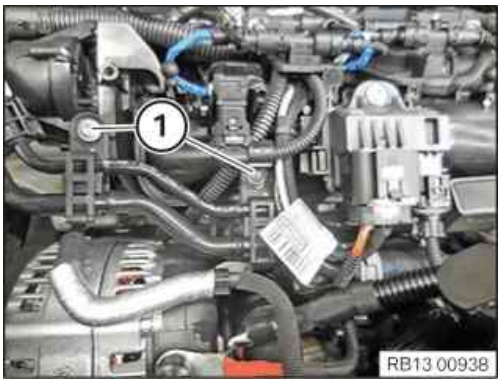


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

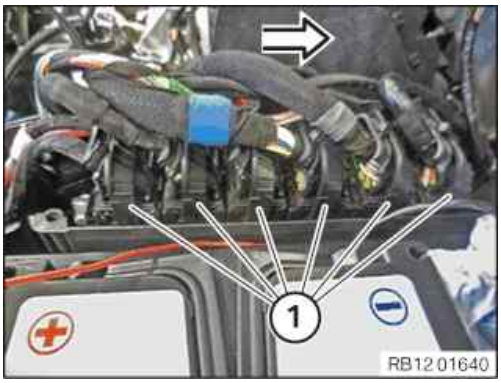


- Position fuel lines.
- Tighten the screws (1).

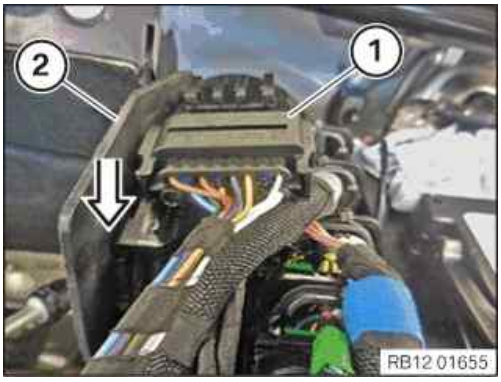
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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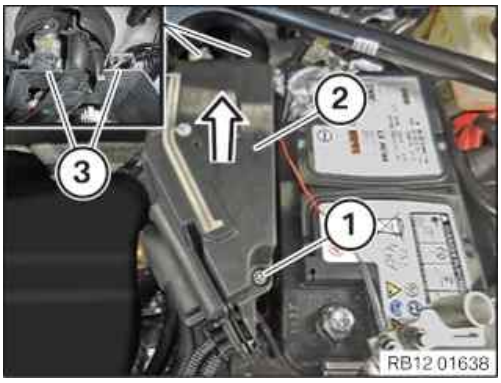
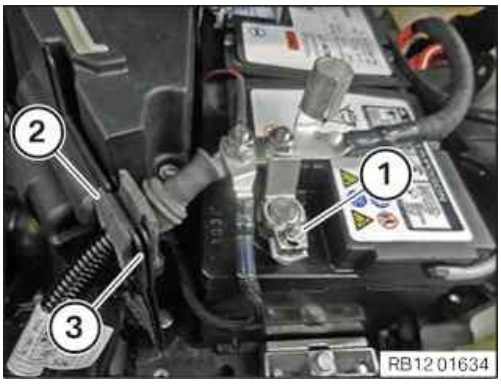


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

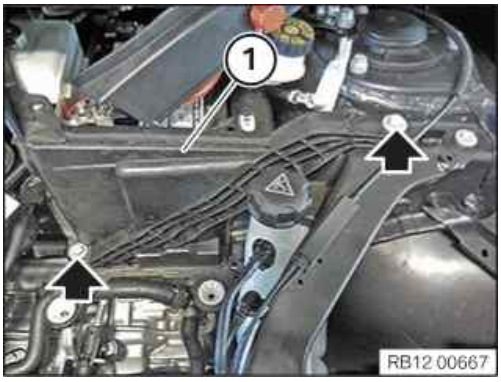
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

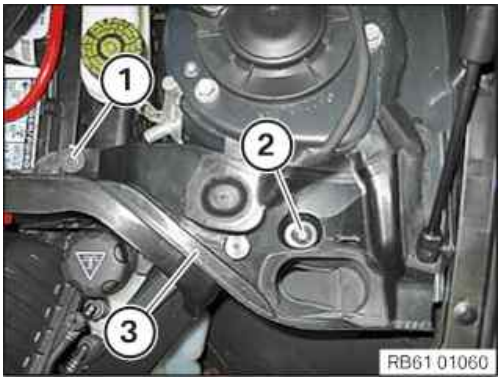
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

133 – Installing clean air pipe

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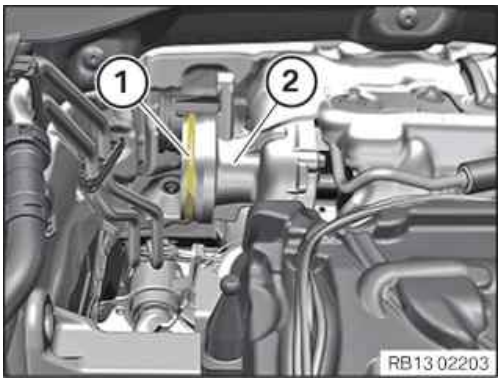
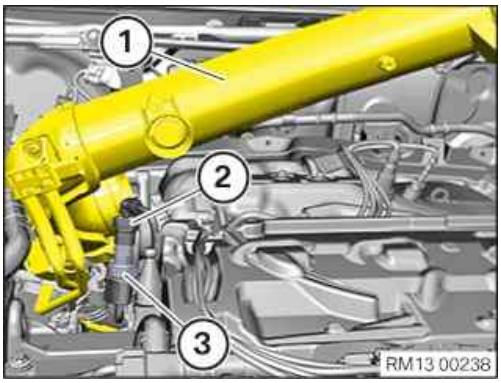


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



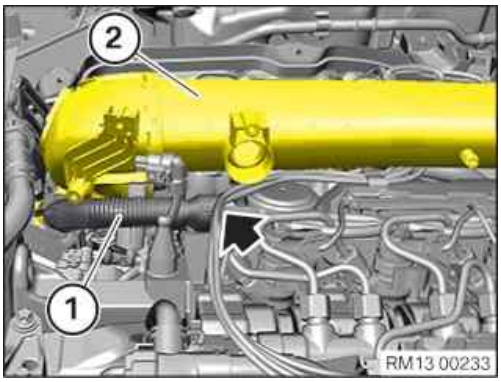
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

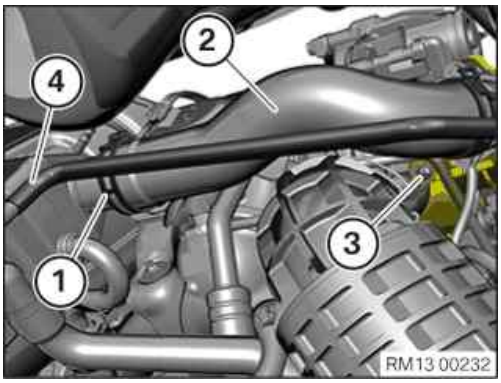
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

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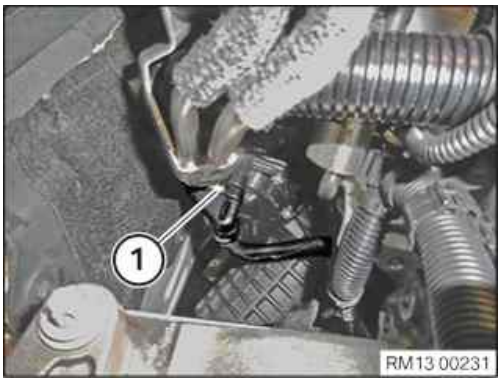
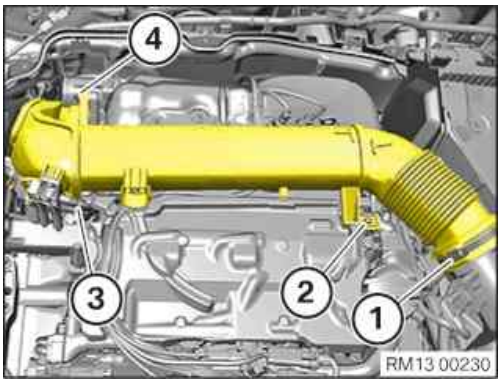


- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

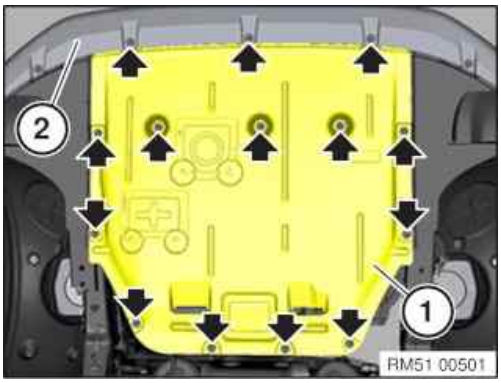
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

134 – Installing the front underbody protection

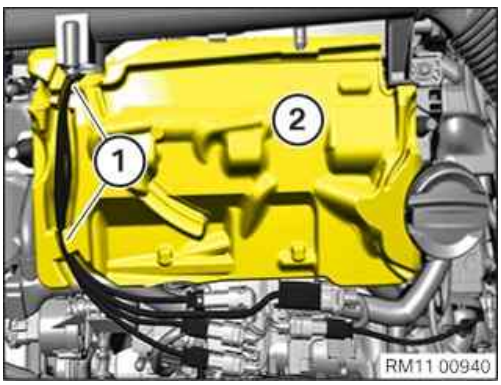


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

135 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

136 – Install resonator

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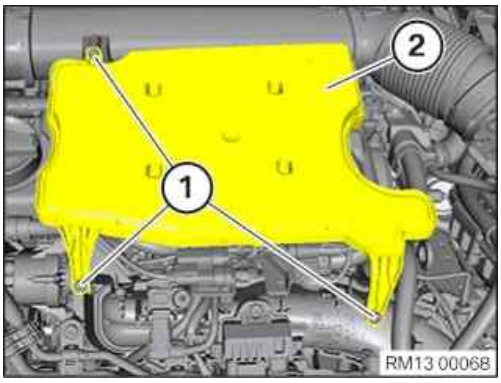

- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

137 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

138 – Install the rear cowl panel cover

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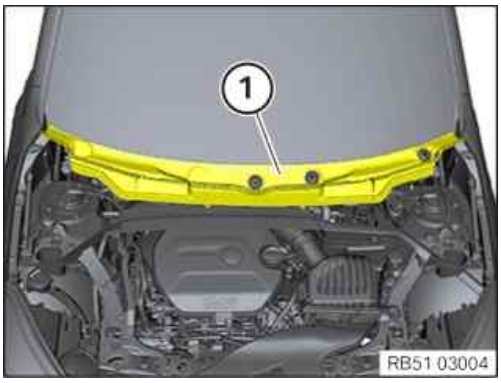
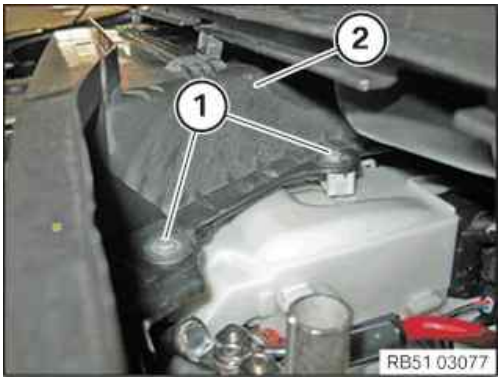


- Feed in and engage the rear cowl panel cover (1).

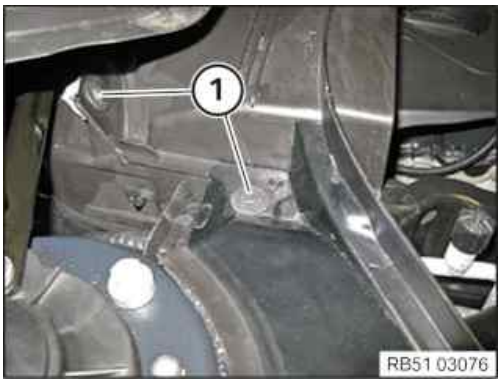
139 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

140 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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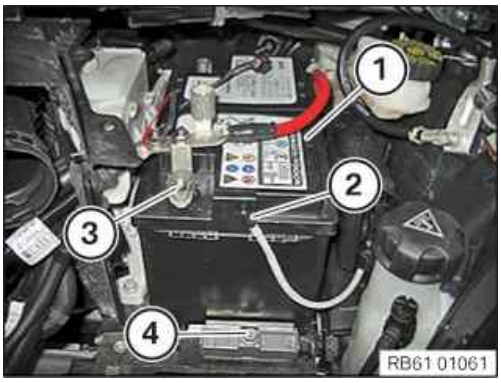


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

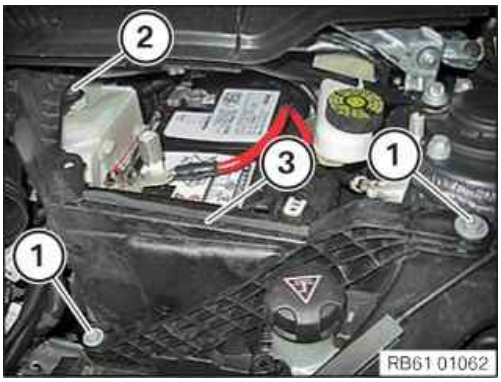
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

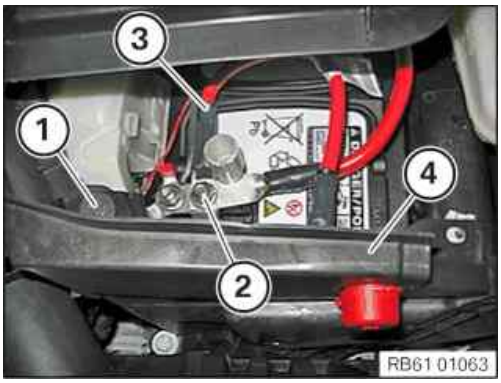
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

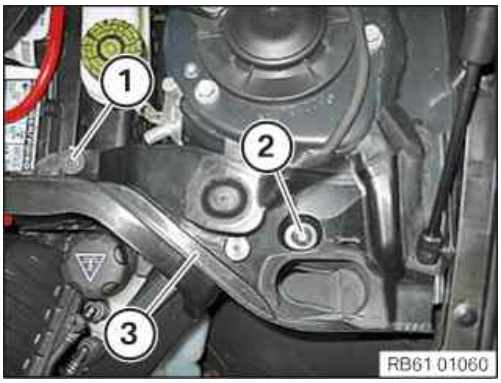
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

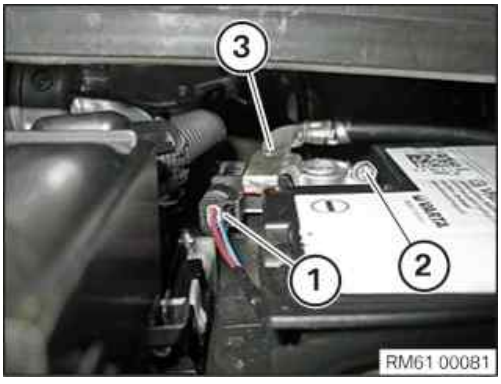
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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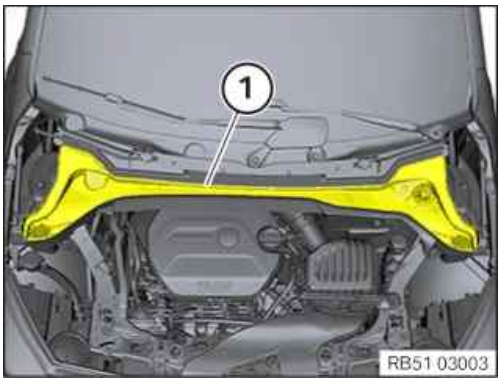
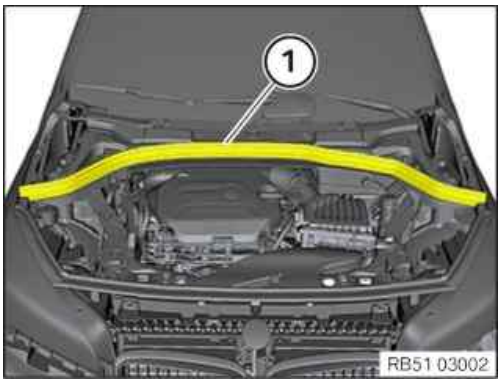


- Feed in the cowl panel cover (1).



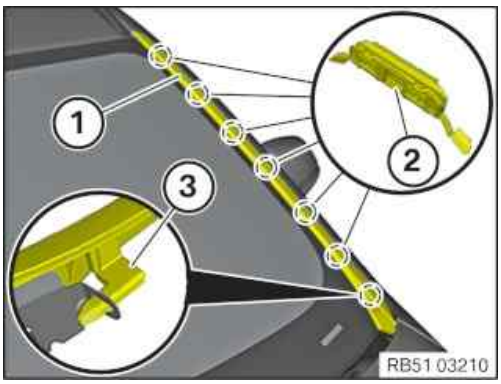
- Press the gasket (1) in a downwards direction.

141 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

142 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

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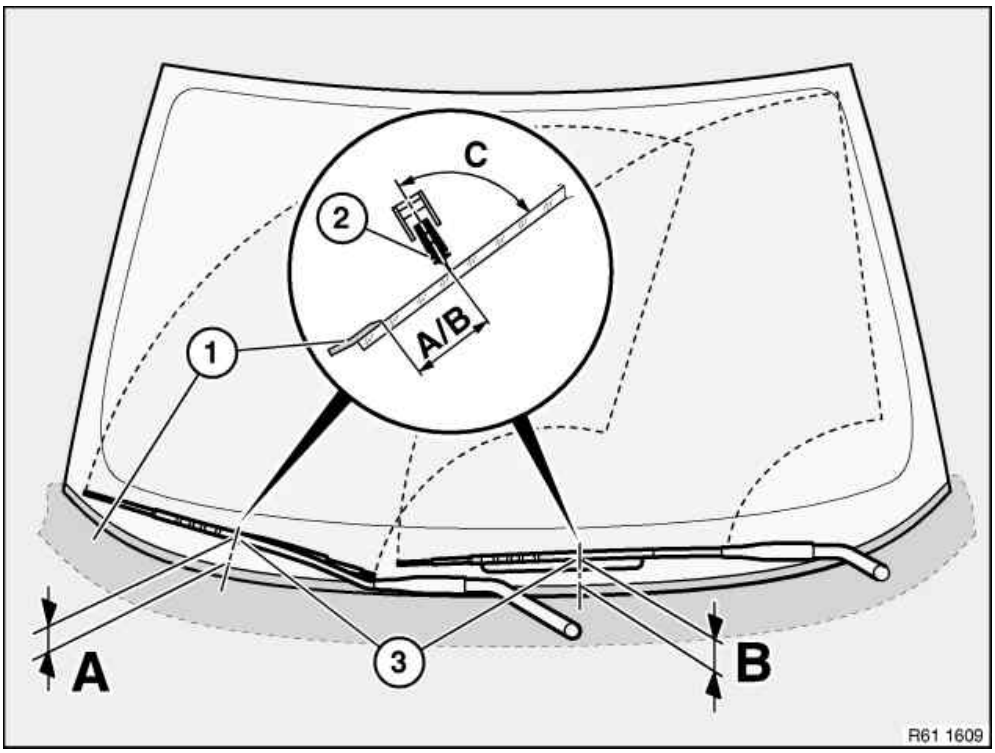
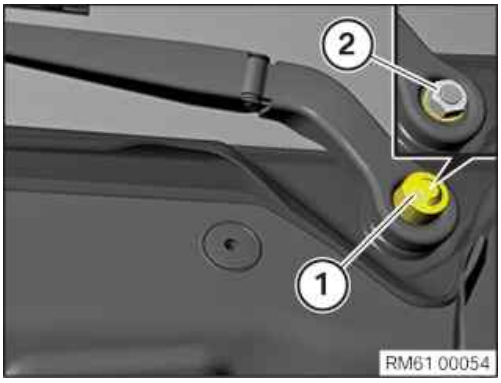
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

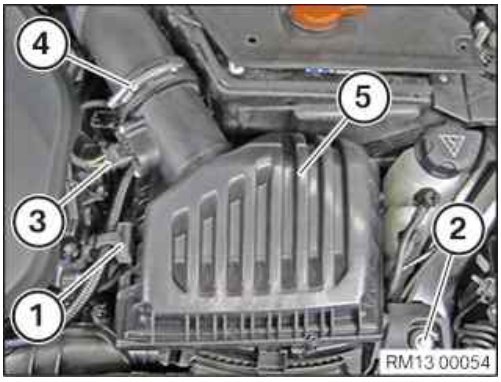
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

143 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

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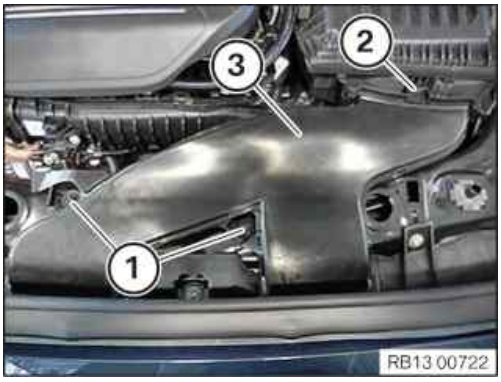
144 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

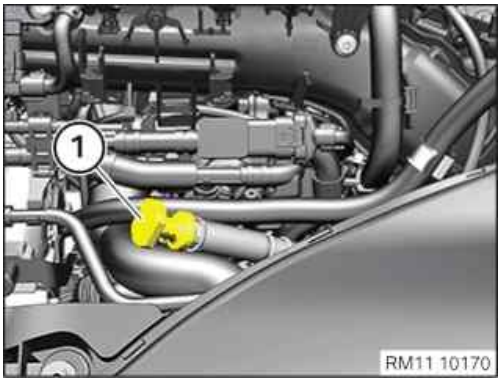
145 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

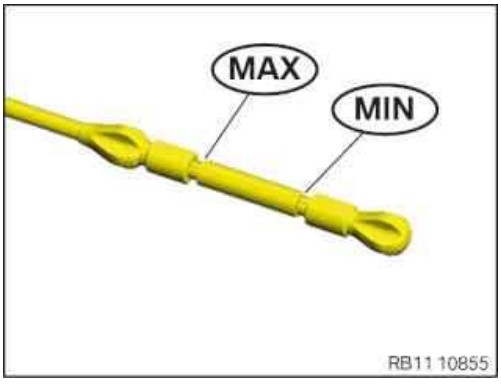


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

146 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Bracing strut to top cross connection — Used in step 32

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 32

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 32

M6x20		Tightening torque	12 Nm

Rear end of front axle support to body — Used in step 67 106

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 67 106

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 67 106 114

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 67

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase — Used in step 78

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 78

M8x40		Tightening torque	19 Nm

Engine support to cylinder head — Used in step 78

M10X45		Tightening torque	41 Nm

Right engine mount to cylinder head — Used in step 78

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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Glow elements to cylinder head

Used in step 78

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 79

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 81

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 81

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 81

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 82

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 83

M7x17.			17 Nm

Exhaust manifold to cylinder head

Used in step 88

M7	If necessary, renew loose stud bolts. Replace nuts.	Tightening torque Tightening torque	11 Nm 13 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 88

Hollow bolt		Renew sealing rings.	30 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 88 127

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust turbocharger to exhaust manifold

Used in step 90

V-band clamp		Tightening torque	19 Nm

Oil feed line to exhaust turbocharger

Used in step 90

Hollow bolt	Renew sealing rings.	Jointing torque Angle of rotation	10 Nm 45 °

Oil return line to turbocharger

Used in step 90

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 90

M8x16		Tightening torque	22 Nm

Charge air line to crankcase

Used in step 91

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 91

M6		Tightening torque	8 Nm

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Heat shield for exhaust turbocharger

Used in step 92 93 118

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head

Used in step 92

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 94

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 94

M8 hexagon nut		Tightening torque	19 Nm

SCR metering module V-clip to exhaust system

Used in step 94

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 94

Torx bolt BM6x16		Tightening torque	8 Nm

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Used in step 94

Flange nutM8		Tightening torque	19 Nm

Control sensor

Used in step 95

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 96 97

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 98

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 99

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 100

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 101

Sensor		Tightening torque	50 Nm

Starter motor to transmission

Used in step 102

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 102

M8		Tightening torque	13,5 Nm

Exhaust system to body

Used in step 103

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 103

Hexagon screw M8x30		Tightening torque	19 Nm

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V-clip to catalytic converter

Used in step 103

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 103

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 103

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 104

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

Front connection carrier to body

Used in step 105

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 105

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing

Used in step 106

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 106

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 107

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support

Used in step 107

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 107

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 107

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 108

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 110

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 112

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 112

Plastic nut		Tightening torque	3 Nm

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Underbody panelling, side

Used in step 113

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 113

Plastic nut		Tightening torque	2,6 Nm

Brake disc to front wheel hub

Used in step 115

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

Used in step 115

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 115

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 117

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 117

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 119

Oval-head screw		Tightening torque	5 Nm

Cylinder head cover to cylinder head

Used in step 120

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 121

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 121 133

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 122

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 122

Screw		Jointing torque Angle of rotation	8 Nm 120 °

Rail on cylinder head cover

Used in step 123

Torx screw M8x25		Tightening torque	19 Nm

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High pressure line between high pressure pump and rail

Used in step 123 124

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 125

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 127

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 127

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 127

M8x20		Tightening torque	19 Nm

Battery holder to engine support

Used in step 128

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 129

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 129 132

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 129 132

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 129 132

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 129 132

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 129 132

		Tightening torque	3 Nm

Battery cover

Used in step 129 132 140

Screw			2,8 Nm

Intake plenum to cylinder head

Used in step 130

M6		Tightening torque	11 Nm

Positive battery cable to alternator

Used in step 132

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 132

TS6x20		Tightening torque	5 Nm

Exhaust gas pressure sensor

Used in step 133

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

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Clean air pipe to exhaust turbocharger — Used in step 133

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 133

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 133 143

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 134

			3 Nm

Resonator to manifold and clean air pipe — Used in step 136

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 139

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 140

M8 screw		19 Nm

Positive battery terminal — Used in step 140

NutM6		5 Nm

Trailing link — Used in step 140

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 140

Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 140

NutM6		5 Nm

Windscreen wiper arm — Used in step 142

Combination hexagon nut		Tightening torque	35 Nm

Intake silencer housing to lock bridge — Used in step 143

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 144

M6		Tightening torque	8 Nm

Overview of Special Tools

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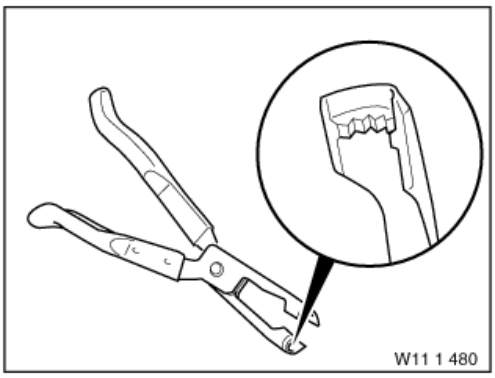
0 490 796 (11 1 480) Pliers



Common	Used in step 20 71
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common	Used in step 24 25 26 123 124 125
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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2 413 106 Fastener

Common Used in step 24 25 124 125

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller

Used in step 27

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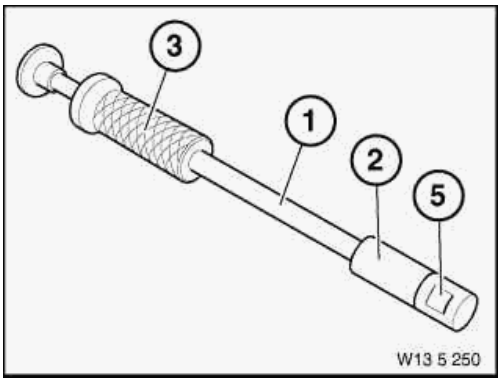

Common

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common

Used in step 27

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common

Used in step 27

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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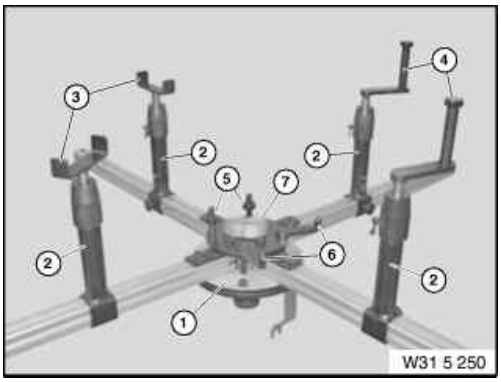
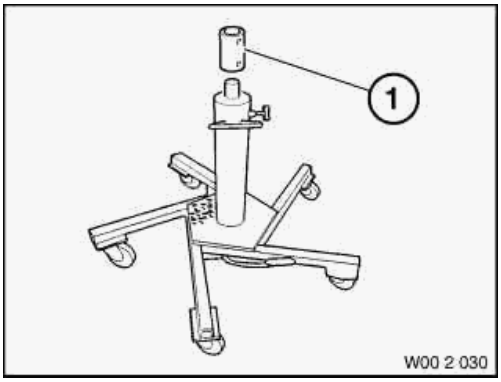
0 495 817 (31 5 251) Basic body



Common Used in step 43 67 78 106

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



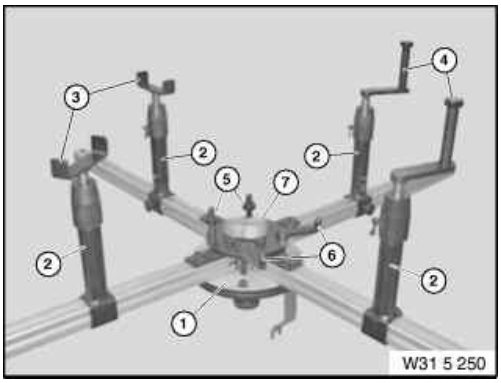
Common Used in step 43 67 78 106

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 821 (31 5 255) Adapter



Common Used in step 43 78

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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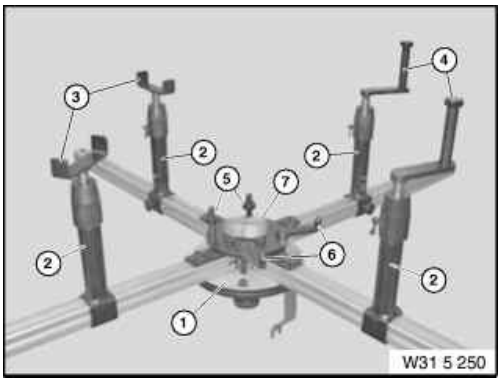
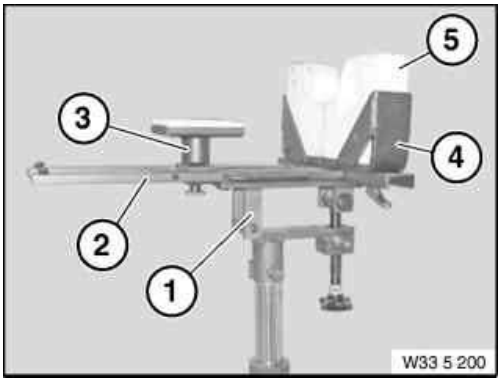
0 495 819 (31 5 253) Adapter



Common	Used in step 43 78
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt



Common	Used in step 43 67 78 106
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

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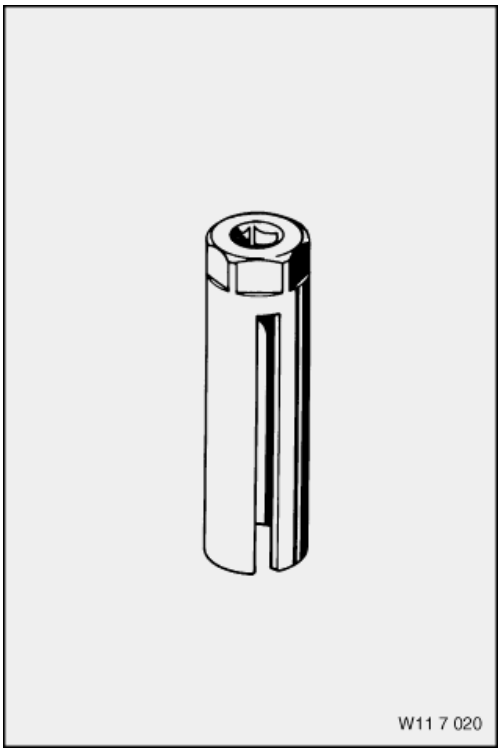
0 491 074 (11 7 020) Socket wrench insert



Common

Used in step 48 49 101

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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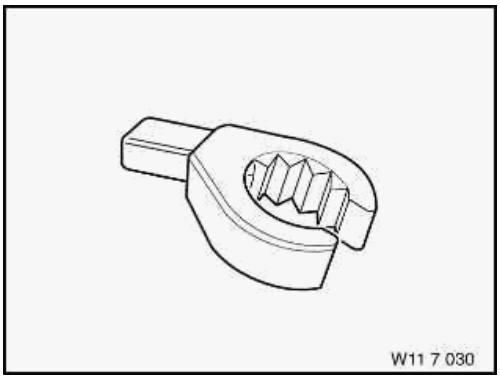
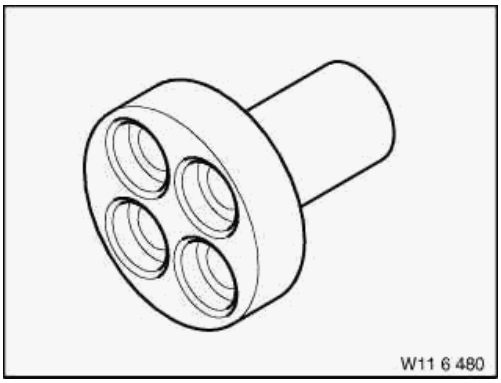
0 491 075 (11 7 030) Socket wrench insert



Common	Used in step 54 95
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

0 493 380 (11 6 480) Connector



Common	Used in step 62 86
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 62 85 86
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge

Common	Used in step 62 84 86
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 414 691 Support

Common	Used in step 67 78
Usage	To support the engine when the engine support is removed.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	2357071
SI-Number	01 12 16 (406)

2 357 071 Panel

Common	Used in step 67 78
Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

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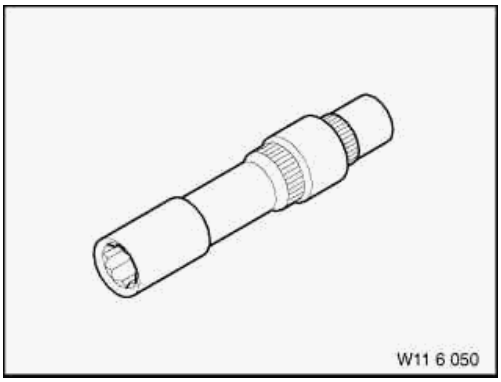
0 491 068 (11 6 050) Socket wrench insert



Common	Used in step 67 78
Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 459 012 Holder

Common	Used in step 67 78
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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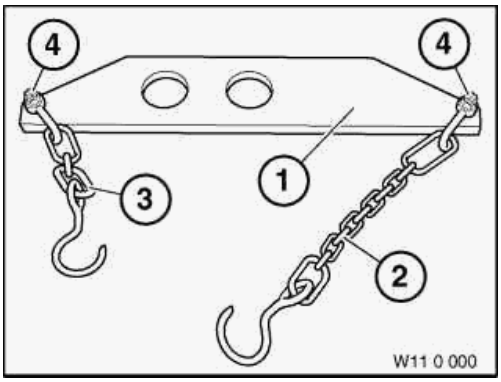
0 490 561 (11 0 000) Lifting gear



Common

Used in step 67 78

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 67 70 72 73

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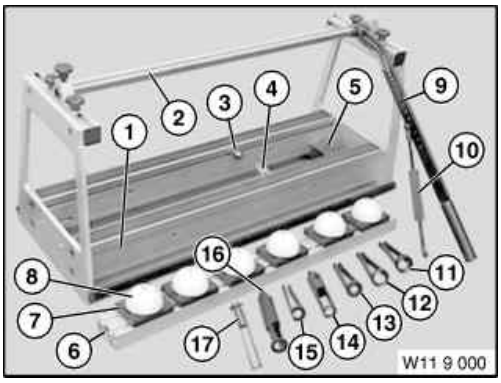

Common

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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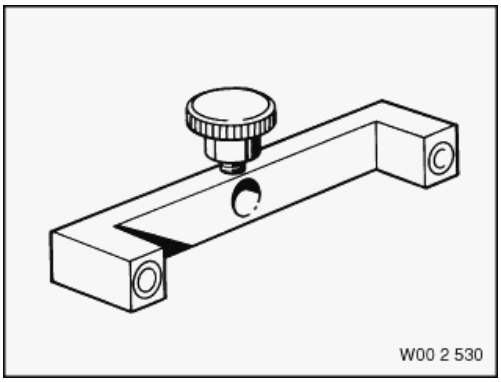
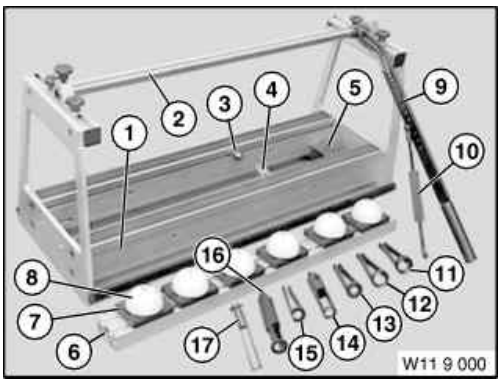
0 490 185 (00 2 530) Bridge



Common	Used in step 68
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

0 494 366 (11 9 001) Device



Common	Used in step 70 75
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 187 (00 2 300) Assembly stand

Used in step 70 75

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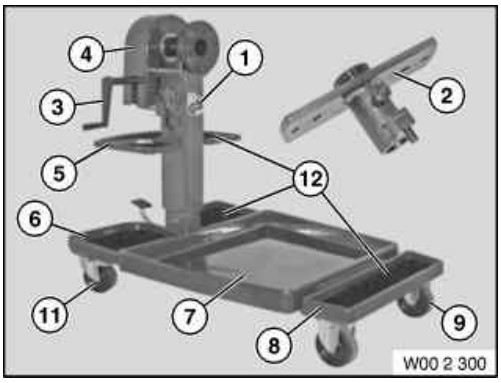

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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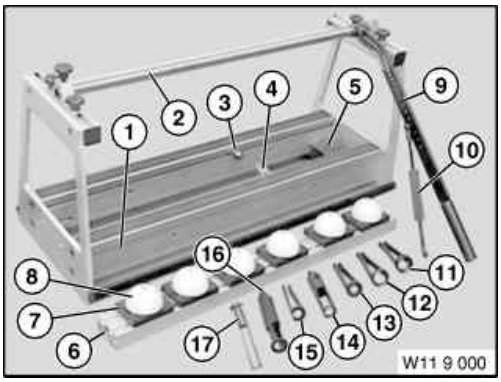
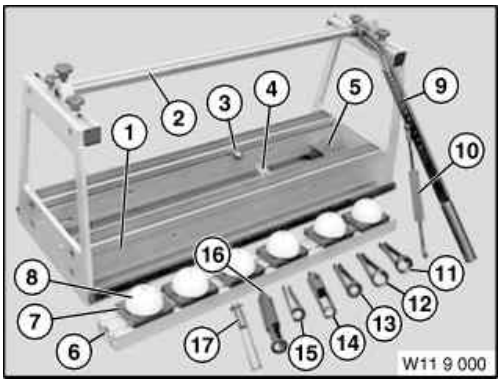
0 494 371 (11 9 006) Insert



Common	Used in step 70 72 73
Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 372 (11 9 007) Shaped part

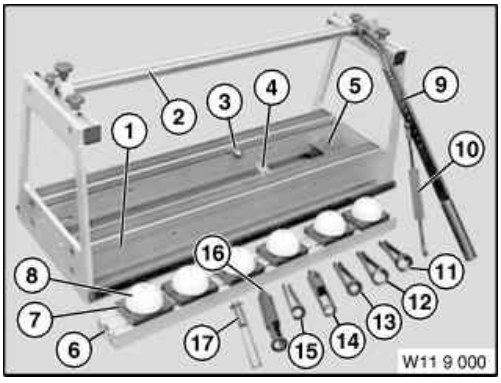


Common	Used in step 70 73
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part

Common	Used in step 70 72 73
Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 370 (11 9 005) Quick fastener



Common	Used in step 70 72 73 75
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 494 374 (11 9 009) Lever

Common	Used in step 70 75
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 143 (11 8 840) Basket

Common	Used in step 70 75
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 70 72

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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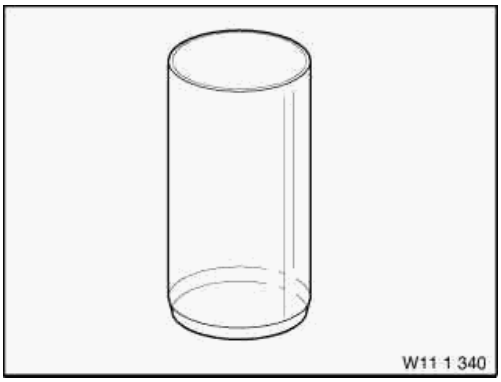
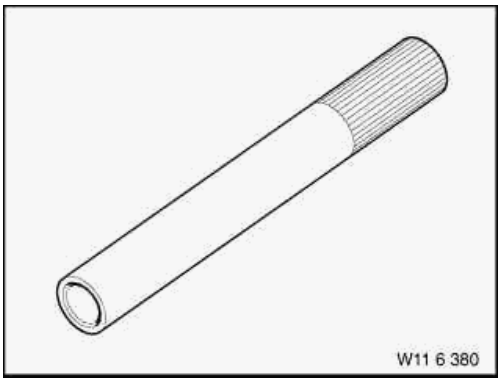
0 490 746 (11 1 380) Holding sleeve



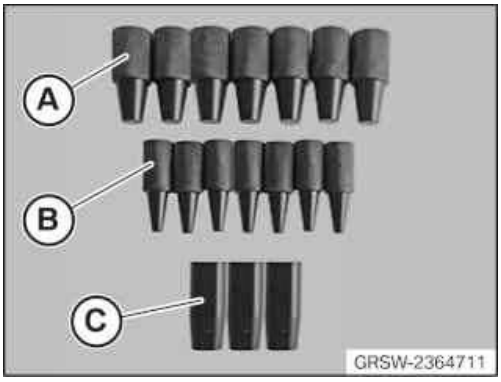
Common	Used in step 74
Usage	(Assembly sleeve) For fitting the valve stem seal, diameter 7 mm
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	

0 493 249 (11 6 380) Bush



Common	Used in step 74
Usage	For fitting valve stem seal
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 364 711 Plug



Common	Used in step 76
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

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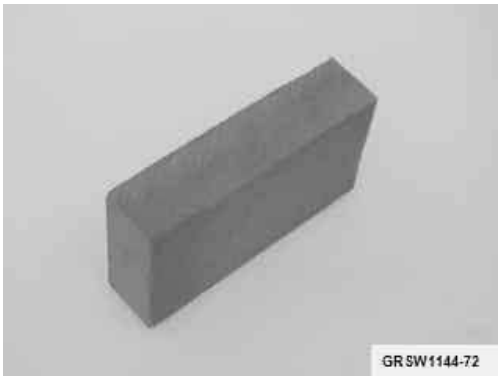
0 495 103 (11 4 471) Scraper

Common	Used in step 76
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 76
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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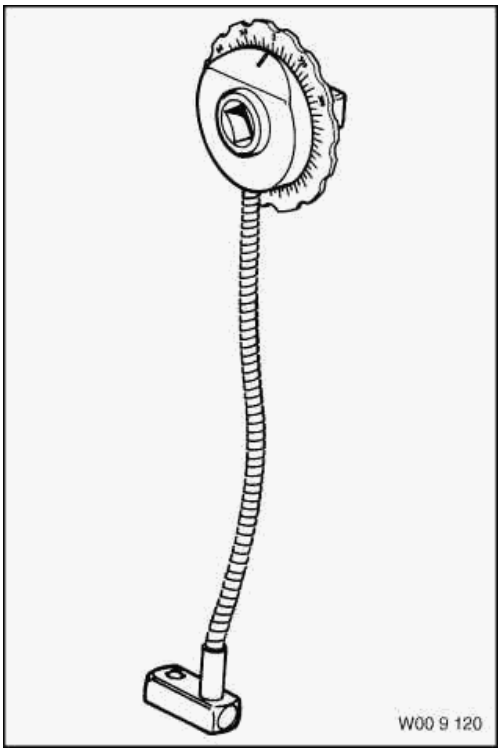
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 78

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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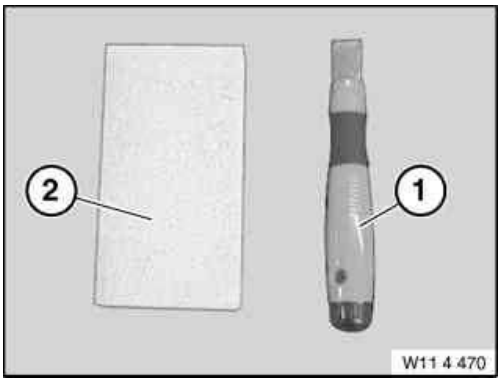
0 495 102 (11 4 470) Tool



Common Used in step 88

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

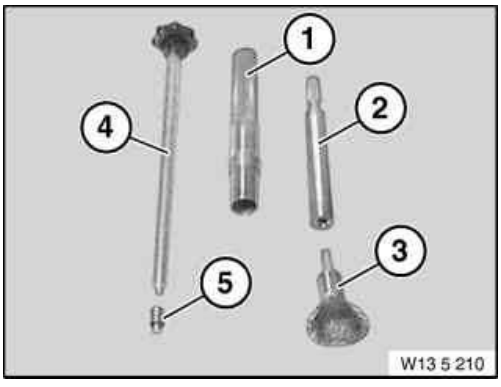
Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 344 011 Tool

Common Used in step 115

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common Used in step 122

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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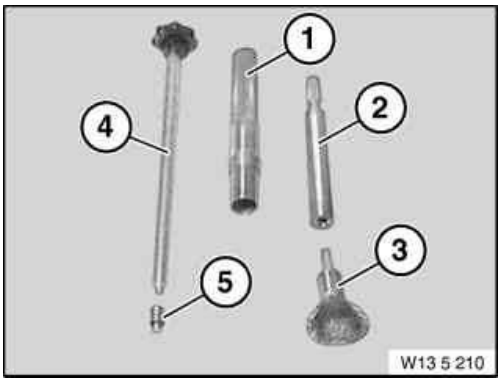
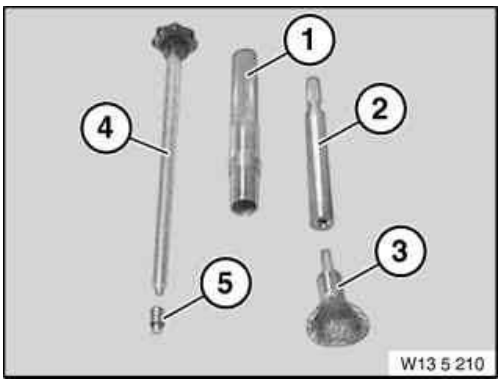
0 493 762 (13 5 214) Rod



Common	Used in step 122
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



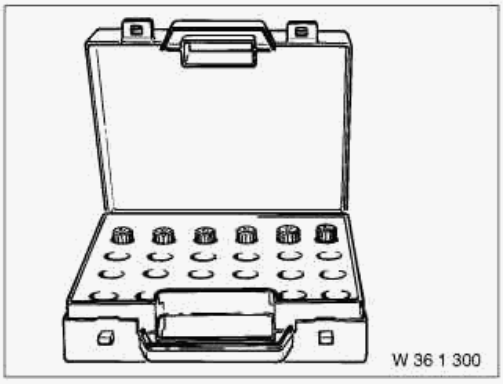
Common	Used in step 122
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 34
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud

Common	Used in step 34
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 34
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 34
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 34
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud

Common	Used in step 34
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 34
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 34
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

2 299 563 Adapter

Common	Used in step 70 75
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

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Overview Technical Data

Valve underprotrusion	Used in step 68
	0,8 (0,7 - 0,9) mm

Cylinder head flatness	Used in step 69
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 127
EGR controller	19 127
Troubleshooting on the exhaust turbocharger	90

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 140
61 12 ... Notes on intelligent battery sensor (IBS)	1 140
61 00 ... Notes for disconnecting and connecting battery	1 140

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	16 27 28 48 49 51 52 53 54
11 65 020 Turbocharger damage due to blocked oil supply lines	90
11 65 ... Test steps in the event of turbocharger damage	90
17 00 008 Draining and topping up coolant for high-temperature circuit	146
17 00 008 Draining and topping up coolant for high-temperature circuit	146
17 00 008 Draining and topping up coolant for high-temperature circuit	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146

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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	146
17 00 039 Bleeding cooling system (B37, B47)	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	146
17 00 008 Draining and topping up the high-temperature coolant circuit	146
17 00 008 Draining and topping up the high-temperature coolant circuit	146
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	146
17 00 008 Draining and topping up the high-temperature coolant circuit	146
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	146
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	146
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	146
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	146
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	146

Operating materials	Used in step
2.0 Grease for wheel centring	115

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	82
Exhaust-gas recirculation cooler seal on exhaust manifold	127
Exhaust-gas recirculation cooler seal on intake plenum	127

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11 34 055 Replace all valve springs

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Maintain conditions of absolute cleanliness.

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1 – Remove vehicle battery

WARNING

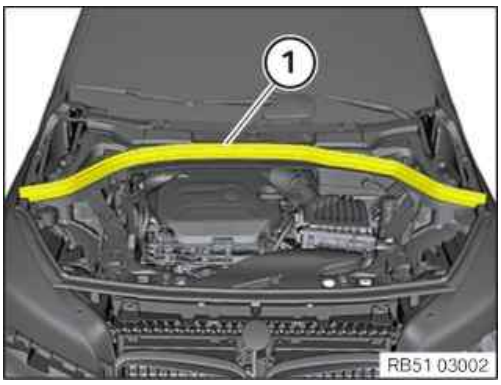
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

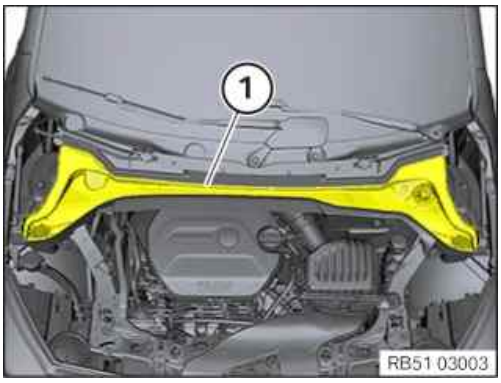
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

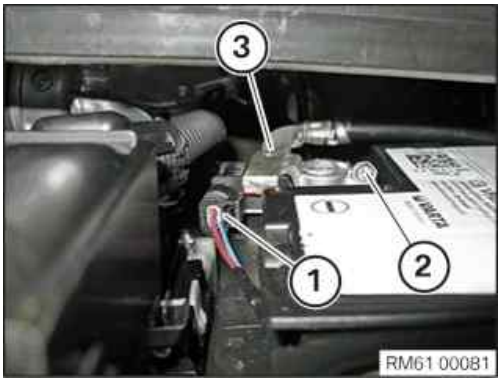
For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).

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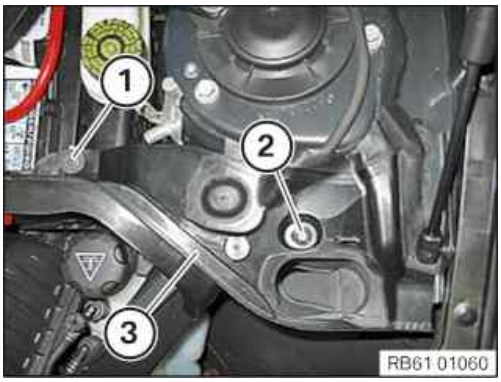
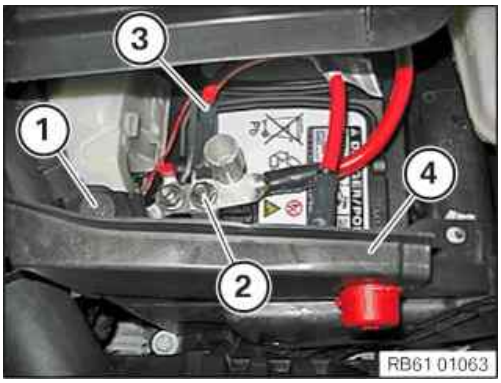
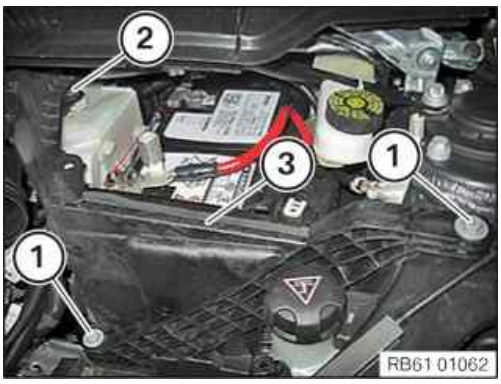


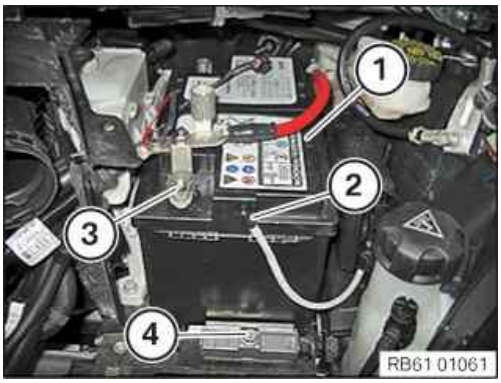
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Removing the upper bulkhead cover

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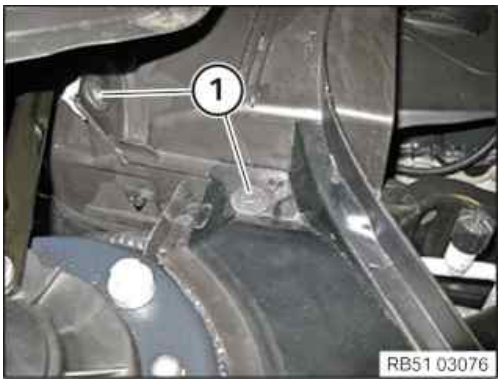
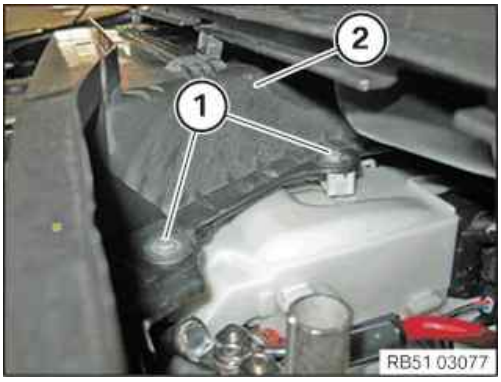
- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

3 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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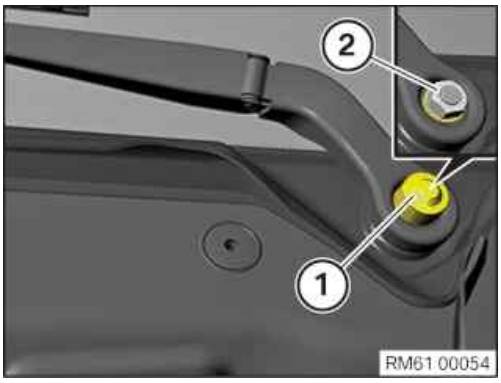
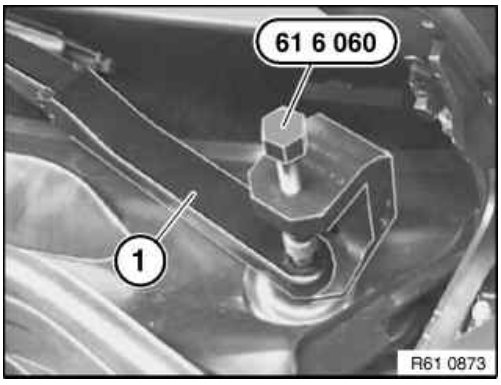


- Remove the protective cap (1).
- Loosen nut (2).



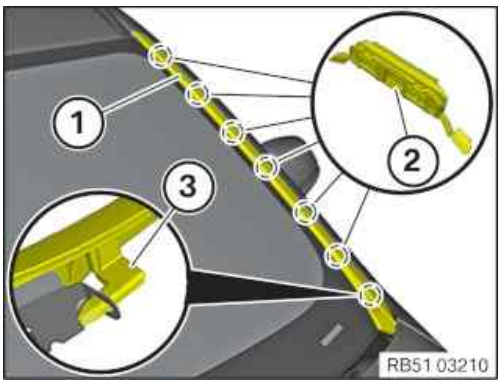
- Pull off the wiper arm (1) using special tool .

4 – Remove the gutter strip on the windscreen on the left and right

NOTICE

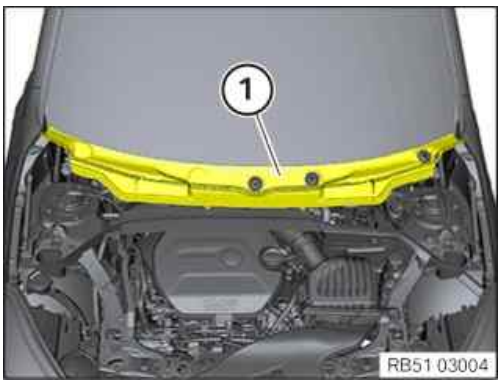
Description is for left component only. Procedure on the right side is identical.

▶ Remove the gutter strip on the windscreen



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

5 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

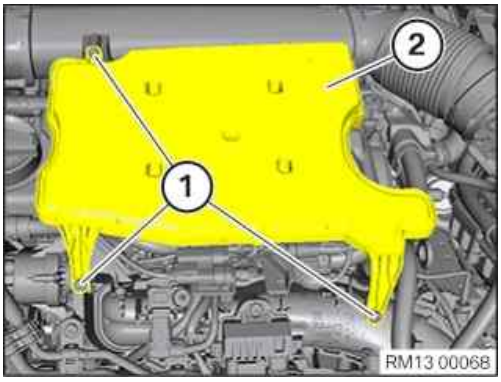
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

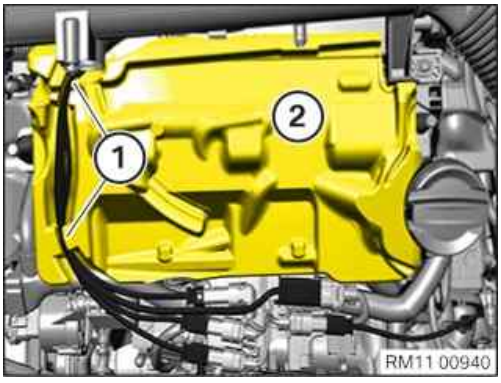
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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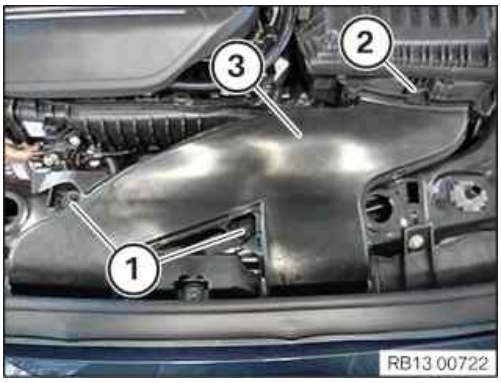
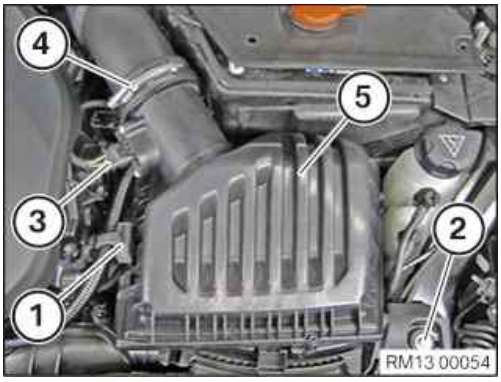


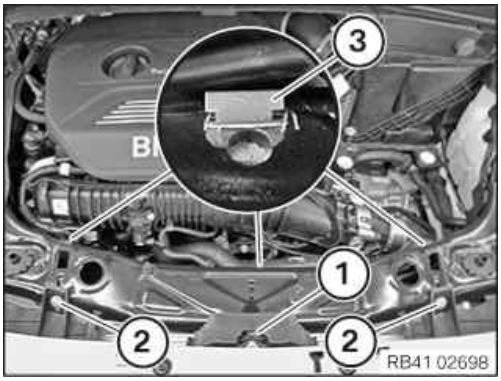
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

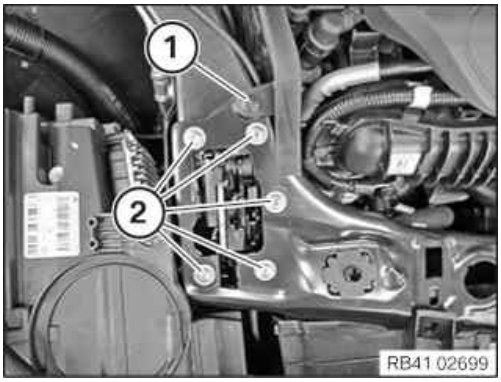


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

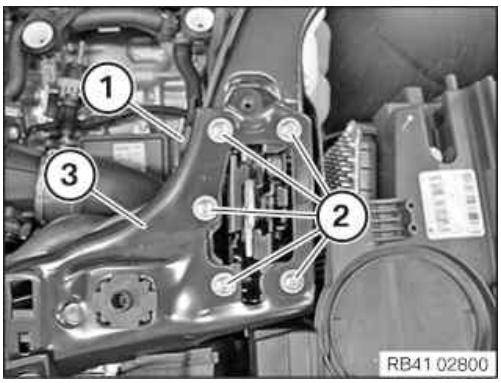
11 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

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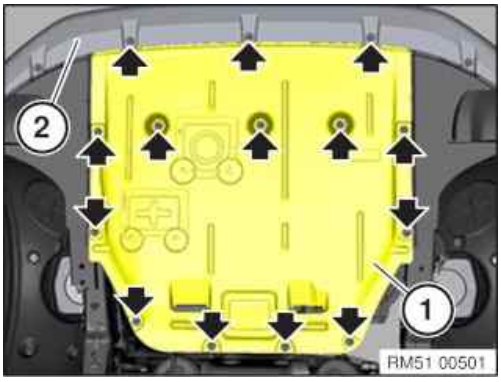
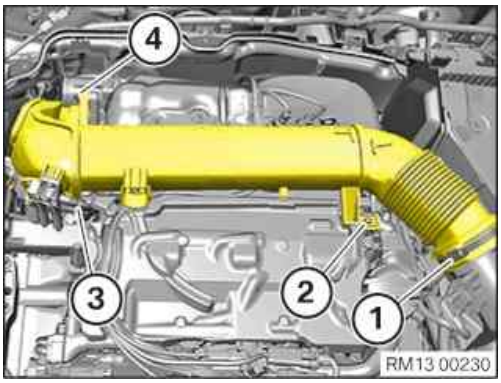
12 – Removing the front underbody protection

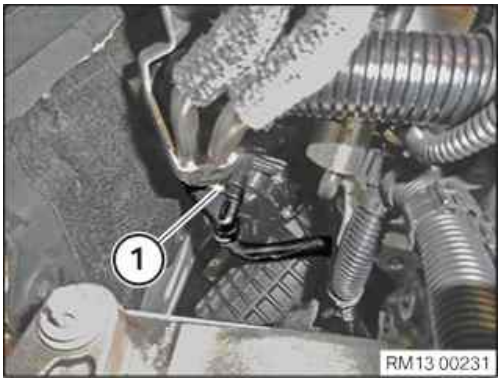


- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

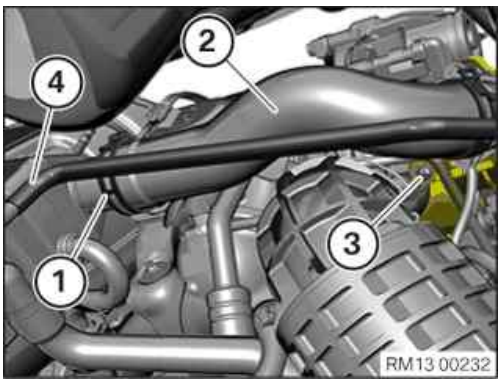
13 – Removing clean air pipe



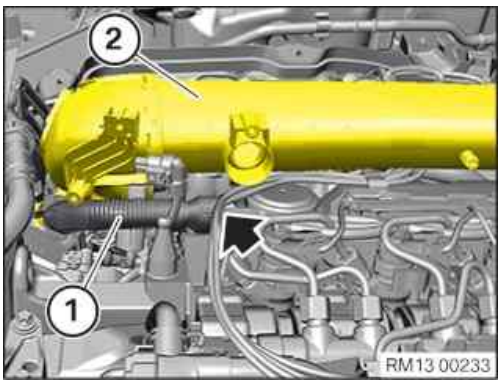
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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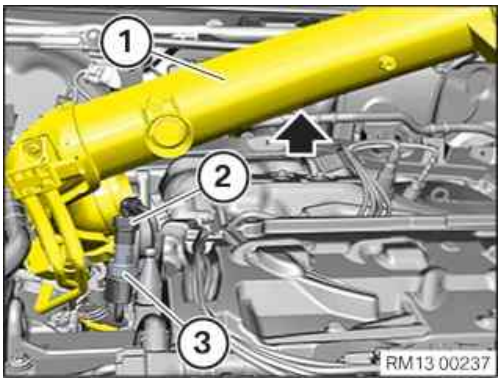

- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

14 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

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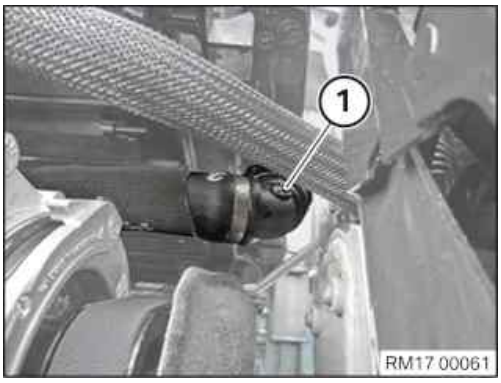
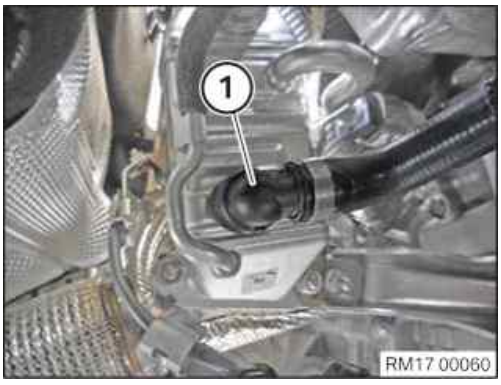


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

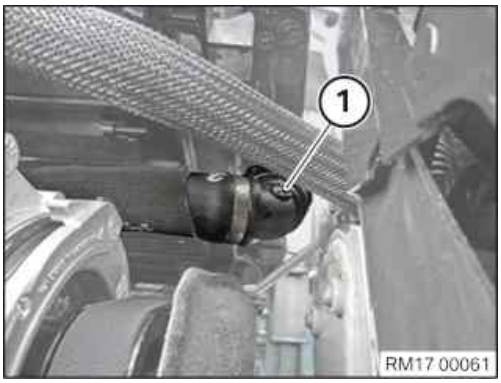


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

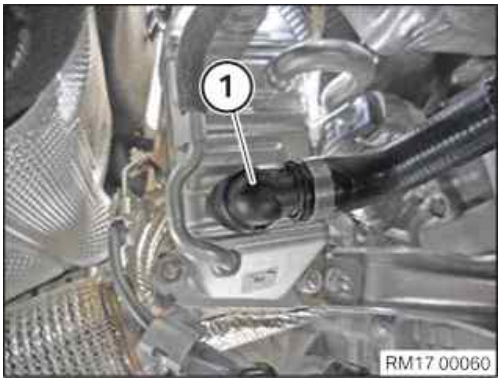
15 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

16 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

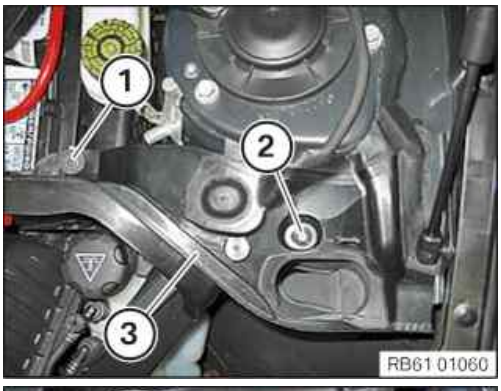
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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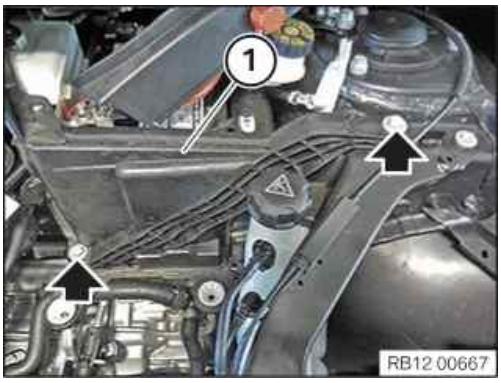
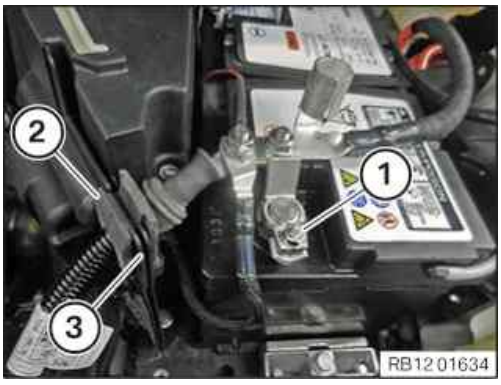
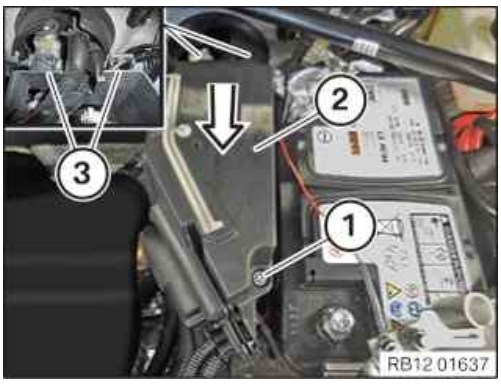


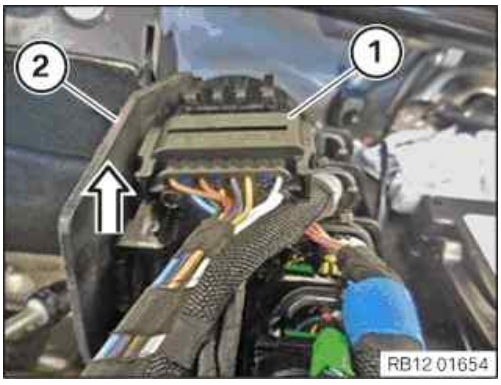
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



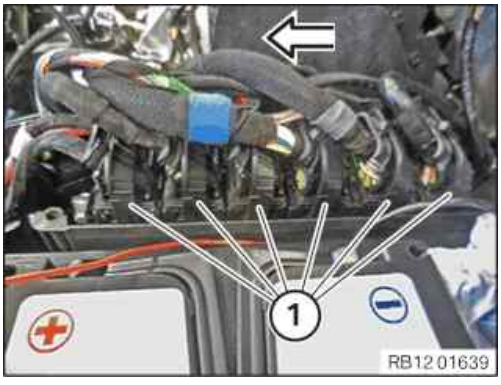
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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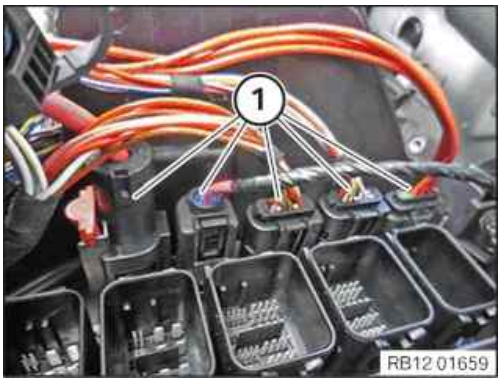
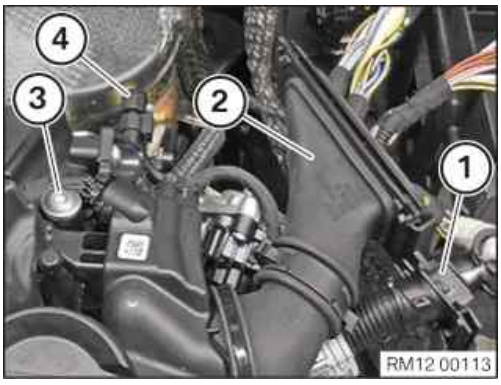
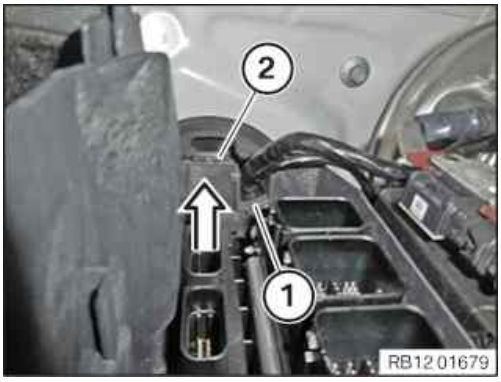


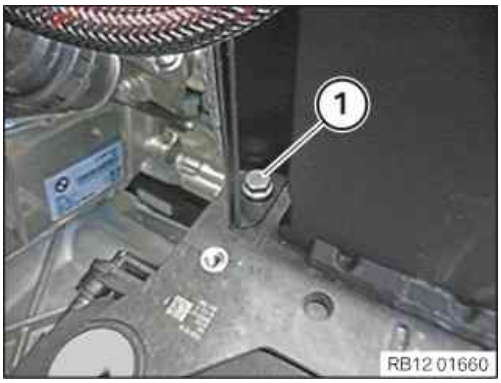
- Unlock and loosen connector (1).



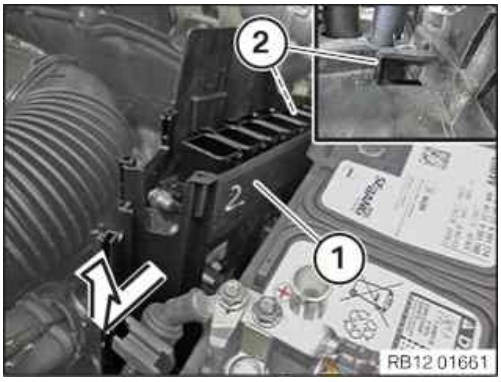
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

17 – Remove battery holder

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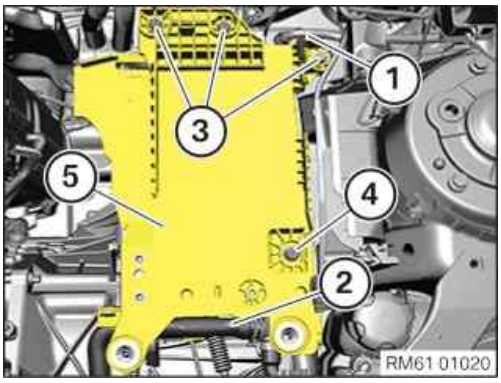
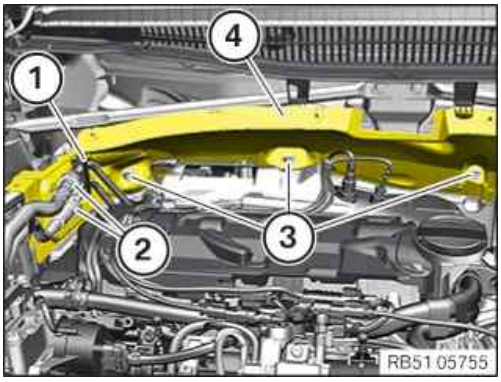


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

18 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

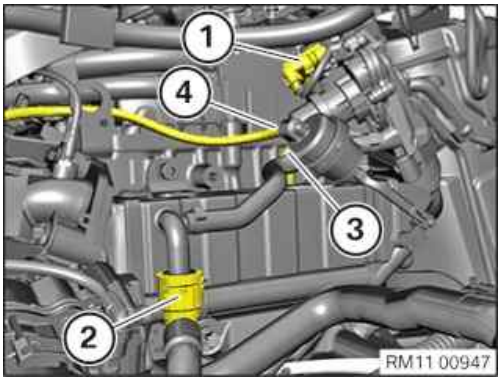
19 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

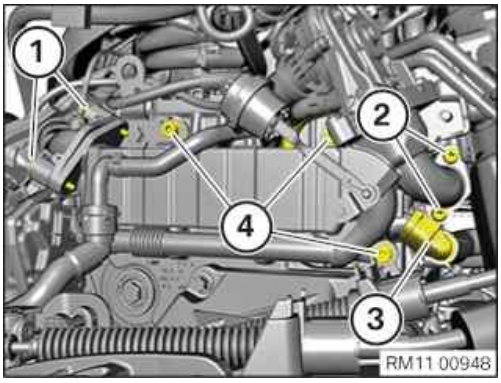
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

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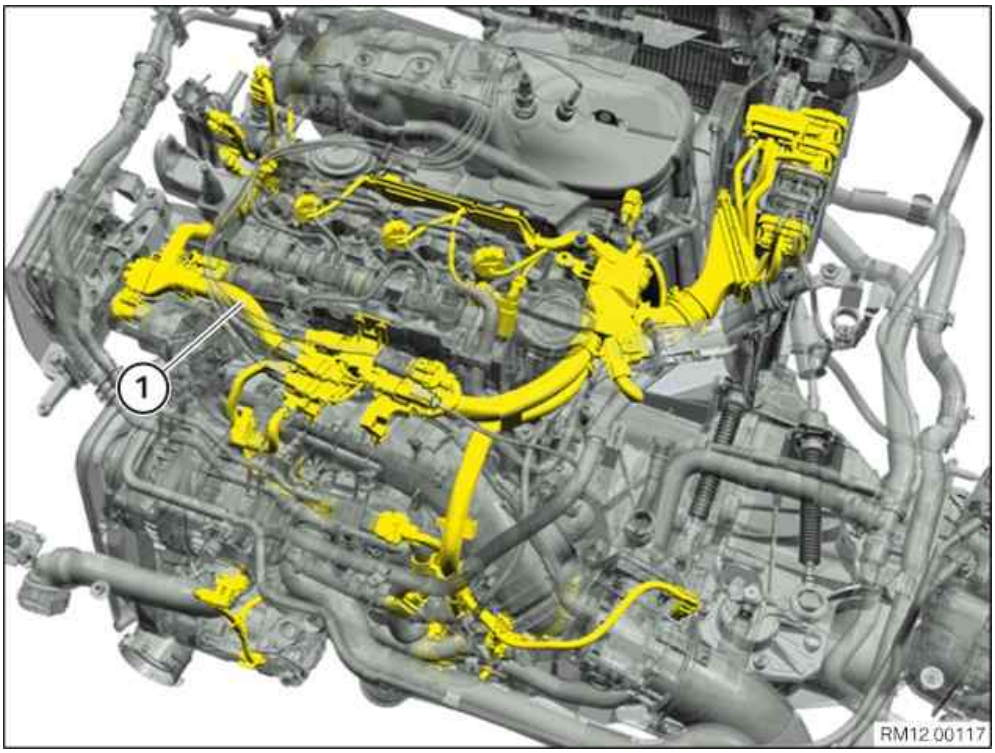
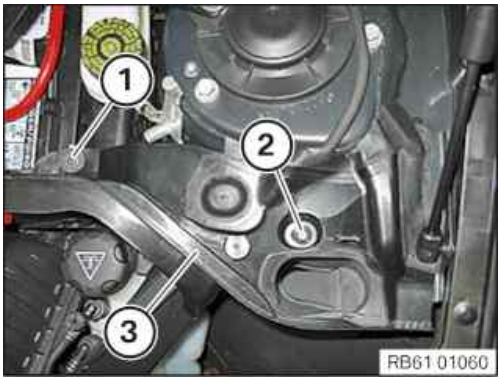
20 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine

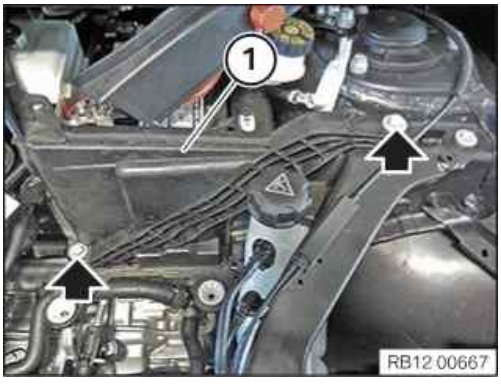


1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.

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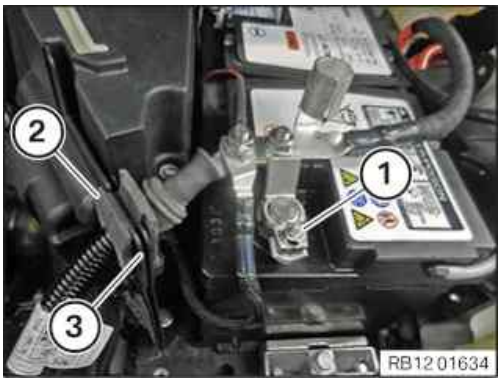
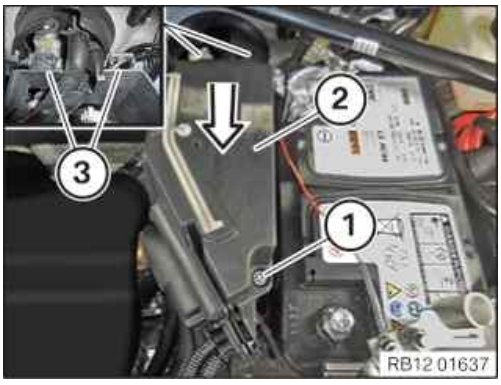
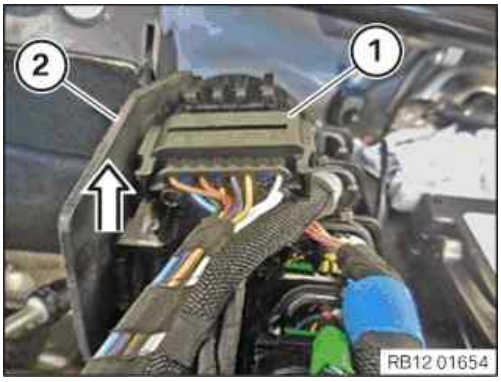


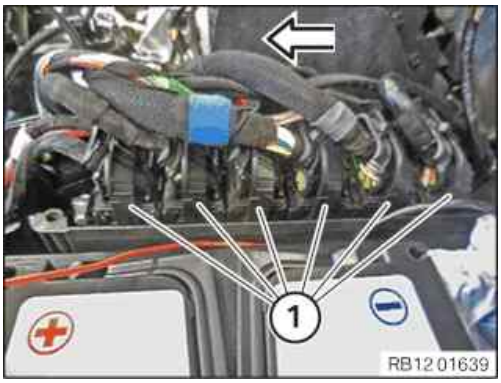
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).

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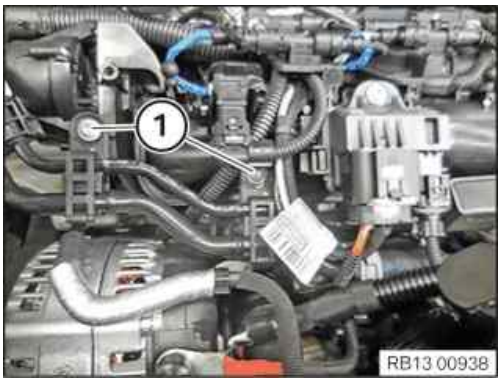
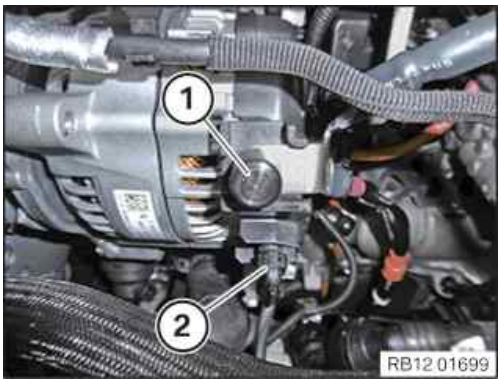
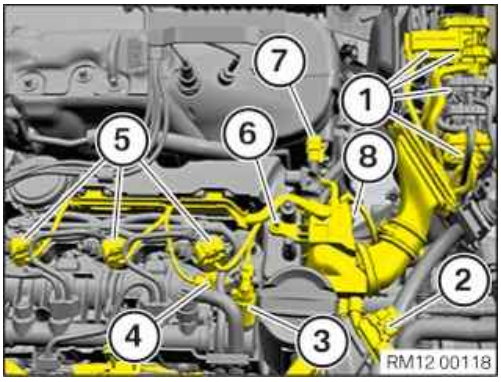


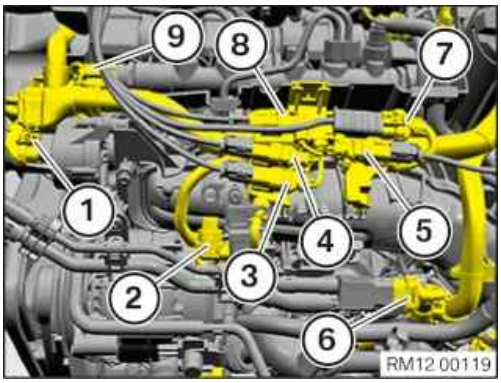
- Loosen screws (1).



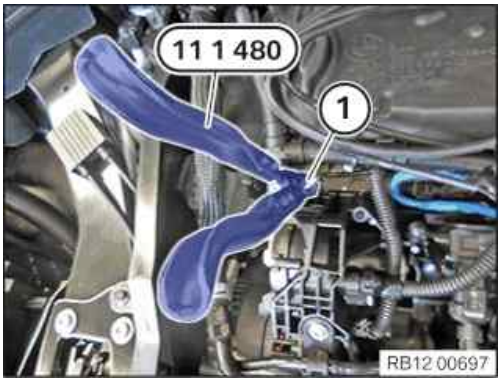
- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.



- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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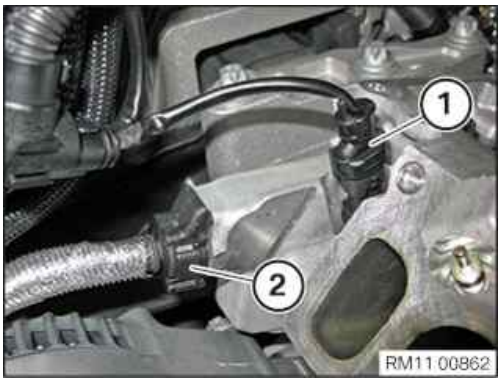
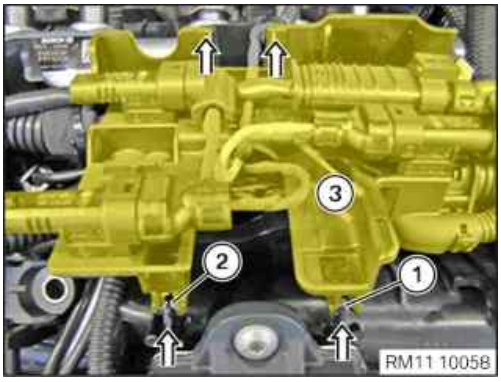


- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

21 – Removing the cable clips from the intake plenum



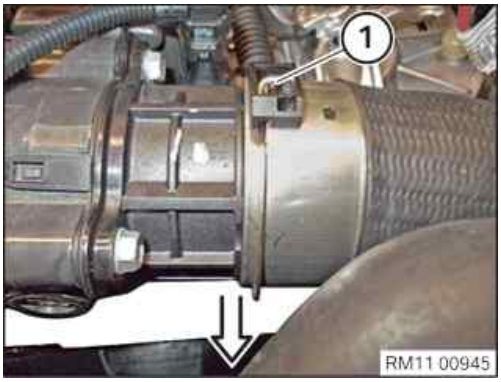
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

22 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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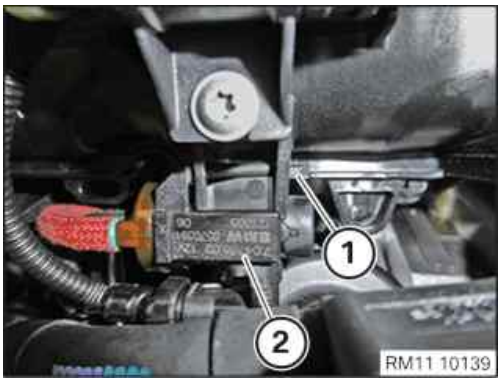
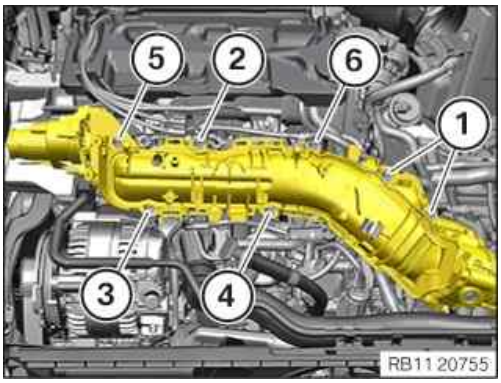
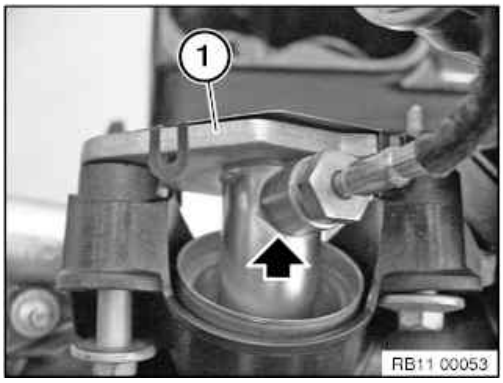


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

23 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

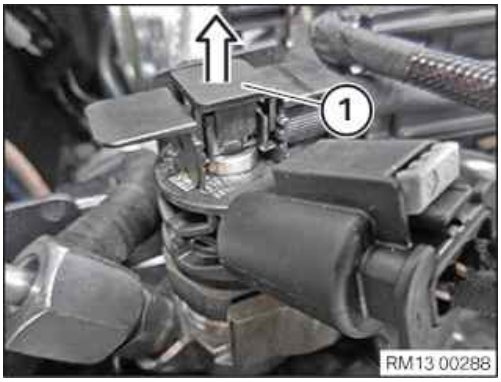
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

24 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

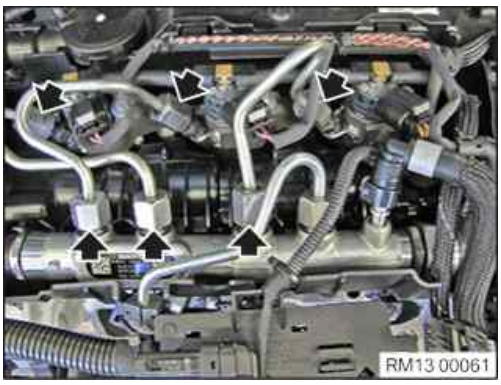
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

25 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

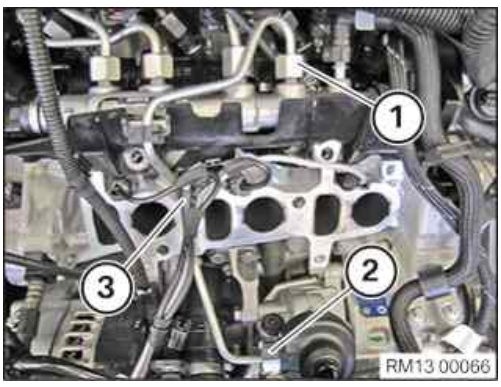
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

26 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

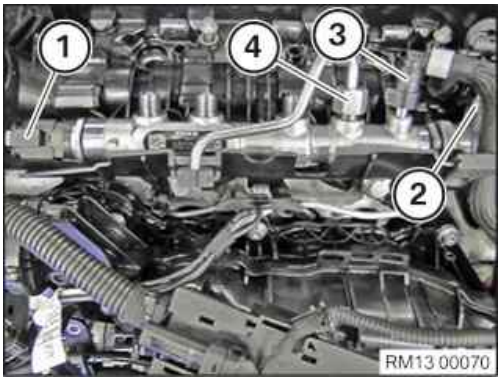
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

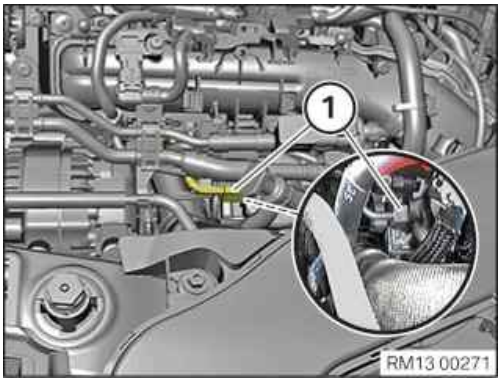
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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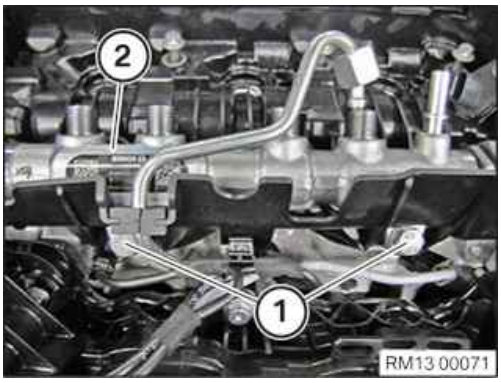

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

27 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

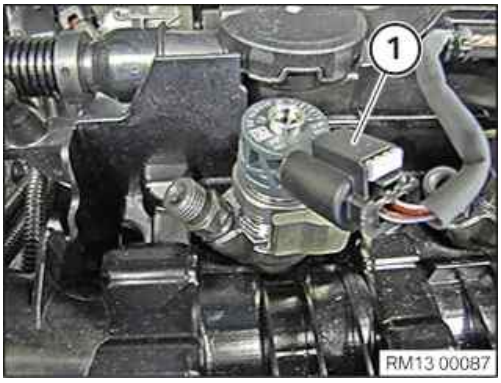
Electrostatic discharge.

Damage to or destruction of electrical components.

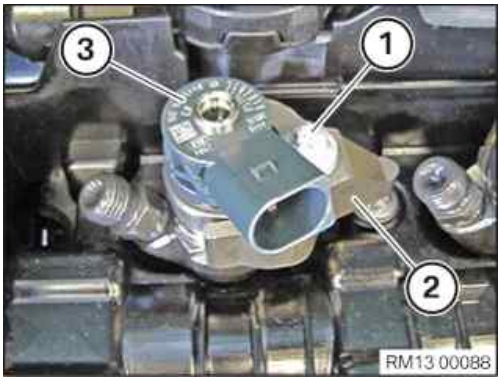
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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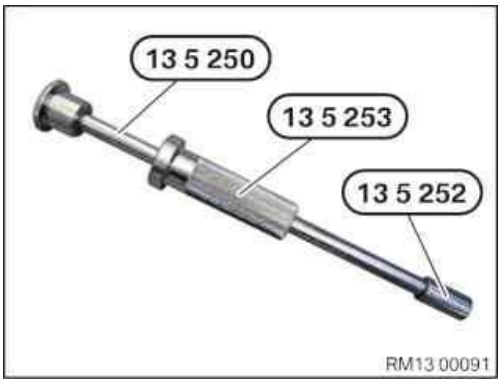
RISK OF DAMAGE

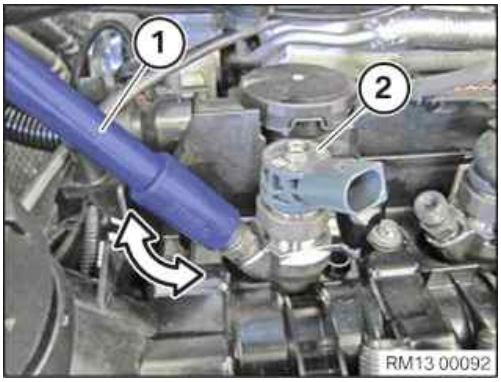
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

28 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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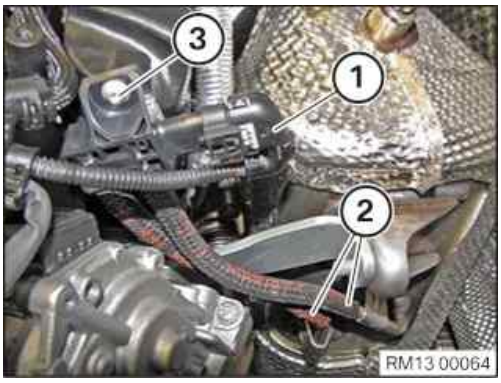
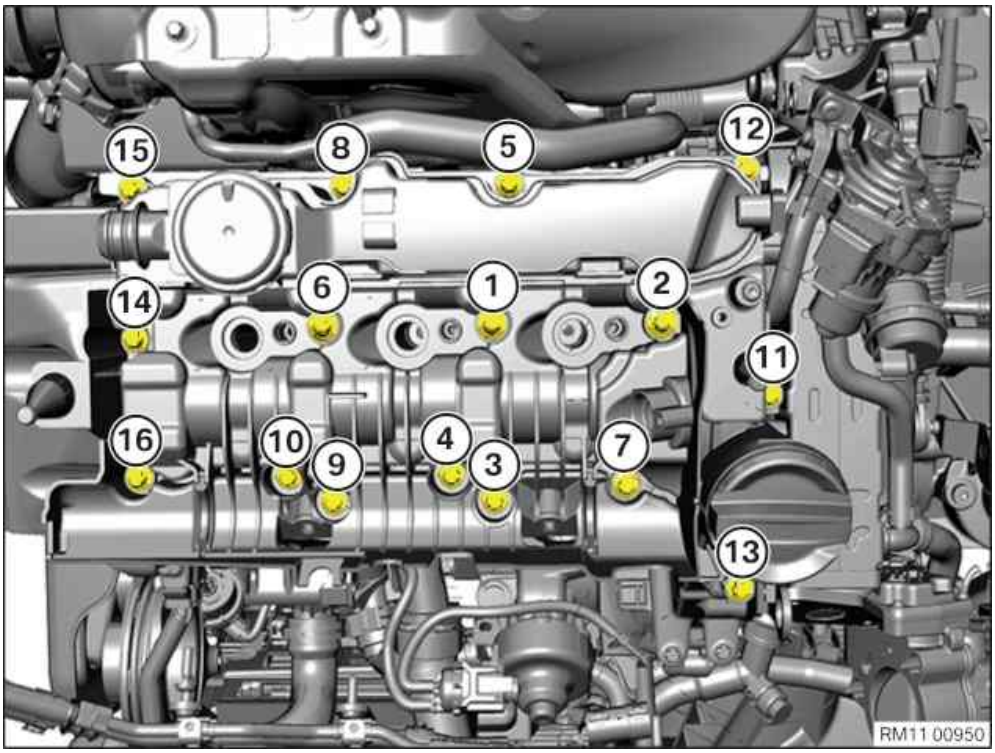


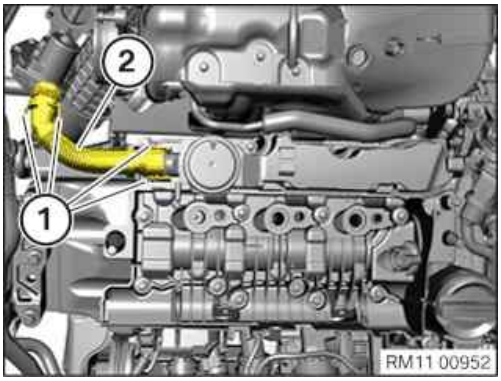
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

29 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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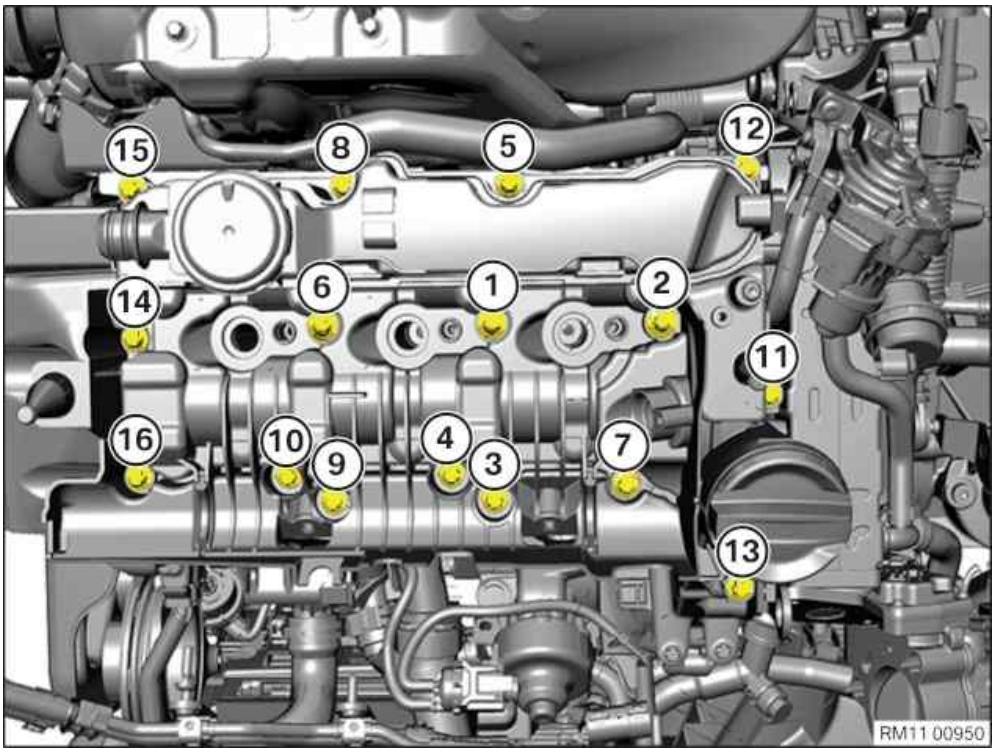


- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

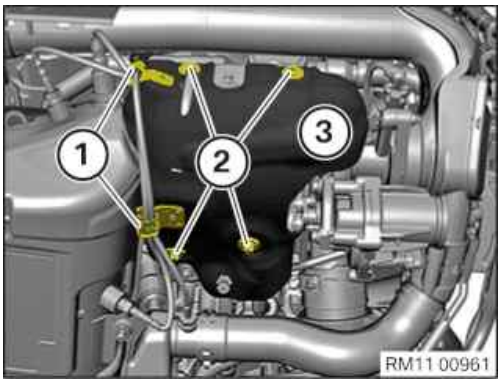
30 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

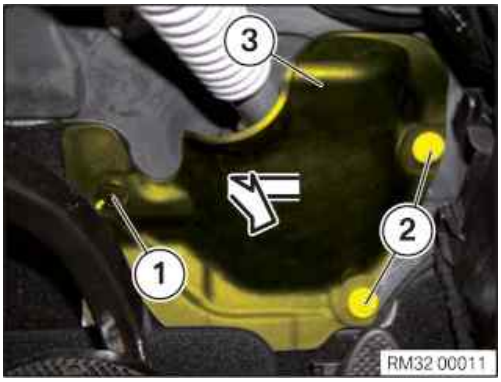
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).

31 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!

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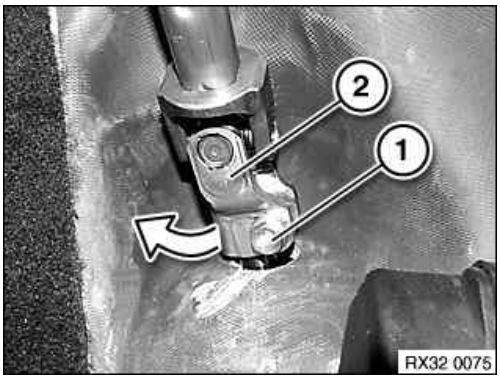
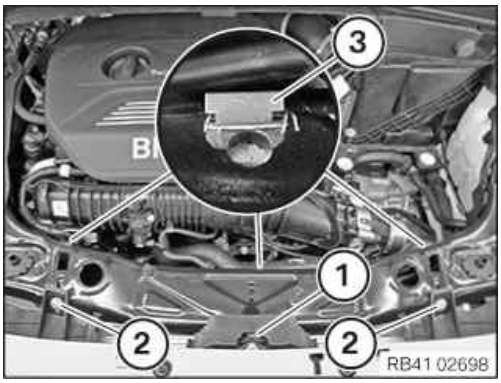


- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

32 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

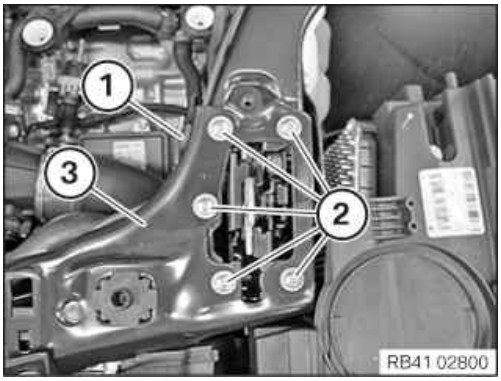
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

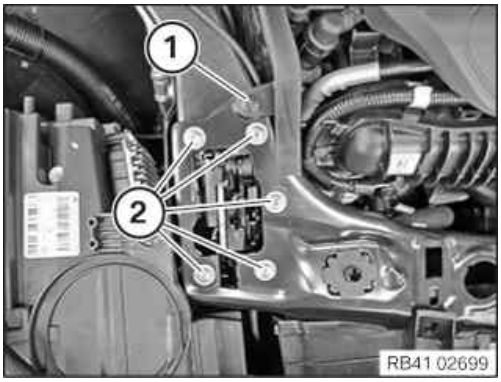


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

33 – Securing radiator on left and right

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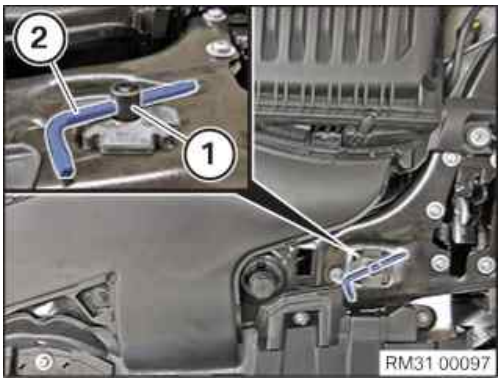


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

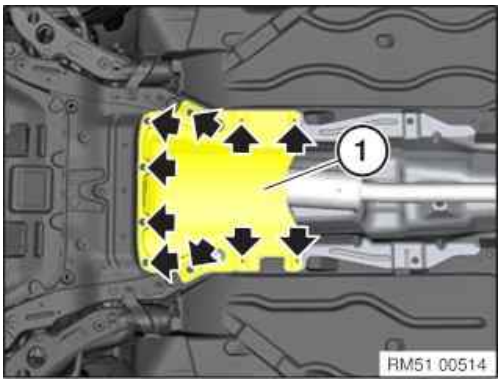
34 – Remove the front left and right wheel

▶ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

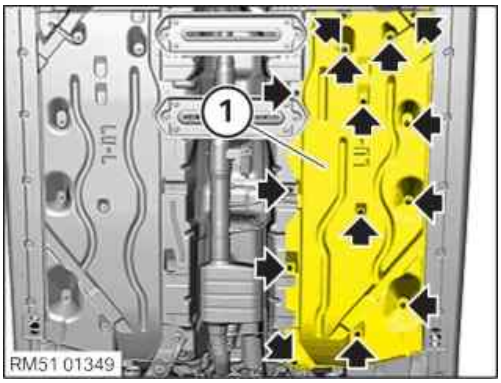
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

35 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

36 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

37 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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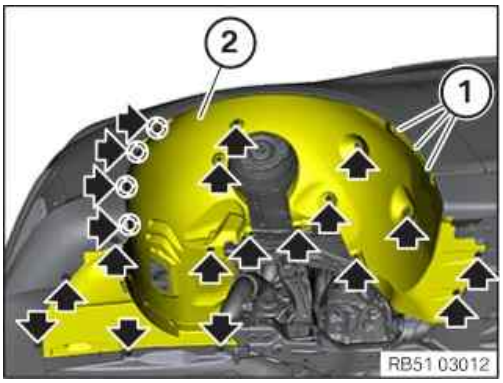
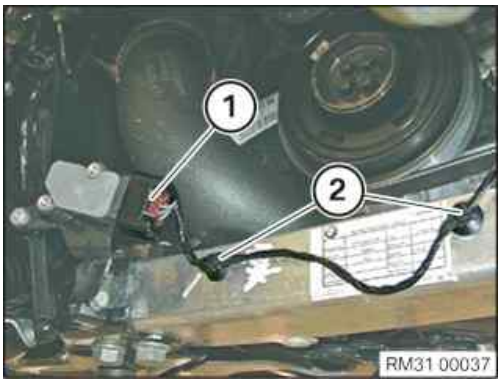
▶ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

38 – With right installation: Detaching ride height sensor cable



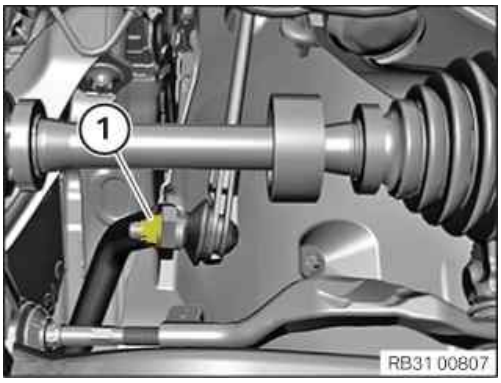
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

39 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

40 – Detaching rubber mount from front axle support

- Spray rubber mount (1) with lubricant and release from holder on front axle support.

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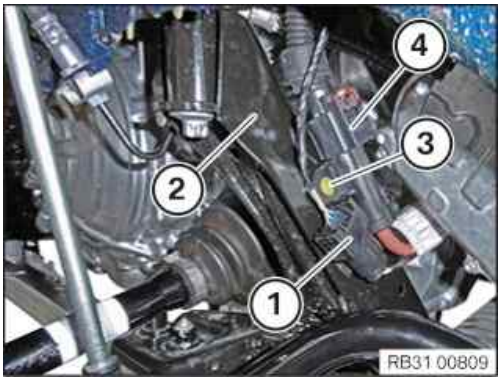
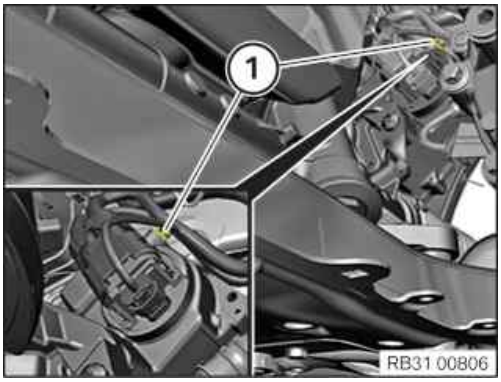
41 – Disconnecting plug connections from steering gear

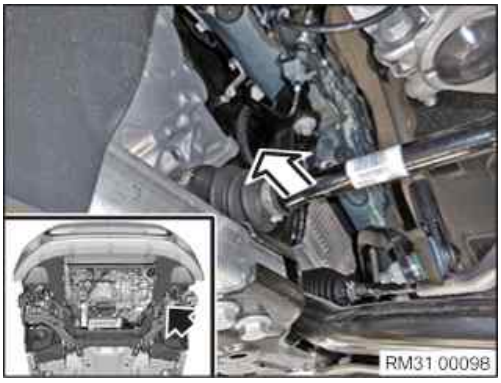
▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

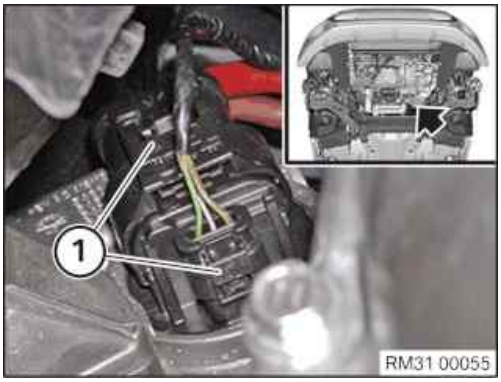


- Disconnect wiring harness (1) from steering gear.



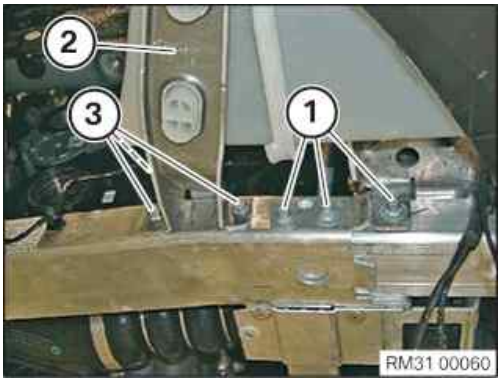
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

42 – Releasing the mounted part from the front axle support



- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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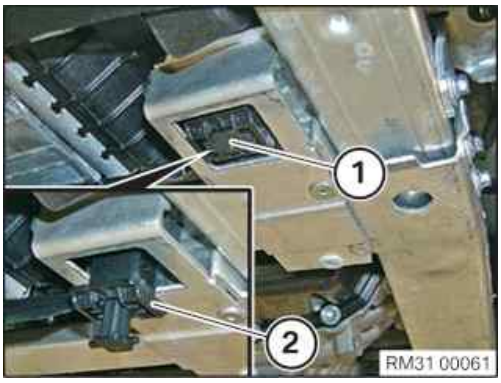
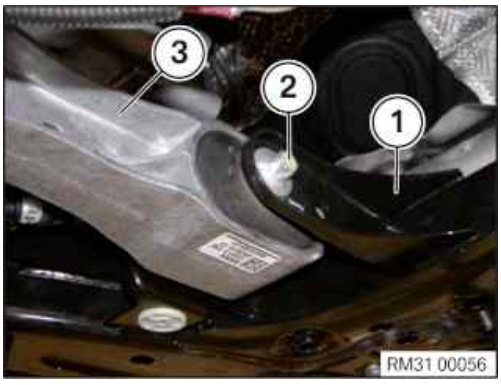


NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



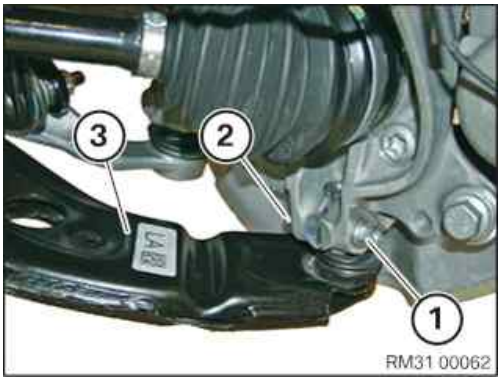
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

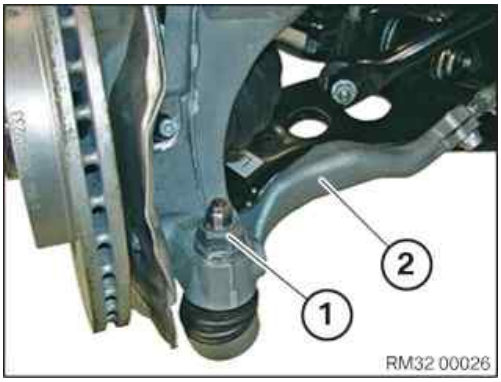
43 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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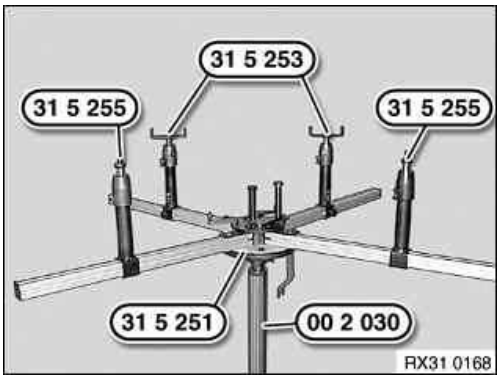
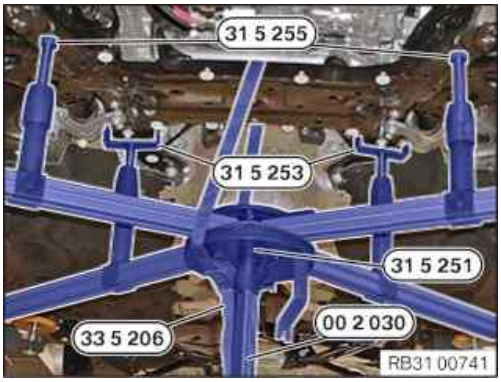


- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

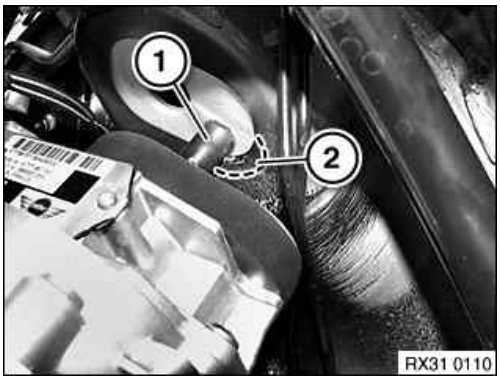
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

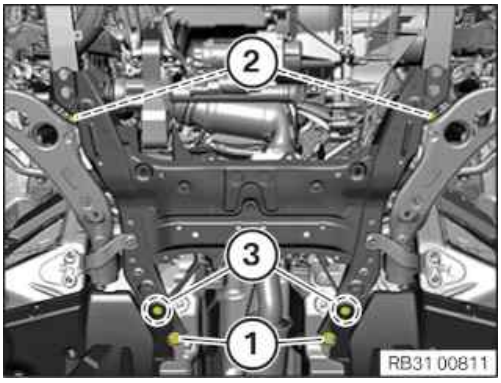


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.

For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

44 – Removing the connecting support from the tunnel in front and back

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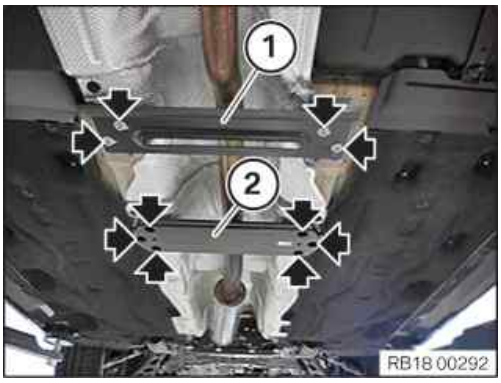
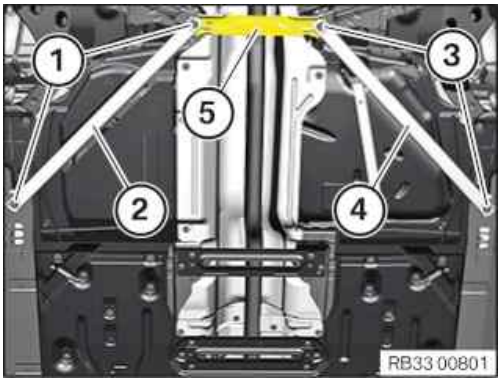


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

45 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

46 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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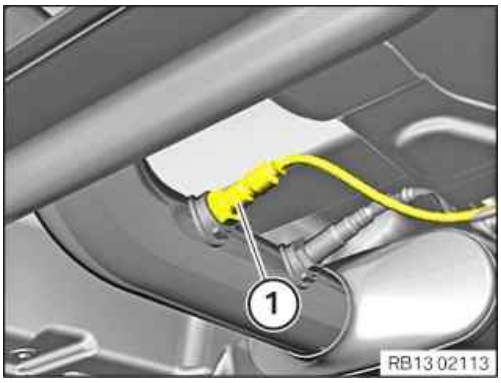
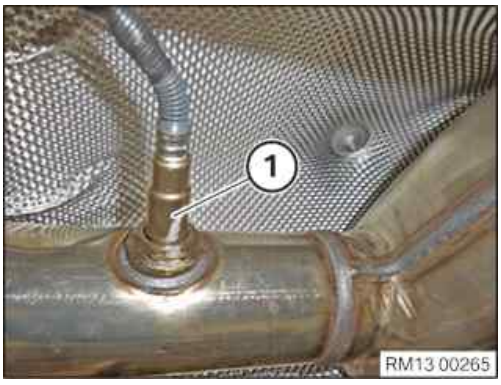
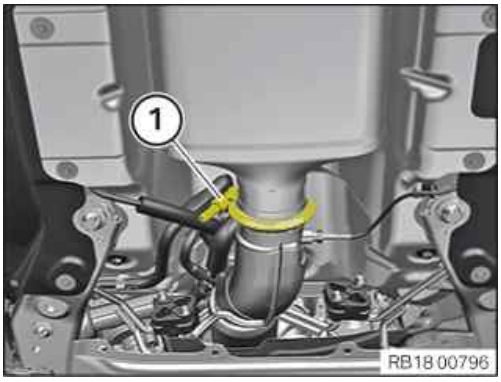


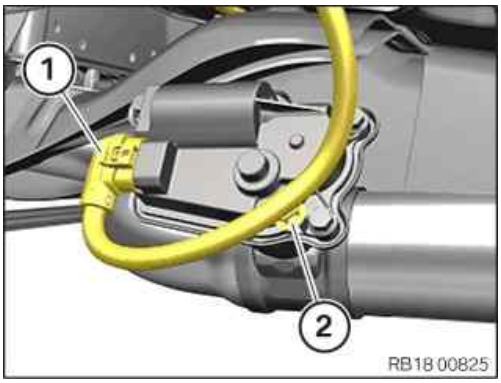
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



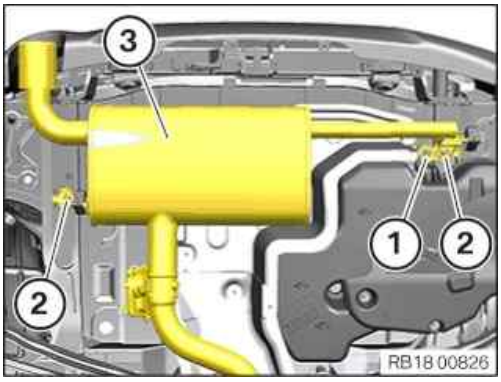
- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Unlock and disconnect connector (1).
- Loosen clamp (2).



- Loosen screw (1).
- Loosen nuts (2).
- Lower the exhaust system (3) with an auxiliary person, guide out and remove.

47 – Removing starter motor

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

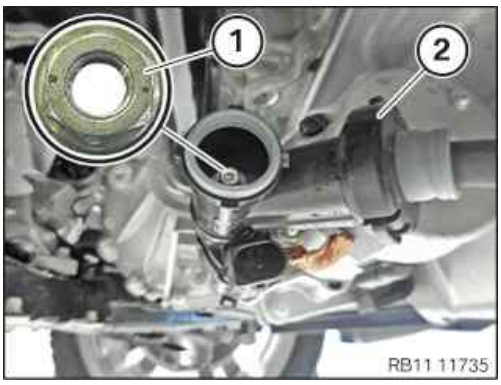
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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- Loosen screws (1).
- Feed out starter motor and remove.

48 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

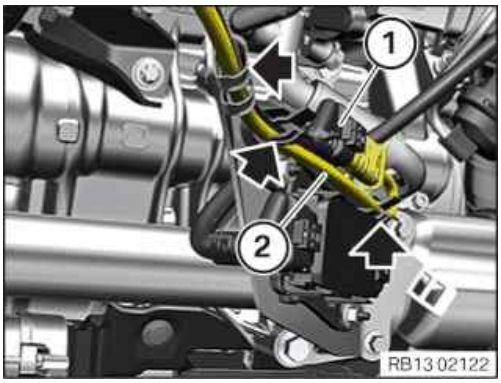
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

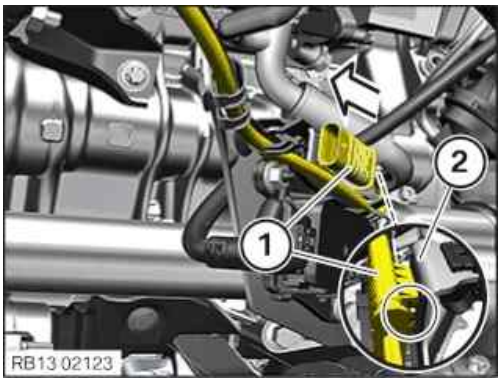
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.

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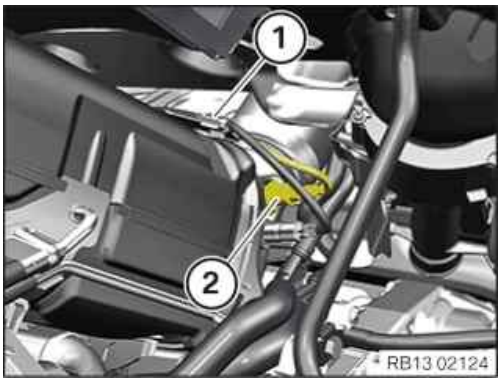


- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

49 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

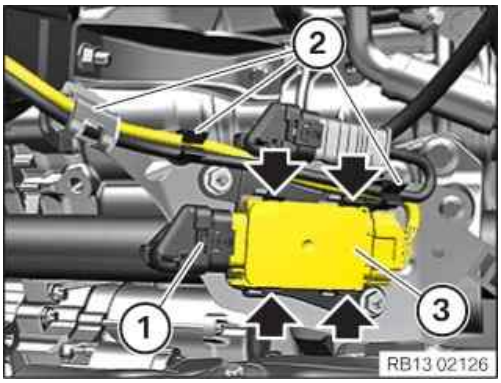
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

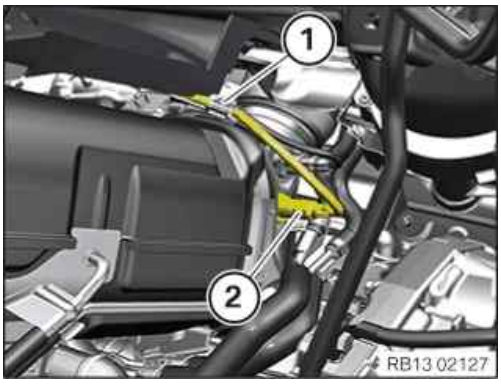
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

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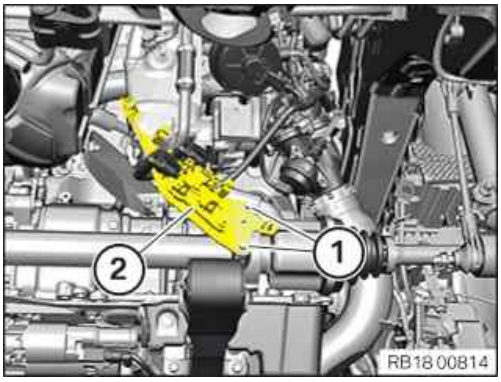
50 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

51 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

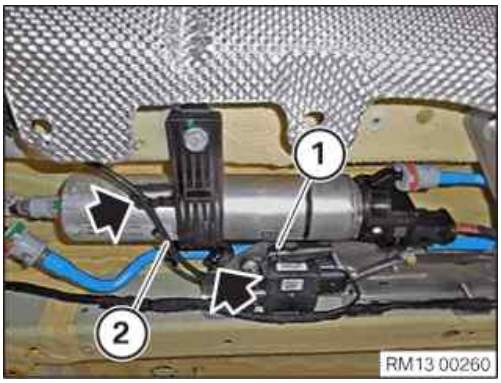
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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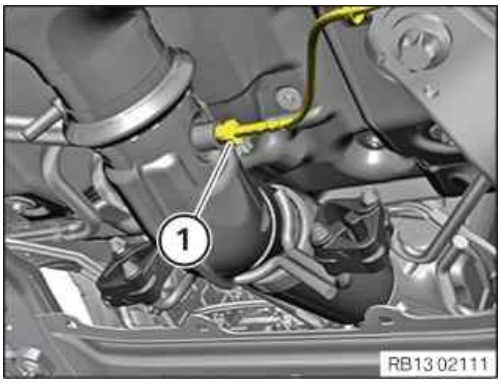
- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

52 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

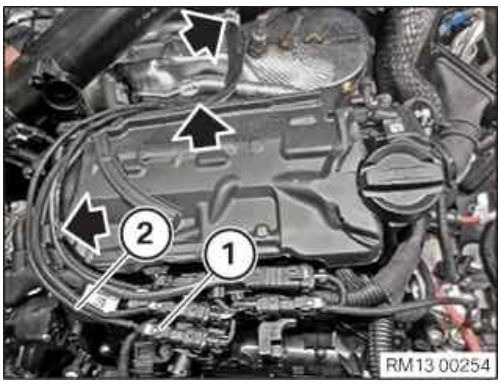
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Feed the cable (2) from the temperature sensor out of the clamps (arrows) and remove it.

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- Release the exhaust temperature sensor (1) with conventional tools (2).

- Feed out and remove exhaust temperature sensor (1).

53 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and disconnect the plug connection (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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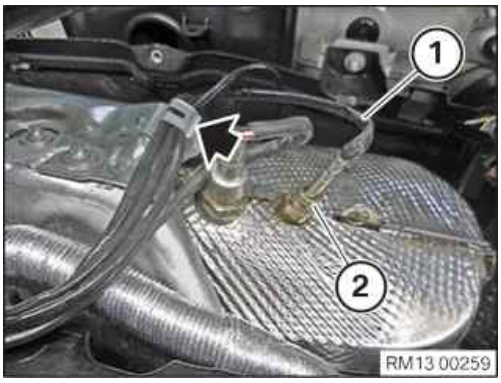


- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

54 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

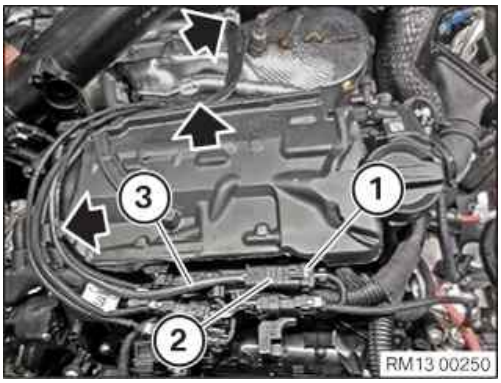
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

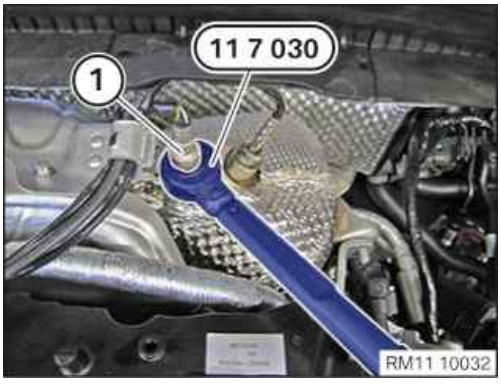
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Detach the connector (2) from the holder .
- Feed out and remove cable (3) out of the oxygen control sensor from the clamps (arrows).



- Release the front oxygen control sensor (1) using special tool **0 491 075 (11 7 030)** .
- Feed out and remove the control sensor (1).

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55 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

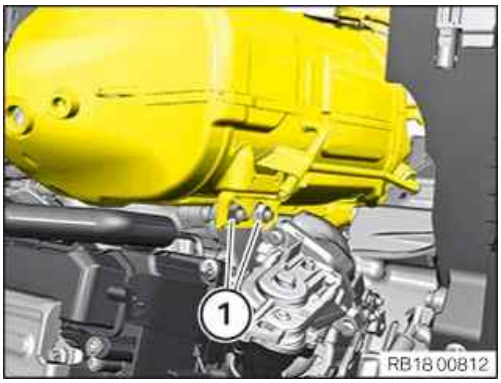
CAUTION

Heavy component.

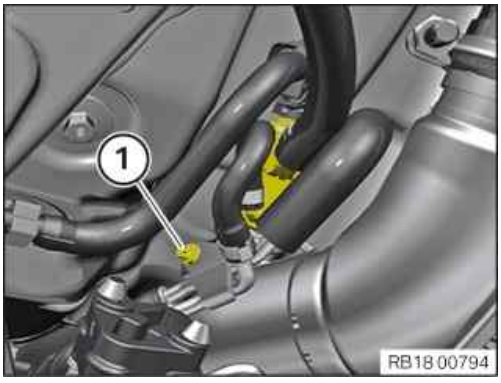
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen nuts (1).



- Loosen screw (1).

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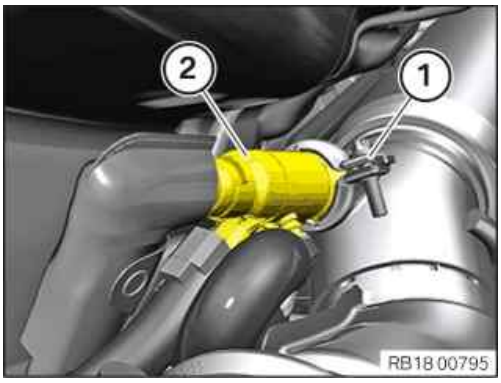
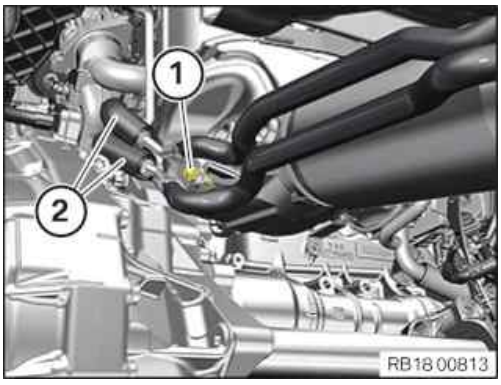
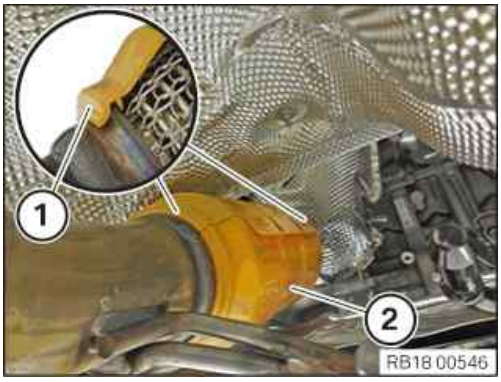


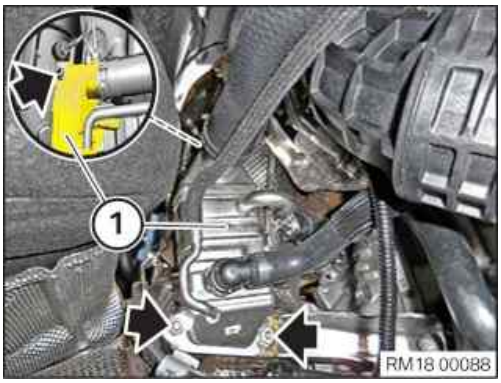
- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



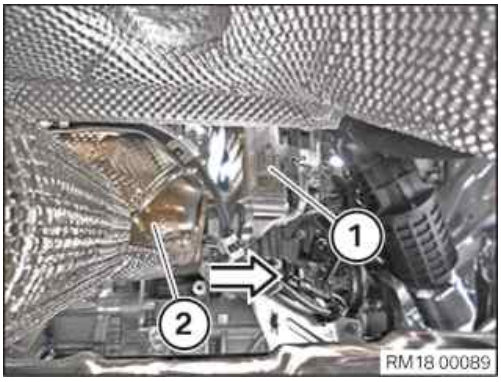
- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Detach nuts (arrows) from low pressure exhaust-gas recirculation cooler (1).



- Feed out low pressure exhaust-gas recirculation cooler (1) from diesel particulate filter (2) in direction of arrow and set aside.

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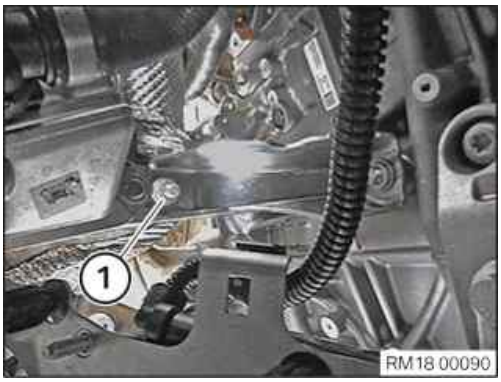
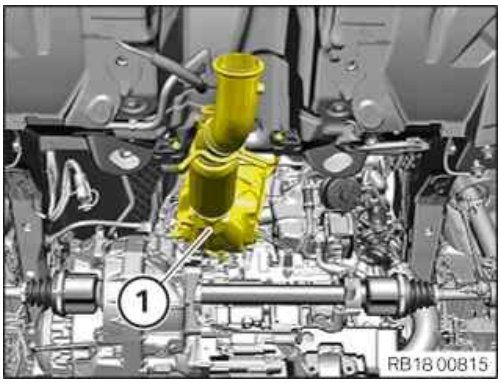


- Unfasten nut (1).



- Feed out diesel particulate filter (1) toward the bottom and remove.

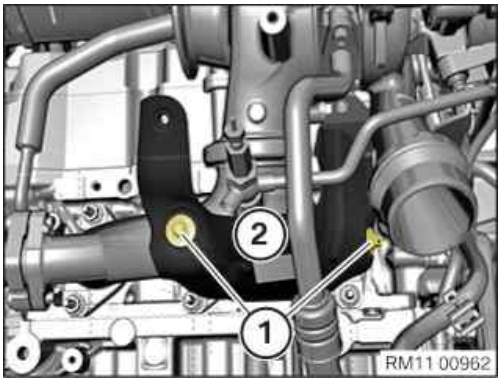
56 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

57 – Removing heat shield from rear exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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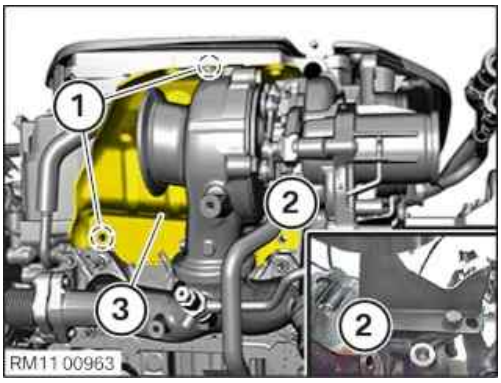
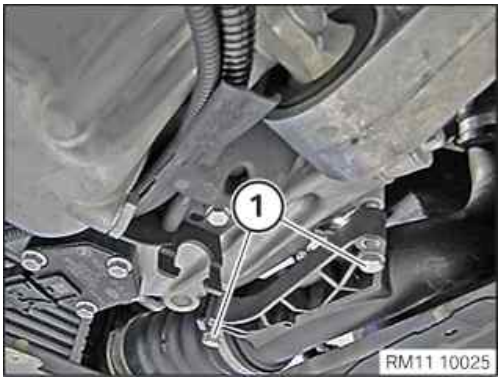


- Loosen screws (1).
- Loosen screw (2).

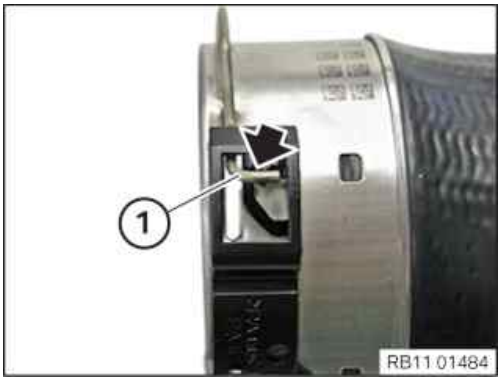
  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

58 – Remove right charge-air line

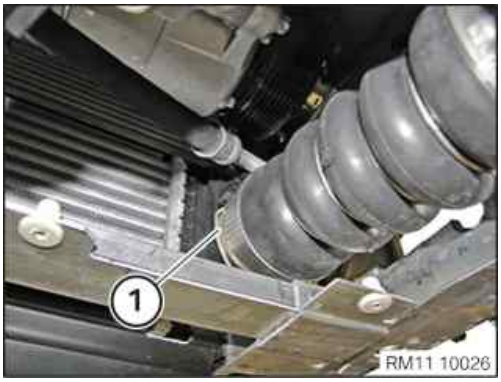


- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.



- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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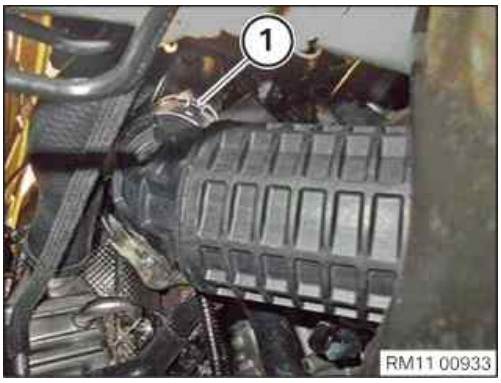

- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

59 – Remove exhaust turbocharger

- Release screw (1) from beneath with a long extension.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).
- Disconnect the oil return line (2) toward the bottom and set it aside.

- Release banjo bolt (1) of oil feed line from exhaust turbocharger and place to one side.

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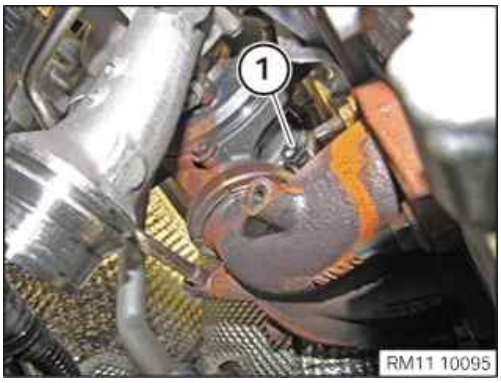


- Release screw (1) and remove V-clip.
- Pull exhaust turbocharger up and remove.
- Remove seal between exhaust turbocharger and exhaust manifold.

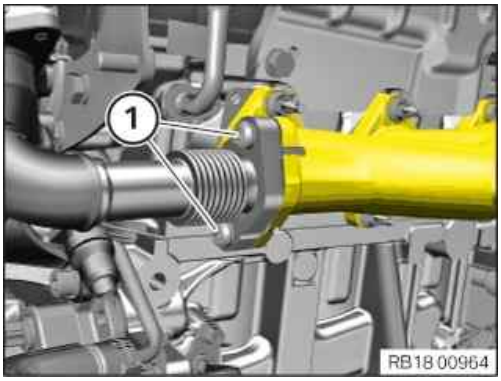
60 – Remove exhaust manifold

WARNING

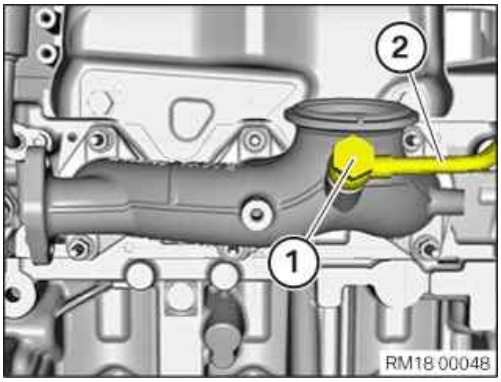
Hot surfaces.

Risk of burning!

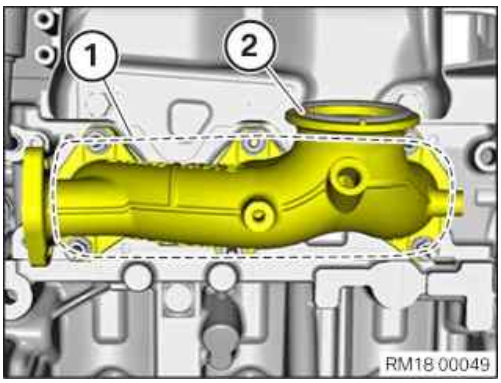
- Perform all work only on components that have cooled down.



- Loosen screws (1).



- Unscrew the banjo bolt (1).
- Feed out exhaust gas pressure pipe (2) and place to one side.



- Evenly release nuts along the dashed line (1) from outer to inner side.
- Feed out exhaust manifold (2) and remove.

61 – Removing the acoustic cover for the engine at the front

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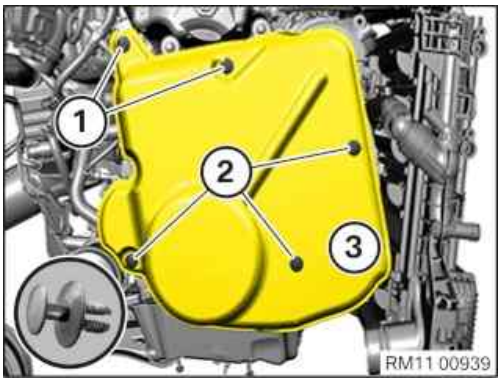


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

62 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

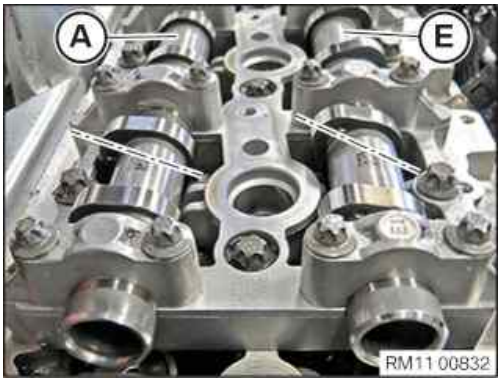
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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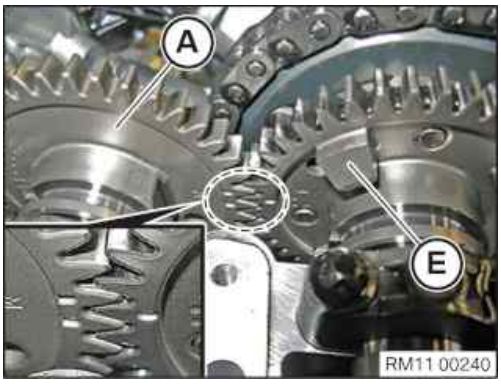
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

63 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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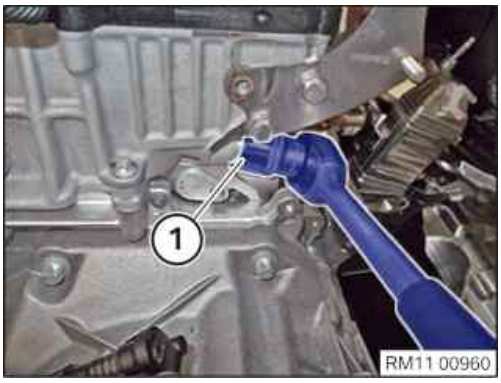
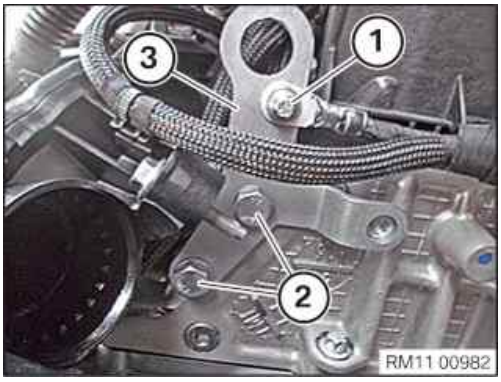


TECHNICAL INFORMATION

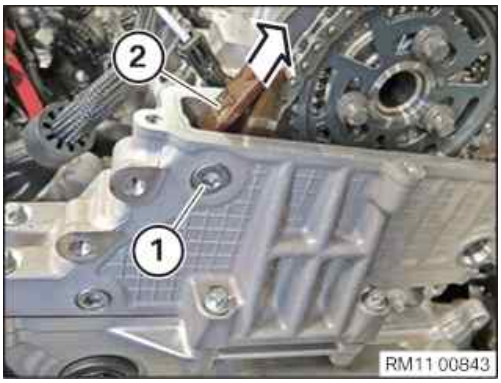
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

64 – Remove the timing chain guide rail

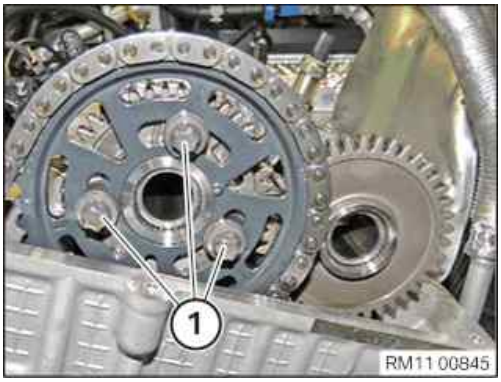


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

65 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

66 – Removing the camshaft support

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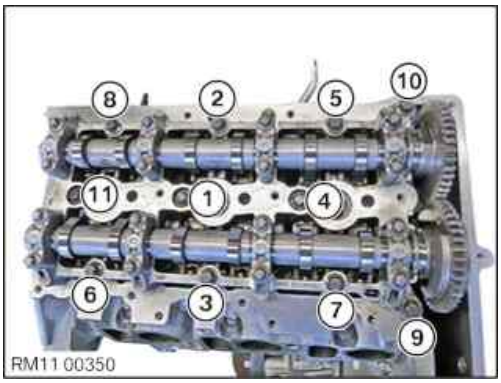
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

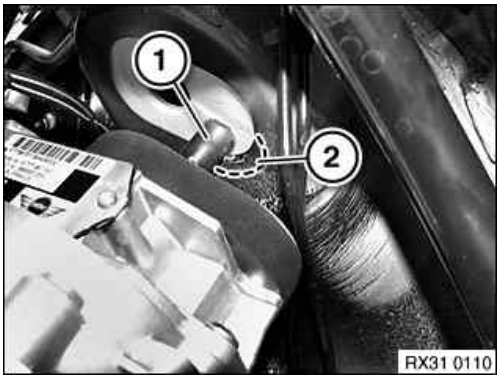
67 – Remove cylinder head.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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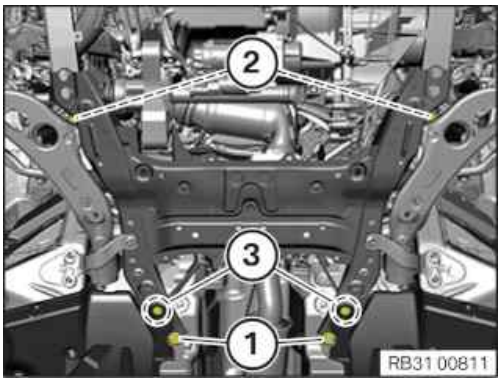


- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

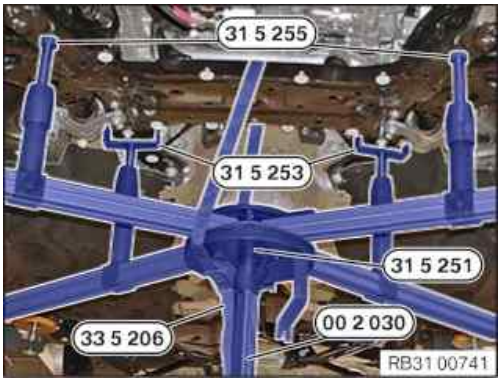
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

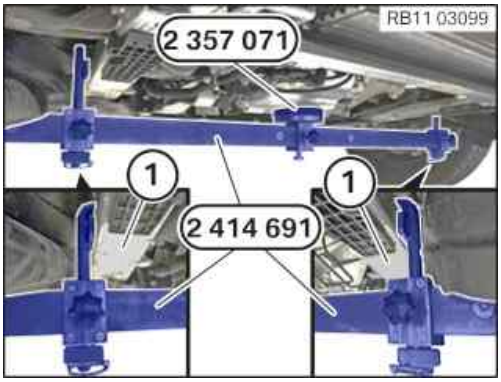
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and set it aside.



- Prepare special tool **2 414 691** together with the special tool **2 357 071**.
- Attach special tool **2 414 691** to front axle support and correctly align the special tool **2 357 071** under the oil sump and tighten.
- Turn special tool **2 414 691** at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools**2 414 691** and **2 357 071**.

- Remove all glow elements with special tool **0 491 068 (11 6 050)** or a standard tool.

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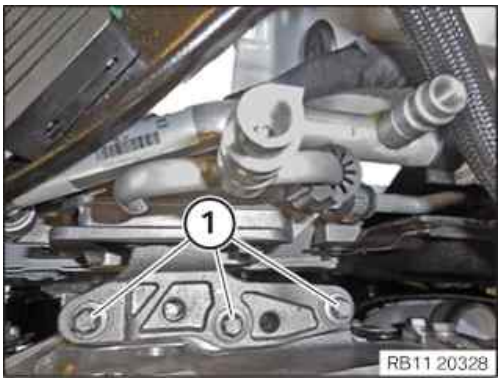
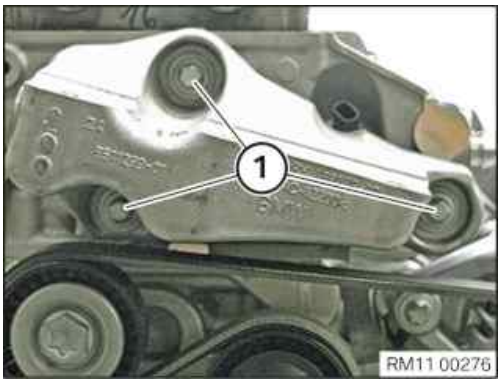


- Loosen screws (1).

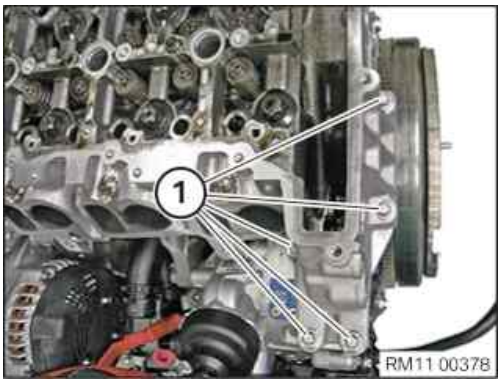


- Loosen screws (1).

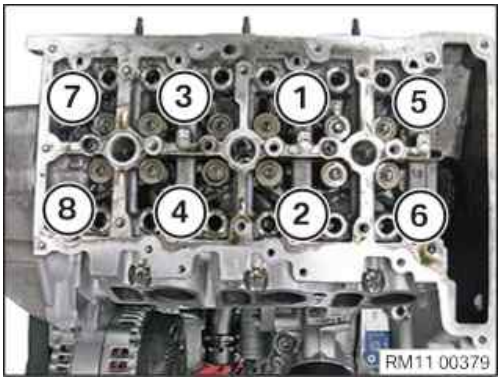
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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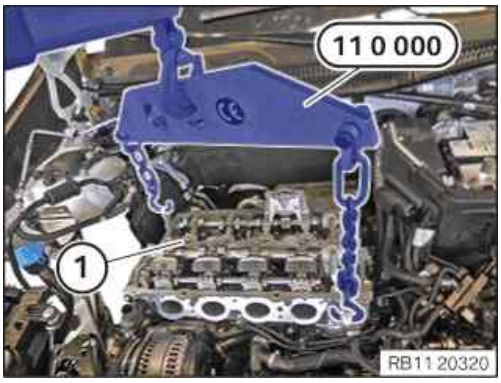


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

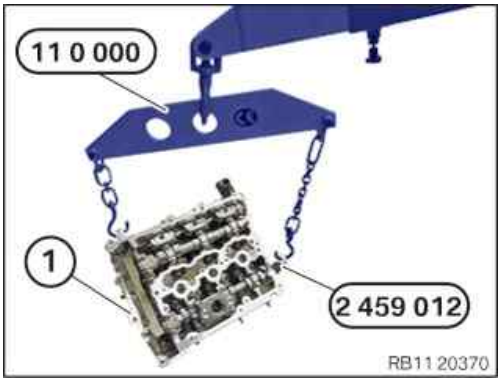
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

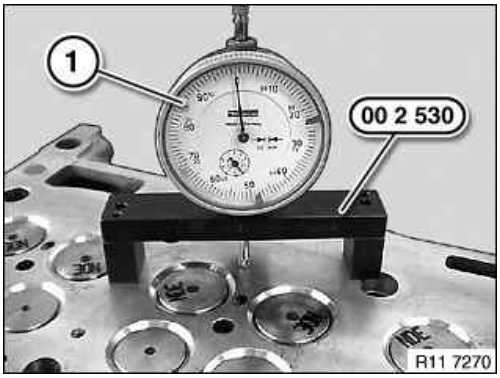
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.

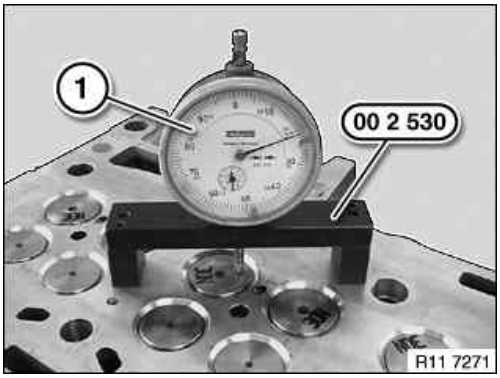


- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

68 – Checking the valve underprotrusion



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

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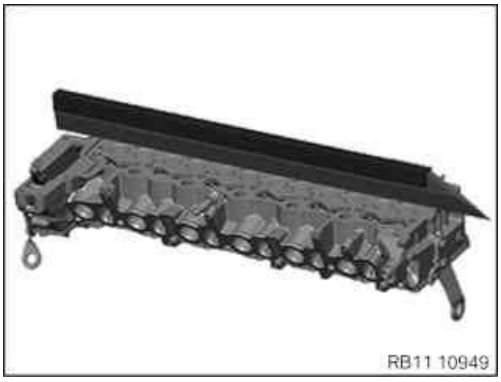
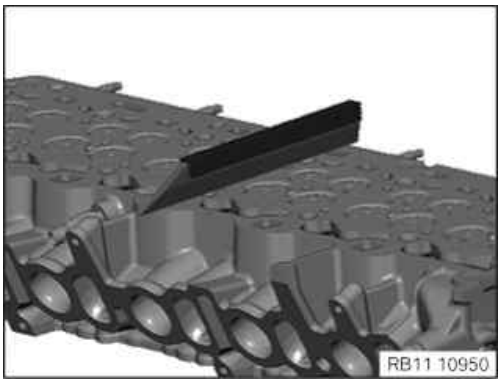
69 – Check the flatness of the cylinder head



- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm



- Check the flatness of the cylinder head crosswise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

MAIN WORK

70 – Remove all valve springs

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

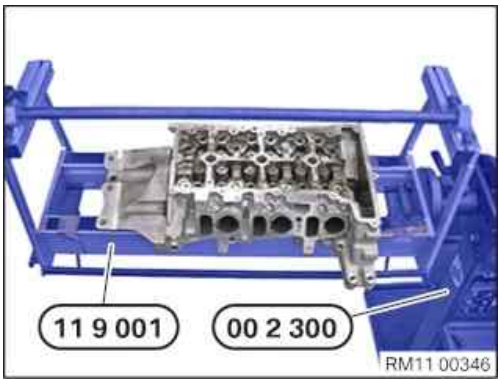
- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Mount and bolt special tool **0 494 366 (11 9 001)** on special tool **0 495 187 (00 2 300)**.
- Mount and bolt the cylinder head to the special tool **0 494 366 (11 9 001)**.

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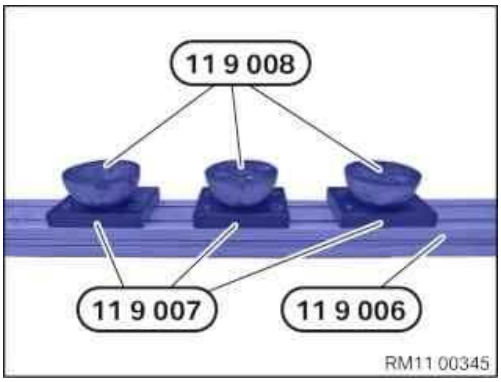
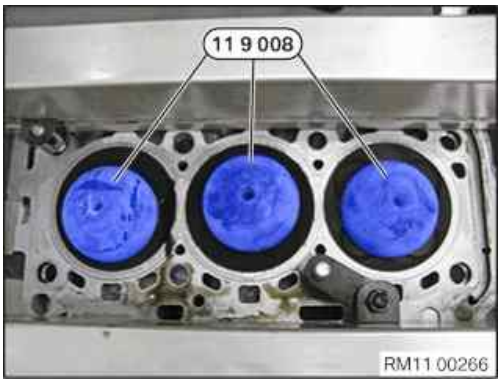
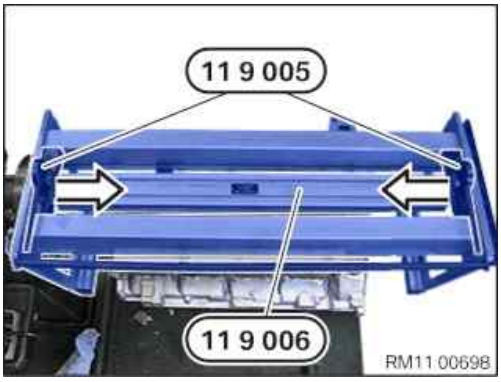


- Prepare special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.

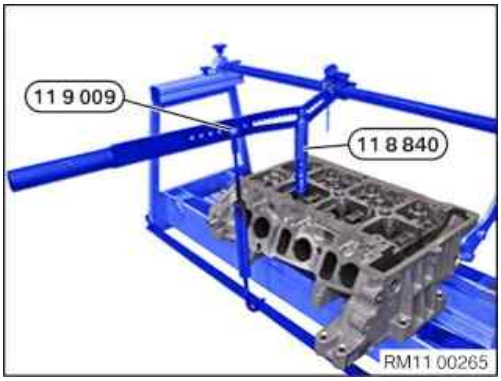


- Make sure that the special tools **0 494 373 (11 9 008)** are positioned as shown in the next operation.



- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Slide the special tool **0 494 370 (11 9 005)** in the direction of the arrow.

- Lock special tool 1**0 494 370 (11 9 005)** in the direction of the arrow.
- Rotate the cylinder head with the special tool **0 494 362 (11 9 000)** by 180° into the installation position.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.

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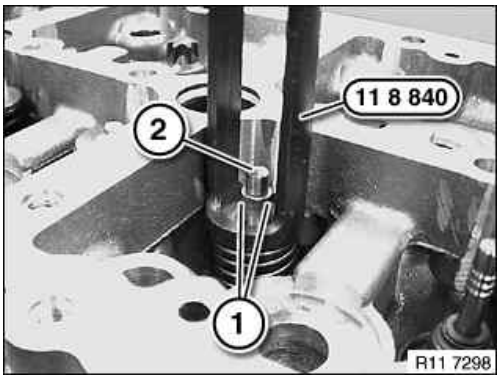
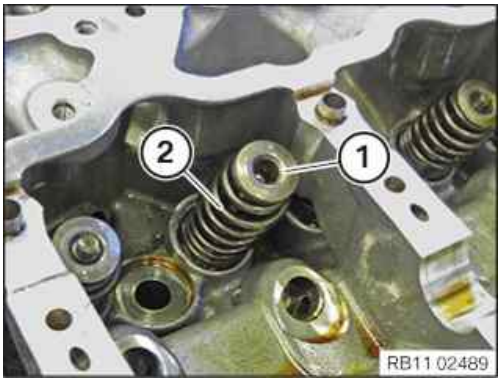
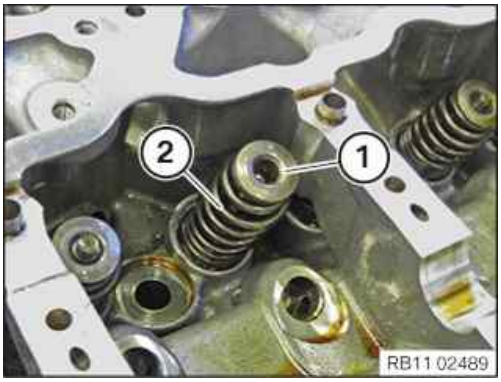


- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Remove the valve shims (1) with a magnet from the valve (2).
- Carefully relieve the valve spring.

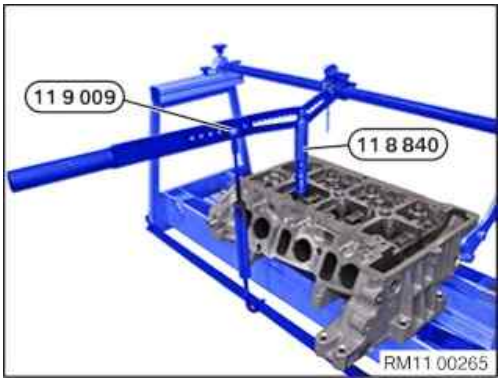


- Set the spring cup (1) and the valve spring (2) down in the special tool **0 495 105 (11 4 480)** in order.

71 – Install all valve springs



- The mounting orientation of the valve springs (2) can be freely chosen.
- Install the valve spring (2) and spring cup (1).



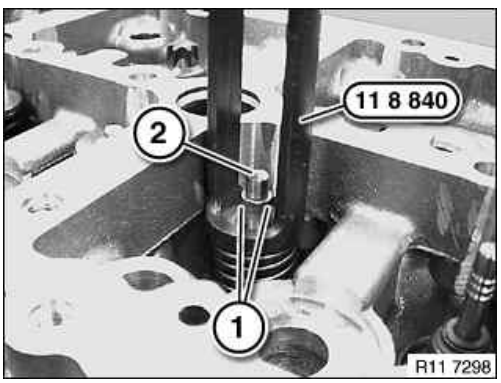
CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

- Align special tool in direction of valve axis.
- Select the corresponding groove using special tool **0 496 143 (11 8 840)**.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Install the valve shims (1) of the valve (2) with a magnet.
- Relieve load on valve spring.

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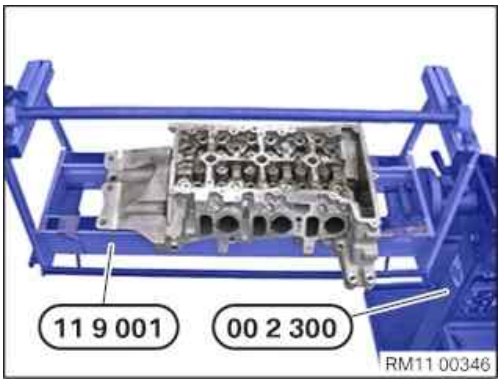
- Unlock special tool **0 494 370 (11 9 005)** in the direction of arrow and remove.



- Remove cylinder head from special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

POSTPROCESSES

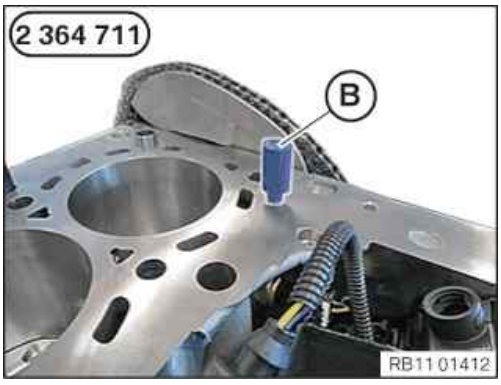
72 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

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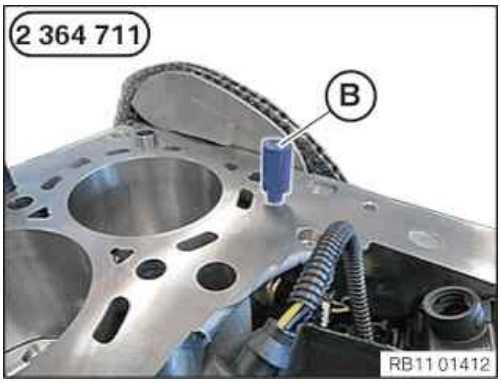
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

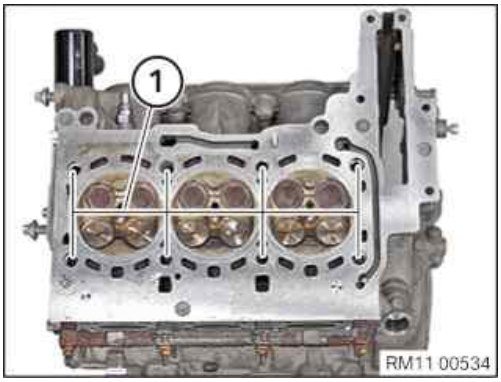
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

73 – Renewing the cylinder head gasket



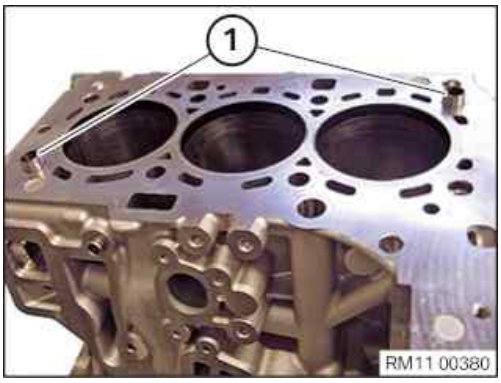
RISK OF DAMAGE

Damage to the surface.

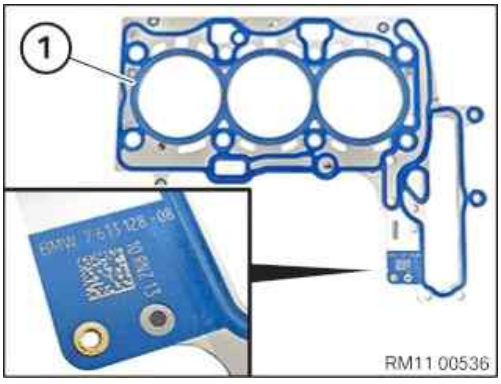
The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).



- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**

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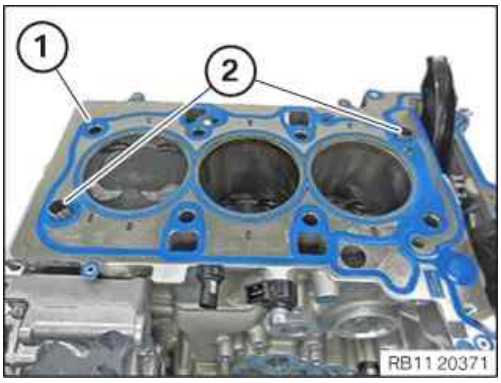


- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

74 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

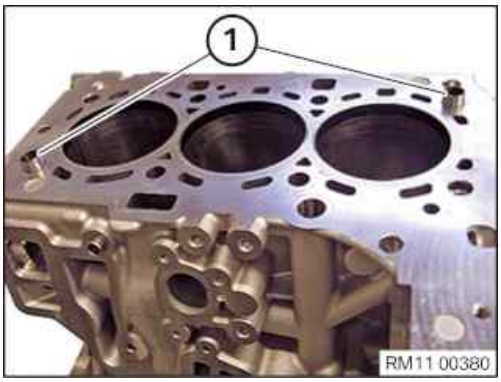
Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

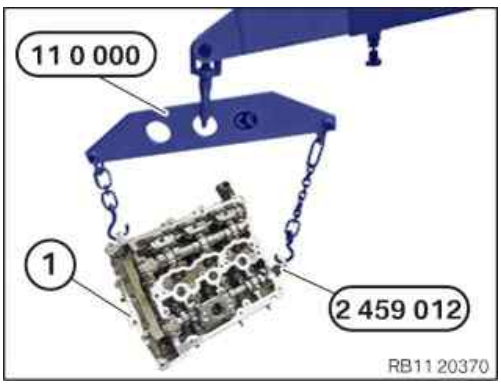
TECHNICAL INFORMATION

Do not remove bolt coating.



- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.
- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.

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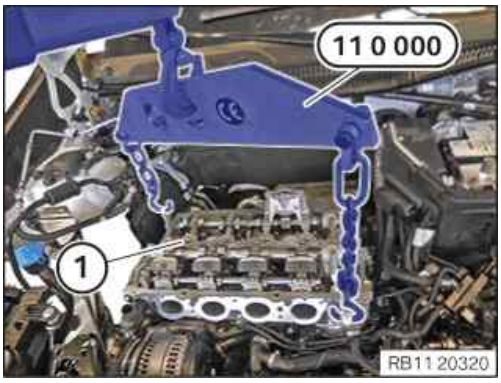


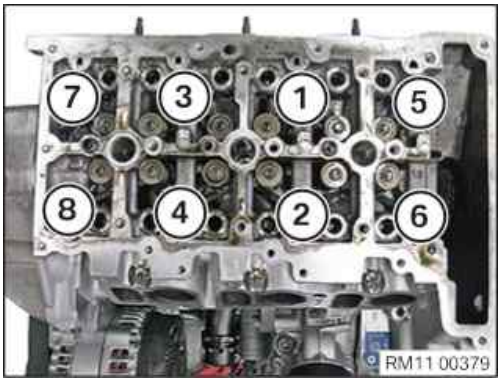
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Fit new cylinder head bolts.

  Parts: Cylinder head bolts

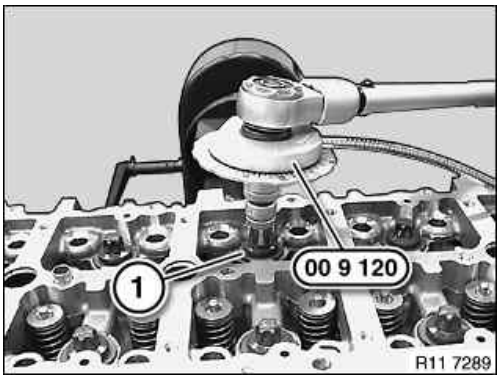
- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

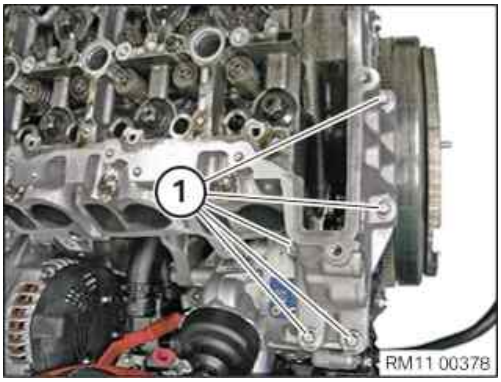
- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).



- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °



- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

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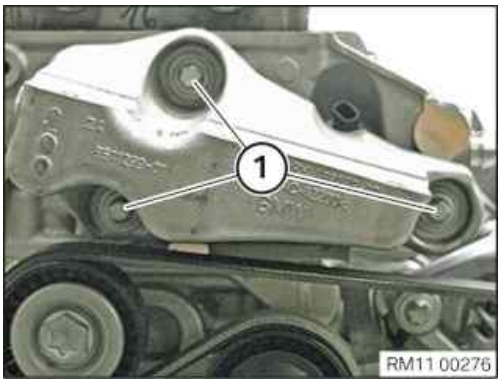
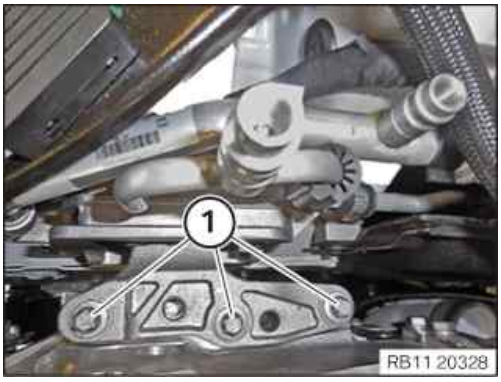
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.



- Tighten the screws (1).

Engine support to cylinder head

M10X45		Tightening torque	41 Nm



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

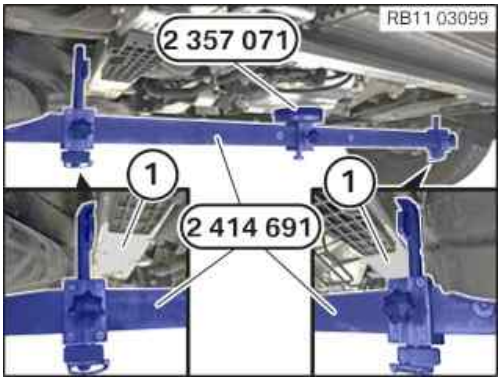
Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm



- Disassemble special tool **2 414 691** using special tool **2 357 071**.

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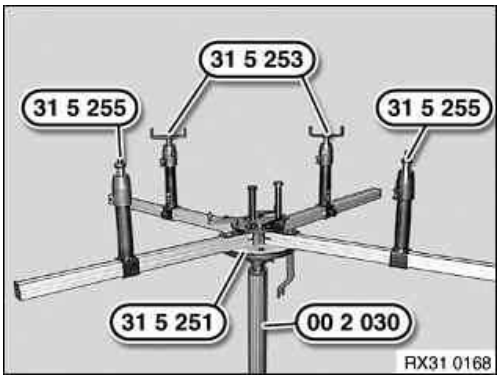
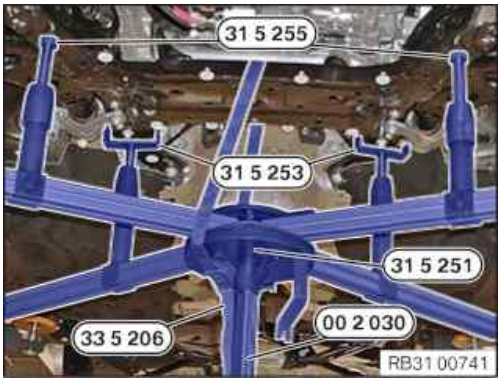


- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

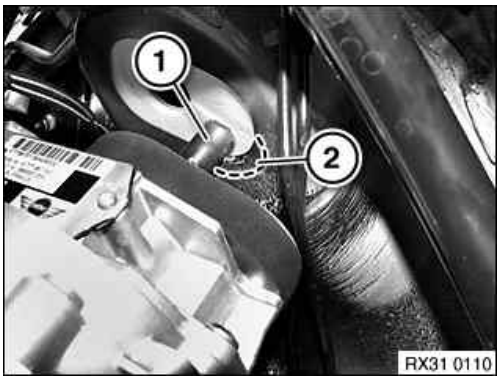
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

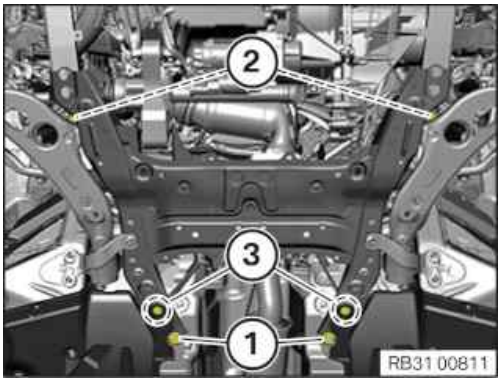


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

75 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

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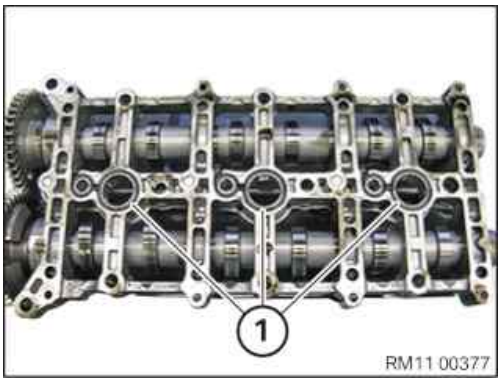
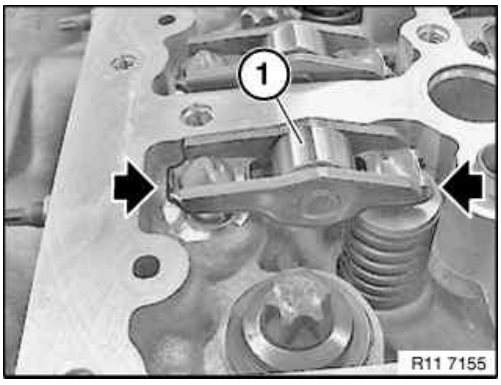
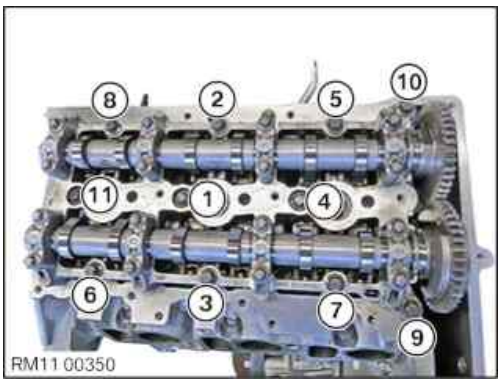


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.

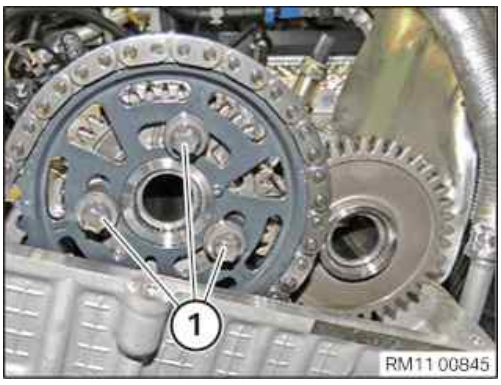


- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

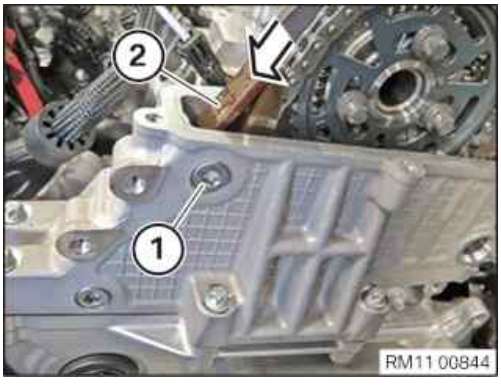
M7x35		Tightening torque	13 Nm

76 – Installing the camshaft sprocket on the intake camshaft



- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

77 – Install the timing chain guide rail



- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

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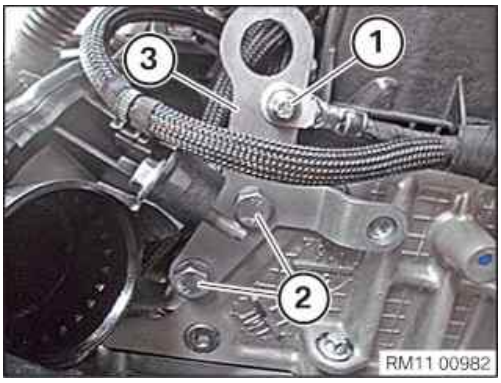


- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

78 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

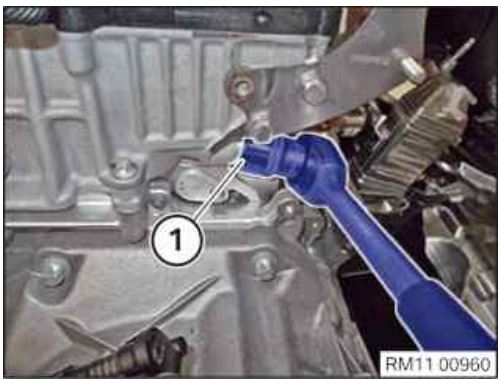
- Renew sealing ring (1).

  Parts: Sealing ring

TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.



- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

79 – Tightening the camshaft sprocket on the intake camshaft

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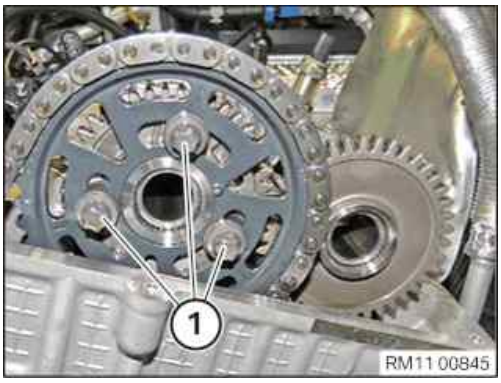

- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

80 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

81 – Remove special tool to disconnect the crank shaft

- Remove special tool **2 288 380**.

82 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

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RISK OF DAMAGE

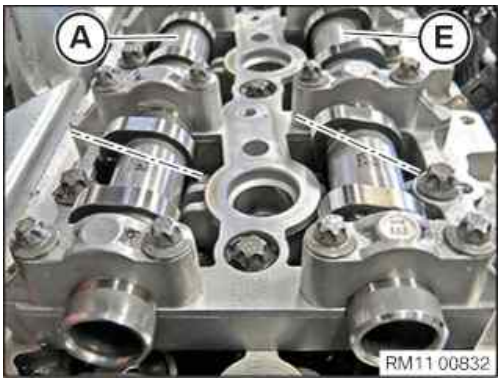
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

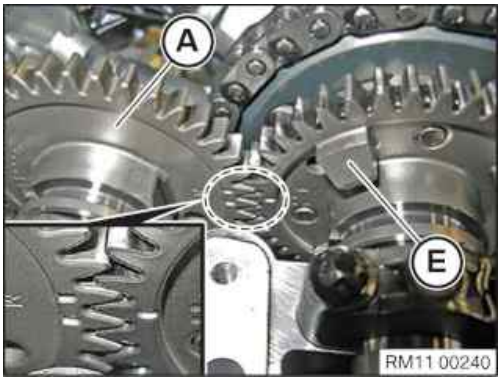
- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

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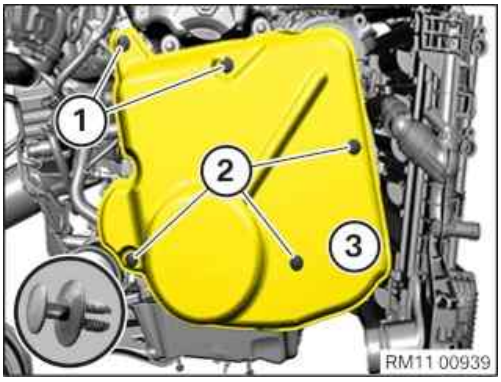
- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

83 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

84 – Installing exhaust manifold

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

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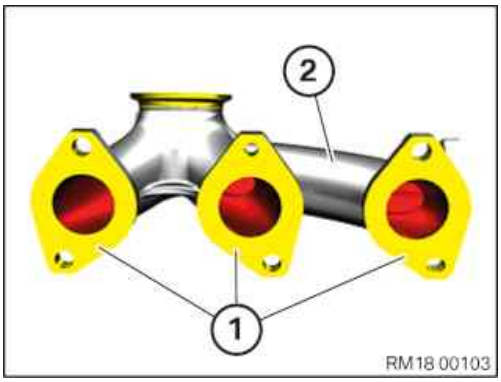
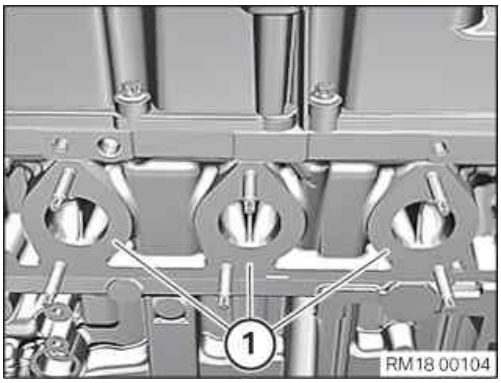
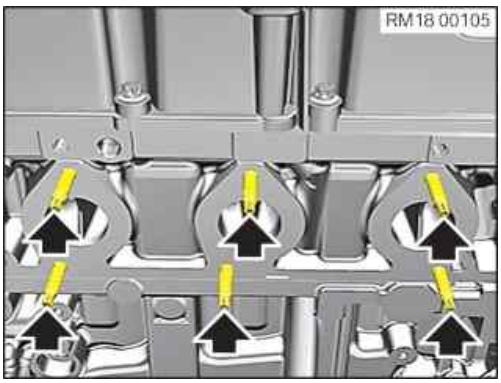


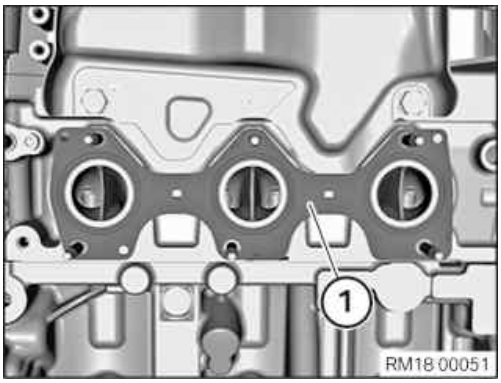
- Clean the connection points (1) on the exhaust manifold (2) with the special tool **0 495 102 (11 4 470)**.



- Clean the connection points (1) on the cylinder head with the special tool **0 495 102 (11 4 470)**.



- Check the stud bolts (arrows) on the cylinder head for **correct** fit.

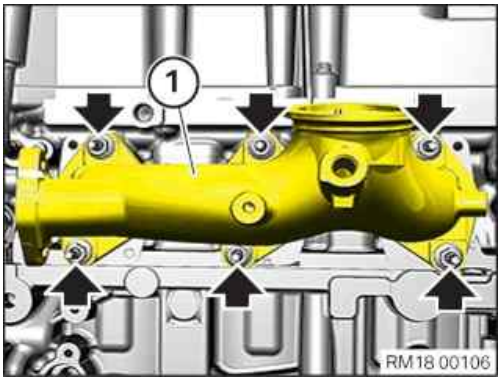


TECHNICAL INFORMATION

The **coated side of the** seal must be mounted facing towards the exhaust manifold.

- Renew the gasket (1).

  Parts: Gasket
- Insert and install the gasket (1).



- Insert and install the exhaust manifold (1).
- Renew the nuts (arrows).

  Parts: Nuts
- Hand-tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.
- Tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.

Exhaust manifold to cylinder head

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm

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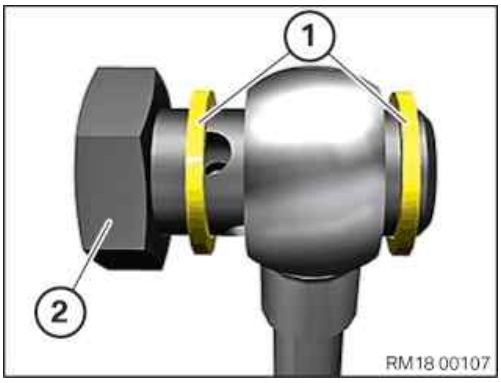
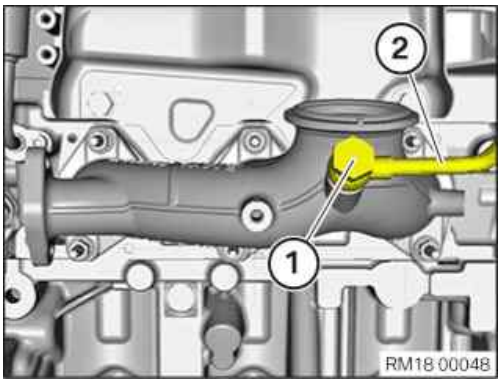


- Renew the sealing rings (1) from the banjo bolt (2).

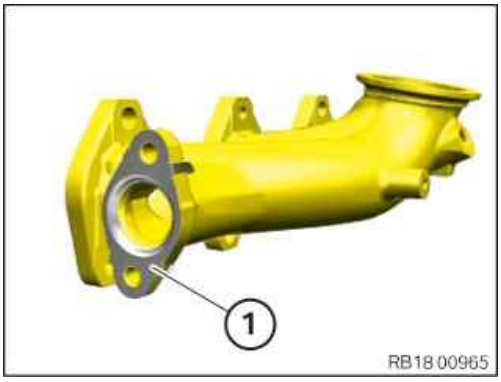
  Parts: Sealing ring



- Insert and install the exhaust gas pressure pipe (2).
- Tighten the banjo bolt (1).

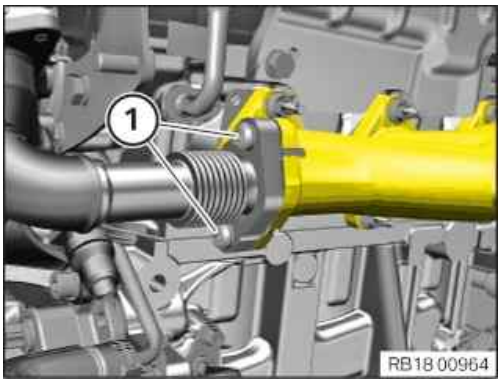
Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt		Renew sealing rings.	30 Nm



- Renew seal (1) between exhaust-gas recirculation cooler and exhaust manifold.

  Parts: Gasket



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

85 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

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86 – Installing exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the exhaust turbocharger

Inadequate initial filling of exhaust turbocharger leads to dry running.

- Make sure the initial filling is correct when replacing exhaust turbocharger.
- Fill the exhaust turbocharger with the suitable additive (see electronic Parts Catalogue).

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

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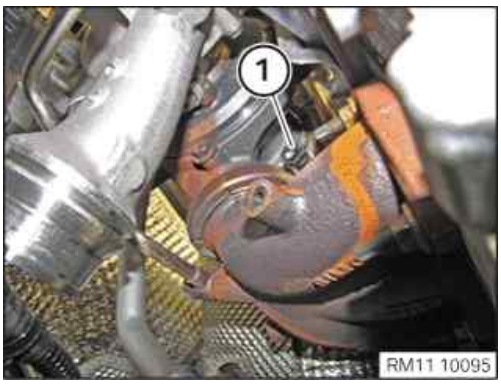
TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger



- Renew gasket.

  Parts: Gasket
- Position seal on exhaust manifold.
- Guide the exhaust turbocharger in from the top and position it.
- **Ensure that gasket is correctly seated.**
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Renew sealing rings.

  Parts: Sealing ring
- Position oil feed line with banjo bolt (1) and sealing rings and tighten hand-tight.

  There are 2 sealing rings fitted on the banjo bolt (1).
- Align oil feed line and tighten banjo bolt (1).

  The oil feed line must not sit on the exhaust turbocharger.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

- Renew gasket.

  Parts: Gasket
- Position oil return line (2) with **seal** on exhaust turbocharger.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Feed in and tighten screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

87 – Install right charge air duct

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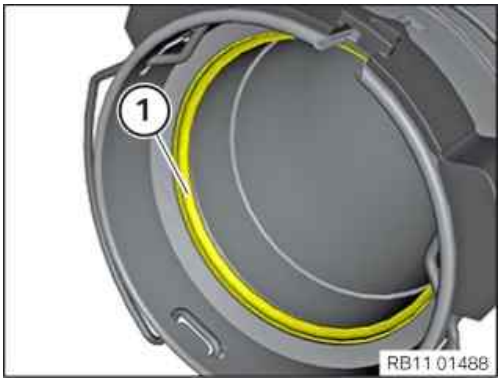
RISK OF DAMAGE

Damage to the exhaust turbocharger.

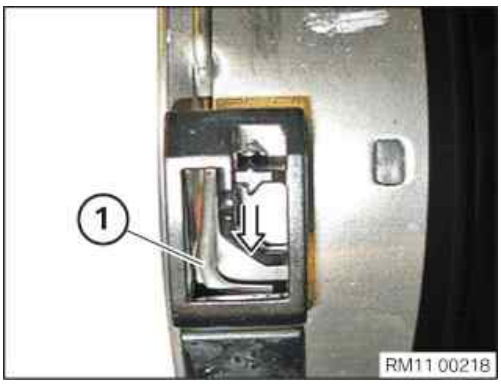
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

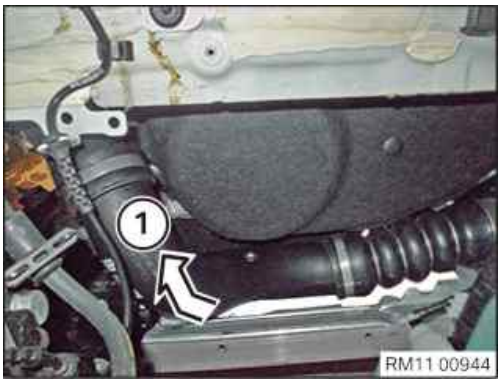


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

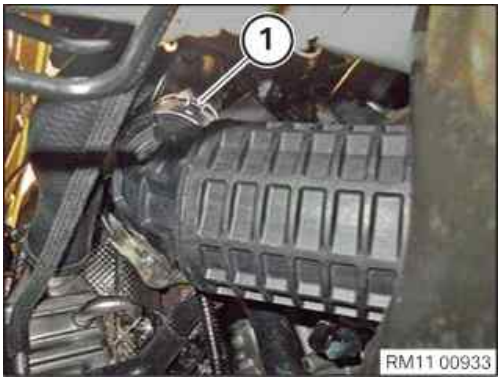
  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.

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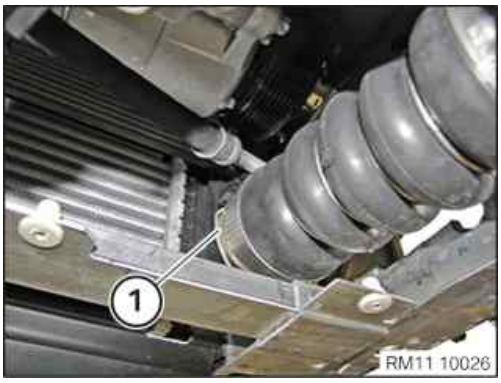


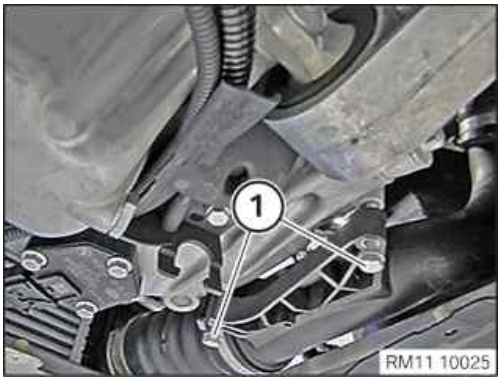
- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm



- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

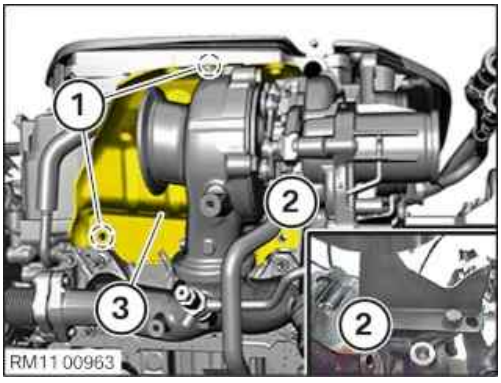
88 – Installing heat shield on exhaust turbocharger at the rear

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

89 – Installing heat shield on exhaust turbocharger at bottom

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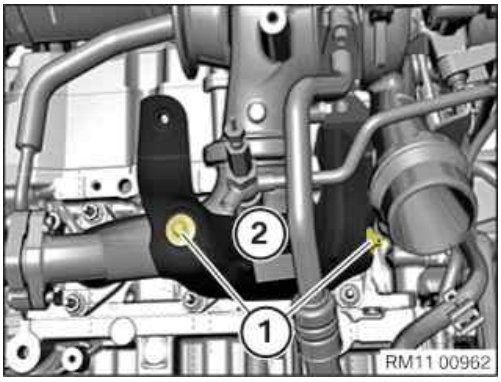
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

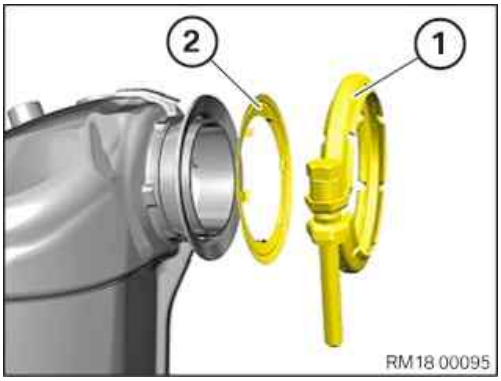
90 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.

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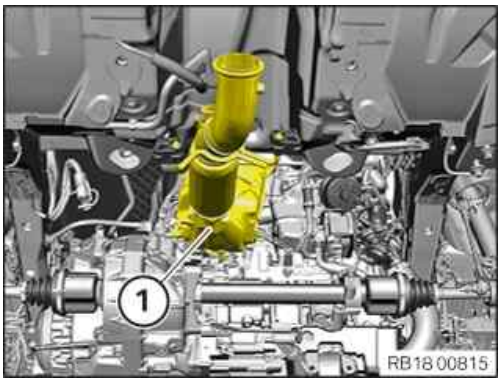
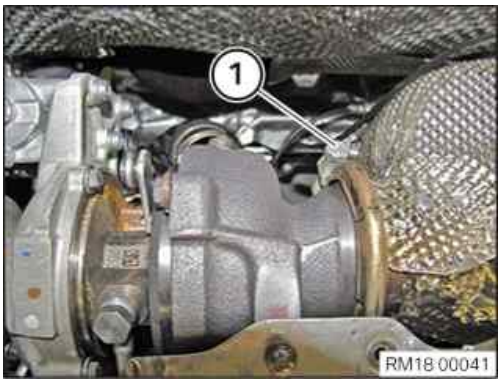
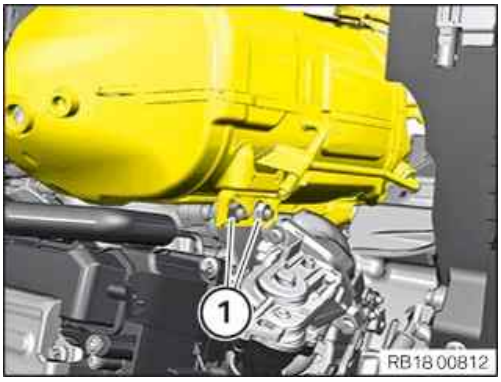


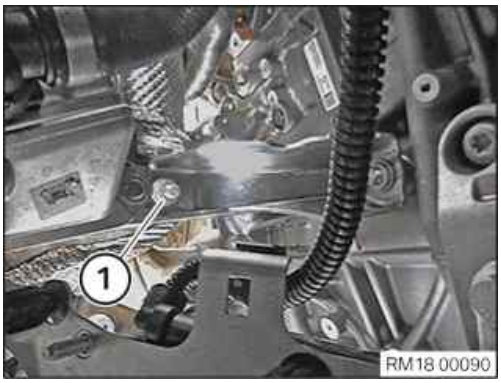
- Carefully insert and install the diesel particulate filter (1).



- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Tighten the nut (1) hand-tight.

- Remove fitting aid (1) for the flexible tube.

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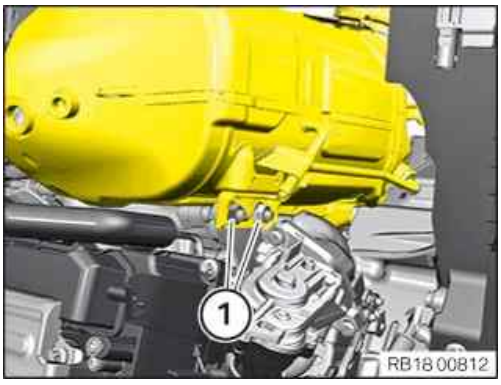
- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

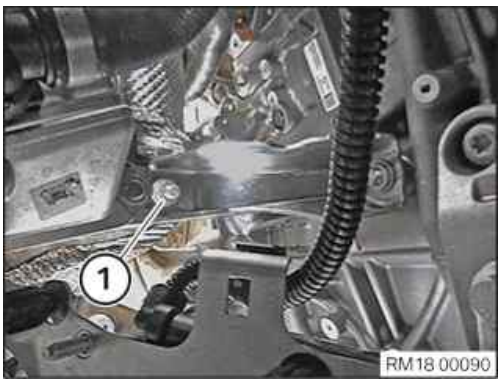
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

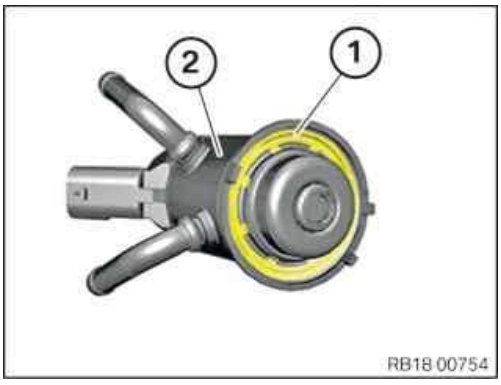
M8 hexagon nut		Tightening torque	19 Nm



- Tighten nut (1).

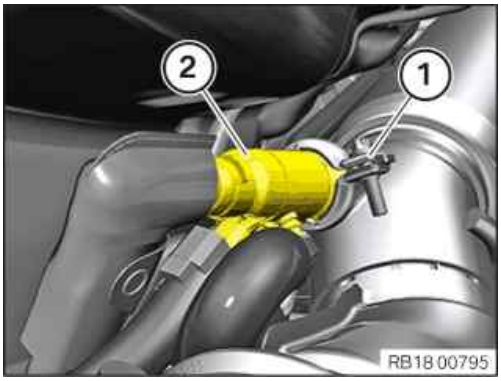
Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring



- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

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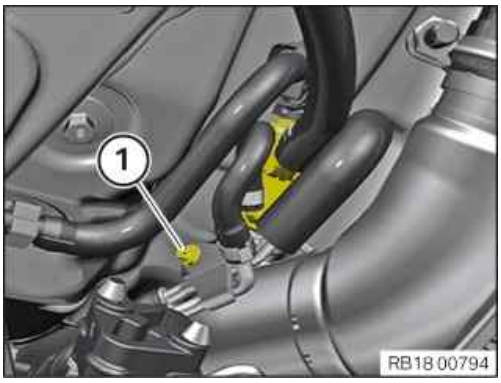
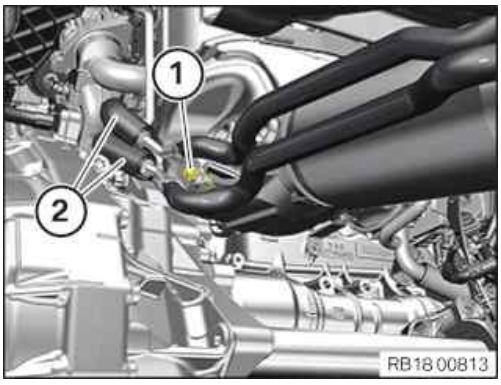


- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

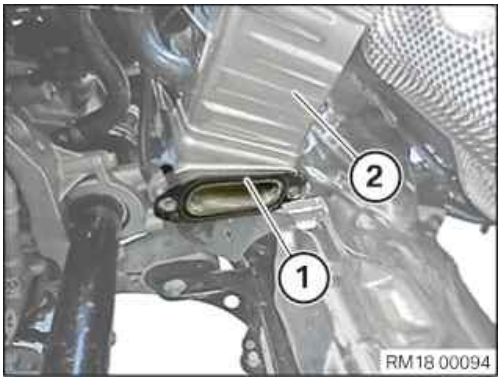
Torx bolt BM6x16		Tightening torque	8 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

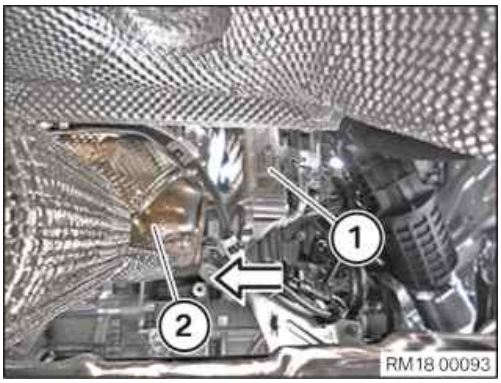
Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm

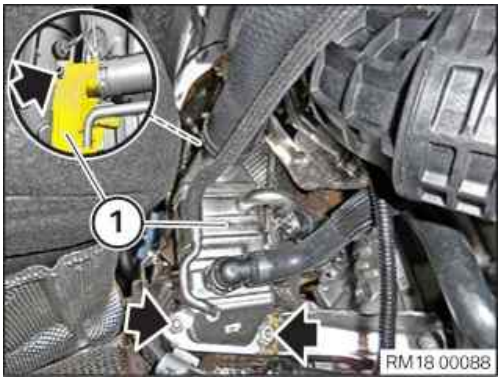


- Replace seal (1) of the low pressure exhaust-gas recirculation cooler (2).

  Parts: Gasket



- Feed in and install the low pressure exhaust-gas recirculation cooler (1) in at the diesel particulate filter (2) in the direction of arrow.



- Tighten nuts (arrows) of the low pressure exhaust-gas recirculation coolers (1).

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Flange nutM8		Tightening torque	19 Nm

91 – Install the control sensor

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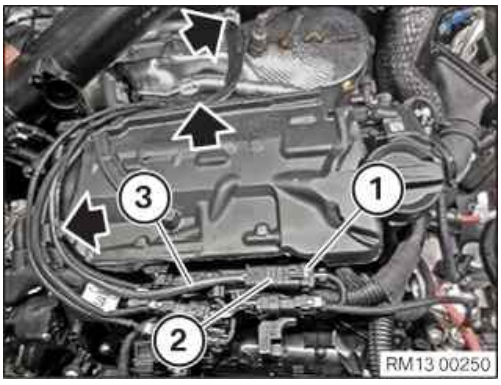
- Feed in front oxygen sensor (1) and install.
- Tighten the front oxygen sensor (1) with the special tool **0 491 075 (11 7 030)**.

Control sensor

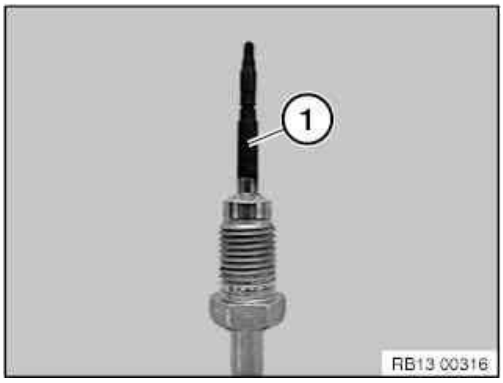
Control sensor		Tightening torque	50 Nm



- Feed in and install cable (3) from the oxygen control sensor into the clamps (arrows).
- Secure connector (2) on holder.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

92 – Install the exhaust-gas temperature sensor on the diesel particulate filter

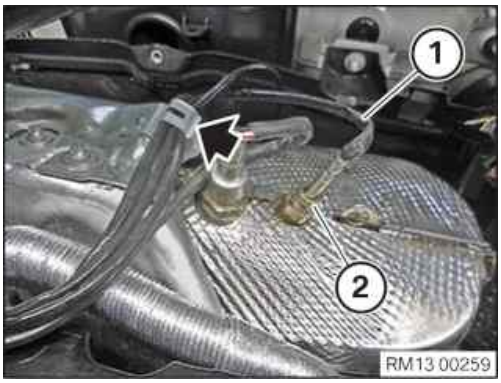


RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.
- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.

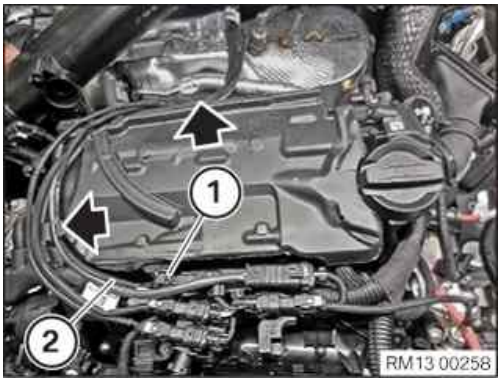


- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).



- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

93 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

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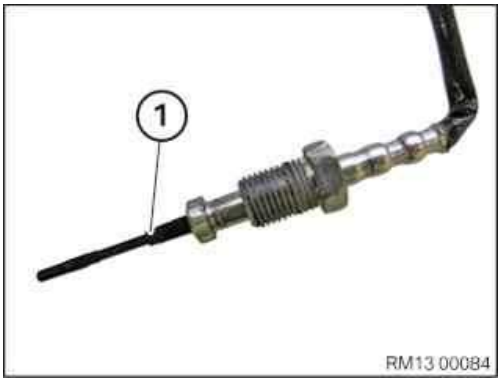
RISK OF DAMAGE

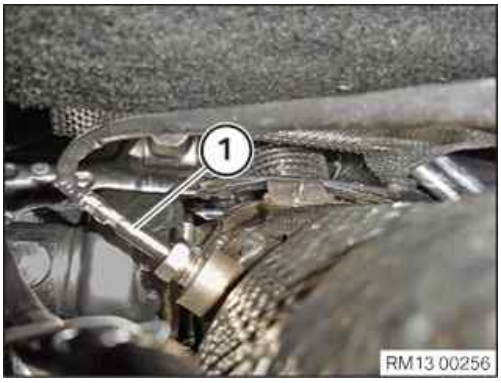
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

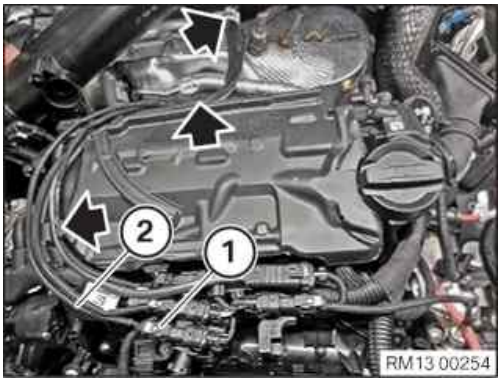


- Feed in and install the exhaust temperature sensor (1).

- Tighten the exhaust temperature sensor (1) with conventional tools (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

94 – Installing exhaust temperature sensor on catalytic converter

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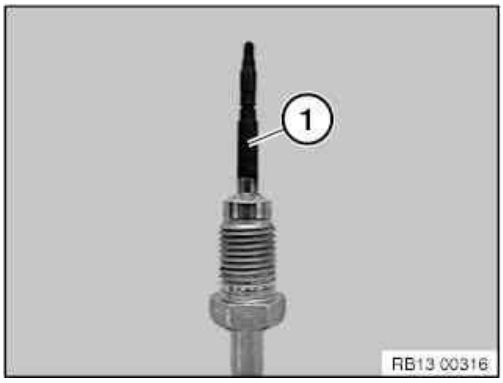


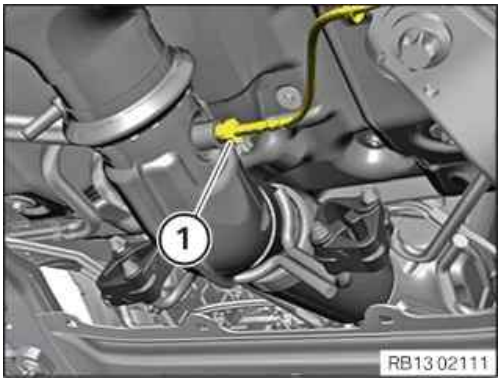
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.

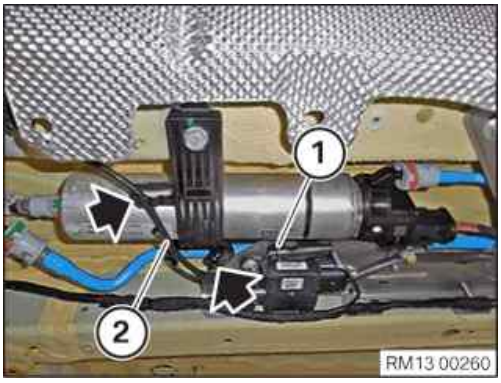


- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

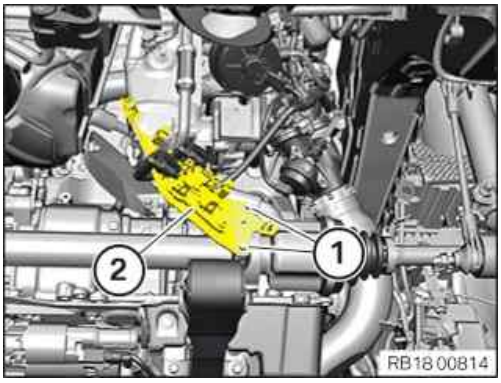
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

95 – Install holder for oxygen sensor



- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

96 – Installing the nitrogen oxide sensor before SCR catalytic converter

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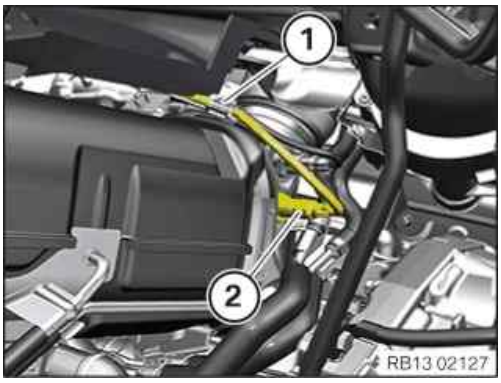
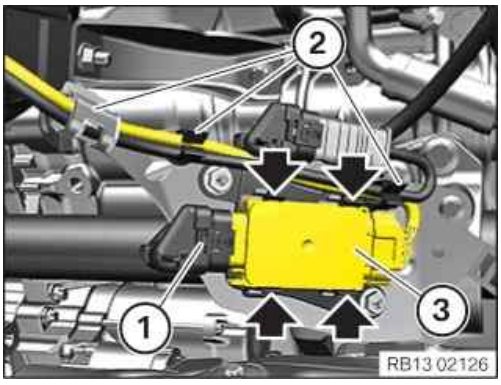


- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

97 – Install the monitoring sensor

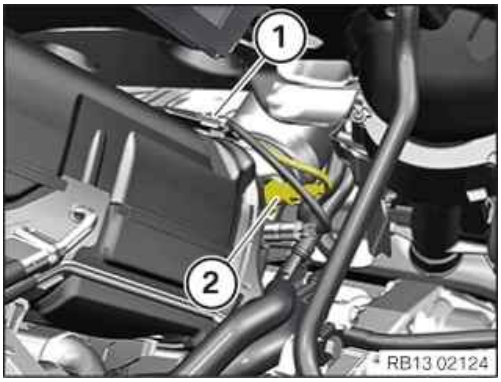
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

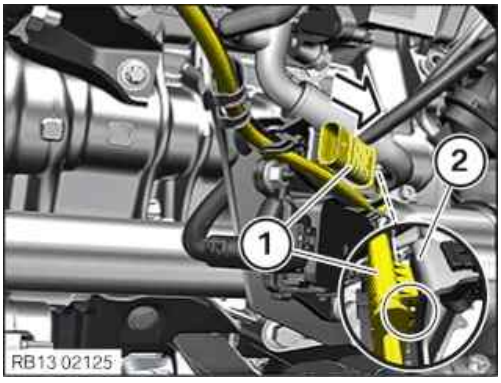


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.

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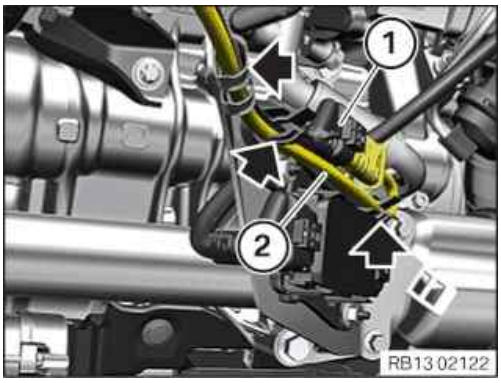


- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

98 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

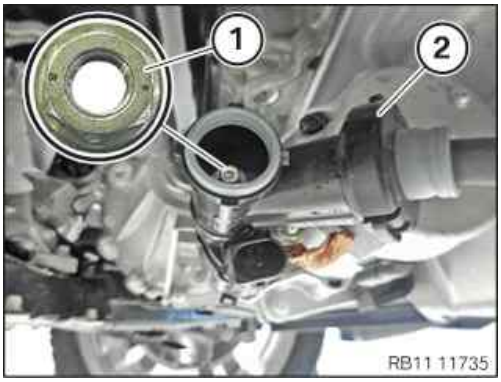
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

99 – Install exhaust system

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CAUTION

Component with heavy weight.

Danger of injury!

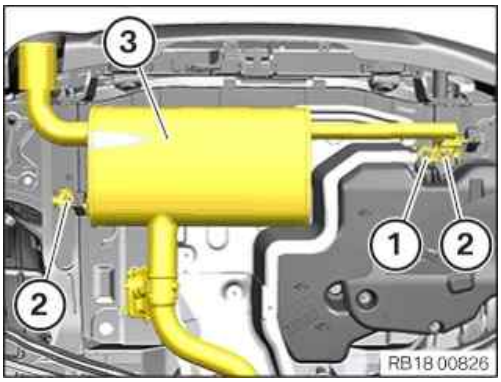
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert and install the exhaust system (3) with the help of another person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

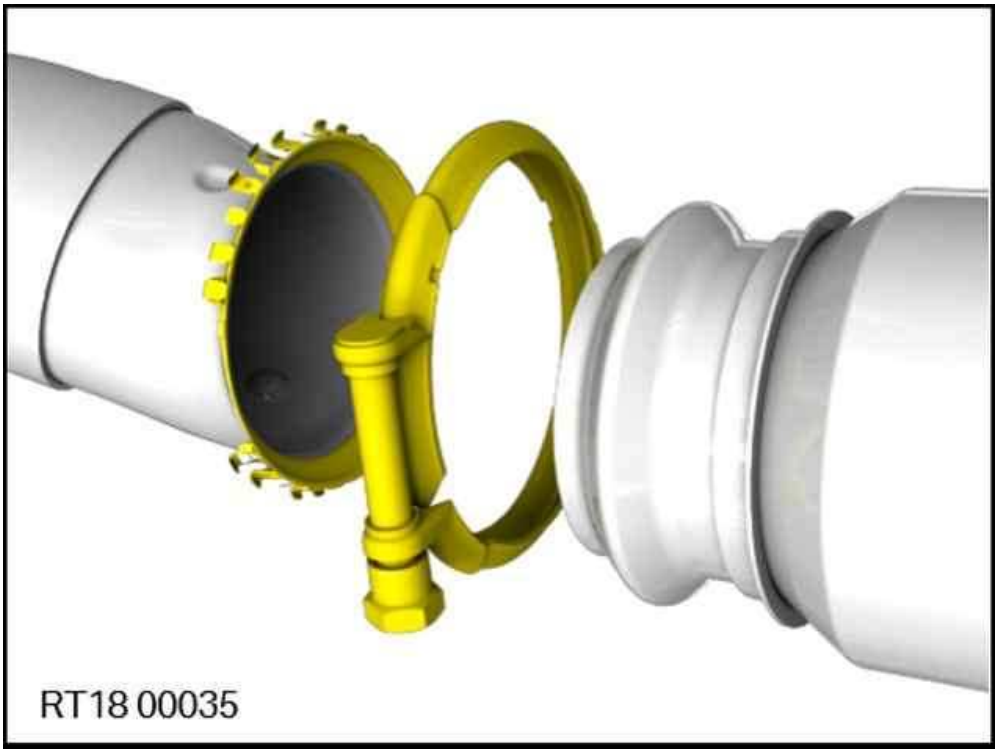
- Tighten down screw (1).

Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

▸ **Install the V-clip**

V-band clamp



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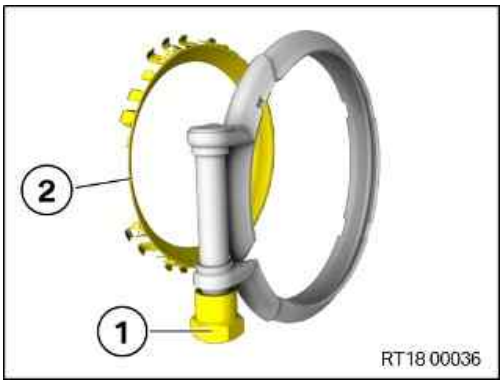
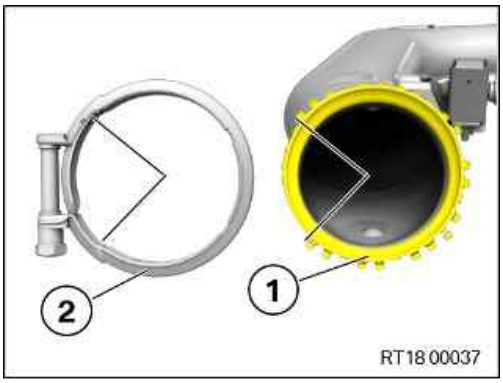
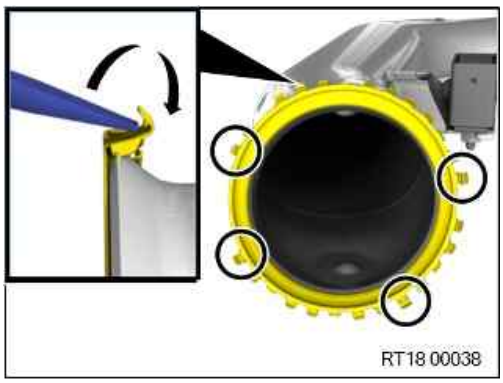


- Unscrew the nut (1) and remove the sealing ring (2).

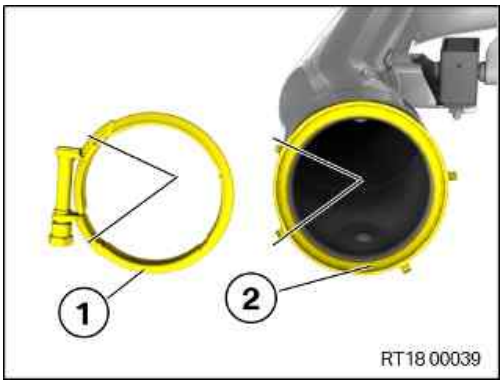


- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).

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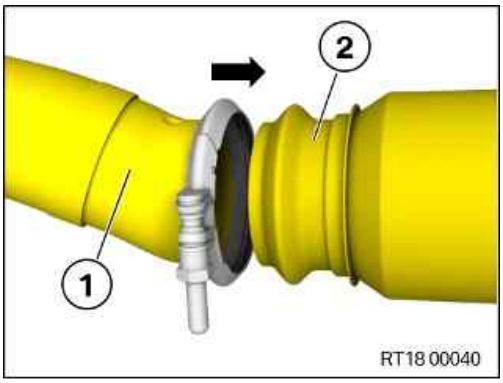
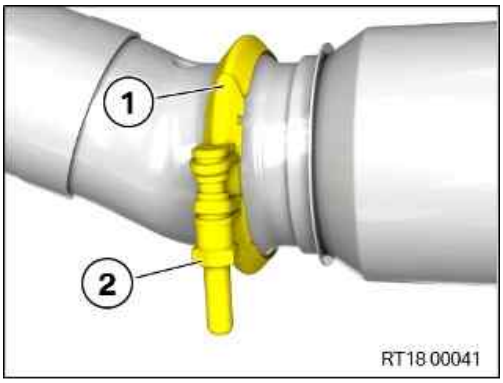


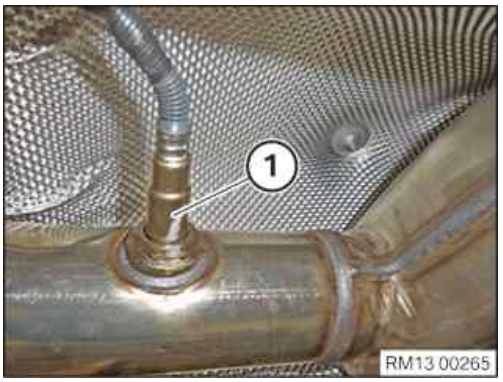
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

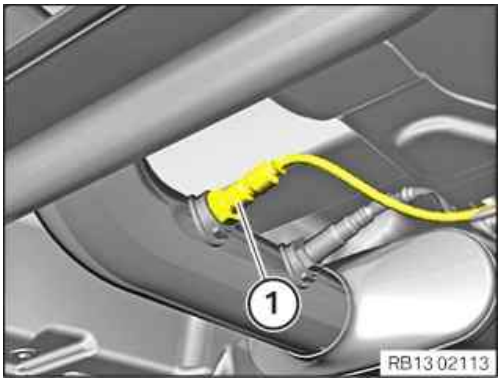
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Guide in, position and tighten the diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

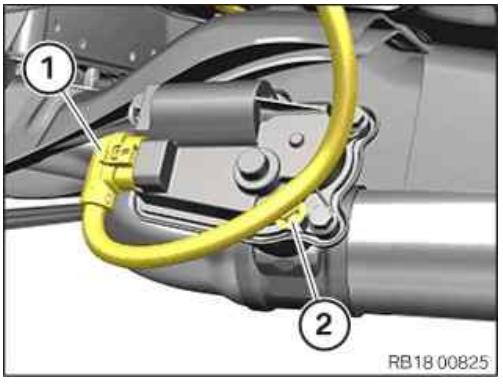
Sensor		Tightening torque	50 Nm



- Guide in, position and tighten the nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

100 – Install the cross-member with torsion struts

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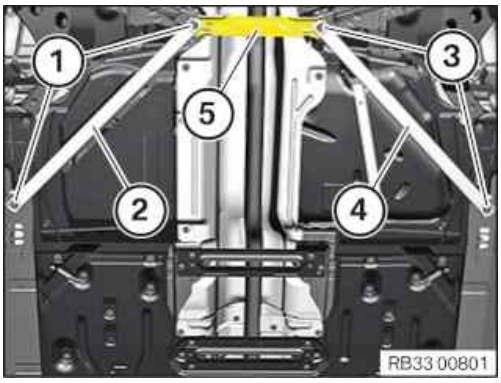


- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

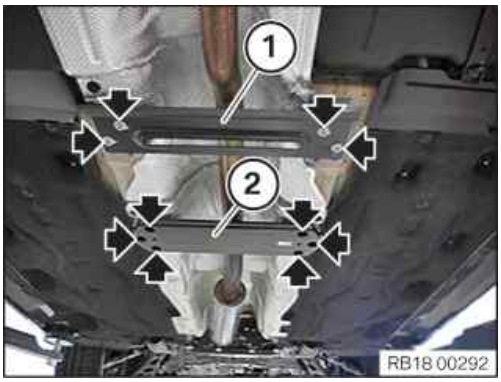
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

101 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

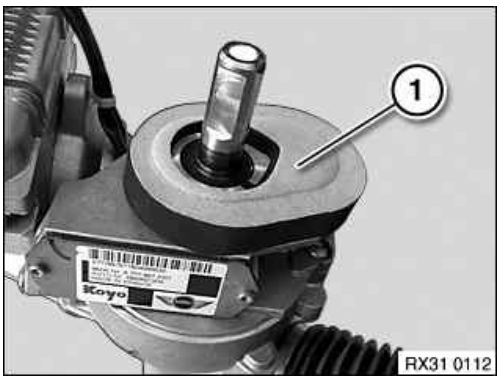
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

102 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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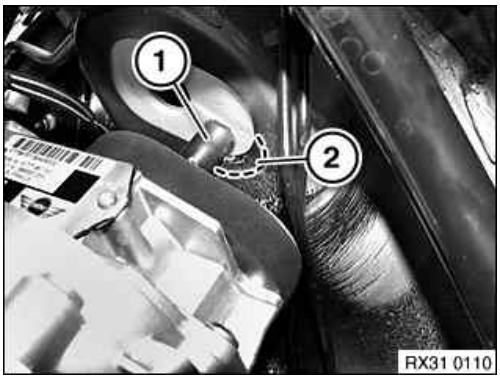
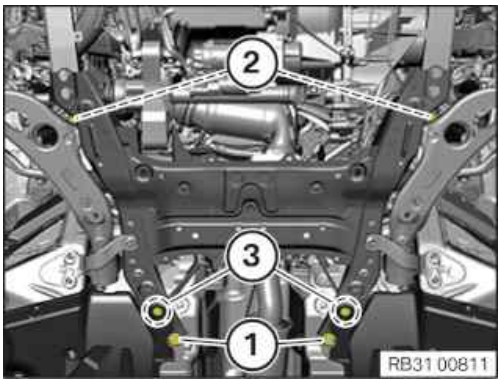


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

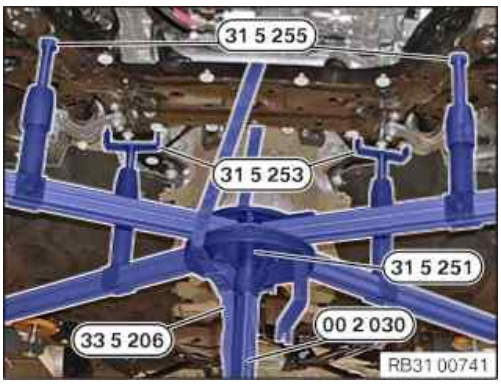
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.

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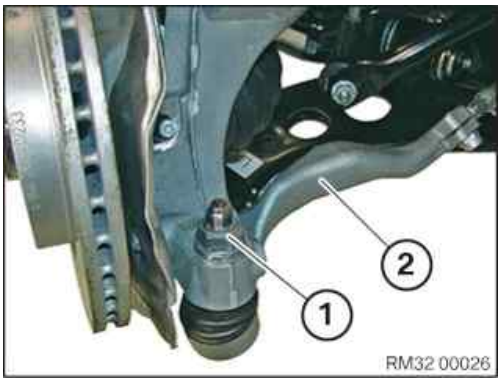


NOTICE

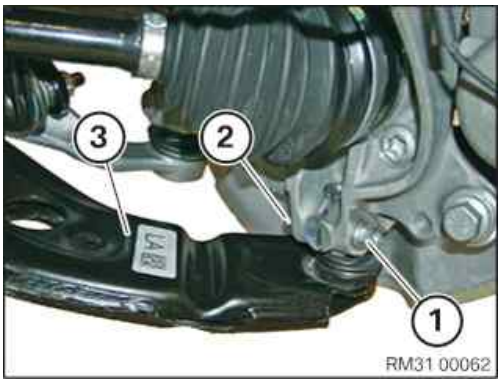
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

103 – Install the mounted parts on the front axle support

NOTICE

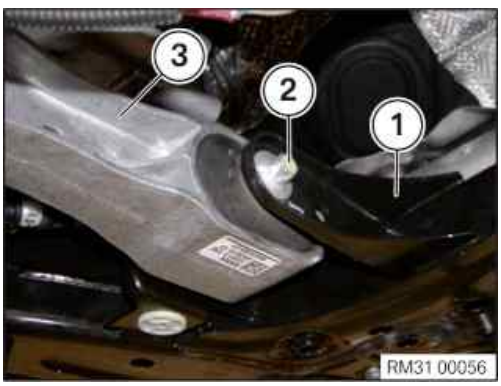
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

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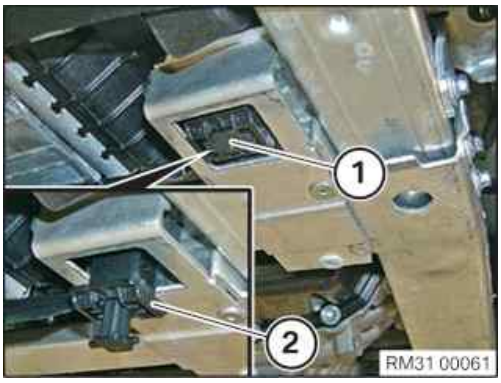
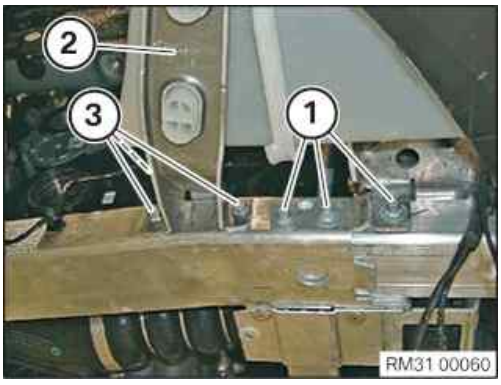


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

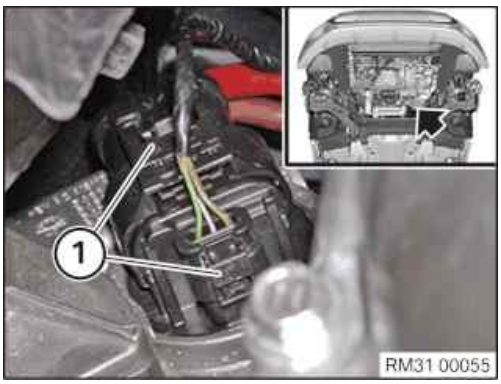
Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

104 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.

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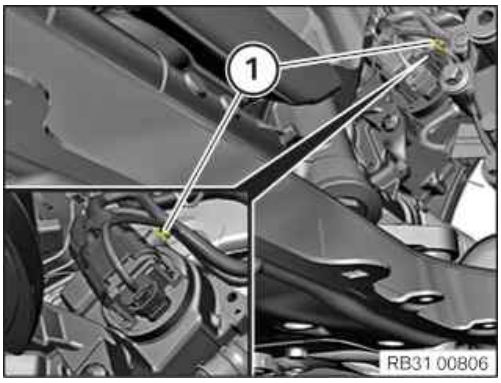
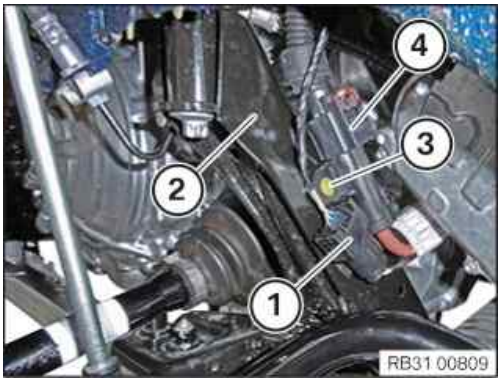


- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

105 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

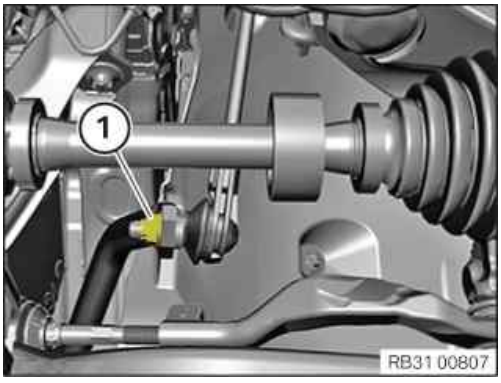
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

106 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

107 – With right installation: Securing the cable for the ride height sensor

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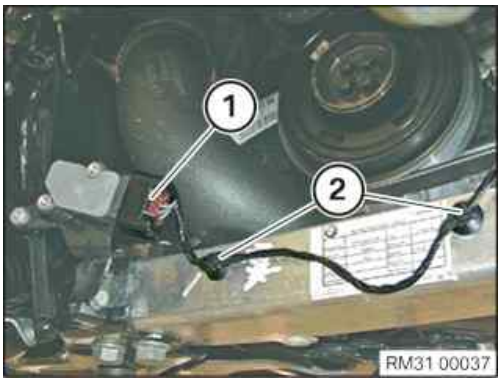


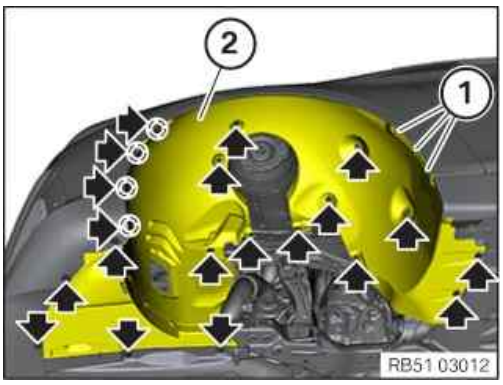
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

108 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▶ Installing the front wheel arch cover



- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

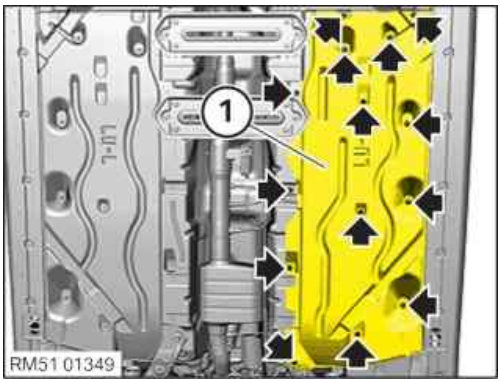
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

109 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

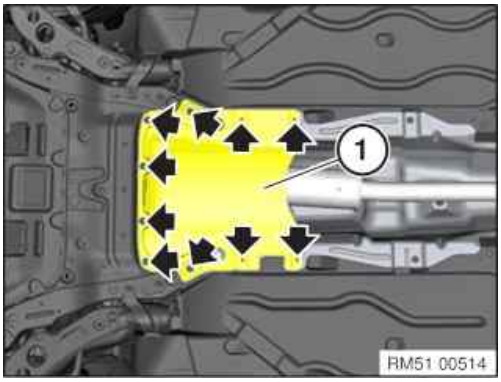
Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

110 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

111 – Mount the front left and right wheels

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▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

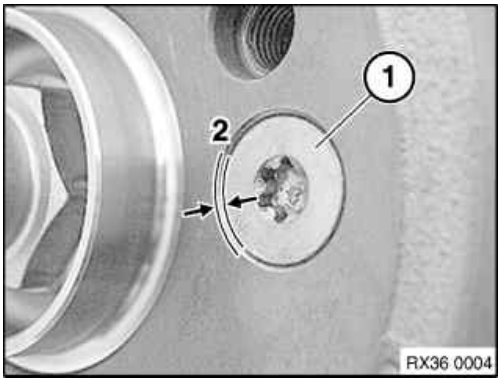
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

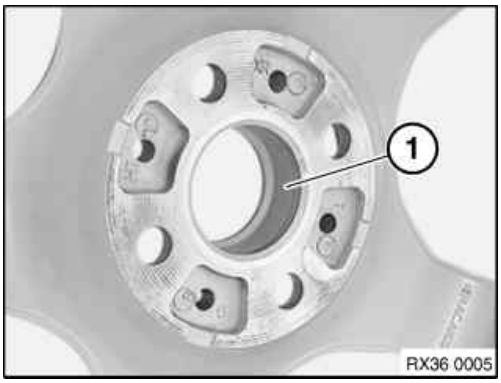
  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

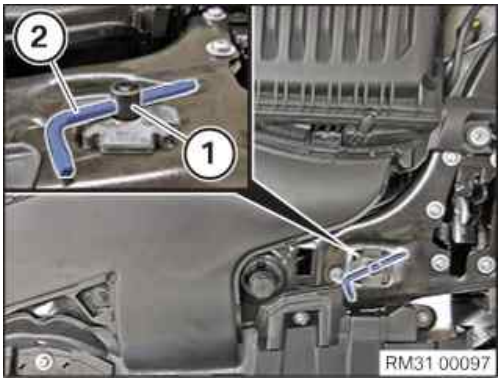
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

112 – Removing fastener for left and right radiator



NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

113 – Secure the steering shaft at the bottom on the steering gear

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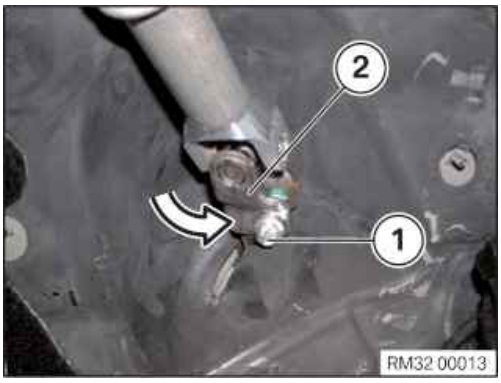
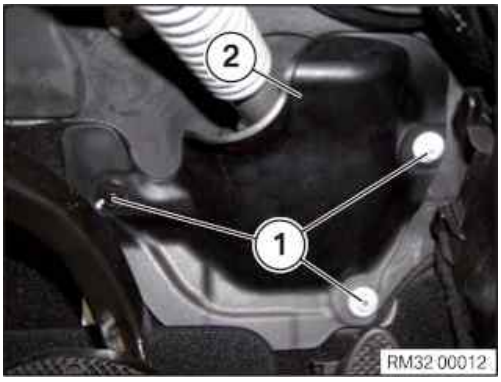


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

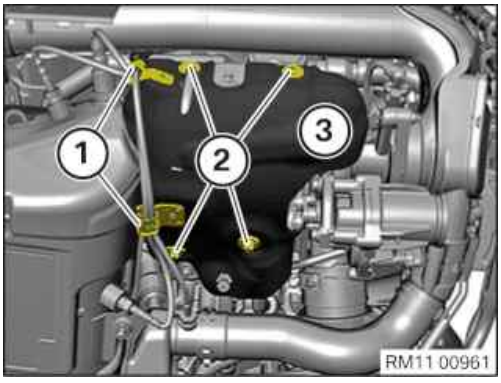
114 – Install the heat shield on the exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



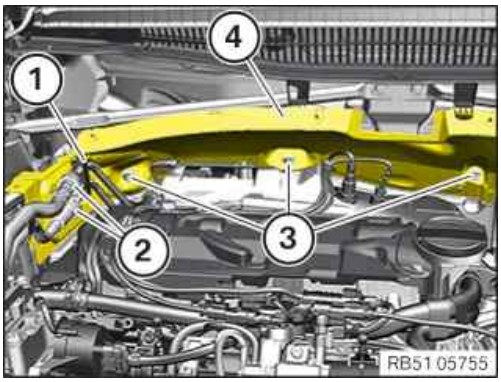
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

115 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

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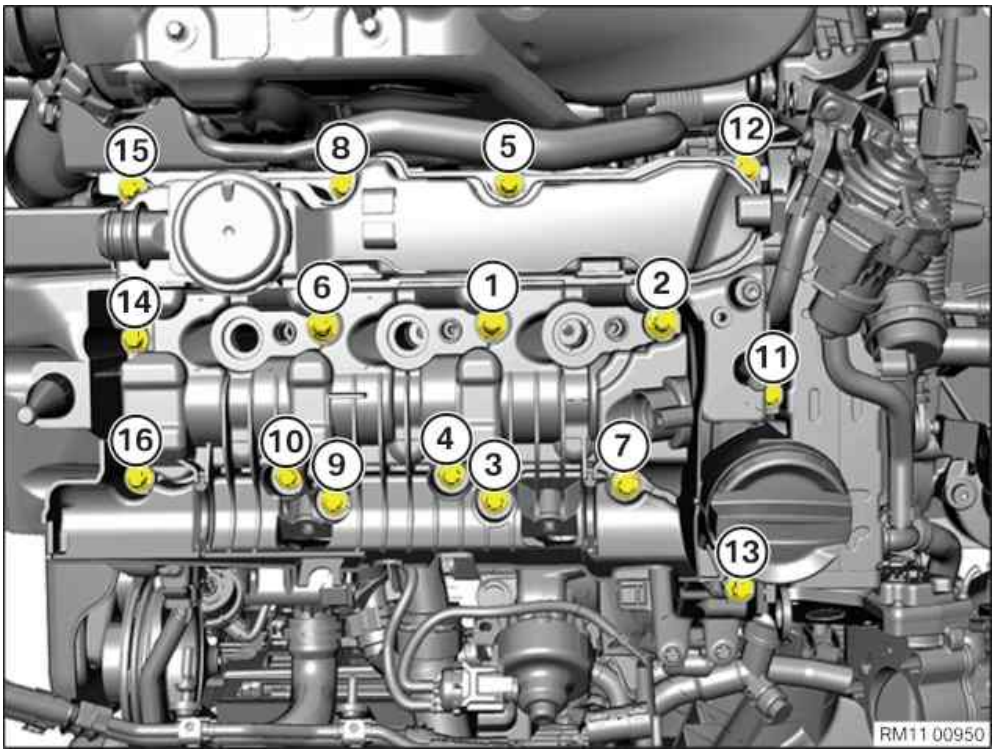
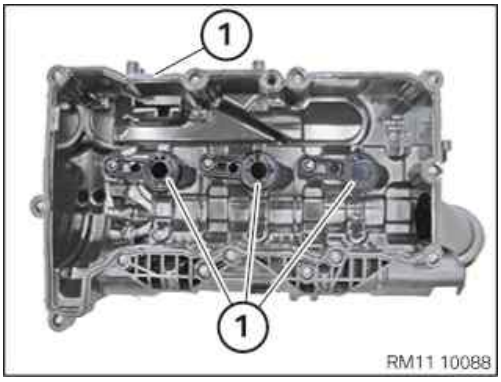
116 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover

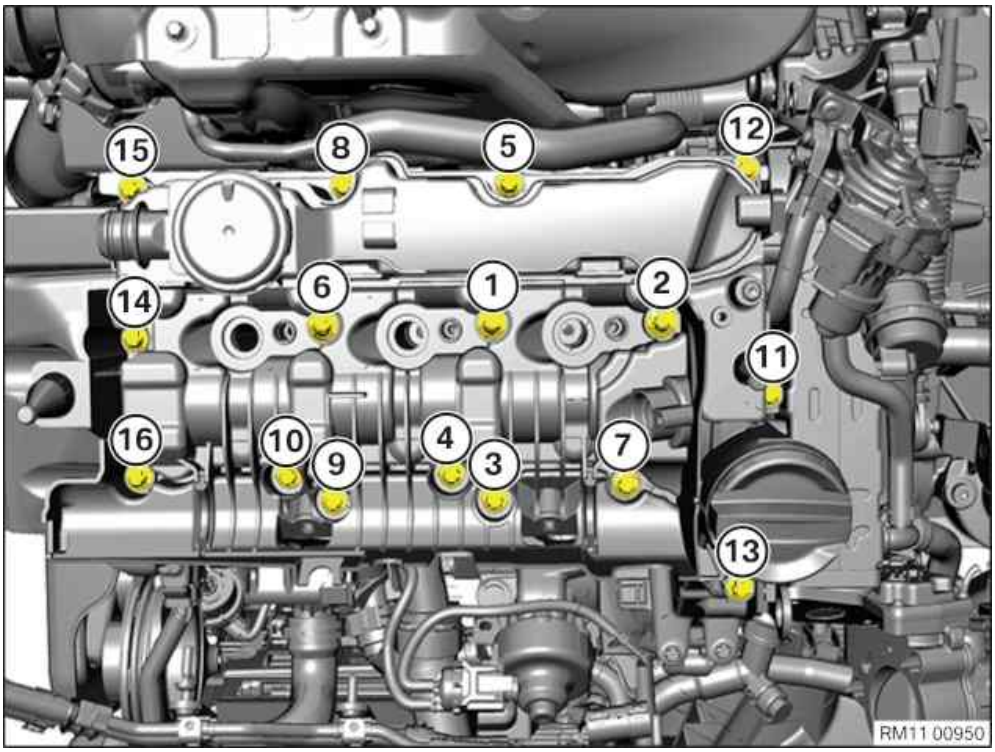


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8,5 Nm

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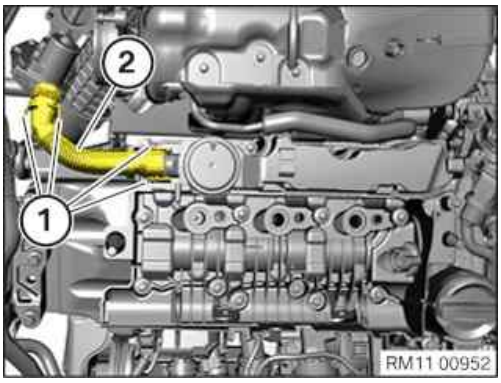
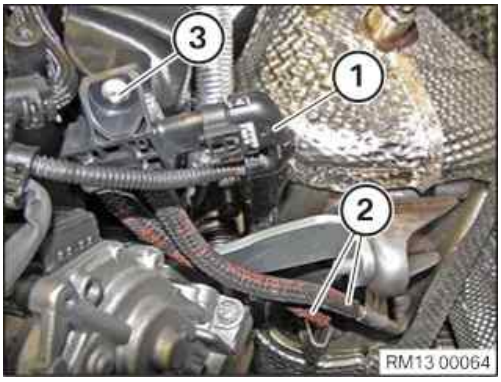


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

117 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

118 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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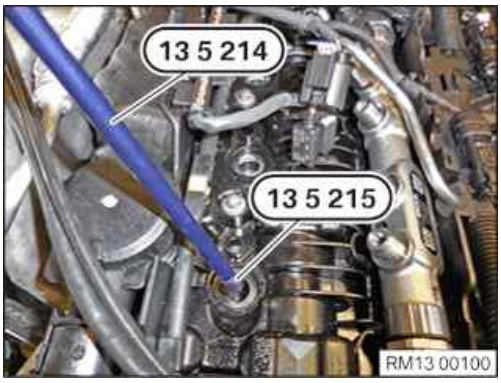
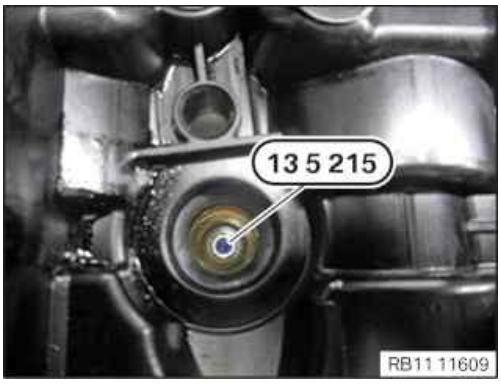


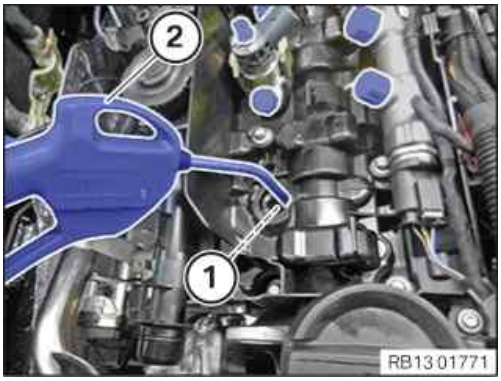
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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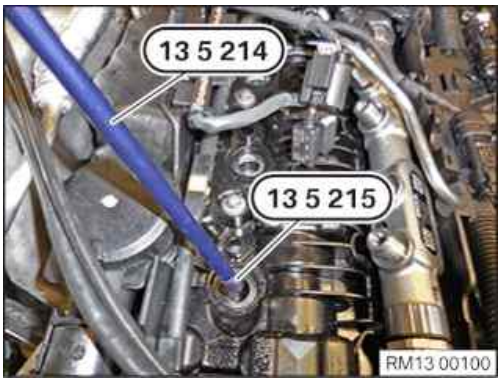


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

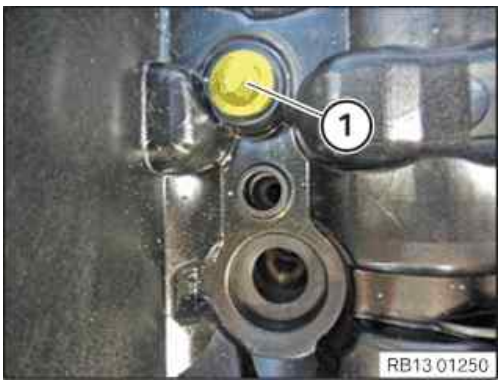
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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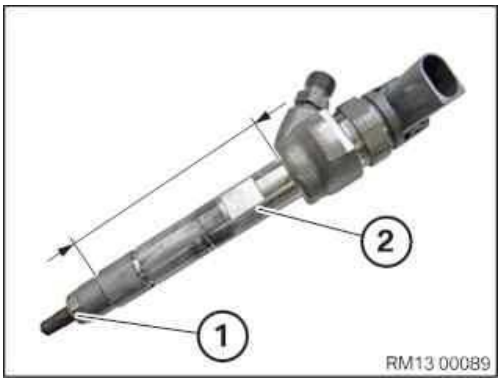


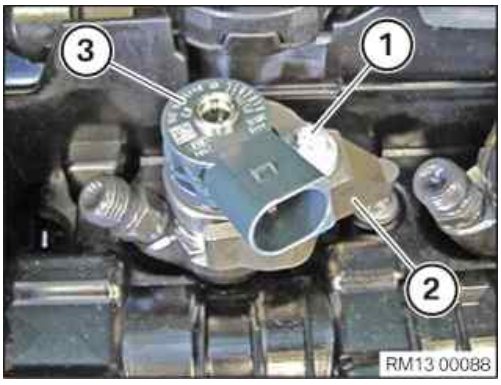
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

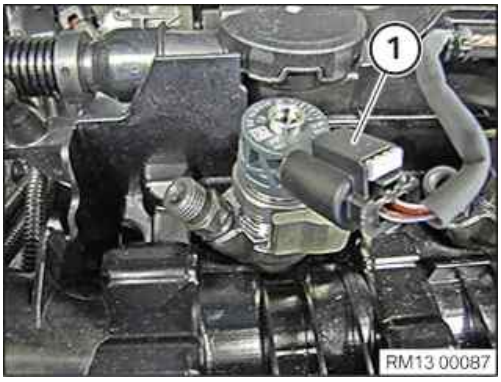
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

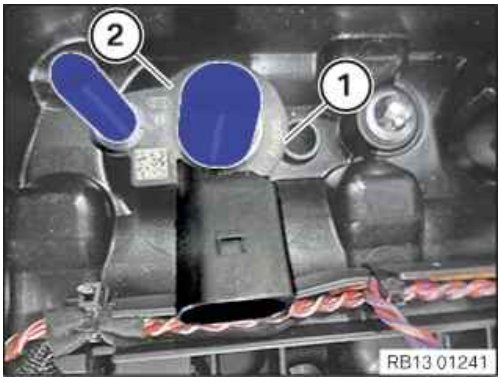
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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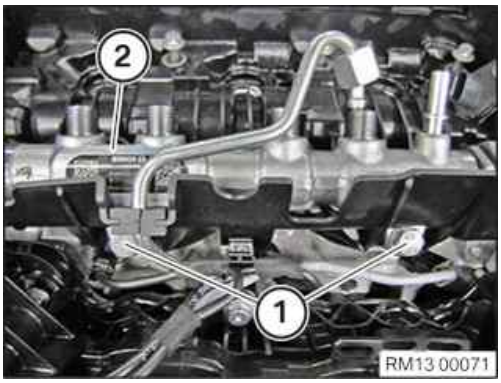
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

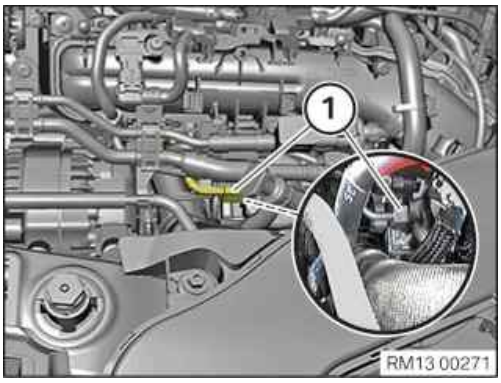
119 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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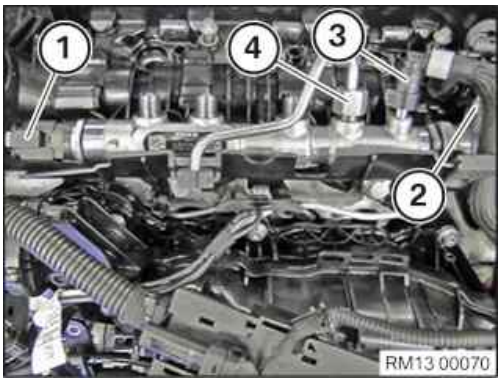

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

120 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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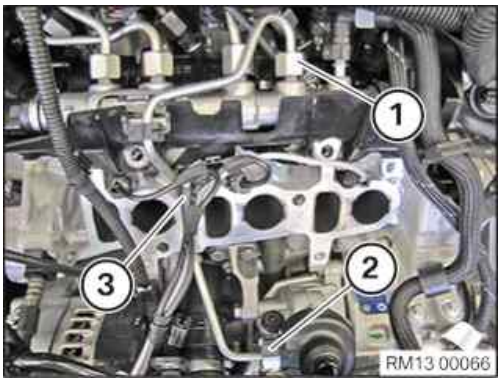

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

121 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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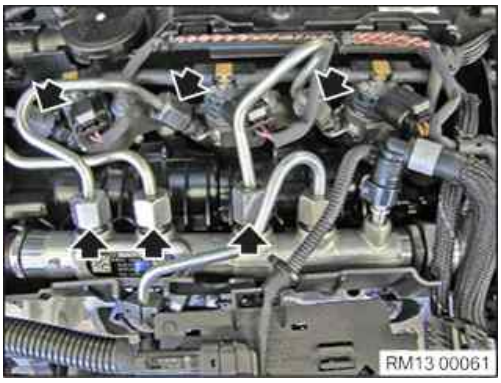

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

122 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

123 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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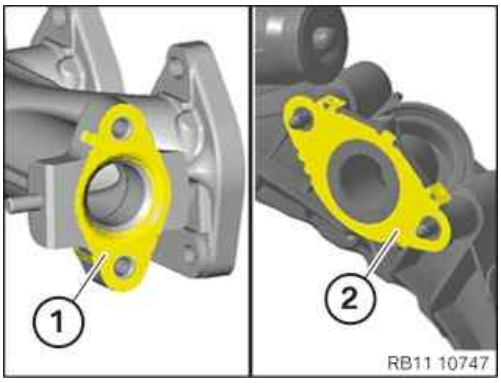
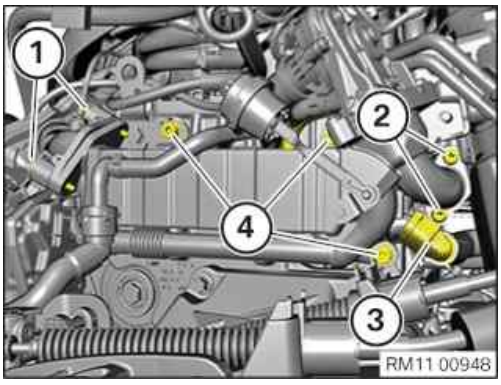


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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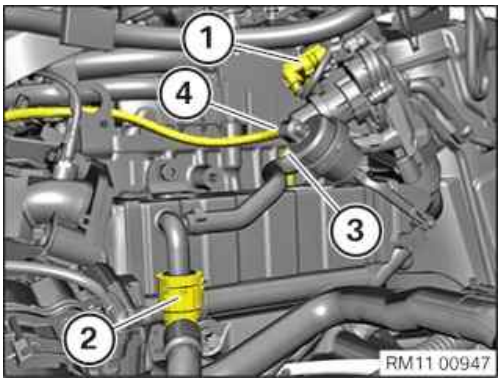


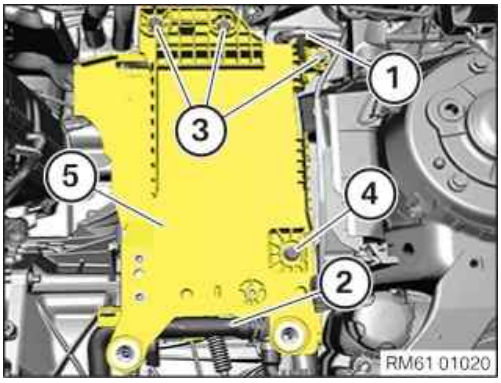
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

124 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

125 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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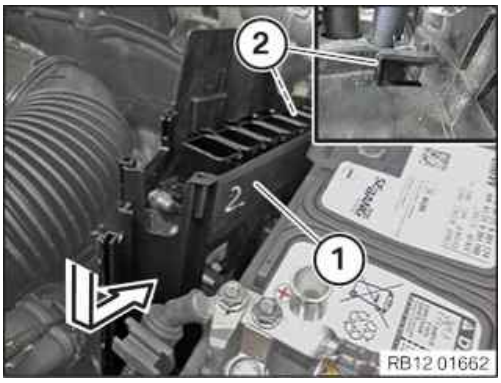
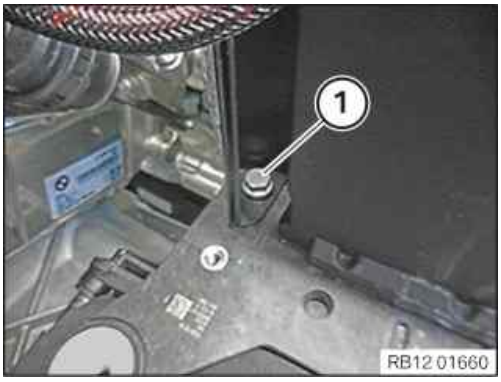


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

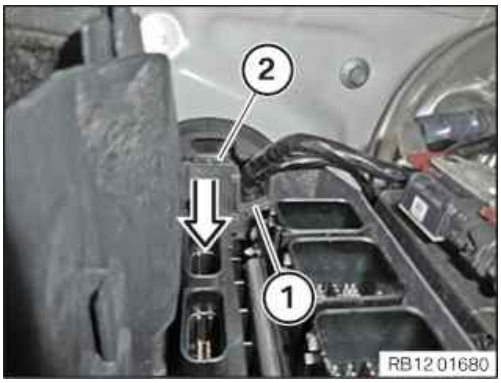
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



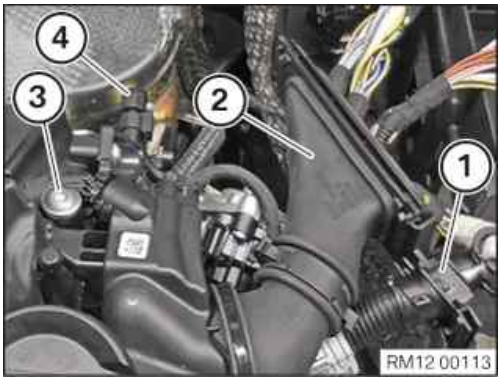
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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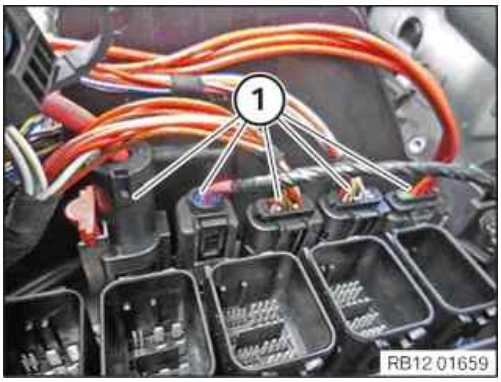
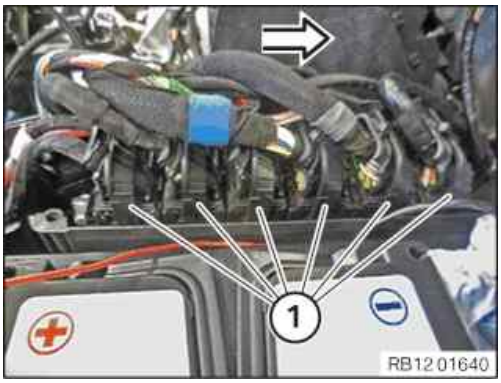
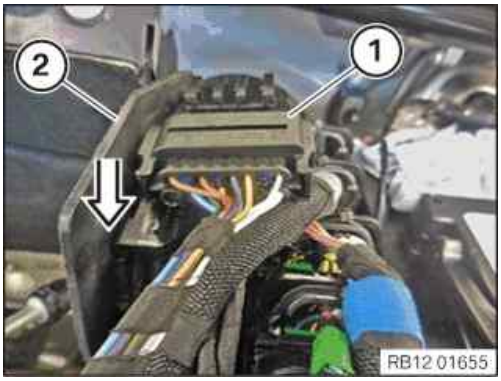


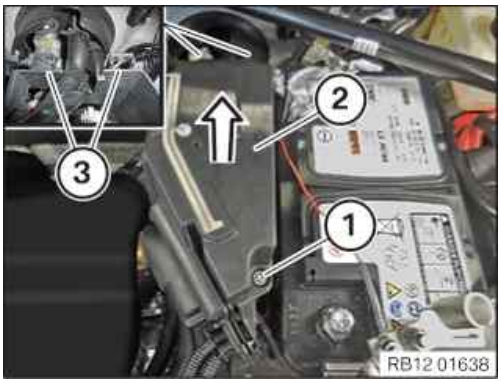
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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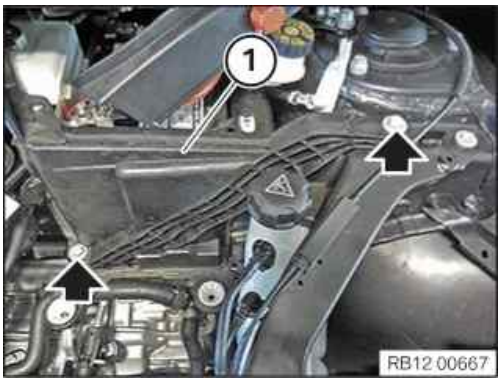


- Feed in and install tension strut (1).
- Tighten screws (arrows).

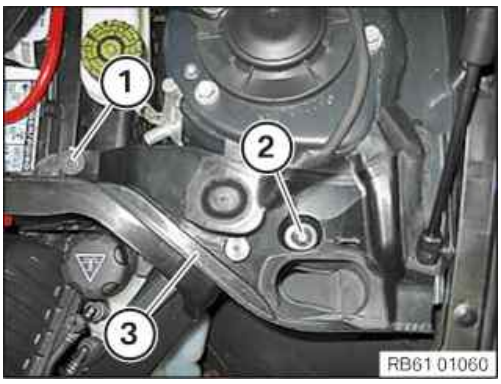
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

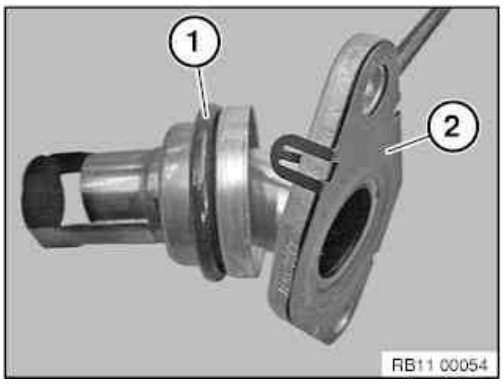


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

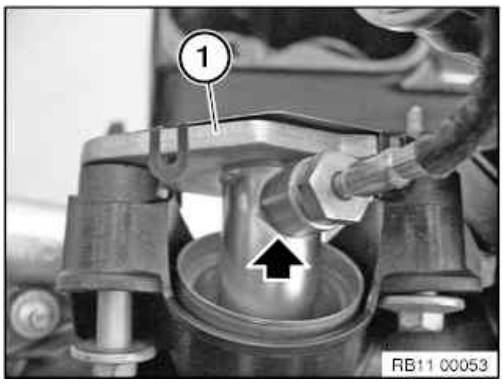
126 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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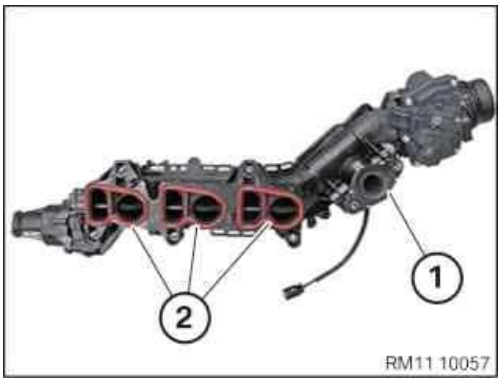
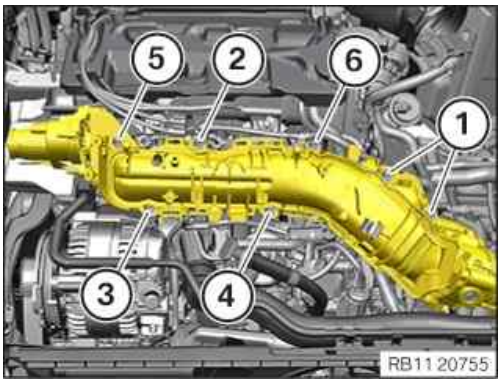


- Renew gaskets (2).

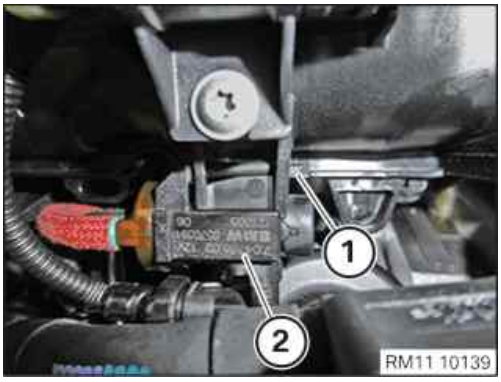
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



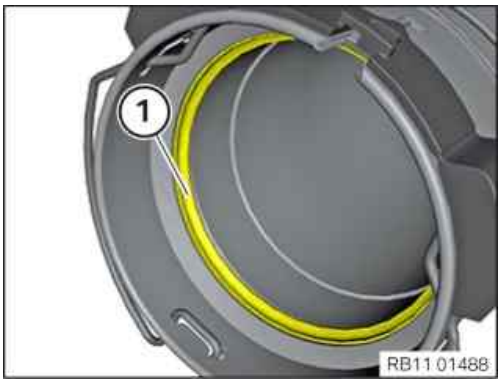
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

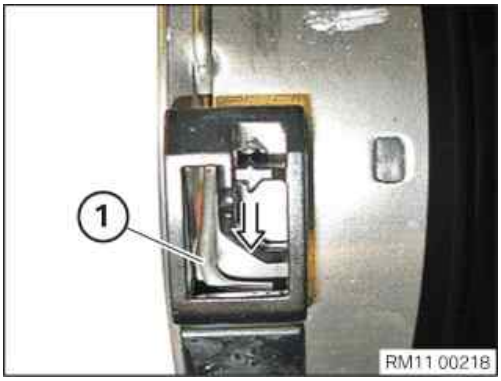


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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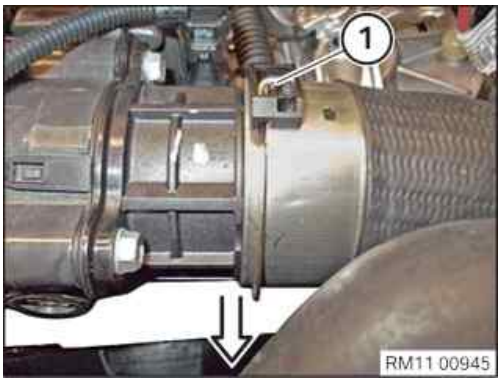
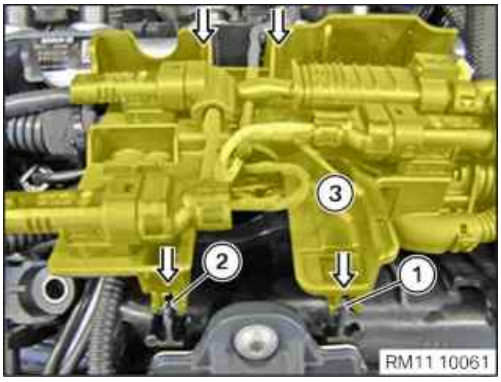


- Connect the charge air line to the throttle valve.
  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

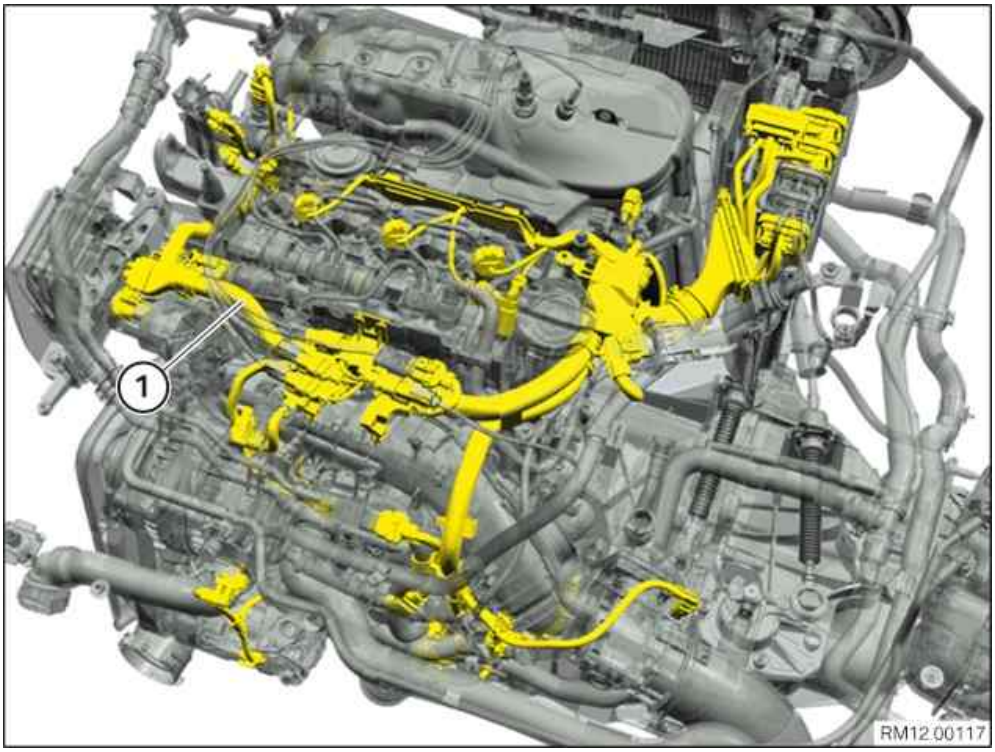
127 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

128 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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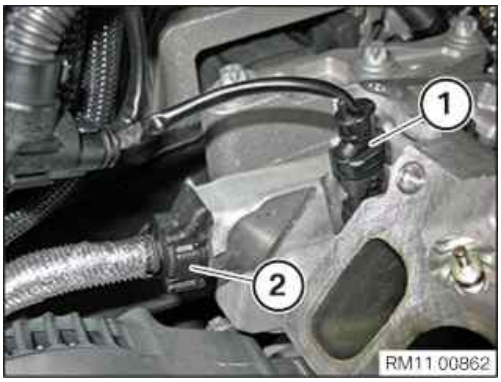
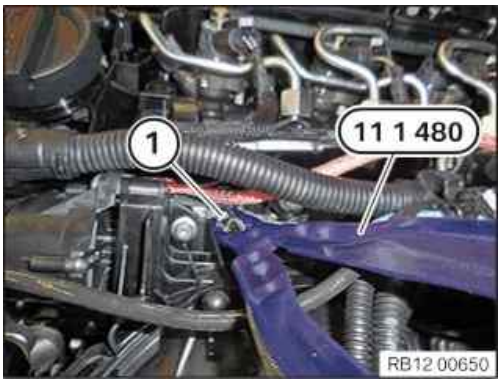
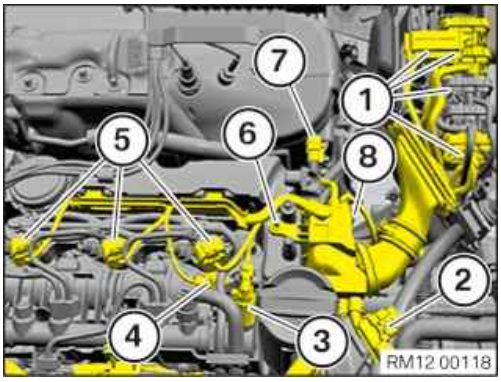


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

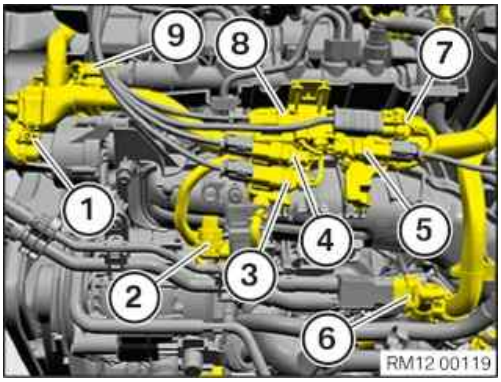


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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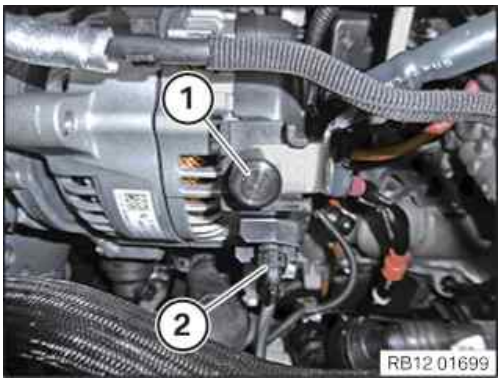
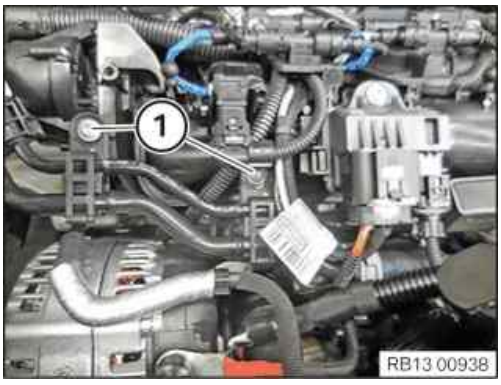


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

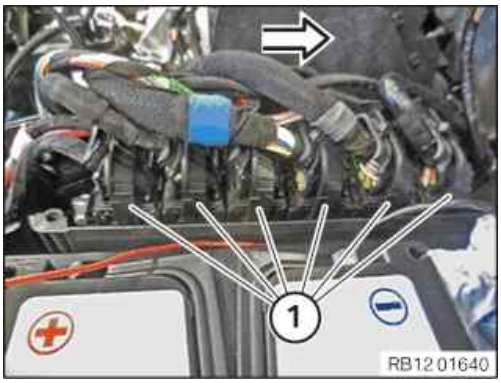


- Position fuel lines.
- Tighten the screws (1).

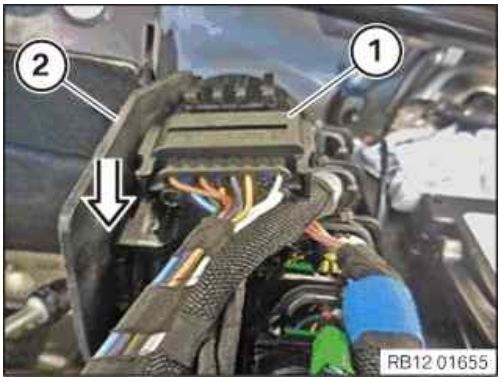
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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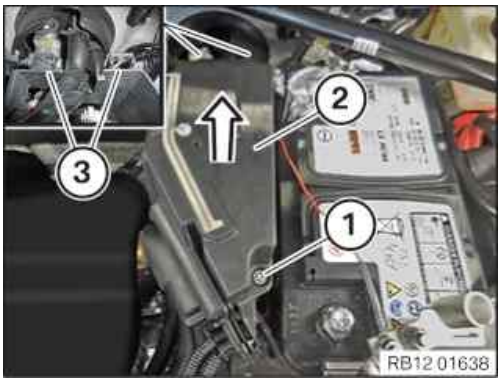
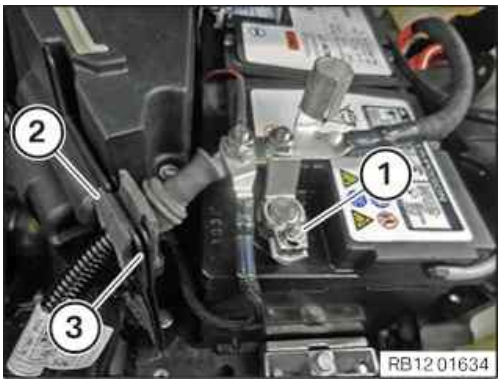


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

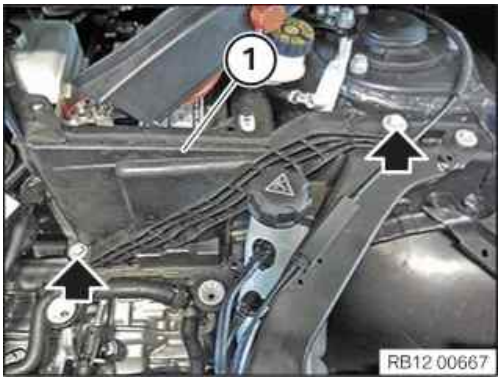
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

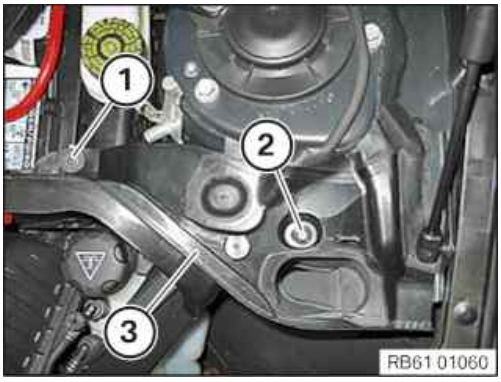
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm

129 – Installing clean air pipe

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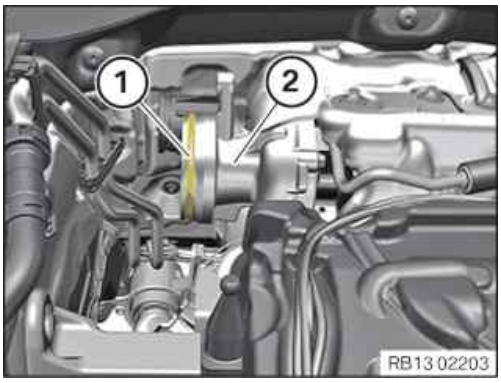
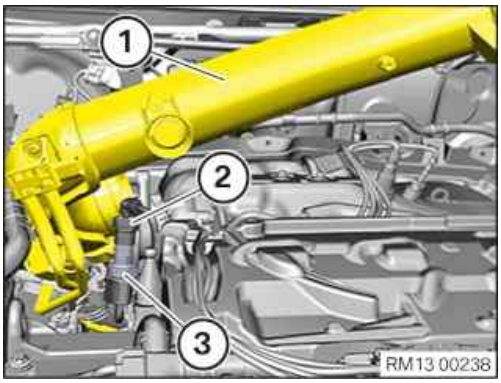


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



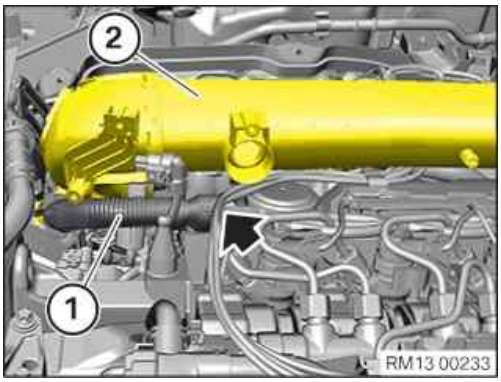
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

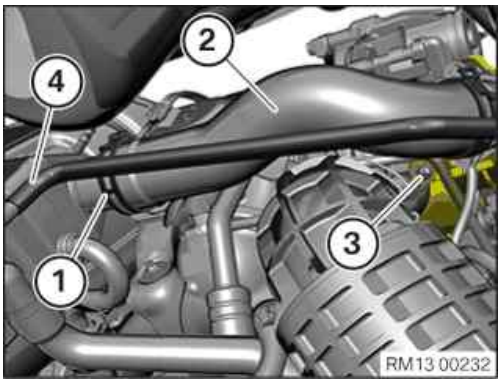
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

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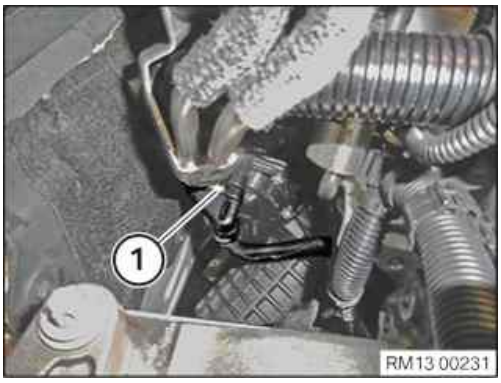
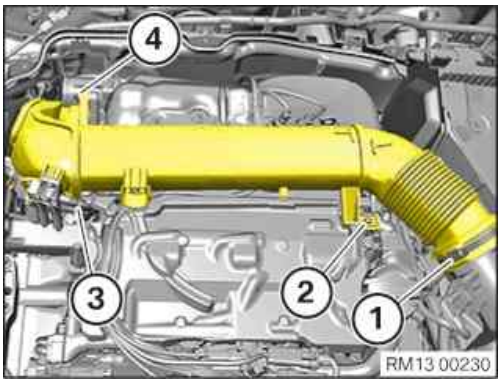


- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

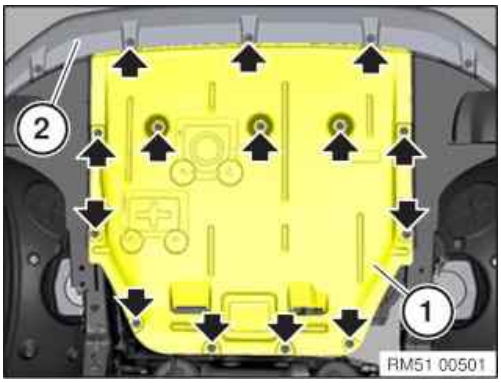
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

130 – Installing the front underbody protection

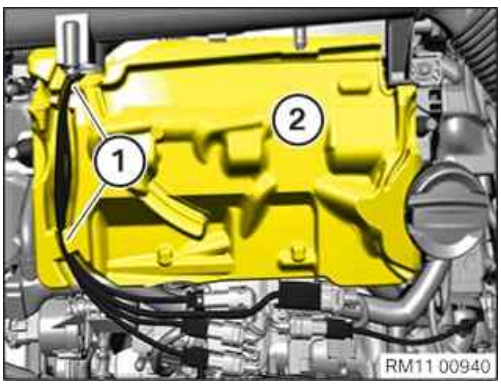


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

131 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

132 – Install resonator

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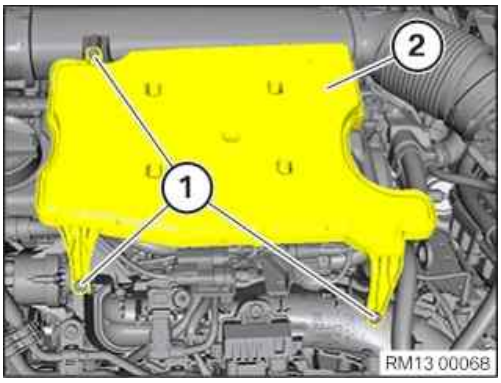

- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

133 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

134 – Install the rear cowl panel cover

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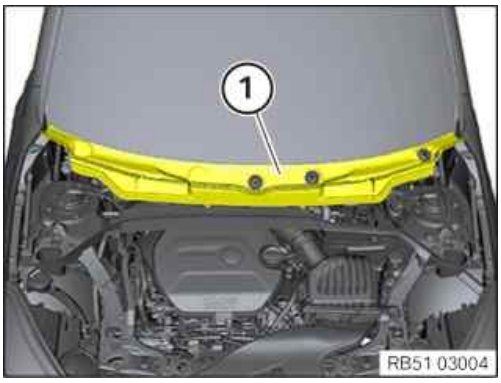
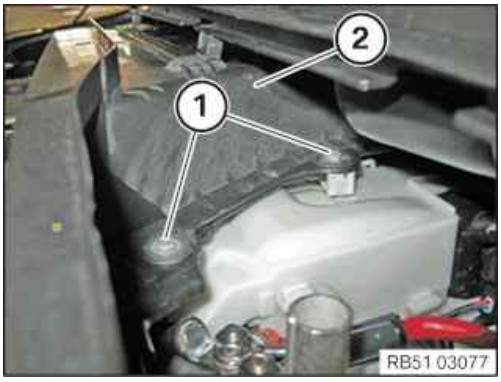


- Feed in and engage the rear cowl panel cover (1).

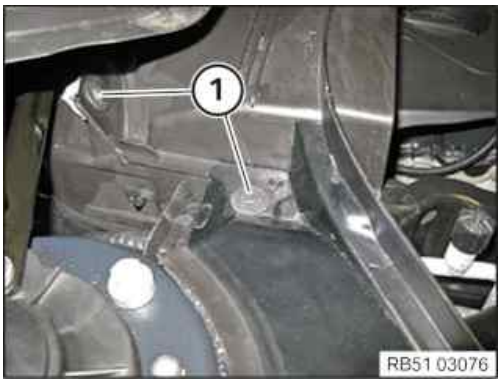
135 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

136 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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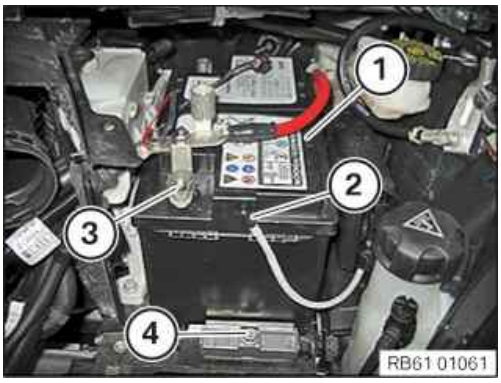


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

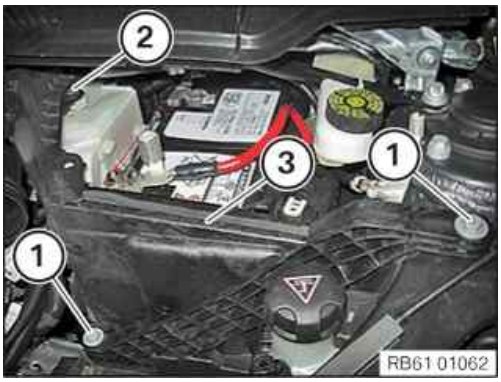
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

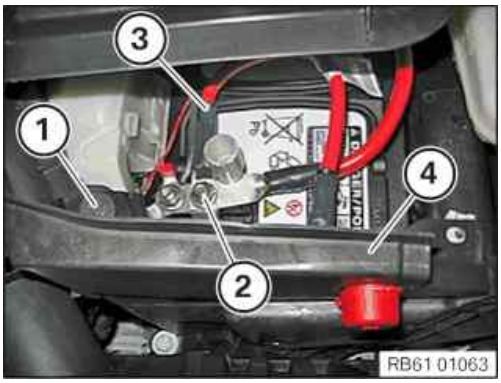
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

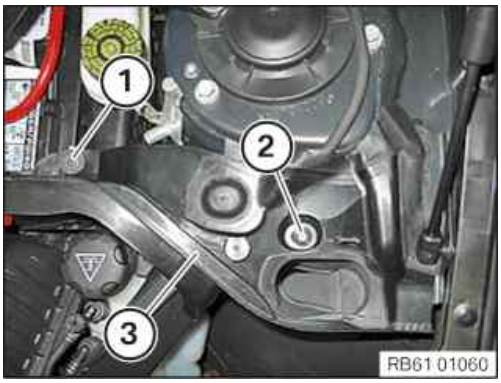
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

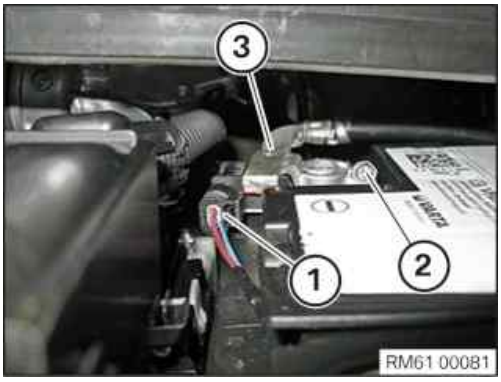
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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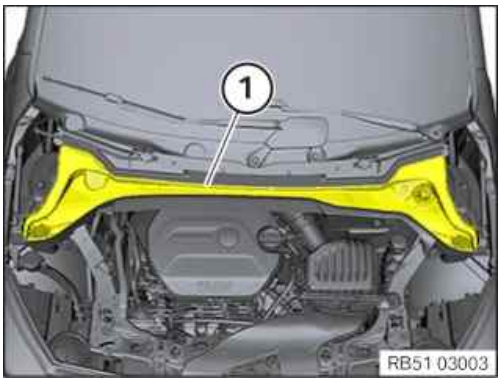
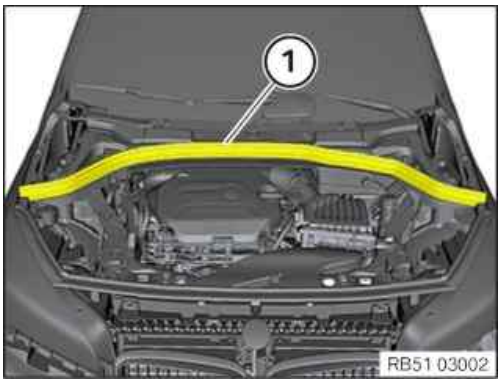


- Feed in the cowl panel cover (1).



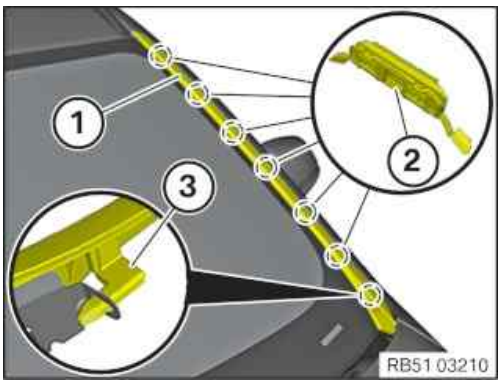
- Press the gasket (1) in a downwards direction.

137 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

138 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

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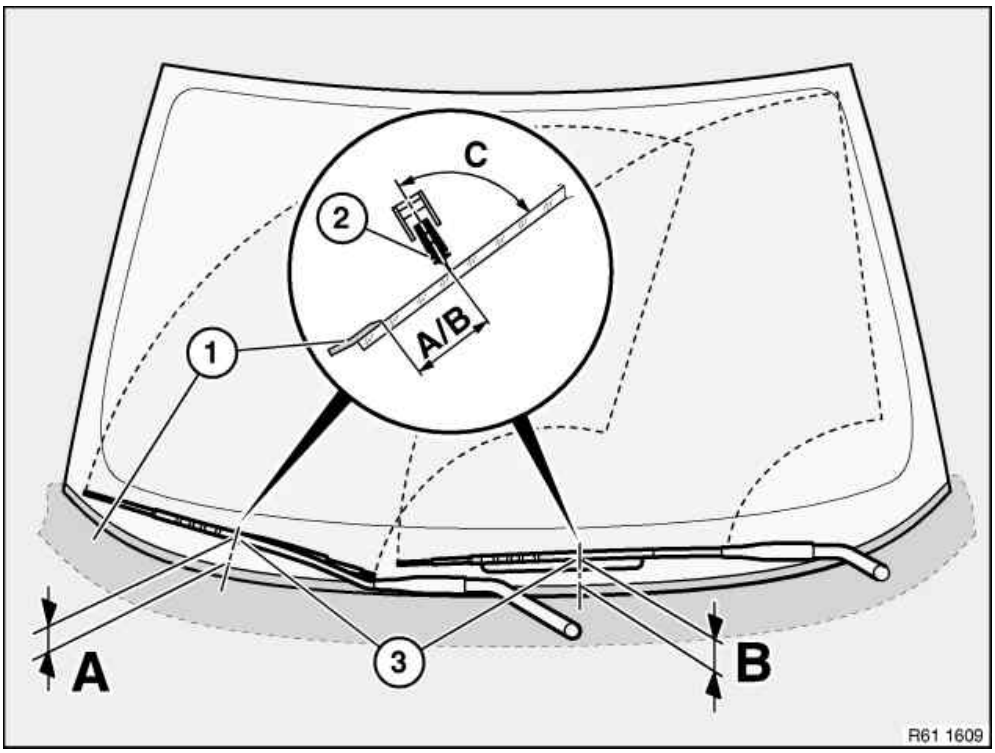
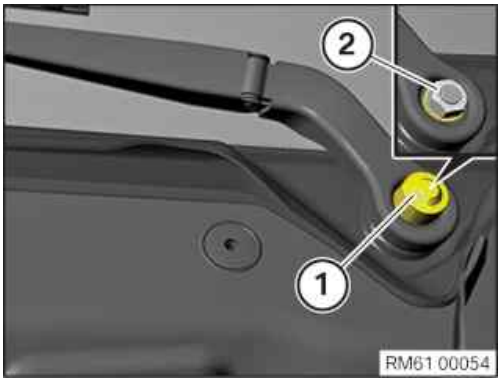
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

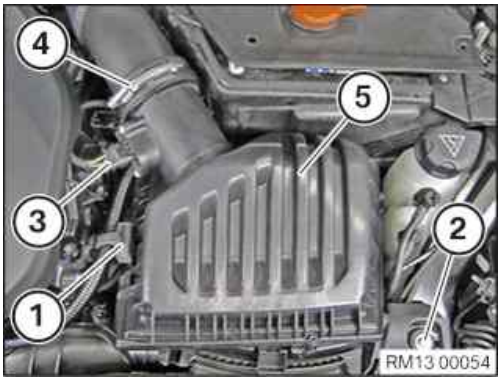
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

139 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

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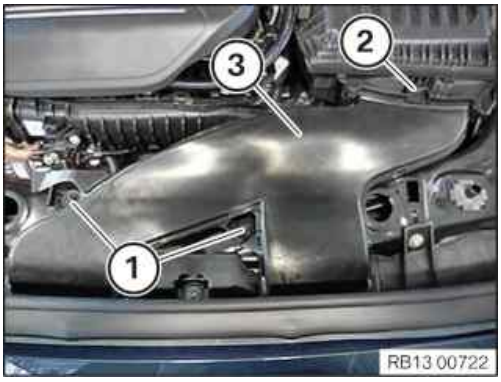
140 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

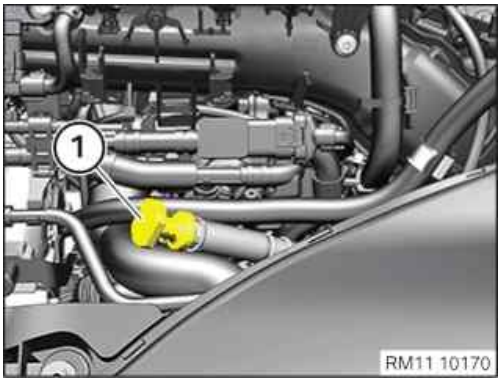
141 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

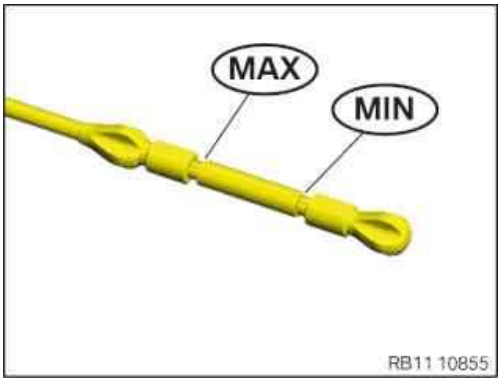


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

142 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Bracing strut to top cross connection — Used in step 32

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 32

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 32

M6x20		Tightening torque	12 Nm

Rear end of front axle support to body — Used in step 67 102

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 67 102

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 67 102 110

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 67

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase — Used in step 74

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 74

M8x40		Tightening torque	19 Nm

Engine support to cylinder head — Used in step 74

M10X45		Tightening torque	41 Nm

Right engine mount to cylinder head — Used in step 74

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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Glow elements to cylinder head

Used in step 74

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 75

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 77

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 77

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 77

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 78

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 79

M7x17.			17 Nm

Exhaust manifold to cylinder head

Used in step 84

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 84

Hollow bolt		Renew sealing rings.	30 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 84 123

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust turbocharger to exhaust manifold

Used in step 86

V-band clamp		Tightening torque	19 Nm

Oil feed line to exhaust turbocharger

Used in step 86

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Oil return line to turbocharger

Used in step 86

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 86

M8x16		Tightening torque	22 Nm

Charge air line to crankcase

Used in step 87

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 87

M6		Tightening torque	8 Nm

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Heat shield for exhaust turbocharger

Used in step 88 89 114

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head

Used in step 88

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 90

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 90

M8 hexagon nut		Tightening torque	19 Nm

SCR metering module V-clip to exhaust system

Used in step 90

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 90

Torx bolt BM6x16		Tightening torque	8 Nm

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Used in step 90

Flange nutM8		Tightening torque	19 Nm

Control sensor

Used in step 91

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 92 93

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 94

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 95

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 96

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 97

Sensor		Tightening torque	50 Nm

Starter motor to transmission

Used in step 98

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 98

M8		Tightening torque	13,5 Nm

Exhaust system to body

Used in step 99

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 99

Hexagon screw M8x30		Tightening torque	19 Nm

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V-clip to catalytic converter

Used in step 99

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 99

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 99

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 100

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

Front connection carrier to body

Used in step 101

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 101

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing

Used in step 102

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 102

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 103

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support

Used in step 103

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 103

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 103

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 104

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 106

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 108

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 108

Plastic nut		Tightening torque	3 Nm

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Underbody panelling, side

Used in step 109

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 109

Plastic nut		Tightening torque	2,6 Nm

Brake disc to front wheel hub

Used in step 111

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

Used in step 111

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 111

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 113

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 113

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 115

Oval-head screw		Tightening torque	5 Nm

Cylinder head cover to cylinder head

Used in step 116

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 117

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 117 129

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 118

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 118

Screw		Jointing torque Angle of rotation	8 Nm 120 °

Rail on cylinder head cover

Used in step 119

Torx screw M8x25		Tightening torque	19 Nm

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High pressure line between high pressure pump and rail — Used in step 119 120

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail — Used in step 121

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 123

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler — Used in step 123

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head — Used in step 123

M8x20		Tightening torque	19 Nm

Battery holder to engine support — Used in step 124

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray — Used in step 125

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 125 128

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 125 128

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 125 128

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 125 128

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 125 128

		Tightening torque	3 Nm

Battery cover — Used in step 125 128 136

Screw			2,8 Nm

Intake plenum to cylinder head — Used in step 126

M6		Tightening torque	11 Nm

Positive battery cable to alternator — Used in step 128

M8		Tightening torque	19 Nm

Fuel line to intake plenum — Used in step 128

TS6x20		Tightening torque	5 Nm

Exhaust gas pressure sensor — Used in step 129

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

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Clean air pipe to exhaust turbocharger — Used in step 129

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 129

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 129 139

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 130

			3 Nm

Resonator to manifold and clean air pipe — Used in step 132

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 135

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 136

M8 screw		19 Nm

Positive battery terminal — Used in step 136

NutM6		5 Nm

Trailing link — Used in step 136

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 136

Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 136

NutM6		5 Nm

Windscreen wiper arm — Used in step 138

Combination hexagon nut		Tightening torque	35 Nm

Intake silencer housing to lock bridge — Used in step 139

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 140

M6		Tightening torque	8 Nm

Overview of Special Tools

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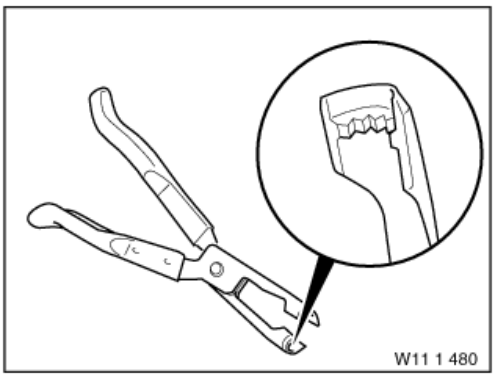
0 490 796 (11 1 480) Pliers



Common	Used in step 20
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common	Used in step 24 25 26 119 120 121
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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2 413 106 Fastener

Common Used in step 24 25 120 121

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller

Used in step 27

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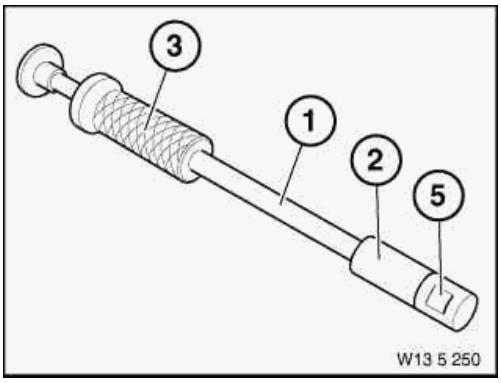

Common

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common

Used in step 27

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common

Used in step 27

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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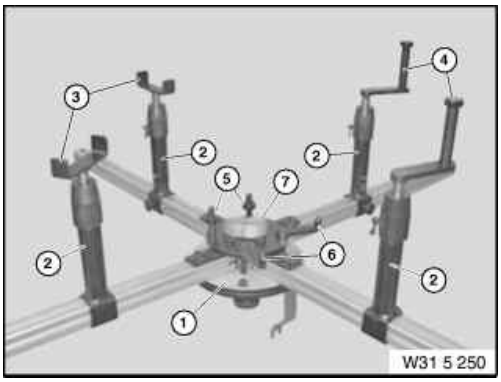
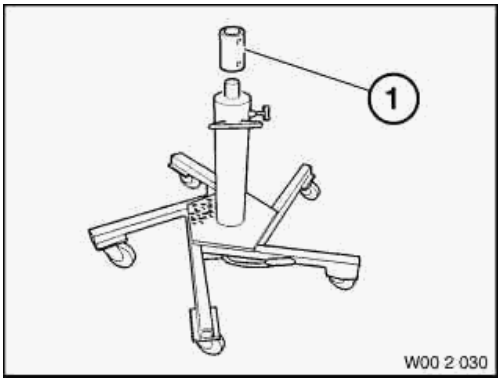
0 495 817 (31 5 251) Basic body



Common Used in step 43 67 74 102

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



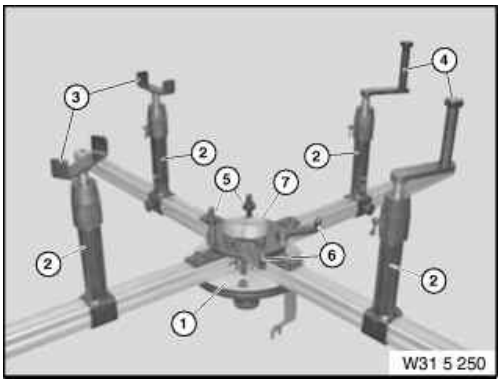
Common Used in step 43 67 74 102

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 821 (31 5 255) Adapter



Common Used in step 43 74

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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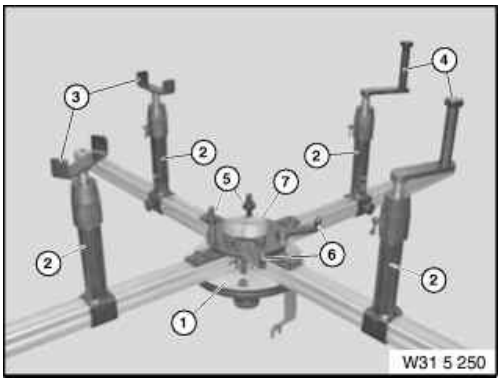
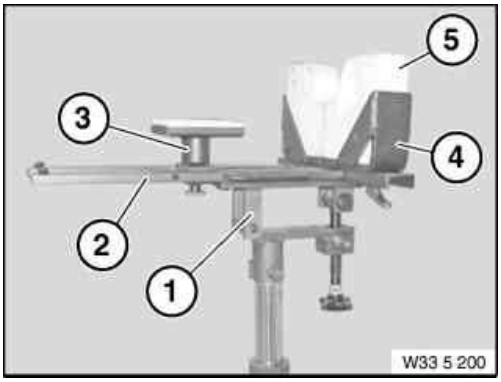
0 495 819 (31 5 253) Adapter



Common	Used in step 43 74
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt



Common	Used in step 43 67 74 102
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

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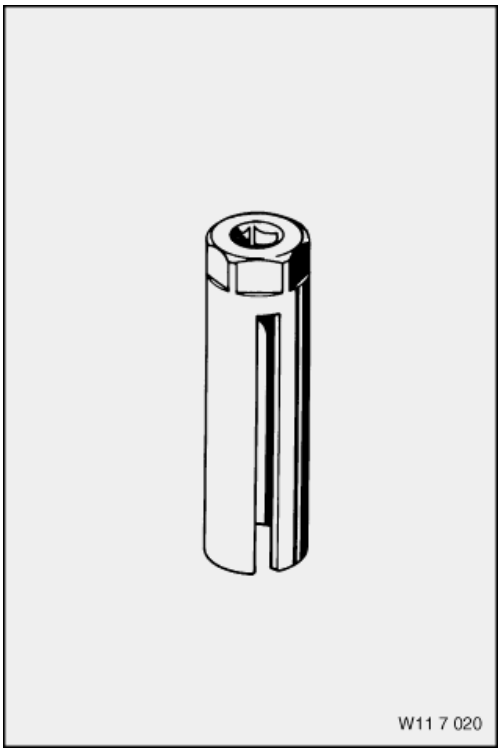
0 491 074 (11 7 020) Socket wrench insert



Common

Used in step 48 49 97

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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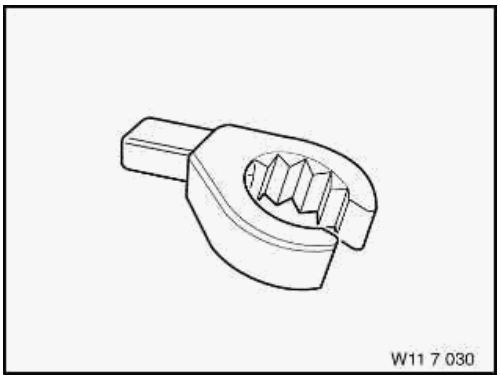
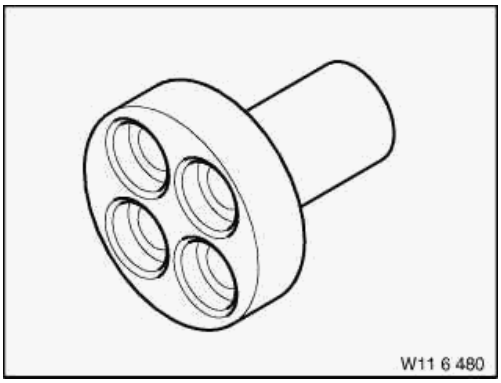
0 491 075 (11 7 030) Socket wrench insert



Common	Used in step 54 91
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

0 493 380 (11 6 480) Connector



Common	Used in step 62 82
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 62 81 82
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge

Common	Used in step 62 80 82
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 414 691 Support

Common	Used in step 67 74
Usage	To support the engine when the engine support is removed.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	2357071
SI-Number	01 12 16 (406)

2 357 071 Panel

Common	Used in step 67 74
Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

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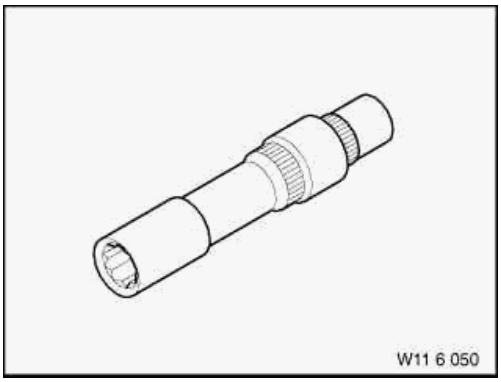
0 491 068 (11 6 050) Socket wrench insert



Common	Used in step 67 74
Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 459 012 Holder

Common	Used in step 67 74
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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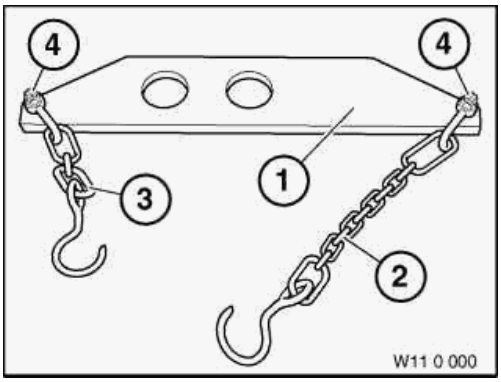
0 490 561 (11 0 000) Lifting gear



Common

Used in step 67 74

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 67 70

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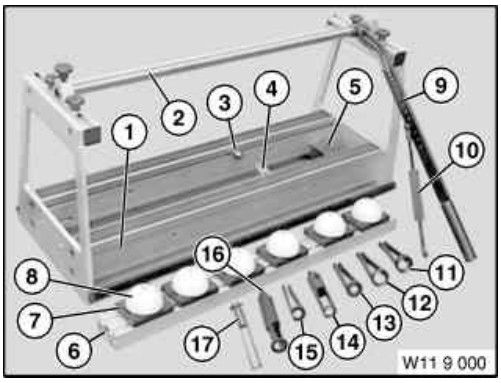

Common

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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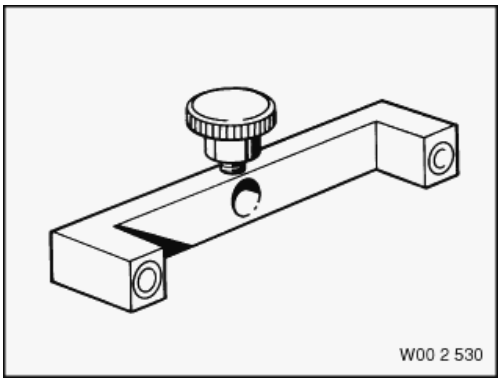
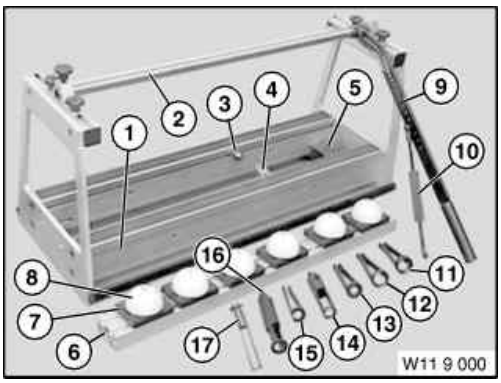
0 490 185 (00 2 530) Bridge



Common	Used in step 68
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

0 494 366 (11 9 001) Device



Common	Used in step 70 71
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 187 (00 2 300) Assembly stand

Used in step 70 71

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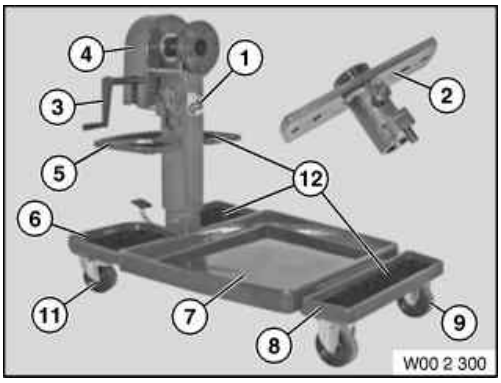

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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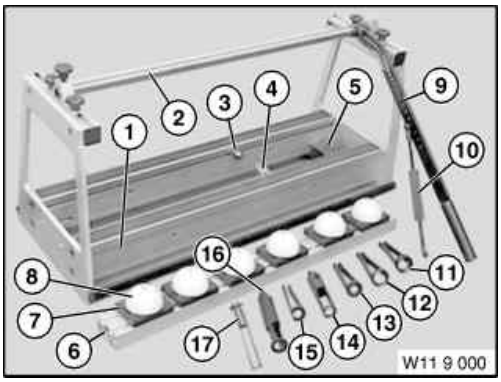
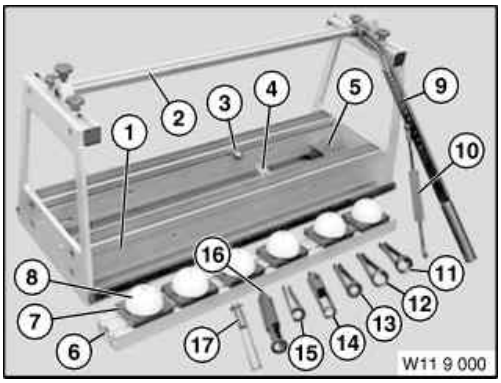
0 494 371 (11 9 006) Insert



Common	Used in step 70
Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 372 (11 9 007) Shaped part

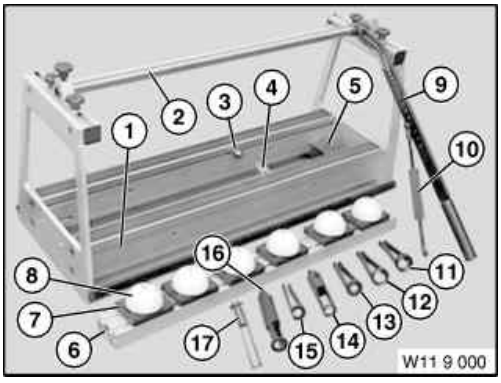


Common	Used in step 70
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part

Common	Used in step 70
Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 370 (11 9 005) Quick fastener



Common	Used in step 70 71
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 494 374 (11 9 009) Lever

Common	Used in step 70 71
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 143 (11 8 840) Basket

Common	Used in step 70 71
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 70

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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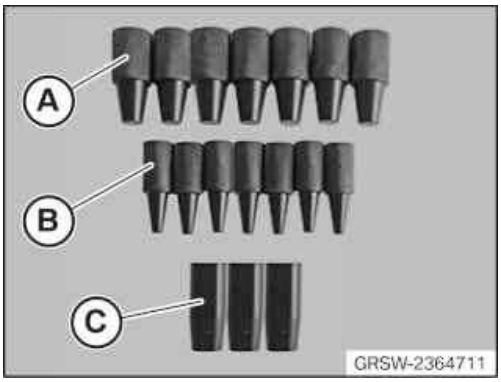
2 364 711 Plug

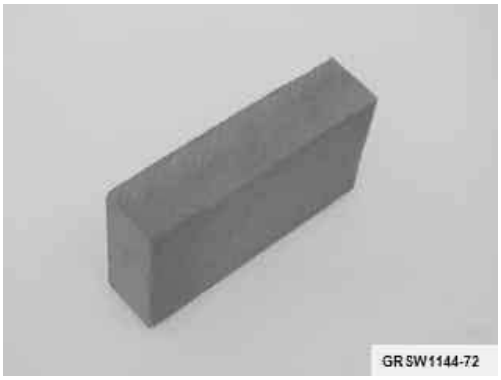


Common	Used in step 72
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

0 495 103 (11 4 471) Scraper

Common	Used in step 72
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 72
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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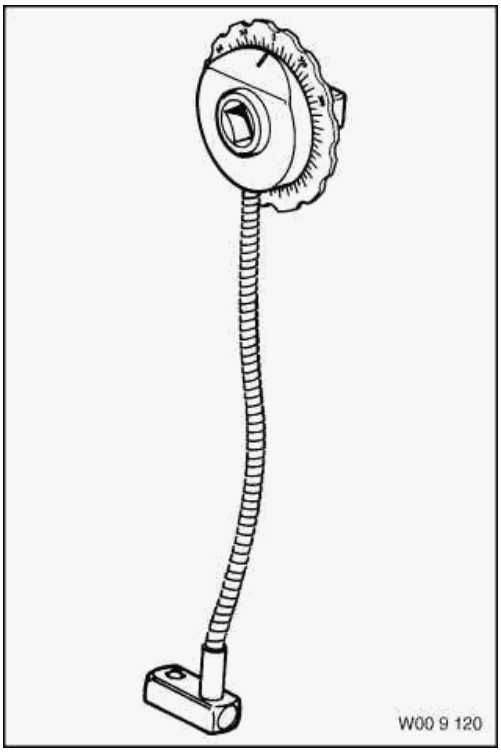
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 74

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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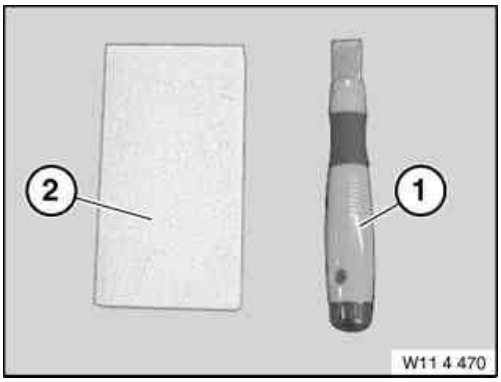
0 495 102 (11 4 470) Tool



Common Used in step 84

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

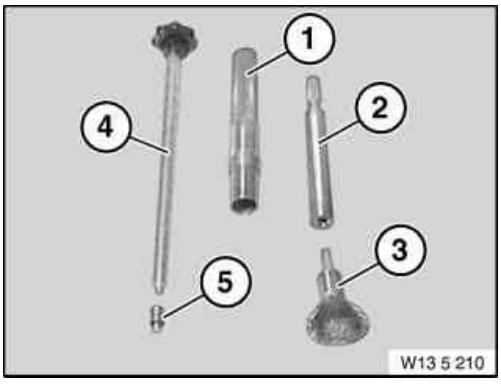
Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 344 011 Tool

Common Used in step 111

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common Used in step 118

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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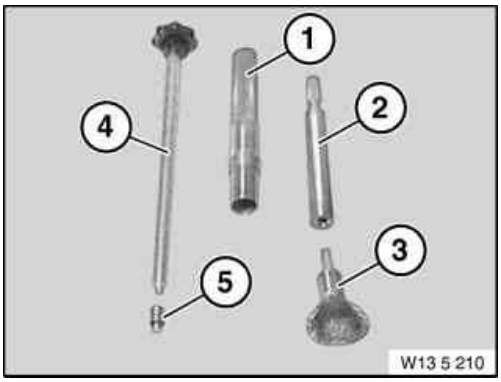
0 493 762 (13 5 214) Rod

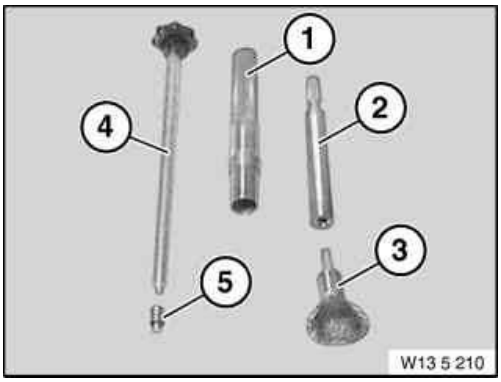


Common

Used in step 118

Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



Common

Used in step 118

Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

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Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 34
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 34
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 34
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 34
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud

Common	Used in step 34
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 34
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 34
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 34
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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2 299 563 Adapter

Common	Used in step 70 71
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Valve underprotrusion	Used in step 68
	0,8 (0,7 - 0,9) mm

Cylinder head flatness	Used in step 69
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 123
EGR controller	19 123
Troubleshooting on the exhaust turbocharger	86

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 136
61 12 ... Notes on intelligent battery sensor (IBS)	1 136
61 00 ... Notes for disconnecting and connecting battery	1 136

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	16 27 28 48 49 51 52 53 54
11 65 020 Turbocharger damage due to blocked oil supply lines	86
11 65 ... Test steps in the event of turbocharger damage	86
17 00 008 Draining and topping up coolant for high-temperature circuit	142
17 00 008 Draining and topping up coolant for high-temperature circuit	142
17 00 008 Draining and topping up coolant for high-temperature circuit	142
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	142
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	142
17 00 039 Bleeding cooling system (B37, B47)	142
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	142
17 00 008 Draining and topping up the high-temperature coolant circuit	142
17 00 008 Draining and topping up the high-temperature coolant circuit	142
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	142
17 00 008 Draining and topping up the high-temperature coolant circuit	142
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	142
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	142
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	142
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	142
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	142

Operating materials	Used in step
2.0 Grease for wheel centring	111

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	78
Exhaust-gas recirculation cooler seal on exhaust manifold	123
Exhaust-gas recirculation cooler seal on intake plenum	123

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11 34 715 Replacing all valve springs (B37C)

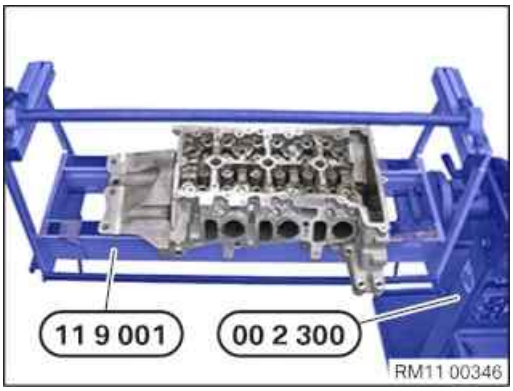
Special tools required:

- 11 9 001
- 00 2 300
- 11 9 006
- 11 9 007
- 11 9 008
- 11 9 005
- 11 9 000
- 11 9 009
- 11 8 840
- 11 9 011
- 11 4 480

Necessary preliminary work:

- Remove all hydraulic valve clearance compensating elements.
- Remove all glow elements.
- Remove cylinder head.
- Install coolant temperature sensor.
- Remove exhaust manifold.

Removal:



Mount and bolt cylinder head on special tools 11 9 001 and 00 2 300 .

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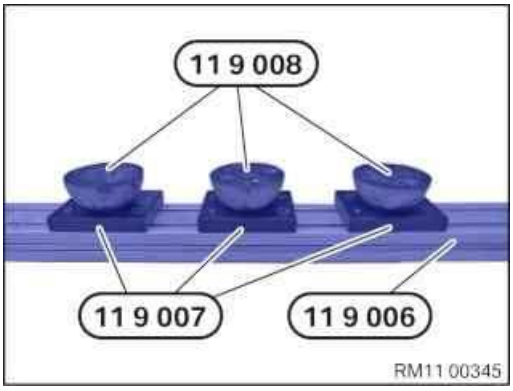
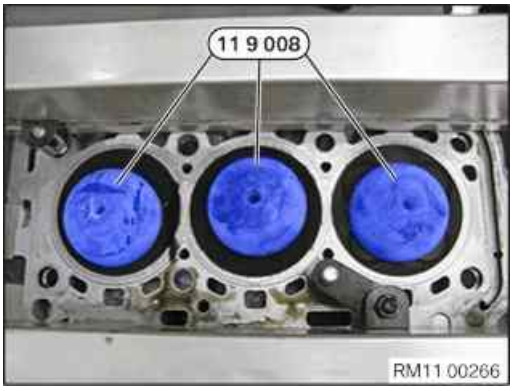
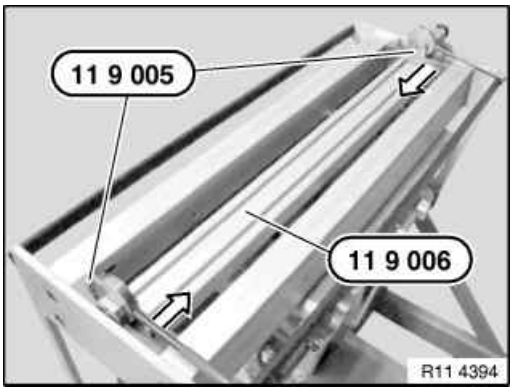


Prepare special tools 11 9 006 , 11 9 007 and 11 9 008 as pictured.

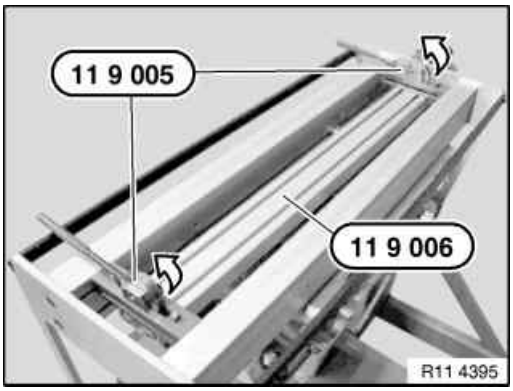


Note:
Special tools 11 9 008 must be positioned accordingly in the next operation.



Turn special tool 11 9 006 over and insert as pictured.

Lock special tool 11 9 005 in the direction of the arrow.



Lock special tool 11 9 005 in the direction of the arrow.

Rotate cylinder head, using special tool 11 9 000 , 180° into installation position.

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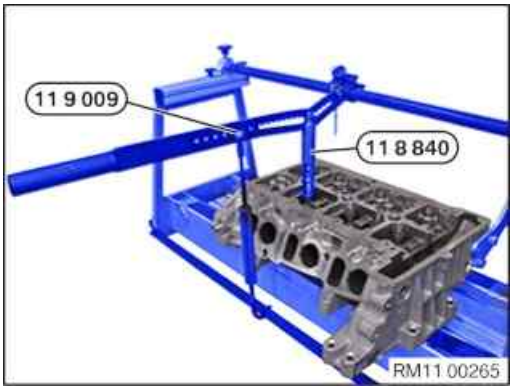
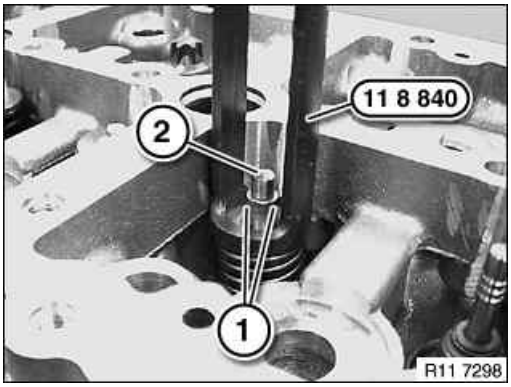


Align special tool 11 9 009 in direction of valve axis. Select corresponding groove with special tool 11 8 840 .

Press down valve spring on upper spring cup with special tools 11 9 009 and 11 8 840 .

Valve spring can be held in pressed-down position with special tool 11 9 011 .



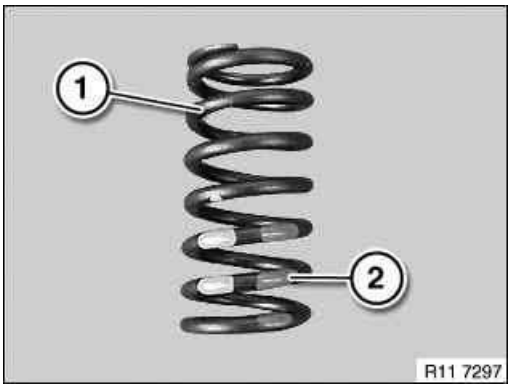
Keep valve spring pressed down with special tool 11 8 840 .

Use a magnet to remove valve keys (1) from valve (2).

Relieve load on valve spring. Remove valve spring and spring cup.

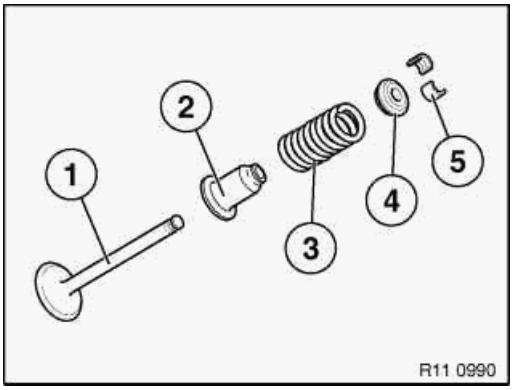
Set down valve spring, spring cup and valve keys in special tool 11 4 480 in an orderly manner.

Installation:



Colour code (2) on the valve spring (1).

The installation position of the valve spring can be freely selected.



If necessary, replace valve stem seals.

Installation sequence:

1. Valve
2. Valve stem seal
3. Valve spring
4. Top spring cup
5. Valve keys

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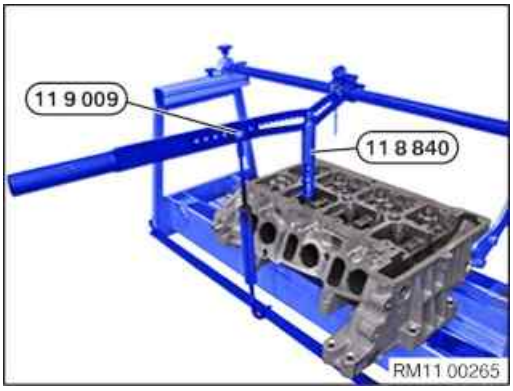
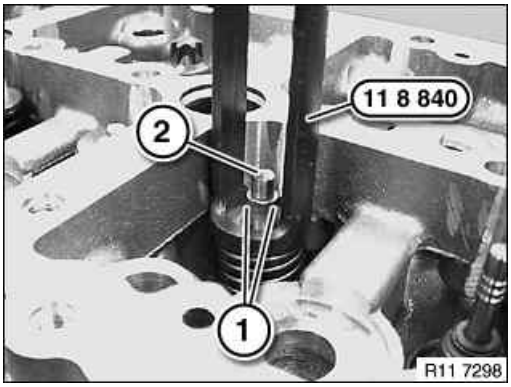


Align special tool 11 9 009 in direction of valve axis. Select corresponding groove with special tool 11 8 840 .

Press down valve spring on upper spring cup with special tools 11 9 009 and 11 8 840 .

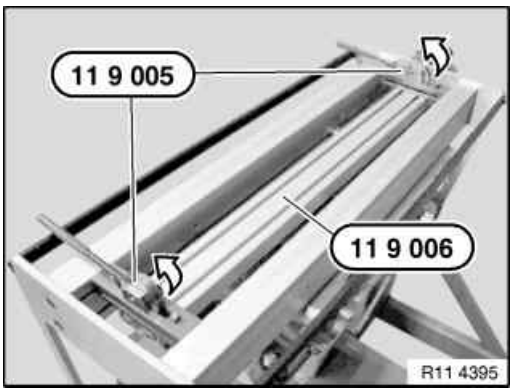
Valve spring can be held in pressed-down position with special tool 11 9 011 .



Keep valve spring pressed down with special tool 11 8 840 .

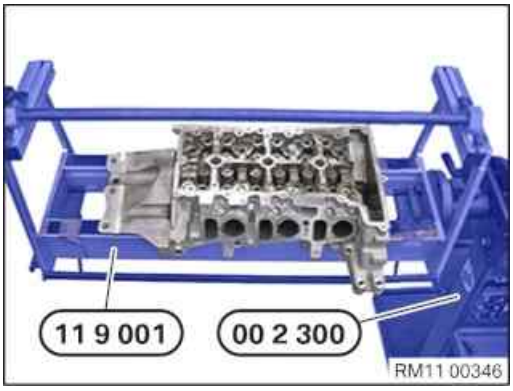
Use a magnet to install valve keys (1) on valve (2).

Relieve load on valve spring.



Unlock special tool 11 9 005 .

Remove special tool 11 9 006 .



Remove cylinder head from special tools 11 9 001 and 00 2 300 .

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Required follow-up work:

- Install exhaust manifold.
- Install coolant temperature sensor.
- Install cylinder head.
- Install all glow elements.
- Install all hydraulic valve clearance compensating elements.

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11 34 190 Replacing all valve stem seals

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Maintain conditions of absolute cleanliness.

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1 – Remove vehicle battery

WARNING

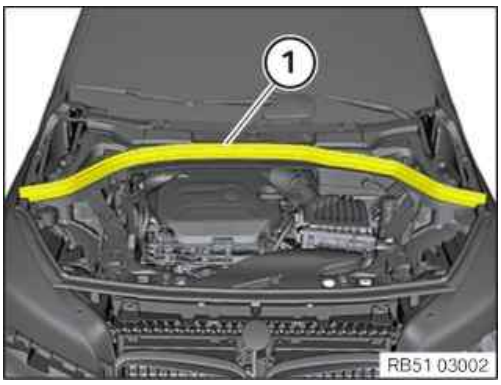
Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

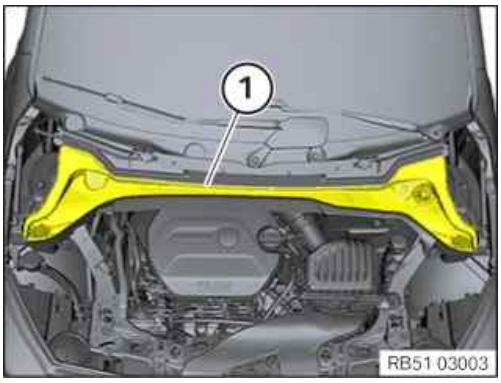
- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

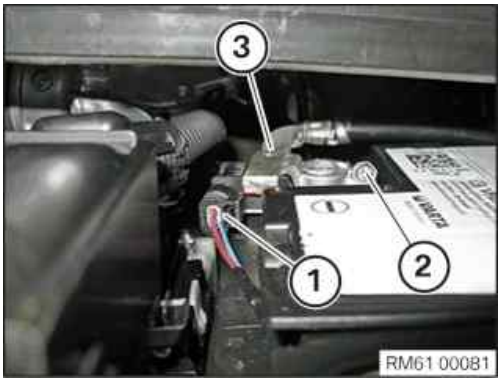
For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- pull off gasket (1) upwards.



- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).

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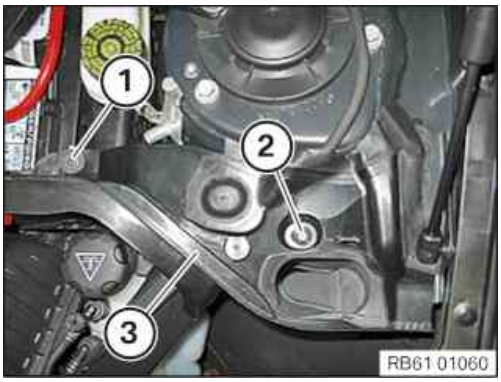
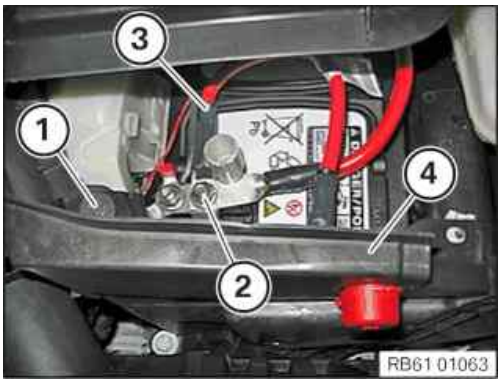
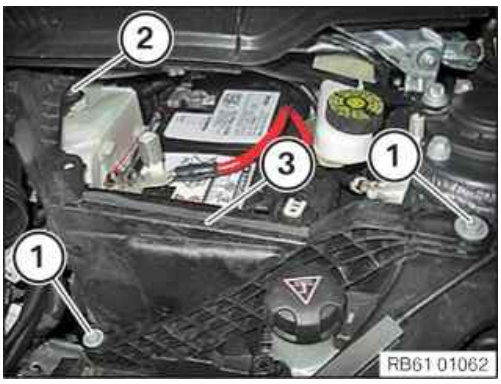


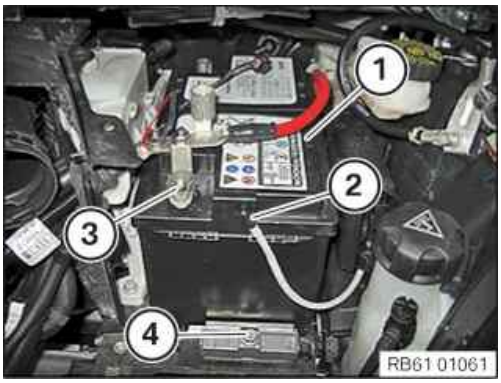
- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.



- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Removing the upper bulkhead cover

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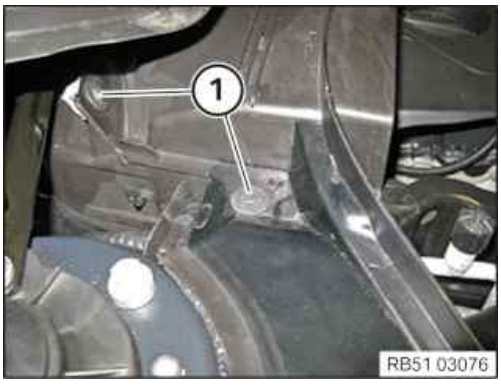
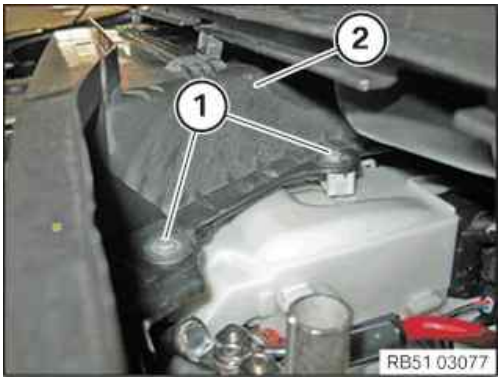
- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

3 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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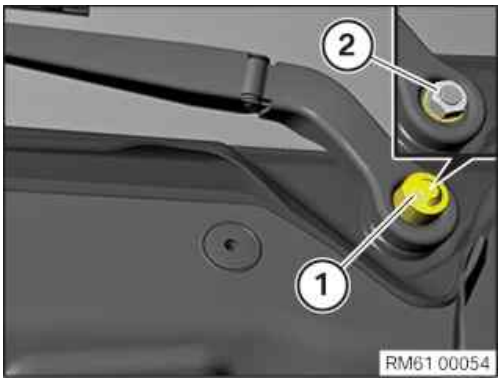
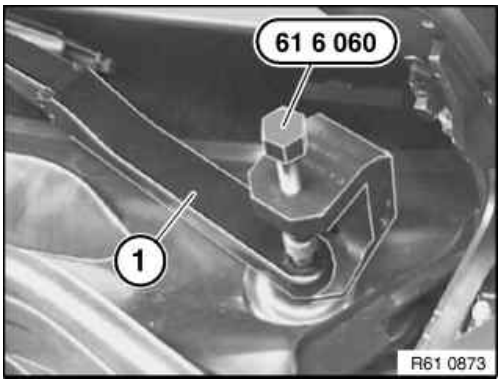


- Remove the protective cap (1).
- Loosen nut (2).



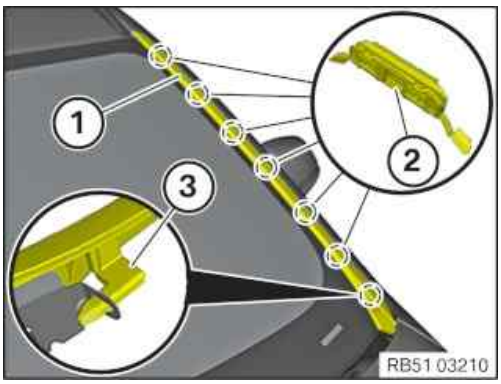
- Pull off the wiper arm (1) using special tool .

4 – Remove the gutter strip on the windscreen on the left and right

NOTICE

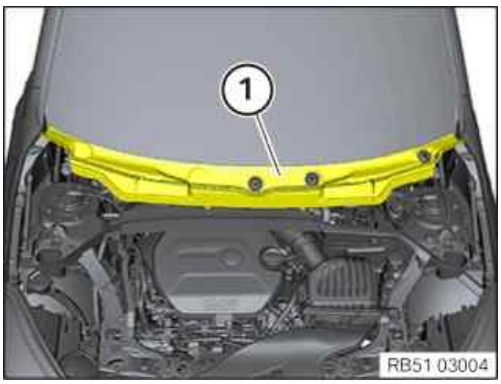
Description is for left component only. Procedure on the right side is identical.

▶ Remove the gutter strip on the windscreen



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

5 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

6 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

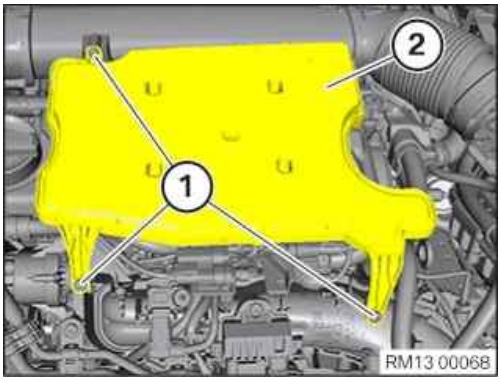
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

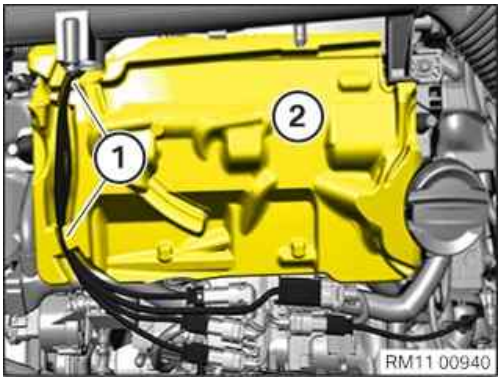
- Unclip the acoustic cover from the marked areas towards the top.

7 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

8 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

9 – Remove the intake neck for intake silencer housing

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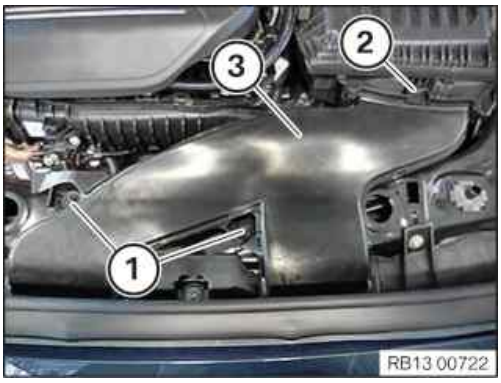
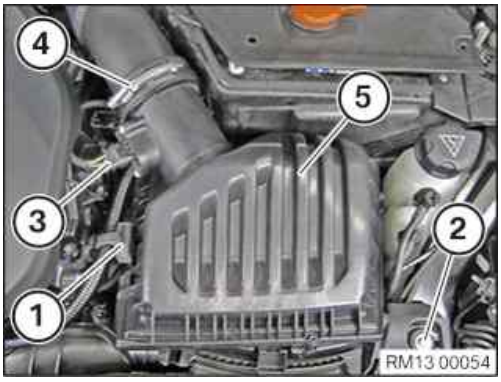


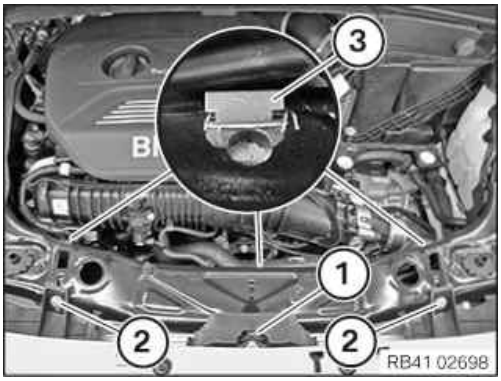
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

10 – Removing intake silencer housing

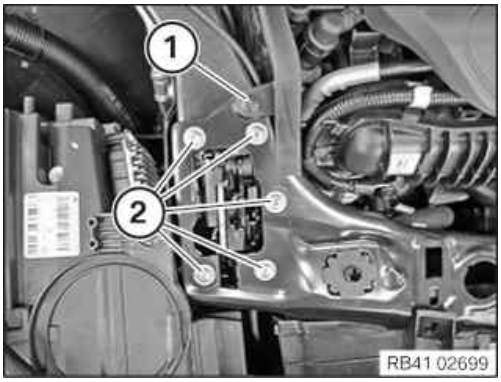


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

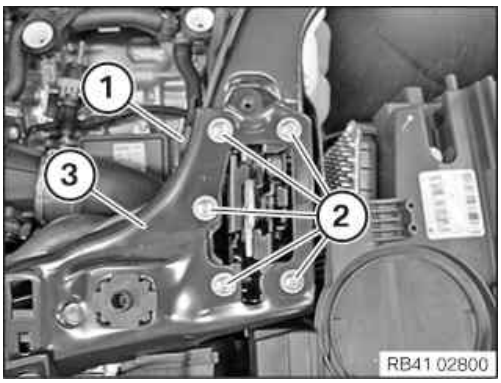
11 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

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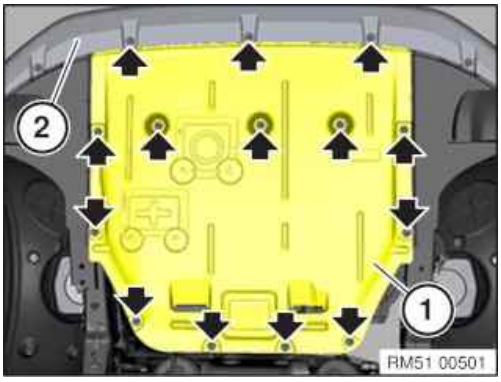
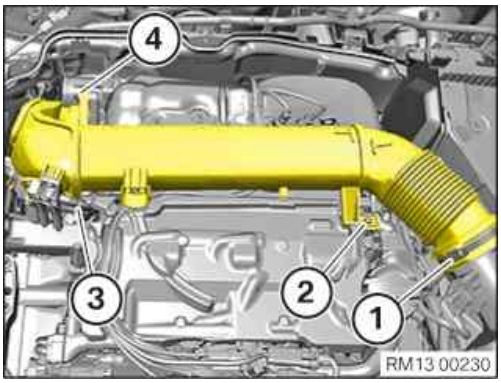
12 – Removing the front underbody protection

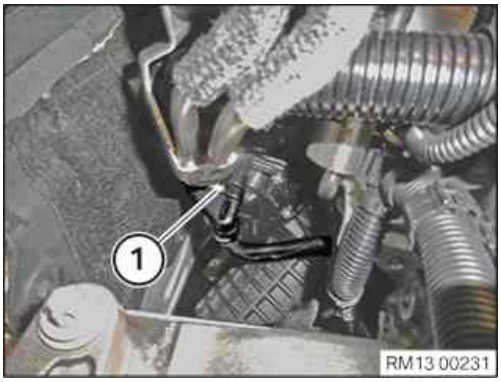


- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

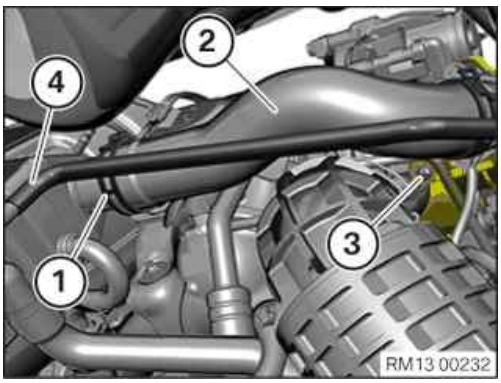
13 – Removing clean air pipe



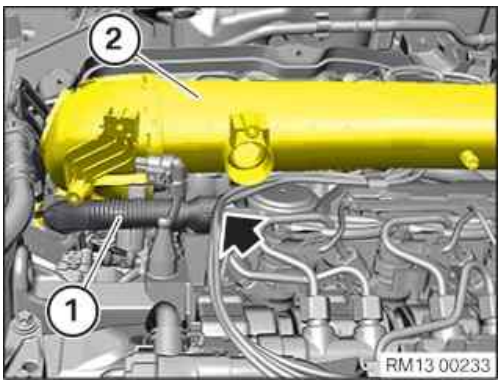
- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

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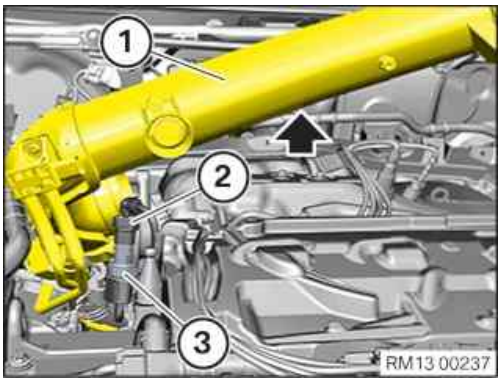

- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

14 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).

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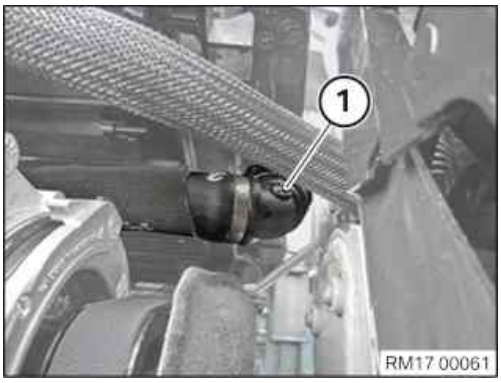
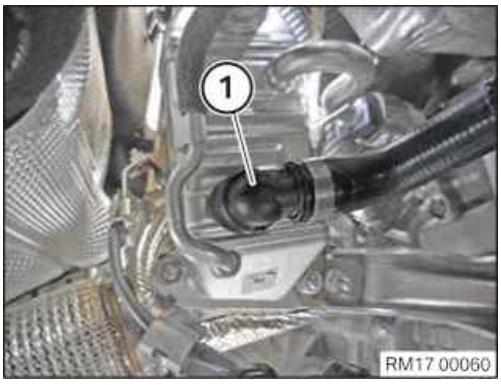


- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

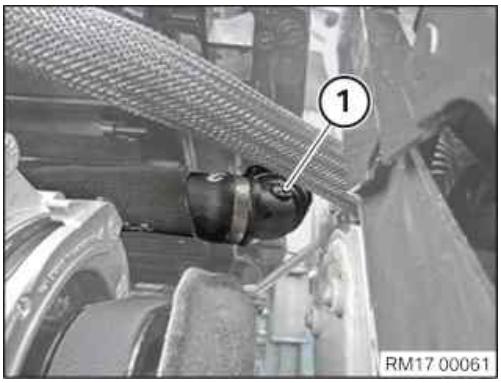


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

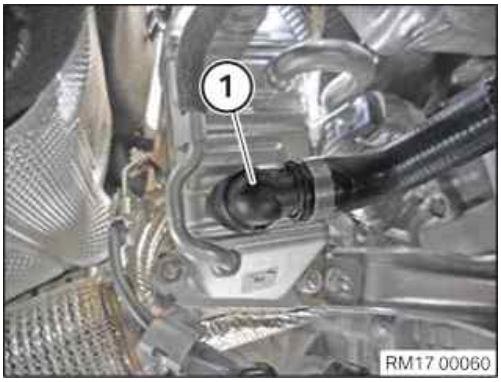
15 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

16 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

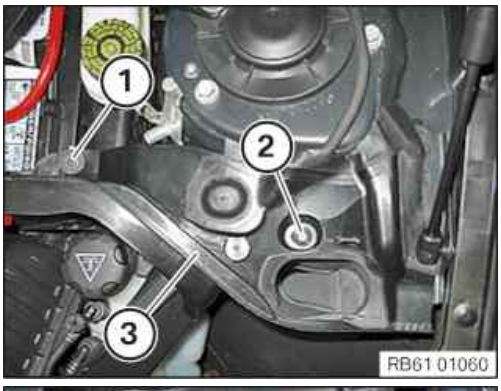
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.

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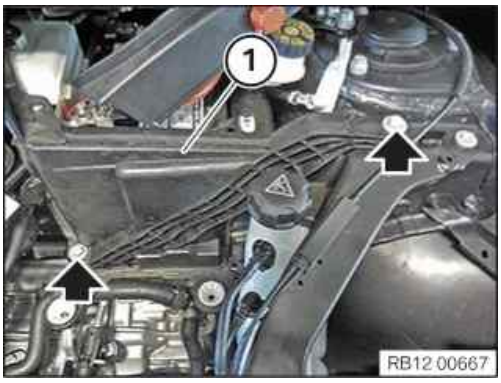
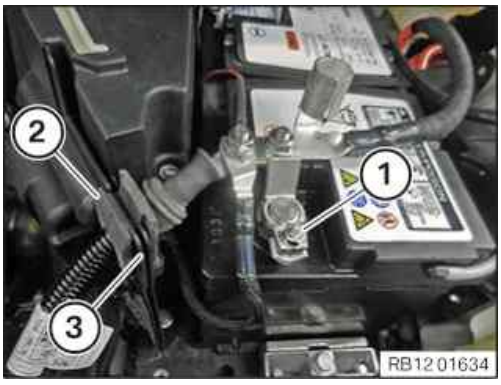
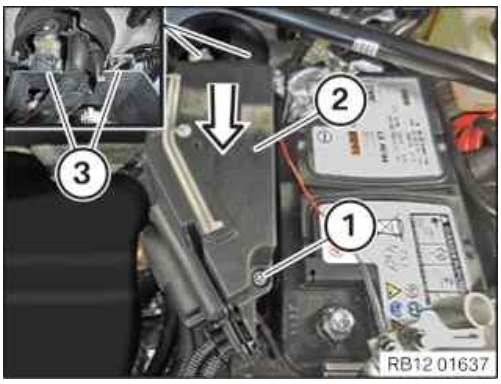


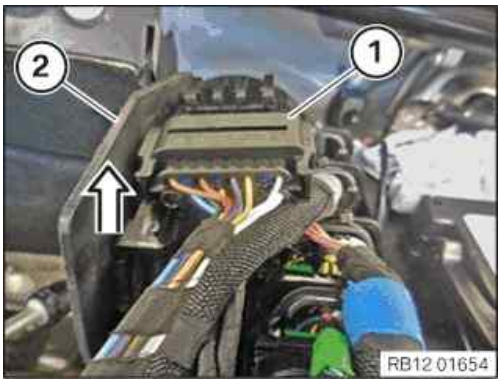
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



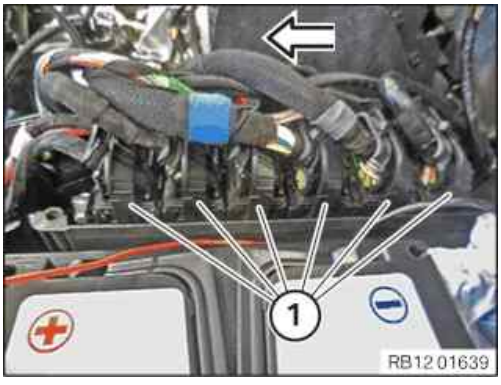
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

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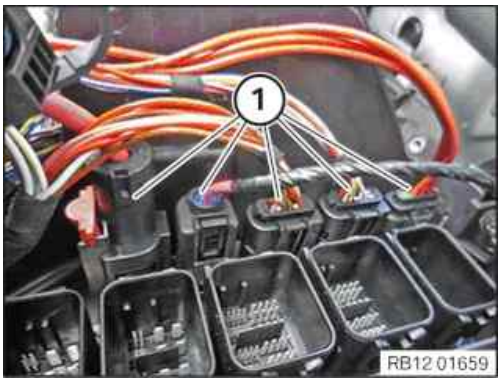
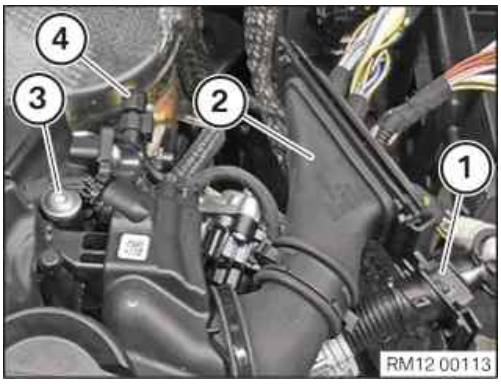
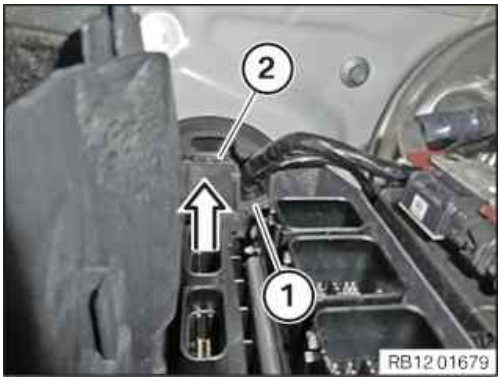


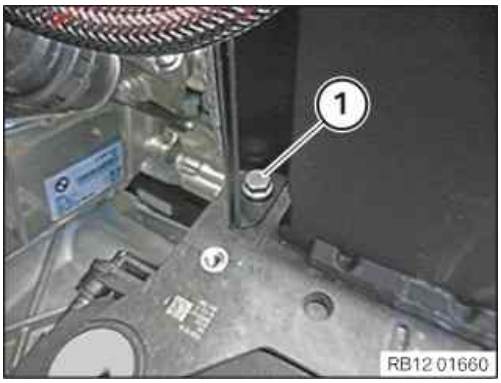
- Unlock and loosen connector (1).



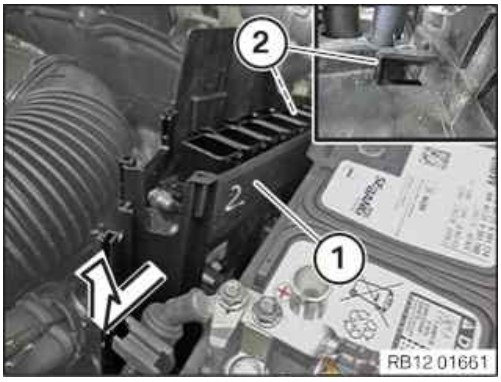
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

17 – Remove battery holder

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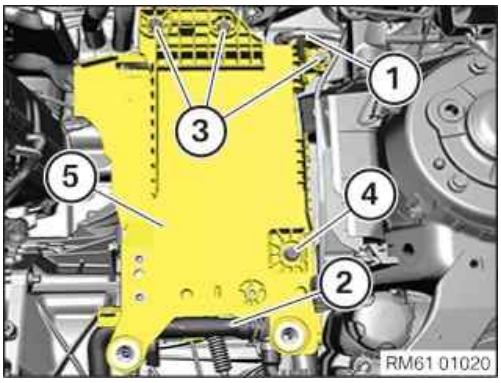
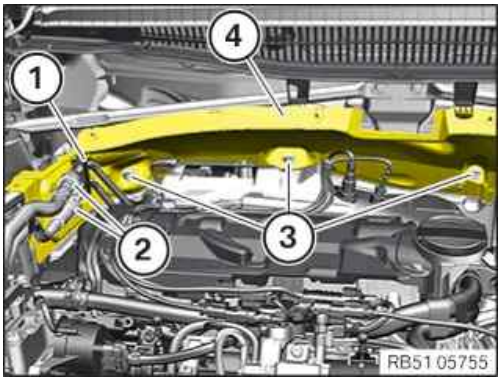


- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

18 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

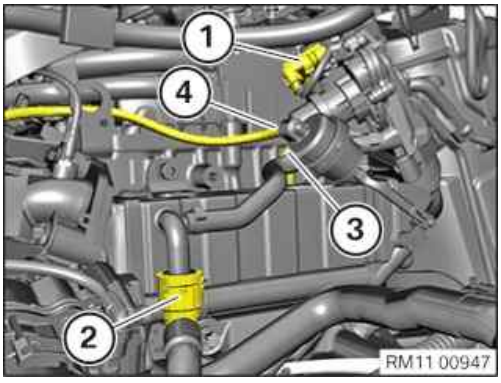
19 – Removing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

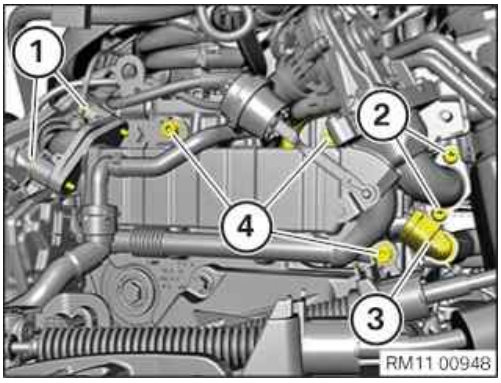
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

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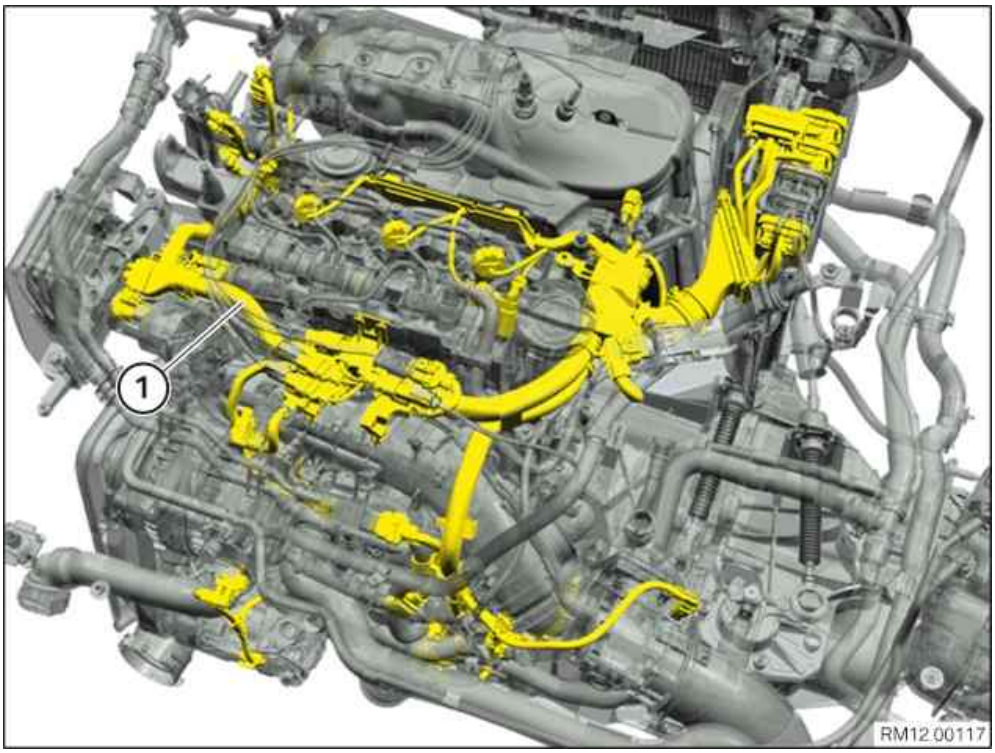
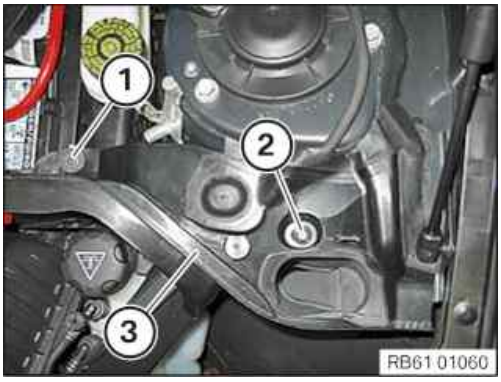
20 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine

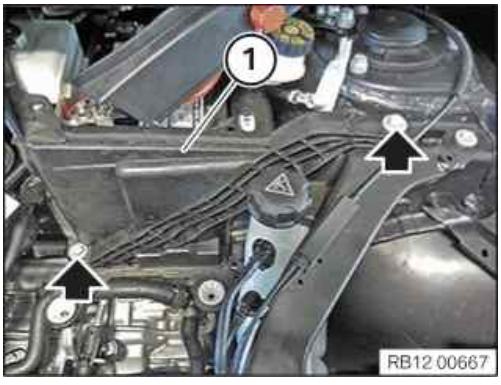


1 Wiring harness section for the engine



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.

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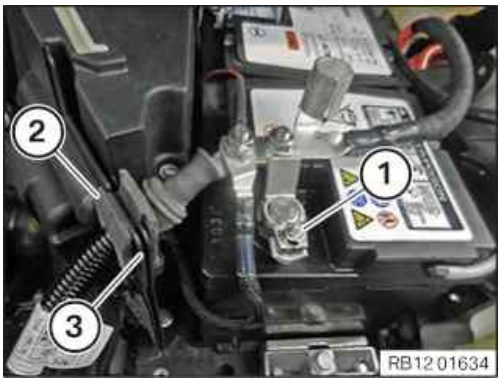
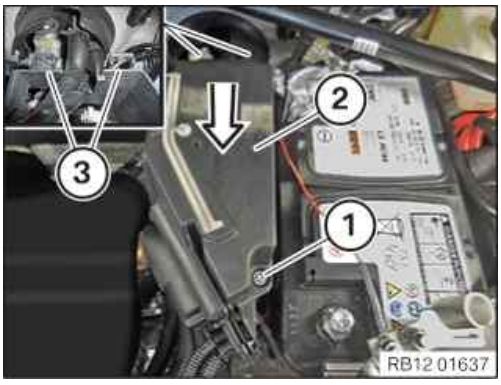
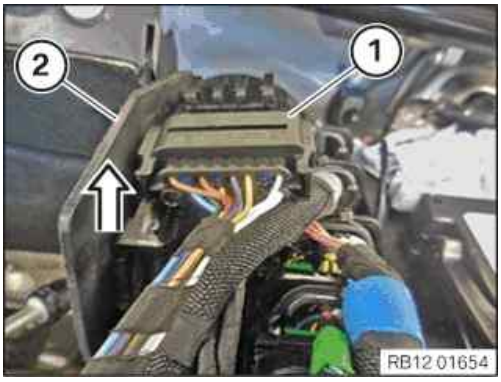


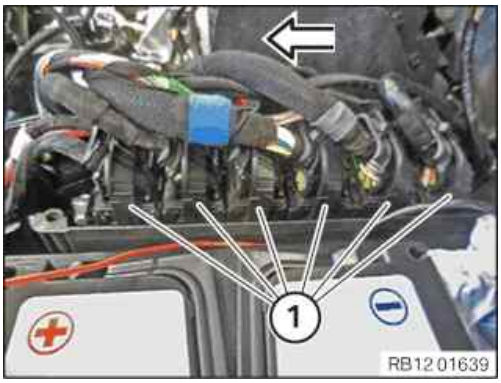
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.

- Unlock and loosen connector (1).

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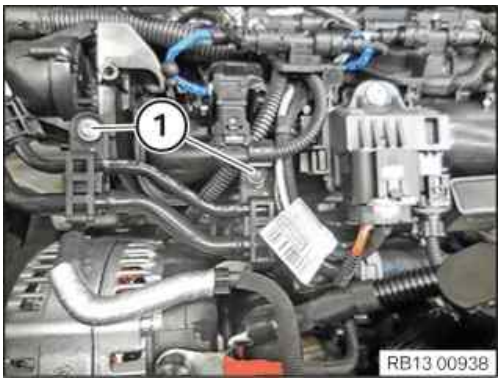
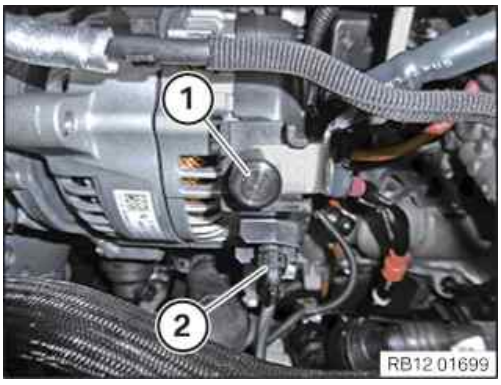
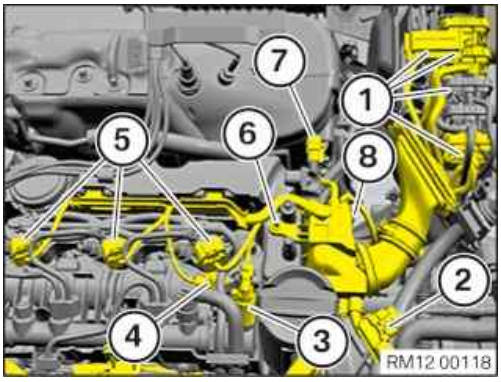


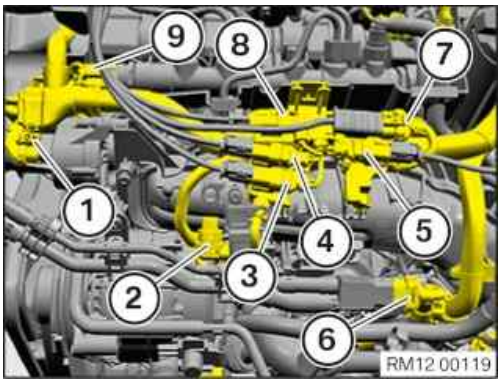
- Loosen screws (1).



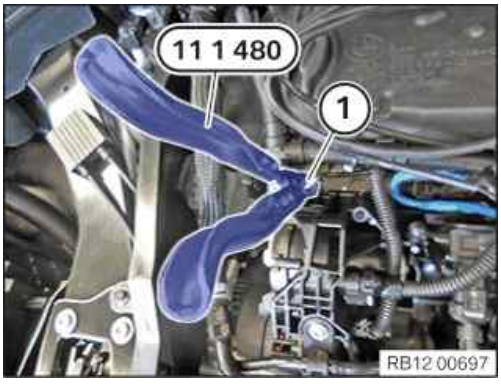
- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.



- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.



- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.

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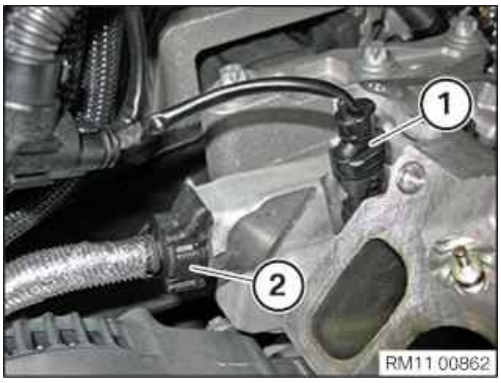
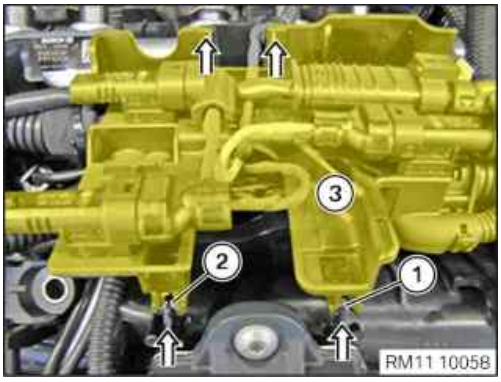


- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

21 – Removing the cable clips from the intake plenum



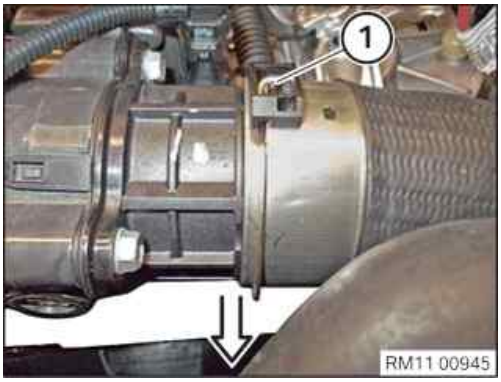
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

22 – Removing the intake plenum

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.

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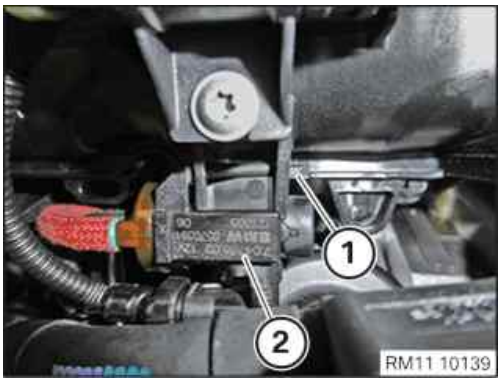
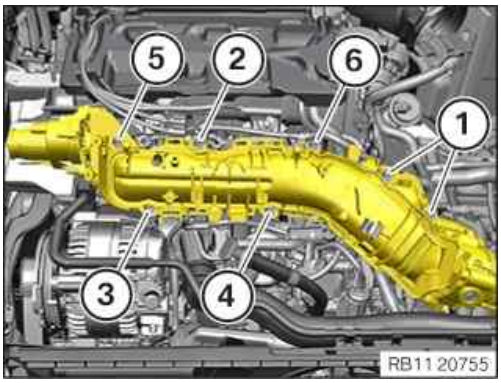
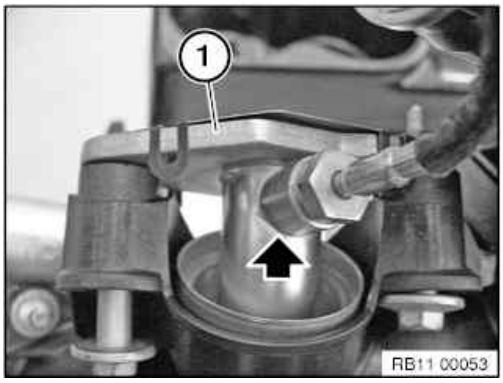


- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

23 – Detaching leakage oil line from injector

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

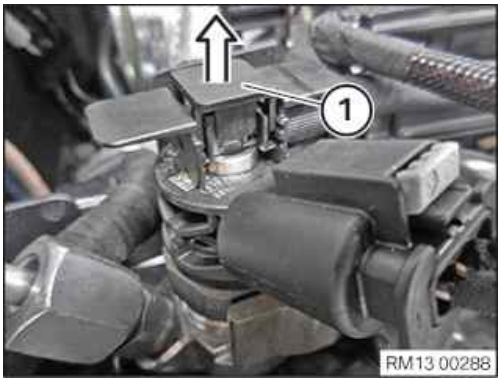
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Release lock (1) in direction of arrow.
- Pull the leakage oil line off the injector in direction of arrow.

24 – Removing high pressure lines between rail and injectors

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

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CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

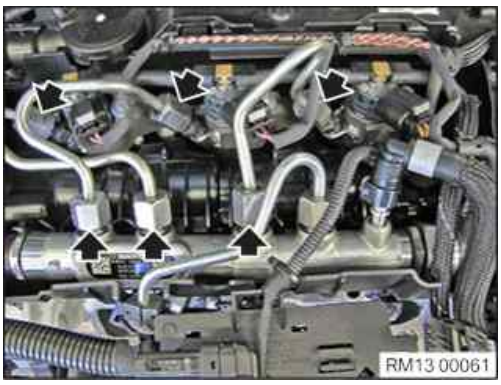
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Release the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)** .
- Feed out and remove the high pressure lines (arrows).
- Seal off all the open cable connections with the special tool **2 413 106**.

25 – Remove the high pressure line between the high pressure pump and the rail

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

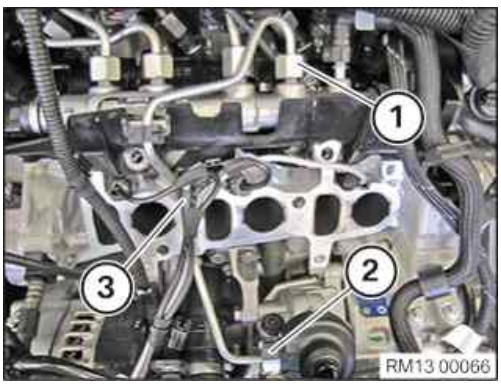
- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Loosen union nut (1) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Loosen union nut (2) with special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).
- Catch and dispose of escaping fuel.
- Feed the high pressure line (3) out and remove.
- Seal open connections using special tool **2 413 106**.

26 – Remove high-pressure rail

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WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

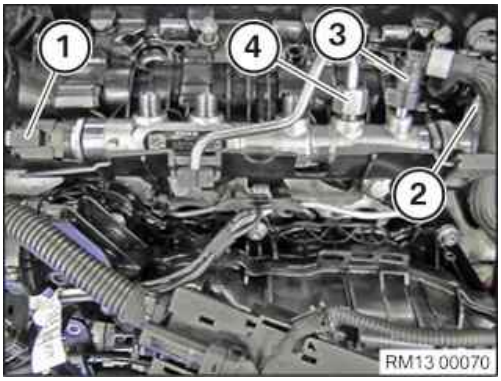
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

TECHNICAL INFORMATION

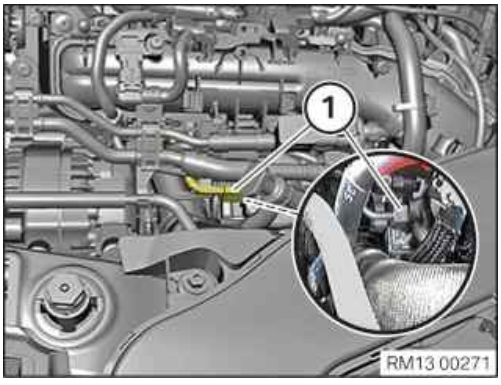
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.



- Unlock and disconnect the plug connection (1).
- Unlock and disconnect the plug connection (2).
- Unlock and release fuel line (3).
- Loosen union nut (4) with special tool **0 495 910 (37 1 152)**.
- Reset special tool **0 495 910 (37 1 152)** early on to avoid bending pressure lines.



- Slacken the union nut (1) on the high pressure pump.

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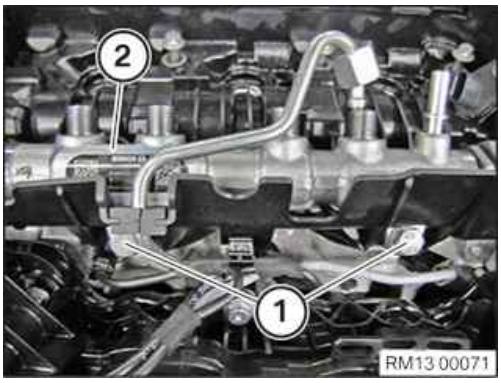

- Loosen screws (1).
- Carefully thread out and remove the rail (2).
- Make sure the pressure line of the high pressure pump is not bent.

27 – Removing injectors of injection system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

CAUTION

On releasing high pressure line, fuel may emerge at high speed.

Danger of injury!

- Wear suitable personal protective equipment.
- Allow the cooling system to cool down to a temperature below 40°C before starting installation work.
- Note warnings on cylinder head cover.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

RISK OF DAMAGE

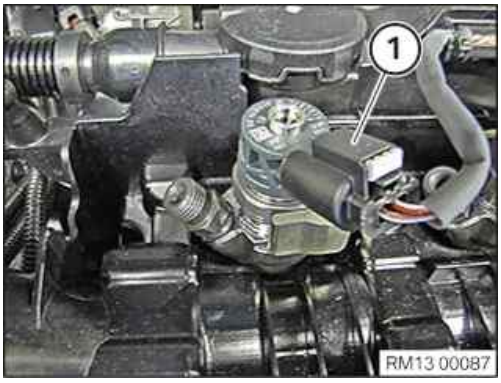
Electrostatic discharge.

Damage to or destruction of electrical components.

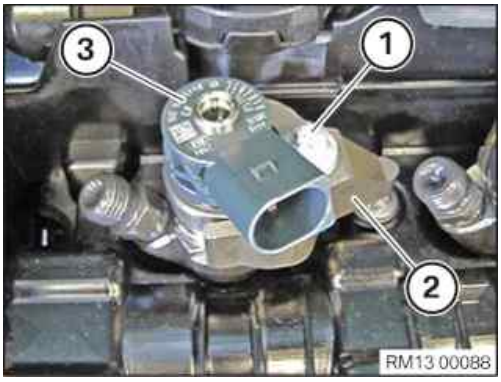
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

If several injectors are removed, ensure that each injector is reinstalled in its original installation location (cylinder). Mark injectors.



- Unlock and disconnect connector (1).



- Loosen screw (1).
- Guide out and remove clamping claw (2).
- Feed out and remove the injector (3) with slight rotational movements.

▸ **Loosen stuck injectors**

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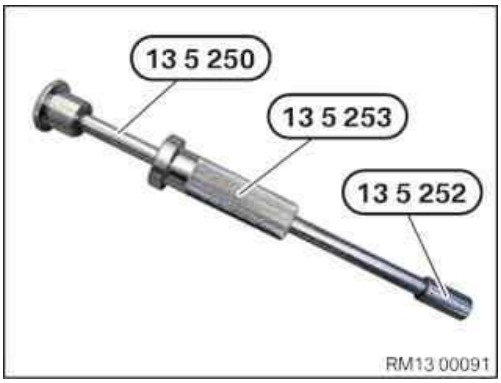
RISK OF DAMAGE

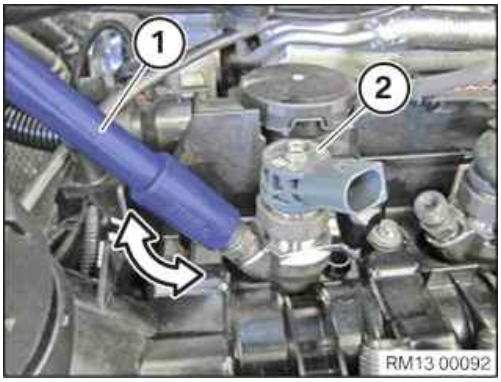
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unscrew the bush **0 493 321 (13 5 250)** from the special tool **0 493 339 (13 5 252)** and remove the impact weight **0 493 340 (13 5 253)**.
- Screw the bush **0 493 339 (13 5 252)**back onto the special tool **0 493 321 (13 5 250)**.



- Screw the special tool (1)**0 493 321 (13 5 250)** with the bush **0 493 339 (13 5 252)** onto the pressure line connection of the injector (2).
- Loosen and remove injector (2) using the special tool (1)**0 493 321 (13 5 250)** and **0 493 339 (13 5 252)** in **short** reciprocating motions.

28 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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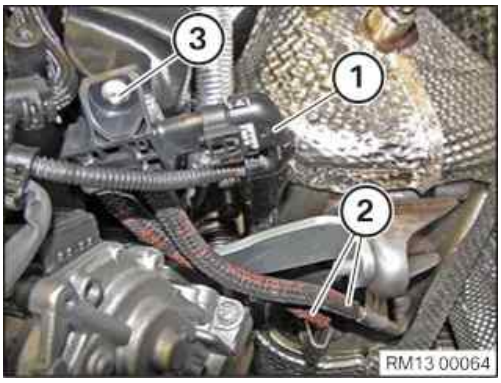
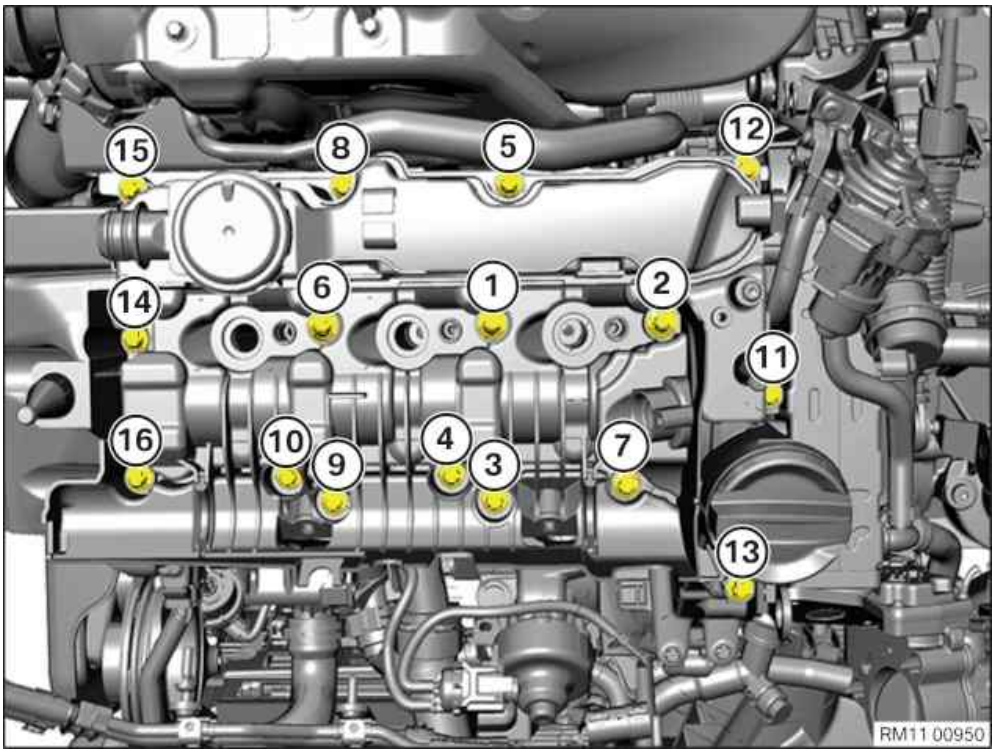


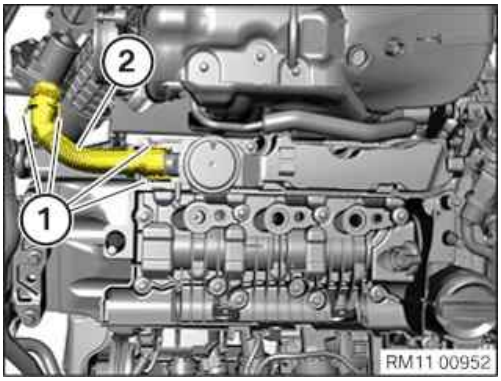
- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

29 – Removing the cylinder head cover

Overview: Screw connection of the cylinder head cover



1 to 16 Bolts of the cylinder head cover



- Carefully unlock the locks (1) of the engine ventilation line (2).
- Remove the engine ventilation line (2).

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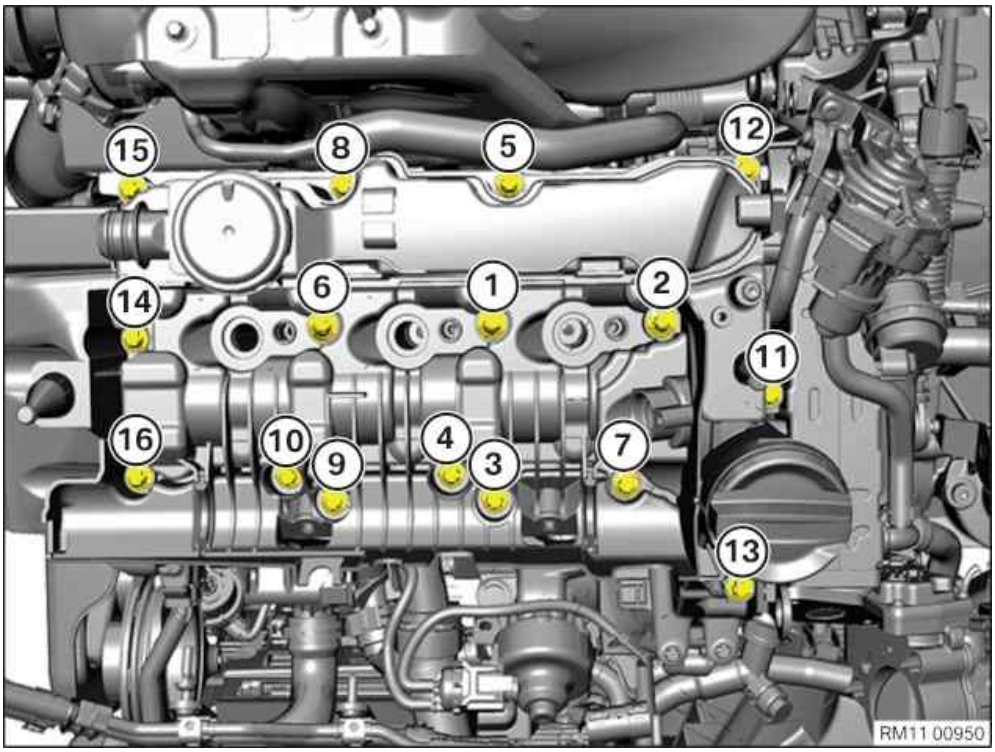


- Loosen screws in the order (16) to (1).
- Remove cylinder head cover by lifting it out.

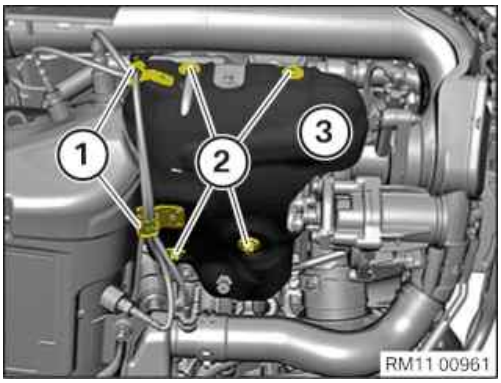
30 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

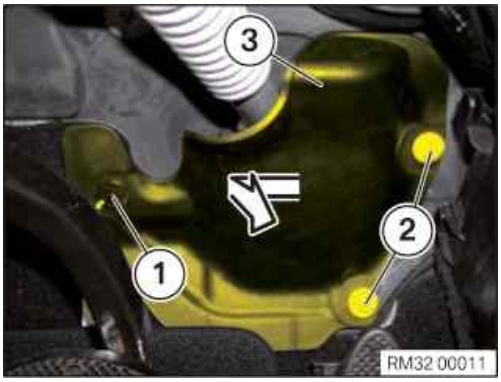
Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).

31 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!

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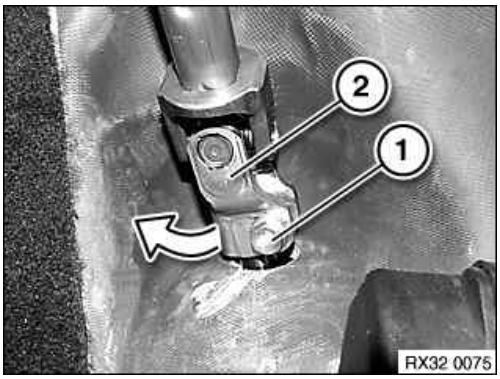
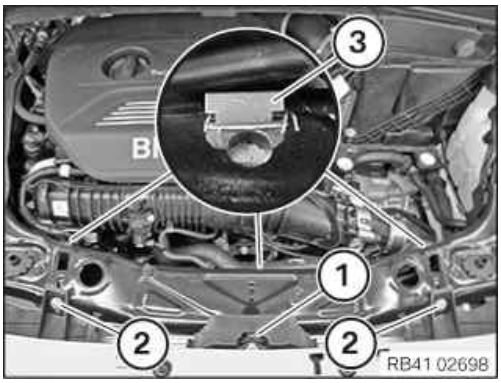


- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

32 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

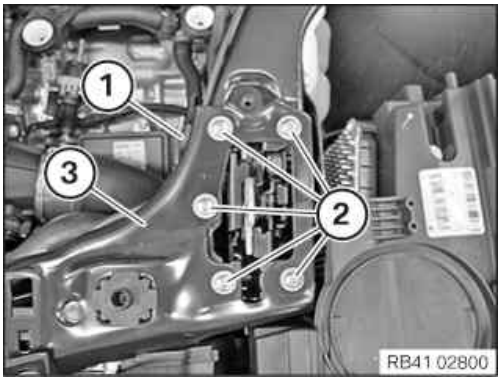
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

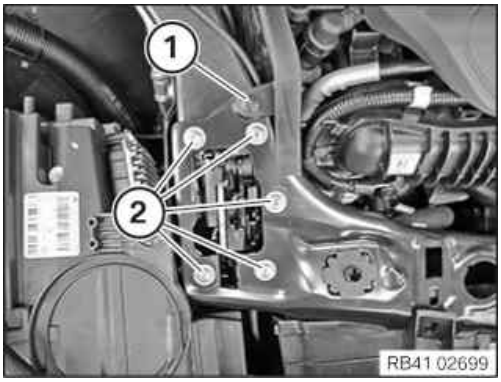


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

33 – Securing radiator on left and right

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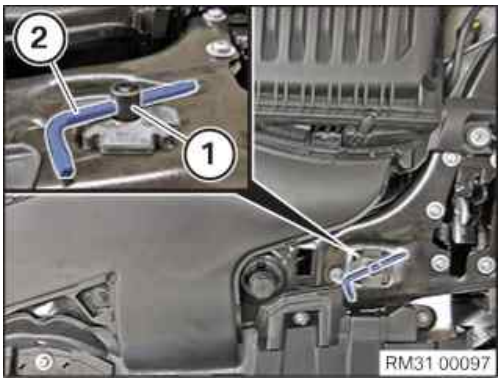


NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

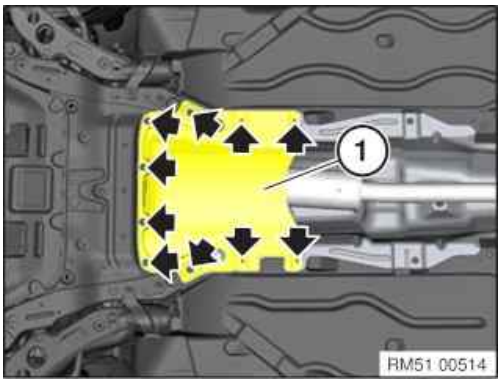
34 – Remove the front left and right wheel

▶ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

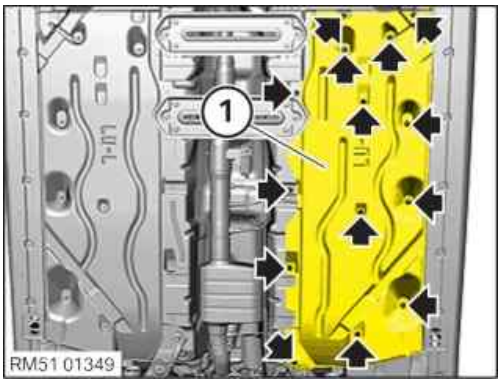
  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

35 – If installed: Removing rear underbody protection



- Remove screws (arrows).
- Remove the rear underbody protection (1).

36 – Removing right underbody panelling



- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

37 – Removing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

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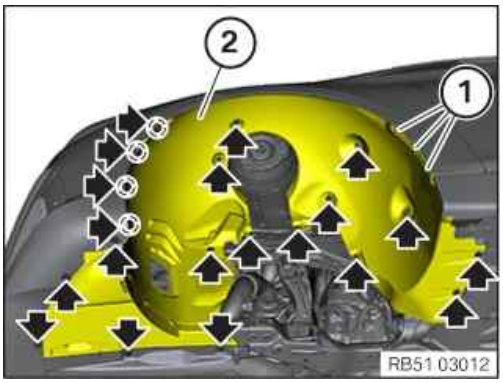
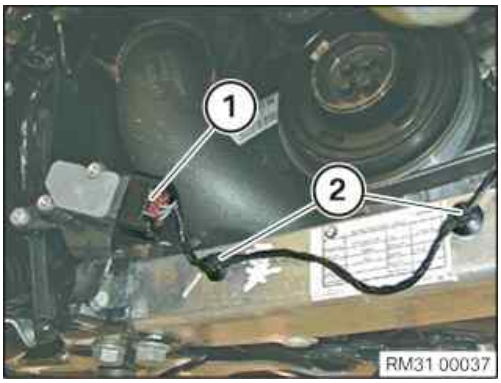
▶ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

38 – With right installation: Detaching ride height sensor cable



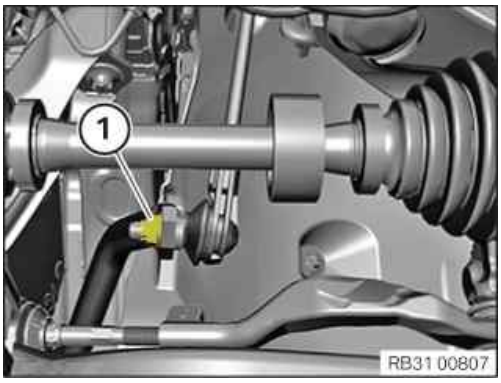
- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

39 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**



- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

40 – Detaching rubber mount from front axle support

- Spray rubber mount (1) with lubricant and release from holder on front axle support.

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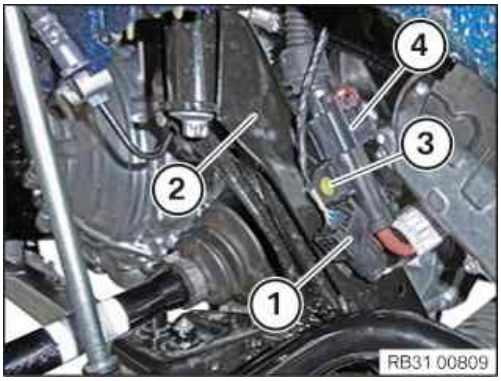
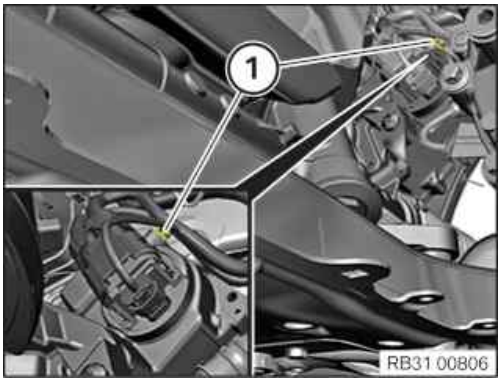
41 – Disconnecting plug connections from steering gear

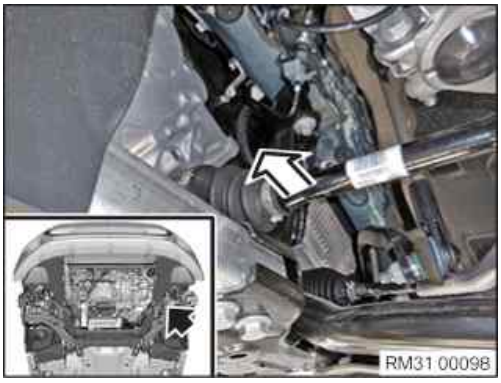
▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

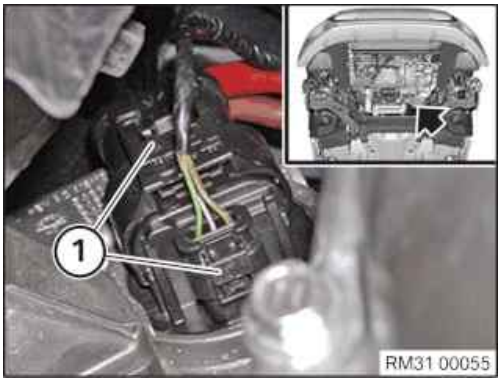


- Disconnect wiring harness (1) from steering gear.



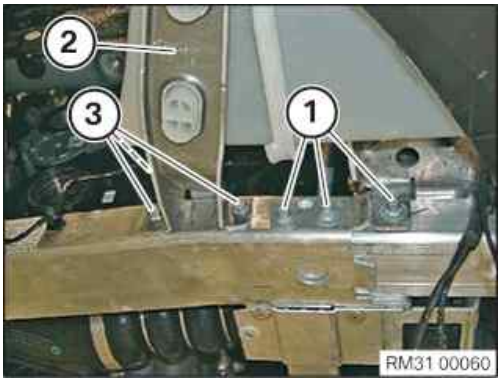
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

42 – Releasing the mounted part from the front axle support



- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

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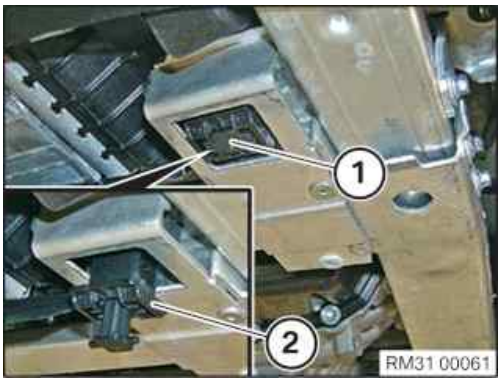
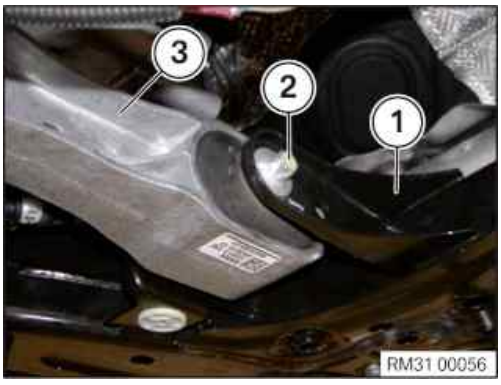


NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).



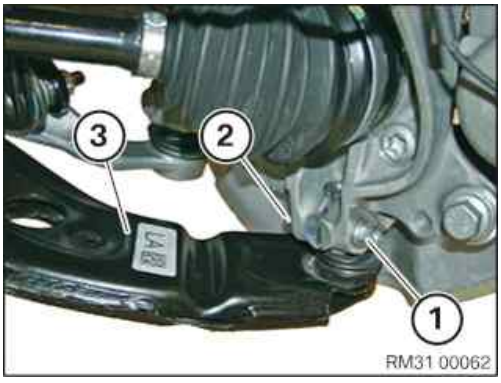
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

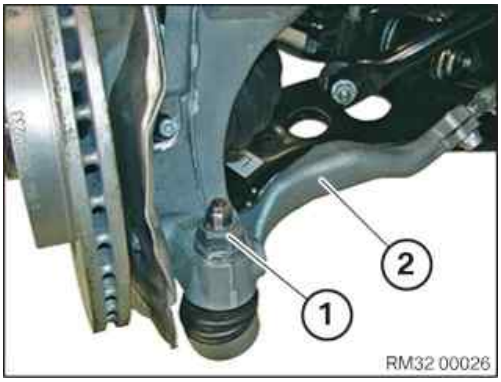
43 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.

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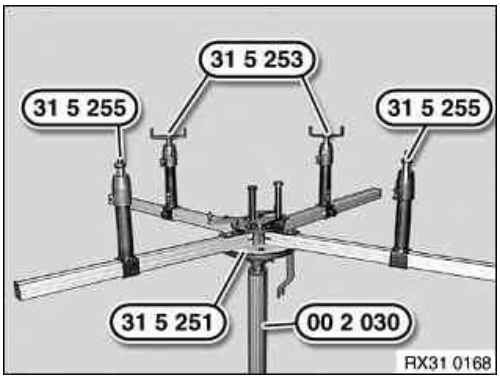
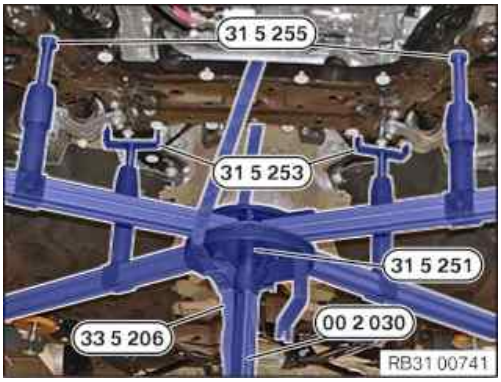


- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

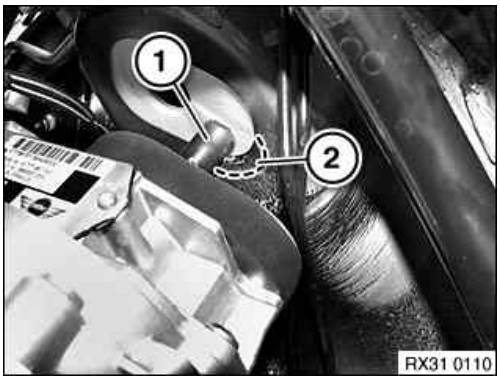
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

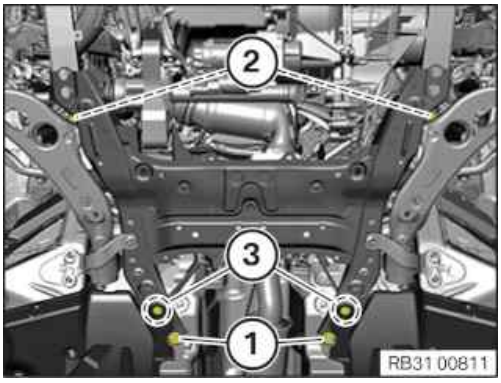


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.

For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

44 – Removing the connecting support from the tunnel in front and back

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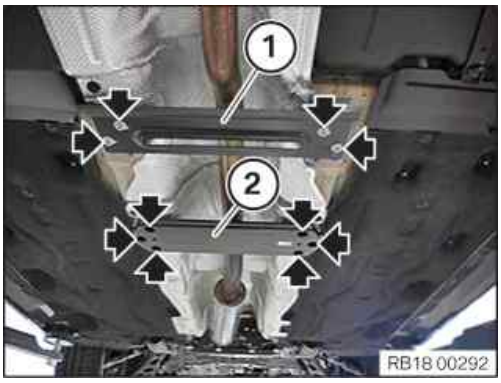
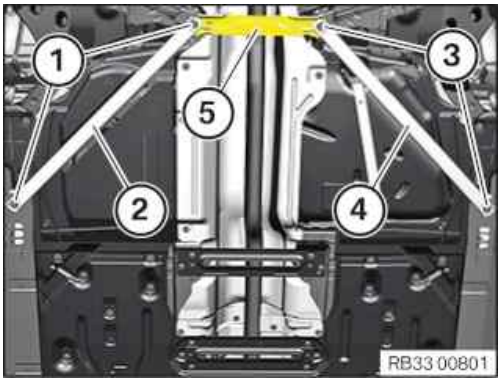


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

45 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

46 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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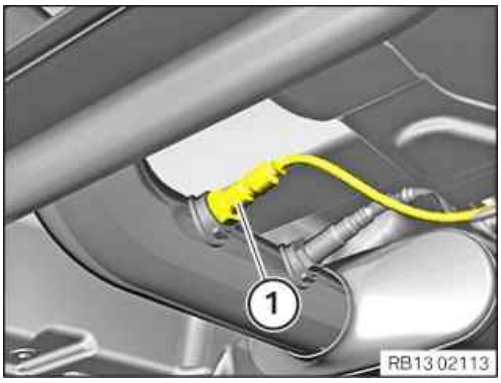
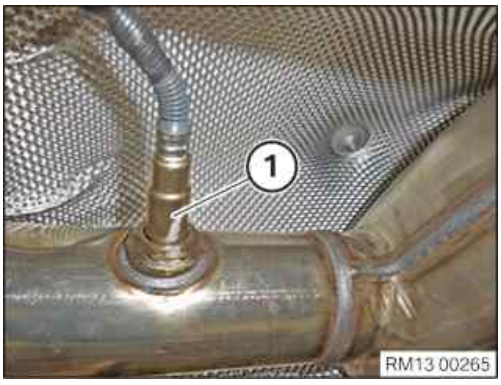
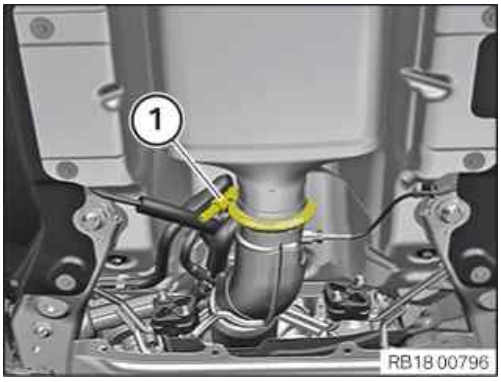


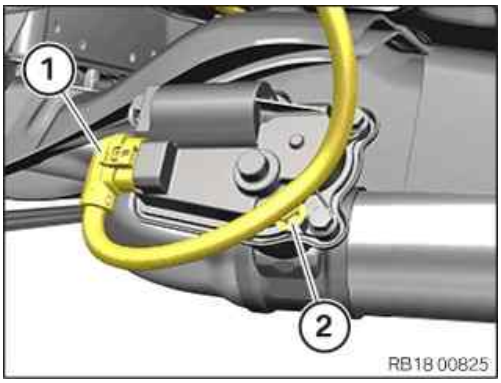
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



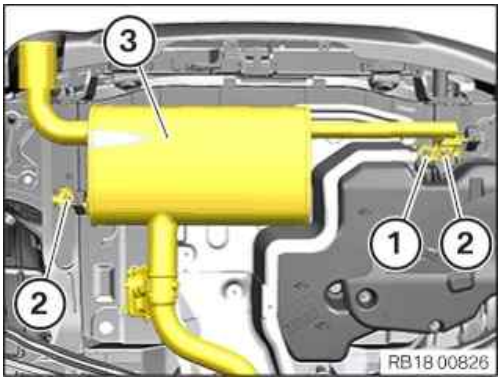
- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Unlock and disconnect connector (1).
- Loosen clamp (2).



- Loosen screw (1).
- Loosen nuts (2).
- Lower the exhaust system (3) with an auxiliary person, guide out and remove.

47 – Removing starter motor

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

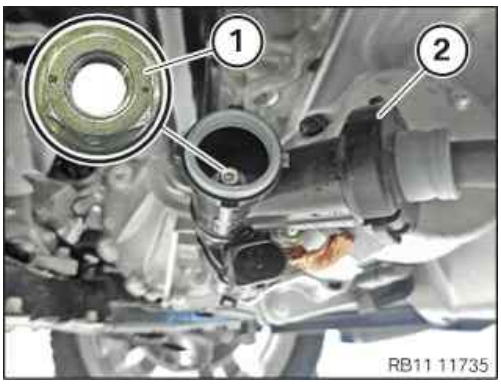
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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- Loosen screws (1).
- Feed out starter motor and remove.

48 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

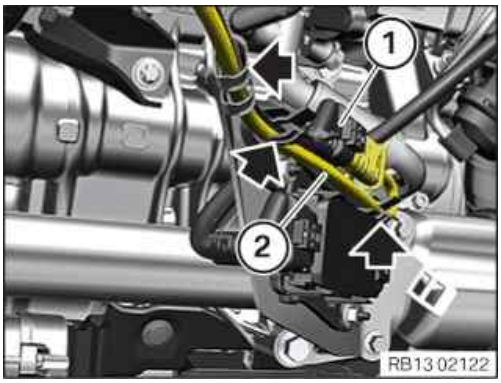
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

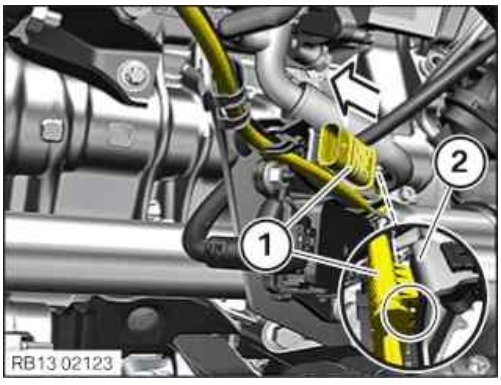
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).



- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.

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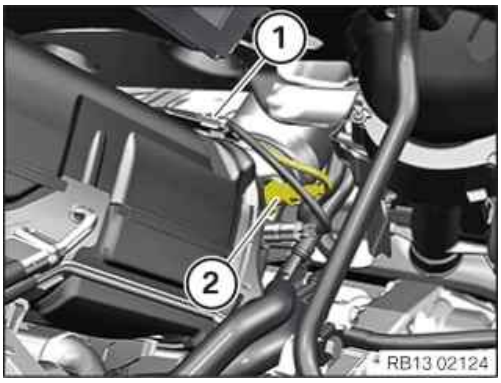


- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

49 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

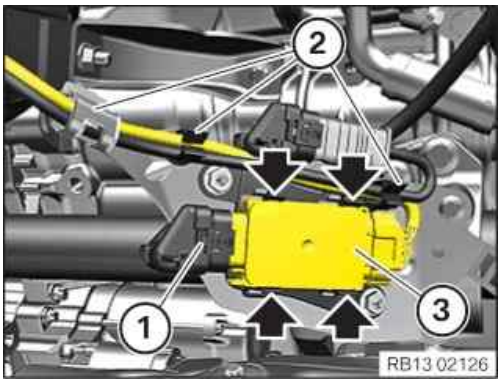
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

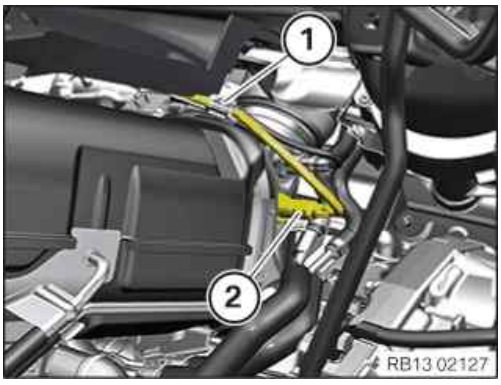
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

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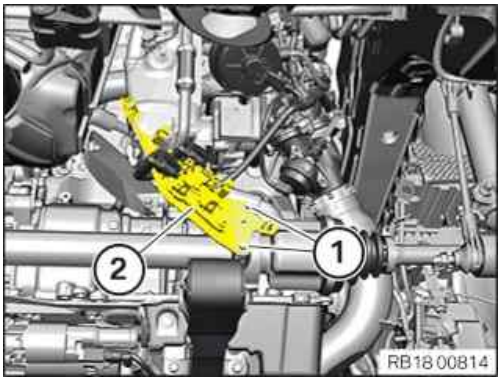
50 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

51 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

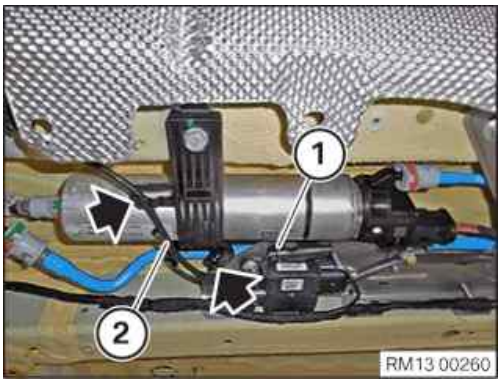
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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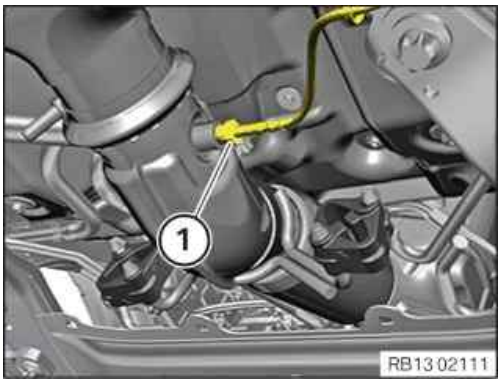
- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

52 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

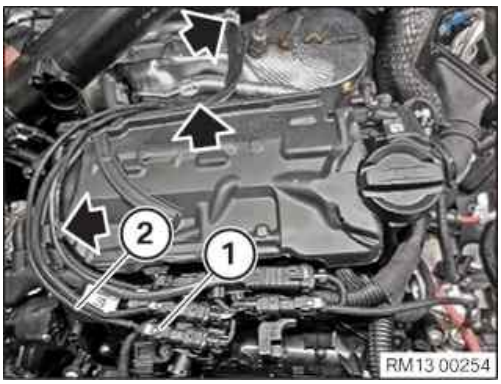
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Feed the cable (2) from the temperature sensor out of the clamps (arrows) and remove it.

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- Release the exhaust temperature sensor (1) with conventional tools (2).

- Feed out and remove exhaust temperature sensor (1).

53 – Remove the exhaust temperature sensor on the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and disconnect the plug connection (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

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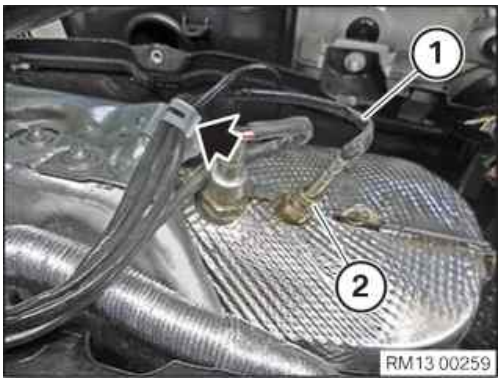


- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

54 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

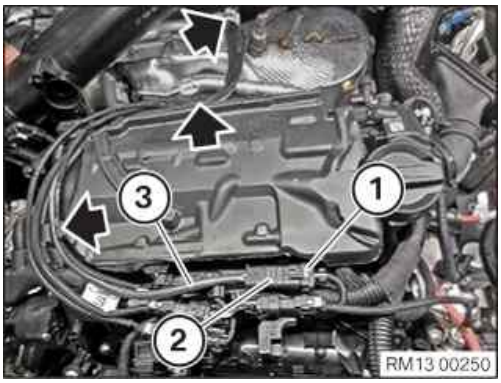
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

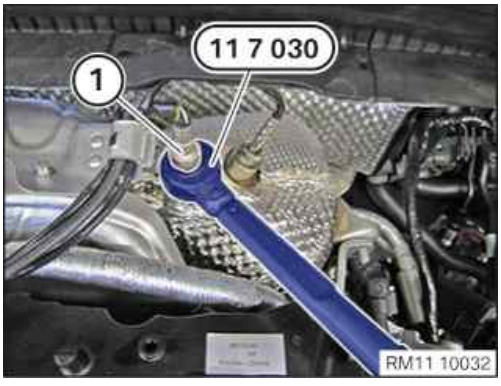
Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Detach the connector (2) from the holder .
- Feed out and remove cable (3) out of the oxygen control sensor from the clamps (arrows).



- Release the front oxygen control sensor (1) using special tool **0 491 075 (11 7 030)** .
- Feed out and remove the control sensor (1).

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55 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

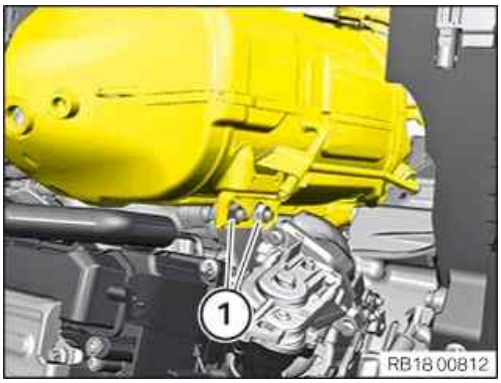
CAUTION

Heavy component.

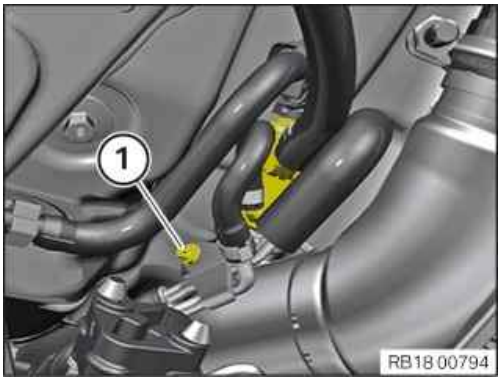
Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen nuts (1).



- Loosen screw (1).

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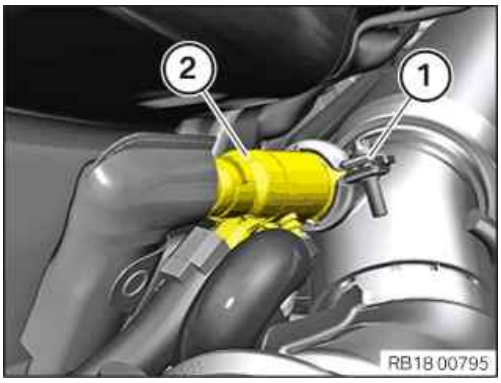
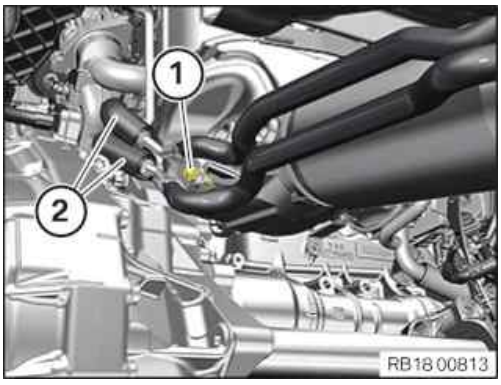
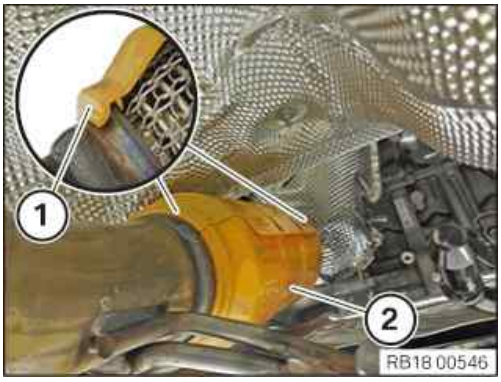


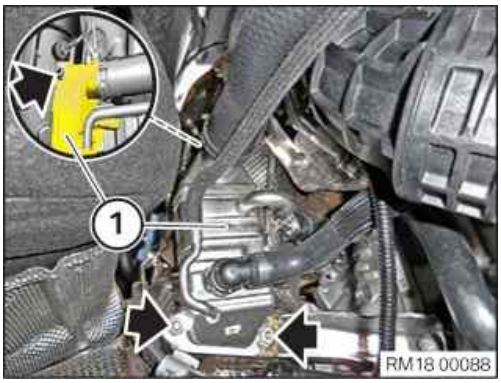
- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



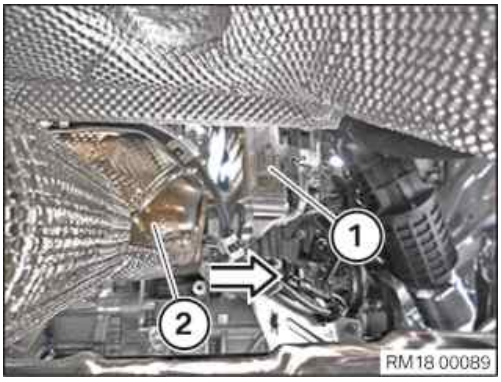
- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Detach nuts (arrows) from low pressure exhaust-gas recirculation cooler (1).



- Feed out low pressure exhaust-gas recirculation cooler (1) from diesel particulate filter (2) in direction of arrow and set aside.

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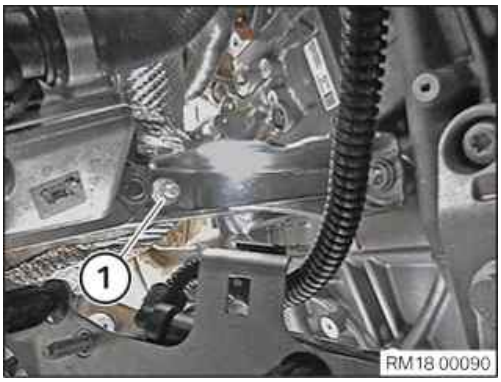
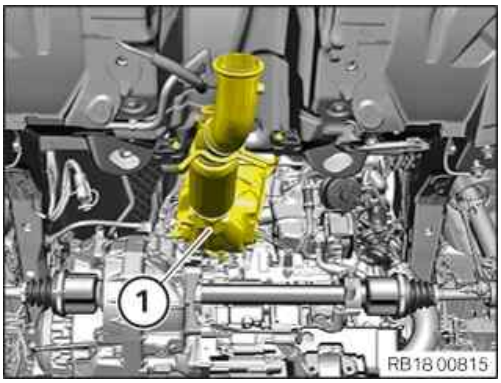


- Unfasten nut (1).



- Feed out diesel particulate filter (1) toward the bottom and remove.

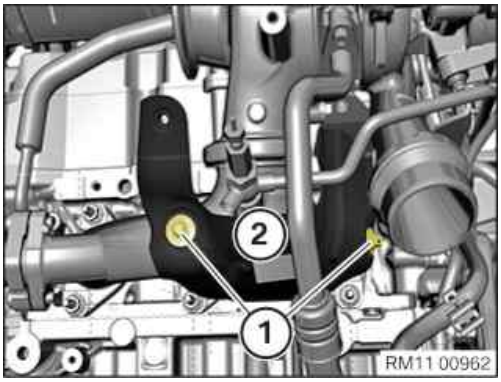
56 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

57 – Removing heat shield from rear exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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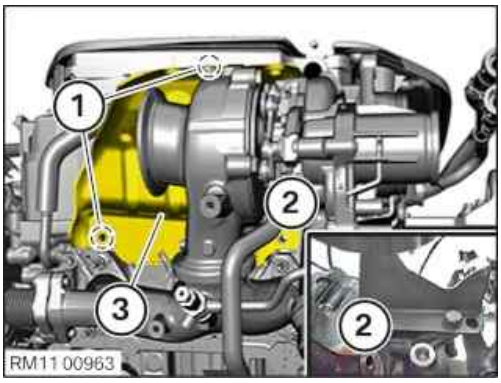
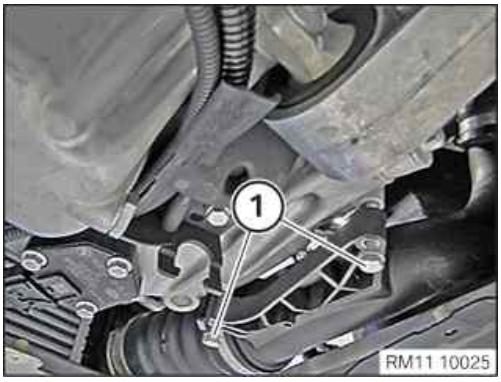


- Loosen screws (1).
- Loosen screw (2).

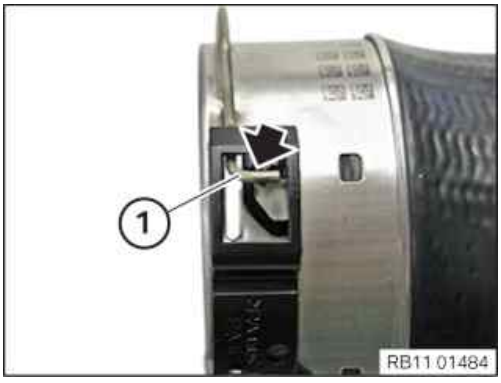
  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

58 – Remove right charge-air line

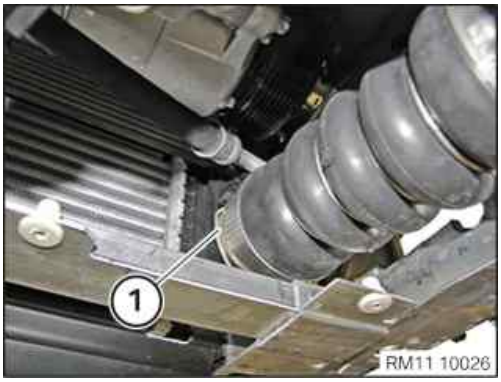


- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.



- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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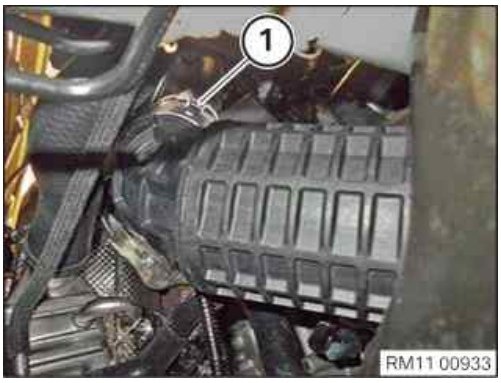

- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

59 – Remove exhaust turbocharger

- Release screw (1) from beneath with a long extension.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).
- Disconnect the oil return line (2) toward the bottom and set it aside.

- Release banjo bolt (1) of oil feed line from exhaust turbocharger and place to one side.

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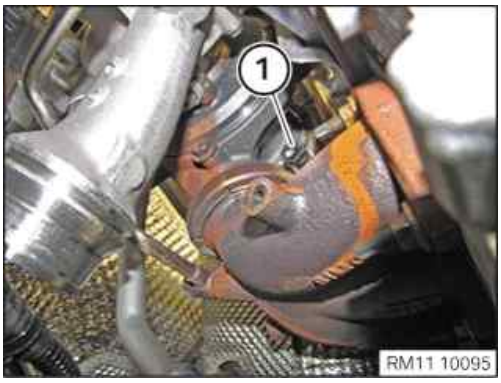


- Release screw (1) and remove V-clip.
- Pull exhaust turbocharger up and remove.
- Remove seal between exhaust turbocharger and exhaust manifold.

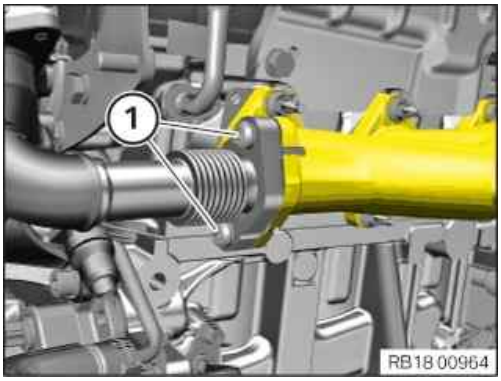
60 – Remove exhaust manifold

WARNING

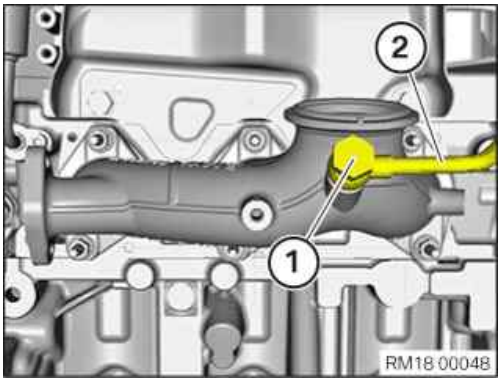
Hot surfaces.

Risk of burning!

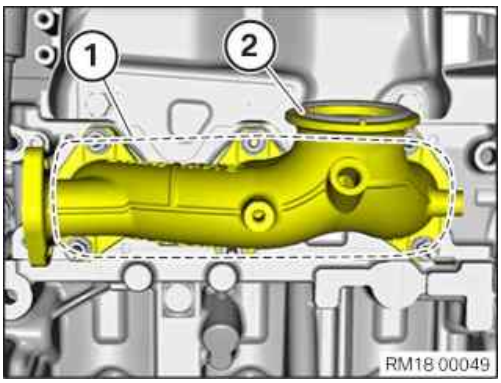
- Perform all work only on components that have cooled down.



- Loosen screws (1).



- Unscrew the banjo bolt (1).
- Feed out exhaust gas pressure pipe (2) and place to one side.



- Evenly release nuts along the dashed line (1) from outer to inner side.
- Feed out exhaust manifold (2) and remove.

61 – Removing the acoustic cover for the engine at the front

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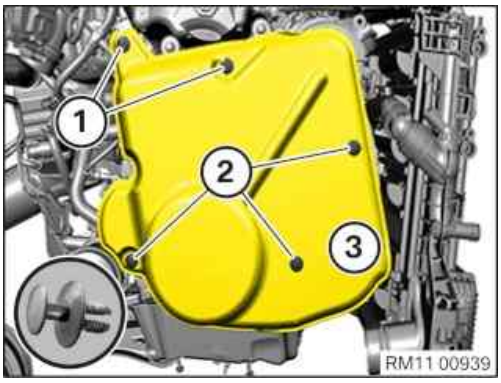


- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

62 – Checking camshaft timing

- Remove protective cap (1) from oil sump.
- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

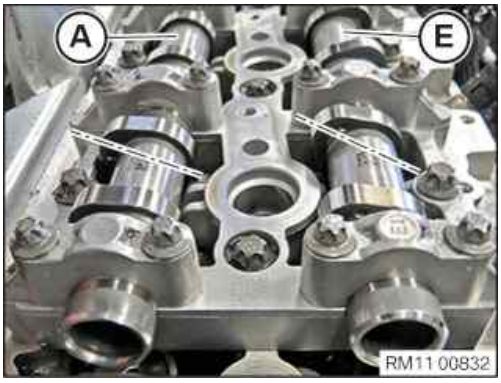
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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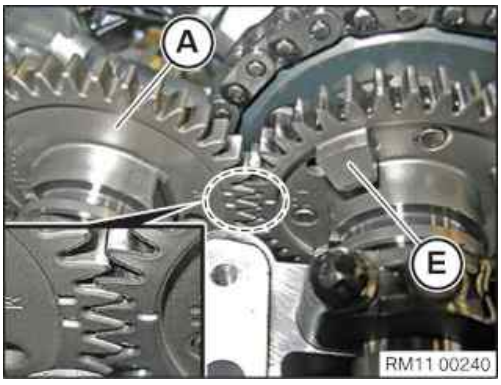
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

63 – Remove chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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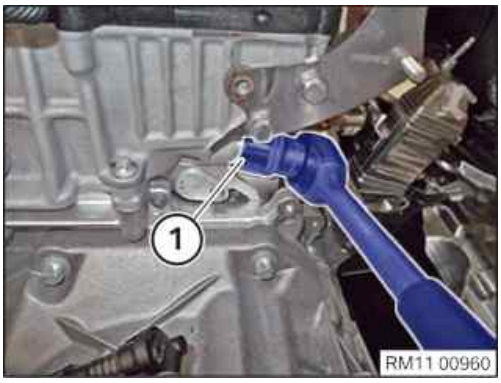
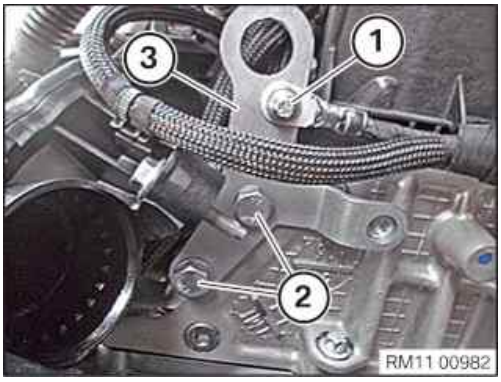


TECHNICAL INFORMATION

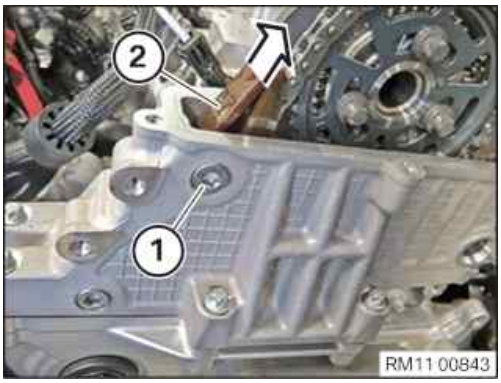
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Remove the chain tensioner piston (1).

64 – Remove the timing chain guide rail

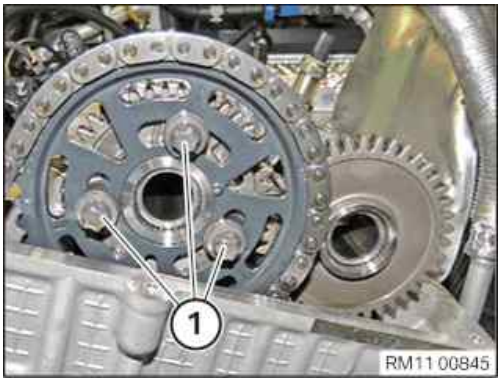


- Release screws (1) and place ground cable to one side.
- Loosen screws (2).
- Remove the mounting bracket (3).



- Remove the bearing journal (1).
- Remove the guide rail (2) in the direction of the arrow.

65 – Removing the camshaft sprocket on the intake camshaft



- Loosen screws (1).
- Secure the drive chain against falling.
- Remove the camshaft sprocket on the intake camshaft.

66 – Removing the camshaft support

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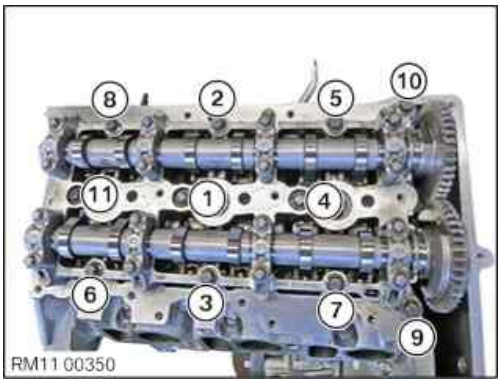
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Loosen all screws step-by-step of the camshaft support in sequence (11) to (1).
- Remove camshaft support in upward direction.

  The camshafts remain installed in the camshaft support.

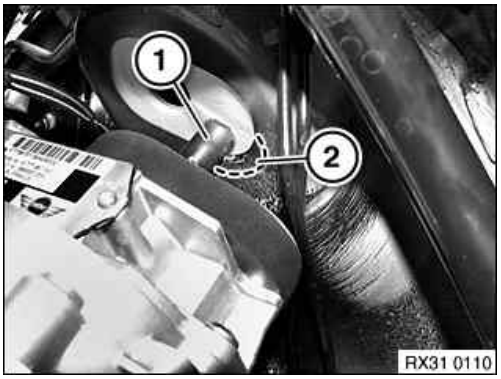
67 – Remove cylinder head.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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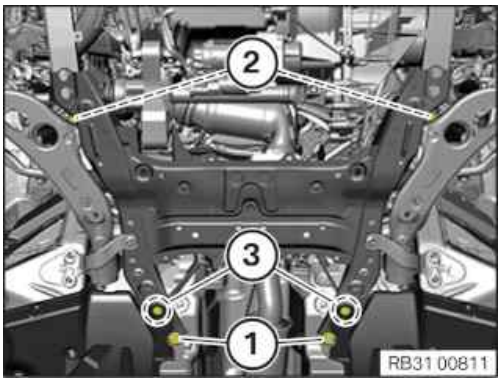


- Position front axle support.
- Bend the underbody panelling to the side in area (3).
- Raise front axle support.
- When raising, insert the charge air cooler into its rubber mount on the transmission cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

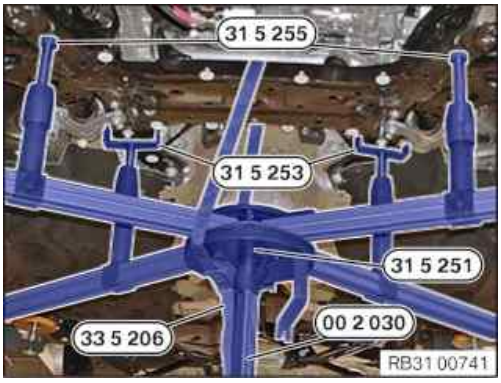
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

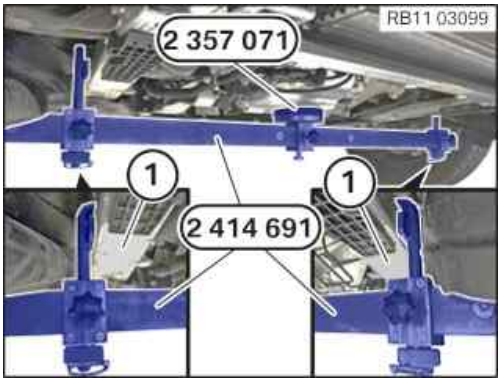
- If applicable, tighten the screws in area (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower the universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and set it aside.



- Prepare special tool **2 414 691** together with the special tool **2 357 071**.
- Attach special tool **2 414 691** to front axle support and correctly align the special tool **2 357 071** under the oil sump and tighten.
- Turn special tool **2 414 691** at adjusting screw uniformly upwards, until the special tool **2 357 071** makes contact with the oil sump.
- Tighten all adjusting screws of special tools**2 414 691** and **2 357 071**.

- Remove all glow elements with special tool **0 491 068 (11 6 050)** or a standard tool.

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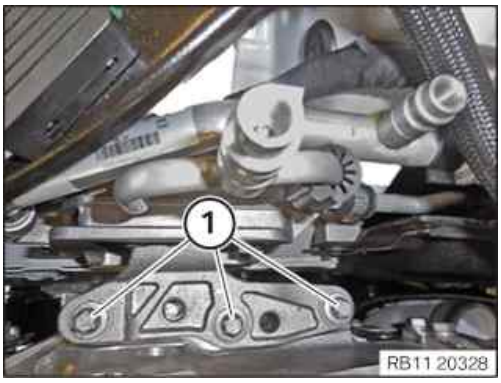
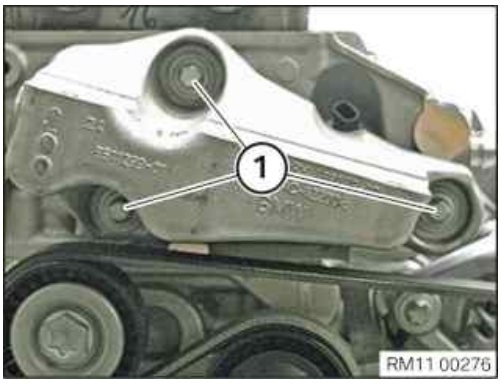


- Loosen screws (1).

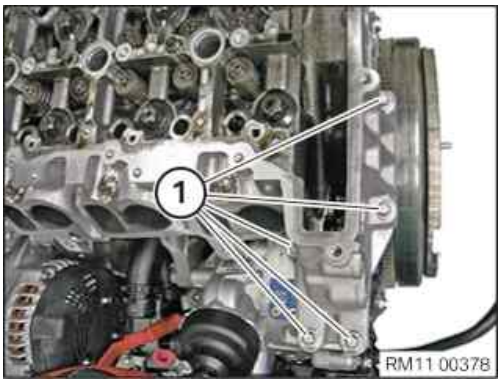


- Loosen screws (1).

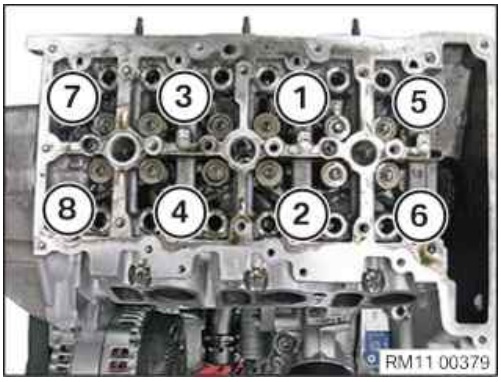
- Guide in and position special tool **2 459 012** on cylinder head.
- Tighten the screws (1) of special tool **2 459 012**.

Special tool to cylinder head

M8		Tightening torque	21,5 Nm



- Loosen screws (1).



- Loosen the cylinder head bolts in the sequence from (8) to (1).

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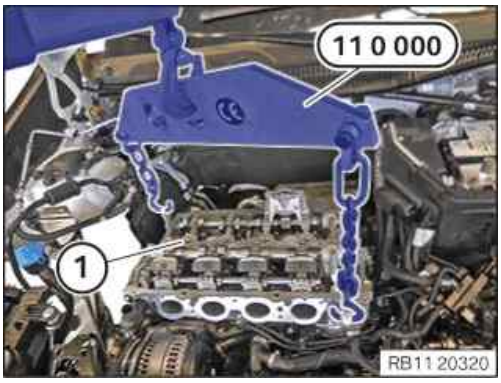


NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

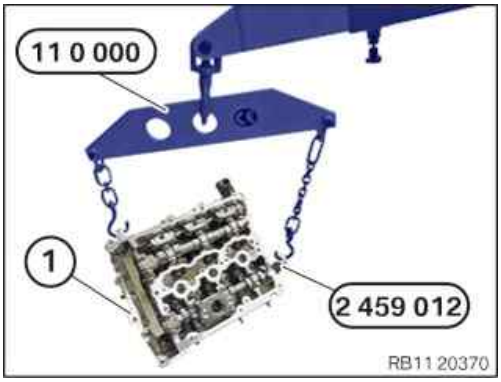
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

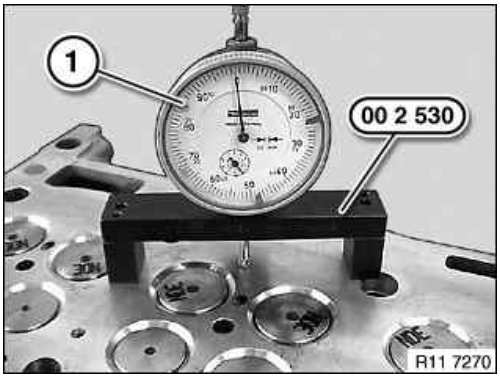
- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- **Carefully** guide out the cylinder head (1) with the engine lifter and the special tool **0 490 561 (11 0 000)** and remove.

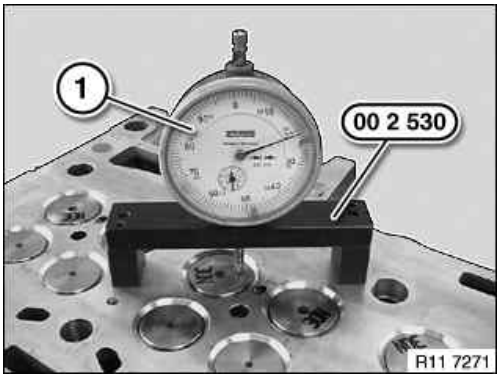


- Mount the cylinder head (1) on the special tool **0 494 362 (11 9 000)**.

68 – Checking the valve underprotrusion



- Set the dial gauge (1) onto the cleaned cylinder sealing surface with slight preload in special tool **0 490 185 (00 2 530)**.
- Set dial gauge in mildly preloaded state to "zero".



Check

- Position the dial gauge (1) on the valve with special tool **0 490 185 (00 2 530)**.
- Measure valve underprotrusion and compare with the setpoint value.

Valve underprotrusion

	0,8 (0,7 - 0,9) mm

Result

» Valve underprotrusion is outside tolerance.

Measure

- Replace cylinder head.

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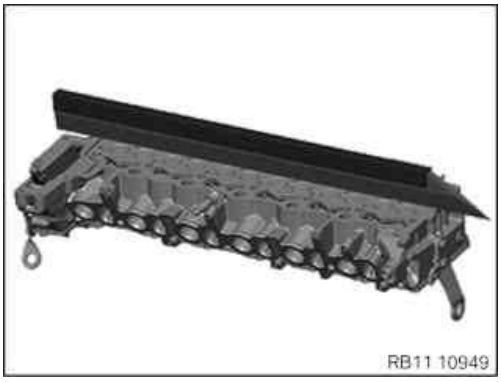
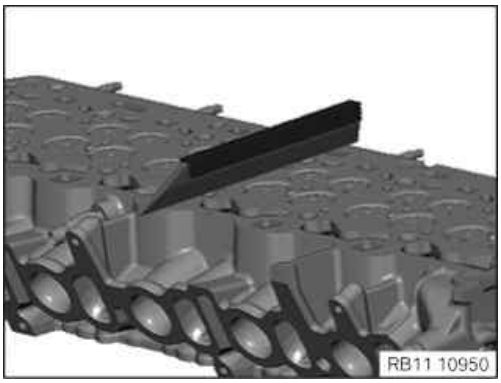
69 – Check the flatness of the cylinder head



- Check the flatness of the cylinder head lengthwise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm



- Check the flatness of the cylinder head crosswise using a straightedge.

Cylinder head flatness

Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

70 – Remove all valve springs

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

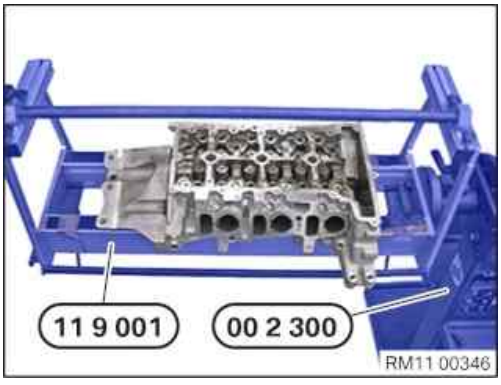
- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Mount and bolt special tool **0 494 366 (11 9 001)** on special tool **0 495 187 (00 2 300)**.
- Mount and bolt the cylinder head to the special tool **0 494 366 (11 9 001)**.

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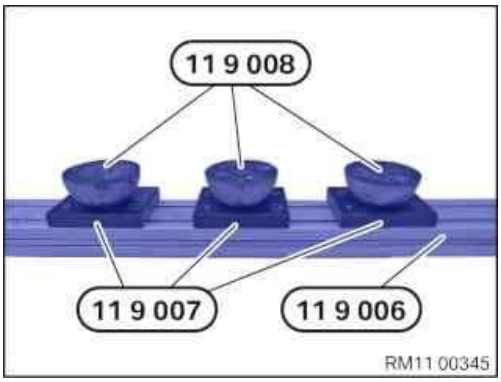
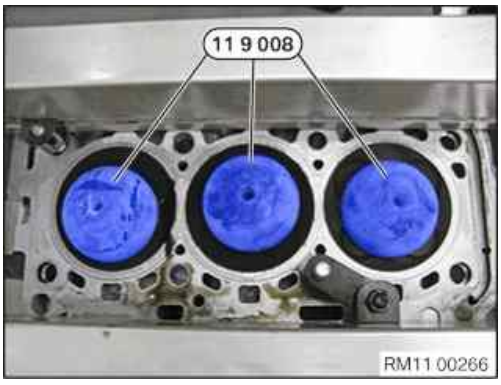
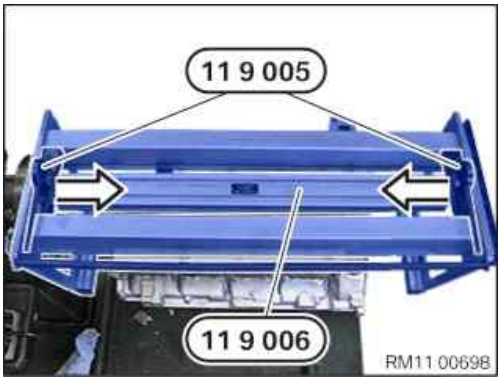


- Prepare special tools **0 494 371 (11 9 006)**, **0 494 372 (11 9 007)** and **0 494 373 (11 9 008)** as shown.

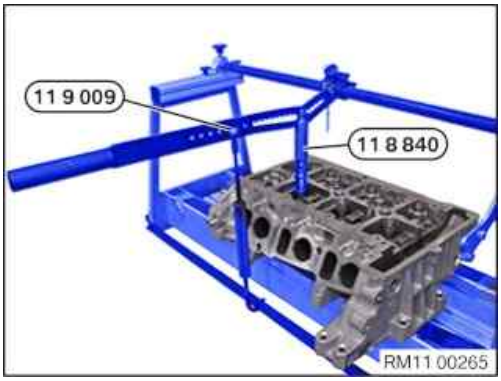


- Make sure that the special tools **0 494 373 (11 9 008)** are positioned as shown in the next operation.



- Turn round special tool **0 494 371 (11 9 006)** and insert as shown.
- Slide the special tool **0 494 370 (11 9 005)** in the direction of the arrow.

- Lock special tool 1**0 494 370 (11 9 005)** in the direction of the arrow.
- Rotate the cylinder head with the special tool **0 494 362 (11 9 000)** by 180° into the installation position.



- Align special tool **0 494 374 (11 9 009)** in direction of valve axis.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.

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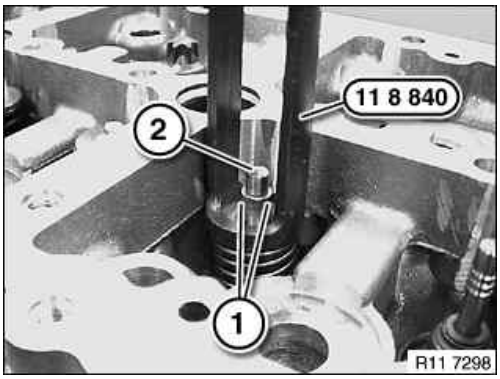
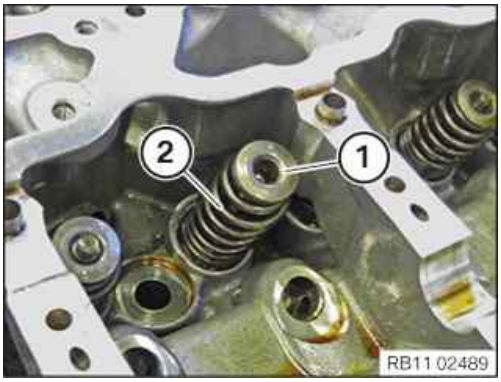


- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Remove the valve shims (1) with a magnet from the valve (2).
- Carefully relieve the valve spring.



- Set the spring cup (1) and the valve spring (2) down in the special tool **0 495 105 (11 4 480)** in order.

MAIN WORK

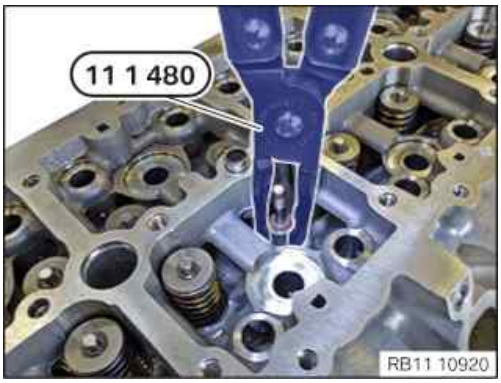
71 – Remove valve stem seals

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.



- Disassemble the valve stem seal (1) using the special tool **0 490 796 (11 1 480)**.

72 – Installing valve stem seals

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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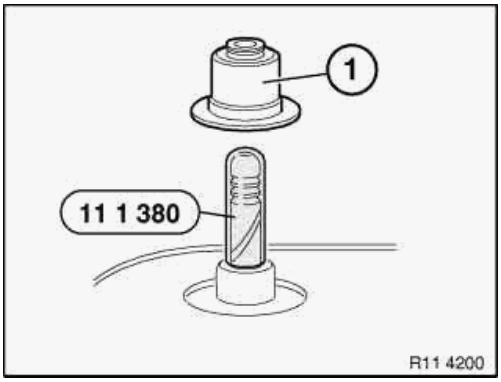
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

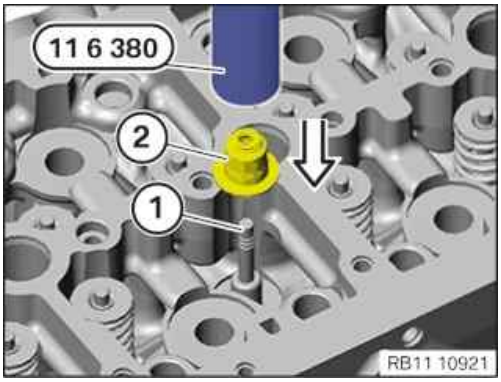
- Do not use any metal-cutting tools.

- Clean the contact surfaces (1).



- Fit special tool **0 490 746 (11 1 380)**.
- Oil the valve stem seal (1) and install it.

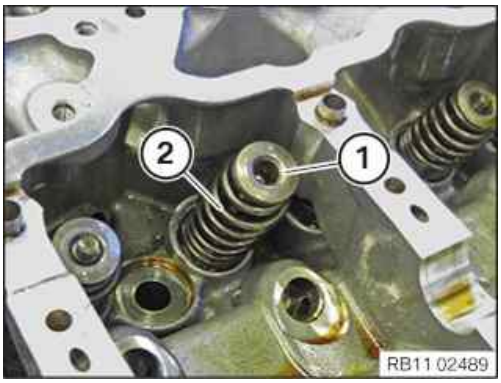
  Parts: Valve stem seal



- Position the valve stem seals (2) on the valve (1).
- Use special tool **0 493 249 (11 6 380)** to press down the valve stem seal (2) until they are in contact with the cylinder head.

POSTPROCESSES

73 – Install all valve springs



- The mounting orientation of the valve springs (2) can be freely chosen.
- Install the valve spring (2) and spring cup (1).

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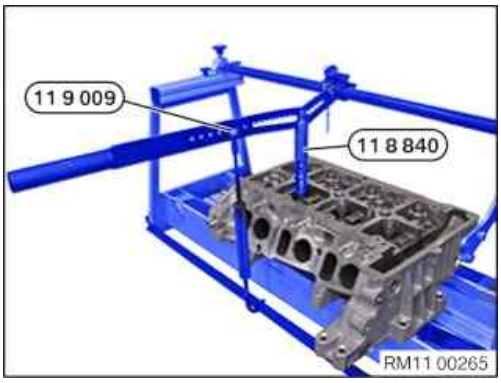


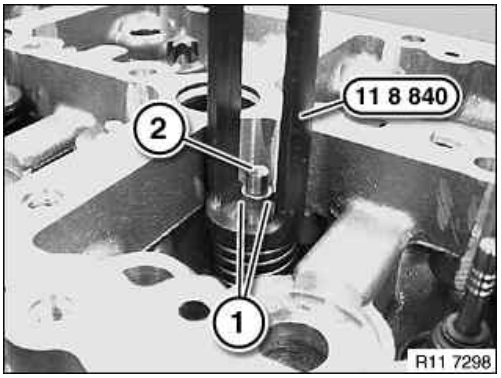
CAUTION

Component with preload.

Danger of injury!

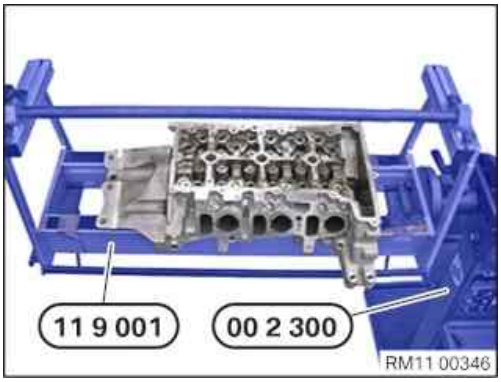
- Reduce preload as far as possible before disassembly. Relieve component.

- Align special tool in direction of valve axis.
- Select the corresponding groove using special tool **0 496 143 (11 8 840)**.
- Press down the valve spring on the upper spring cup with the special tools **0 494 374 (11 9 009)** and **0 496 143 (11 8 840)**.



- Keep the valve spring pressed down with the special tool **0 496 143 (11 8 840)**.
- Install the valve shims (1) of the valve (2) with a magnet.
- Relieve load on valve spring.

- Unlock special tool **0 494 370 (11 9 005)** in the direction of arrow and remove.



- Remove cylinder head from special tools **0 494 366 (11 9 001)** and **0 495 187 (00 2 300)**.

74 – Cleaning the sealing surface

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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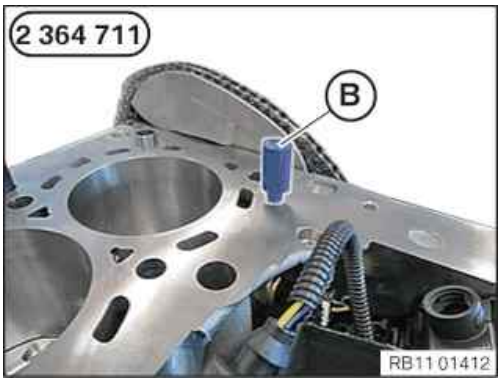


- Lock the front oil duct using special tool (B) from special tool **2 364 711**.

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 103 (11 4 471)**.

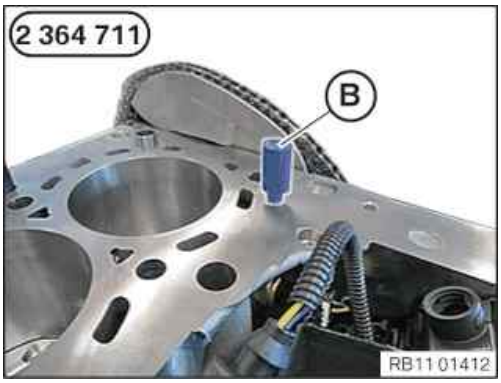
RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

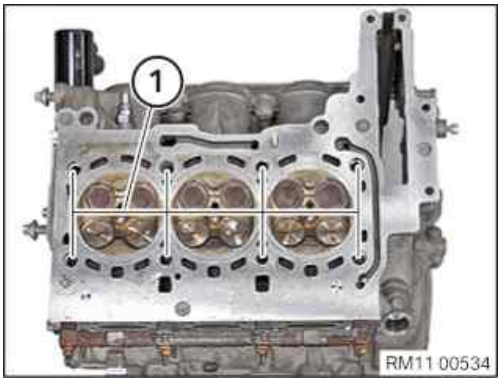
- Do not use any metal-cutting tools.

- Clean the sealing surface using special tool **0 495 104 (11 4 472)**.



- Remove special tool (B).

75 – Renewing the cylinder head gasket



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Remove oil and dirt residue from the blind holes (1).

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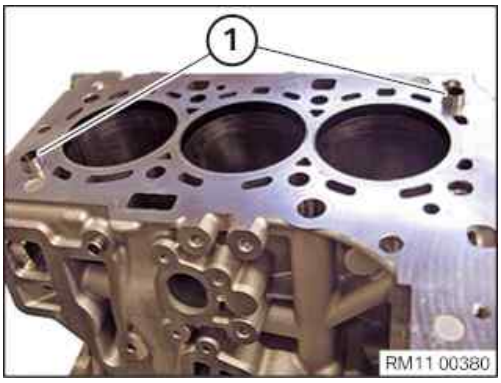
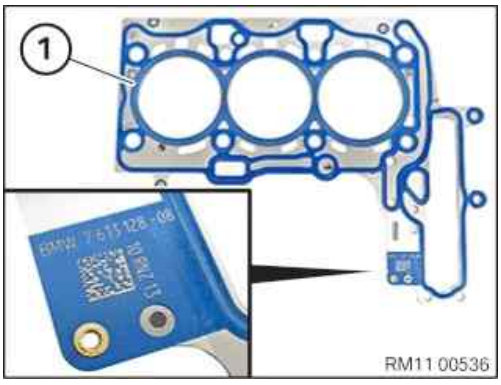
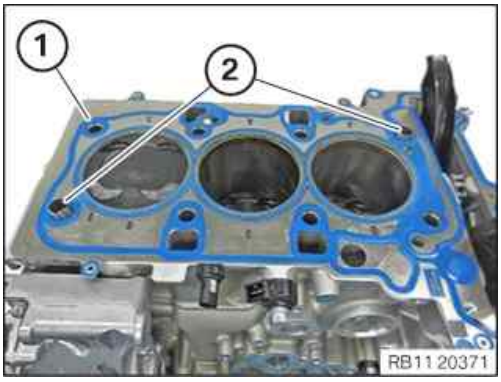


- Check the fitting sleeves (1) for secure fit and damage.



- Identify the cylinder head gasket (1) using the part number.
- **After work on the crankshaft drive and processing the cylinder head, the thickness of the cylinder head gasket must be determined.**



- Guide in the cylinder head gasket (1) and install.

  Parts: Cylinder head gasket.
- Ensure that the cylinder head gasket (1) is installed correctly in the fitting sleeves (2).

76 – Installing the cylinder head

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

RISK OF DAMAGE

Damage to threads.

Fluid in the threaded hole may damage the thread when screws are tightened in the threads.

- Dry threaded holes (e.g. using compressed air).

TECHNICAL INFORMATION

Do not remove bolt coating.

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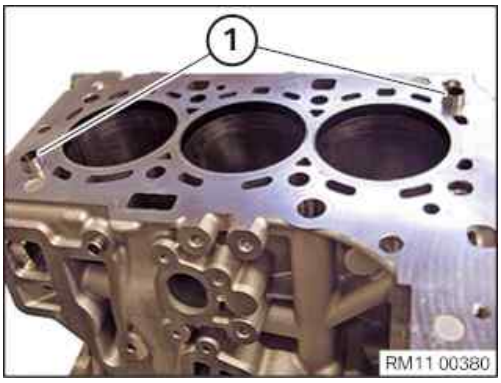
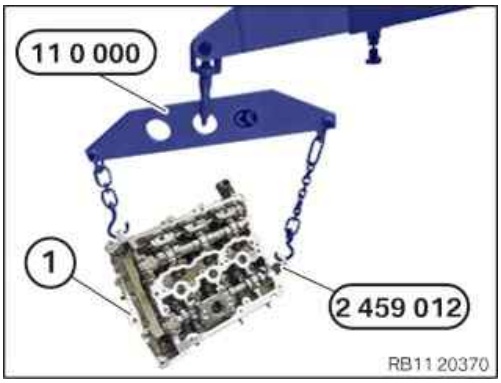


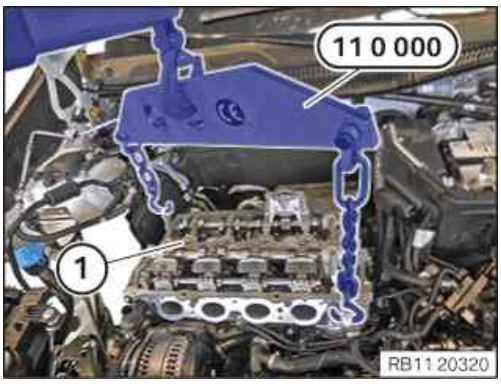
- Check the fitting sleeves (1) for damage and renew, if necessary.

  Parts: Fitting sleeves.

- Make sure that the fitting sleeves (1) are installed in the correct mounting orientation.



- Position cylinder head (1) on special tool **0 490 561 (11 0 000)** and engine lifter.



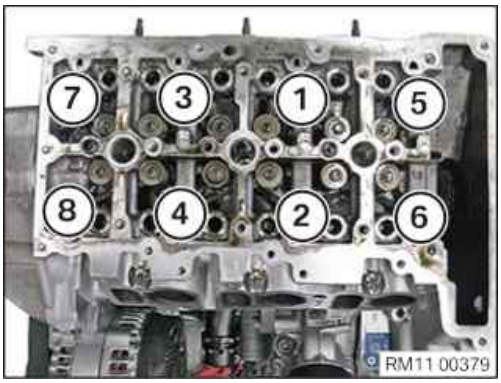
RISK OF DAMAGE

Damage to the guide rails.

Large amounts of force may damage the guide rails of the timing chain.

- Make sure not to damage the guide rail with the cylinder head when removing and installing the cylinder head.

- Feed in the cylinder head (1) **carefully** with the engine lifter and the special tool **0 490 561 (11 0 000)** and install.



- Fit new cylinder head bolts.

  Parts: Cylinder head bolts

- Do **not** wash off coating of cylinder head bolts.
- **Lightly** oil contact surfaces of cylinder head bolt screw heads.

  There must be **no** coolant, water or engine oil in any of the threaded holes in the engine block.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.
Non-observance of these requirements may result in leaks and damage.

- Feed in cylinder head bolts and install.
- Screw in the cylinder head bolt in the sequence (1) to (8).

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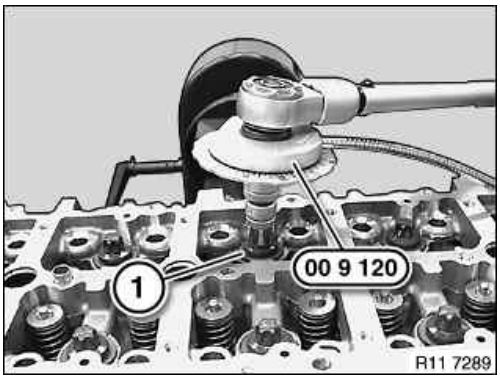
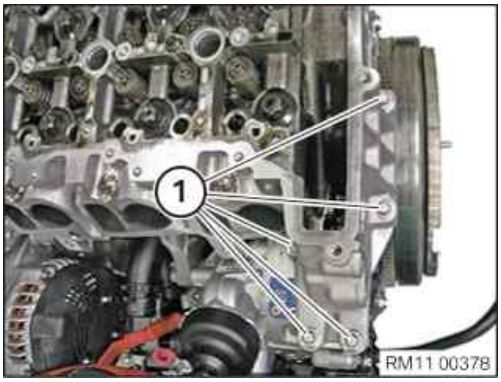


- Tighten the cylinder head bolts in the sequence (1) - (8) using special tool **0 490 504 (00 9 120)**.

Cylinder head to crankcase

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

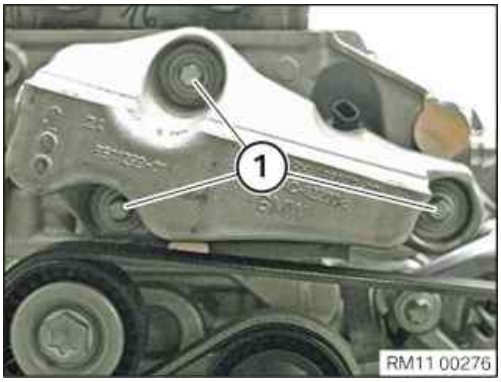


- Tighten the screws (1).

Cylinder head bolt to timing case cover

M8x40		Tightening torque	19 Nm

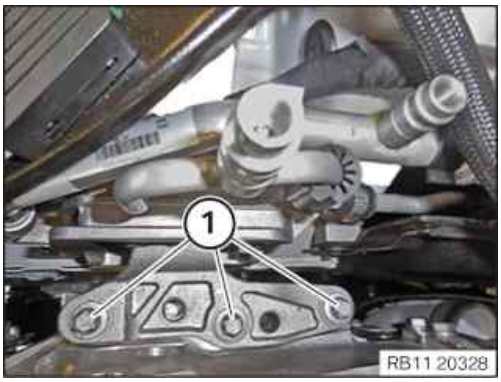
- Unscrew the bolts (1) of the special tool **2 459 012**.
- Guide the special tool **2 459 012** out and remove.



- Tighten the screws (1).

Engine support to cylinder head

M10X45		Tightening torque	41 Nm



- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Right engine mount to cylinder head

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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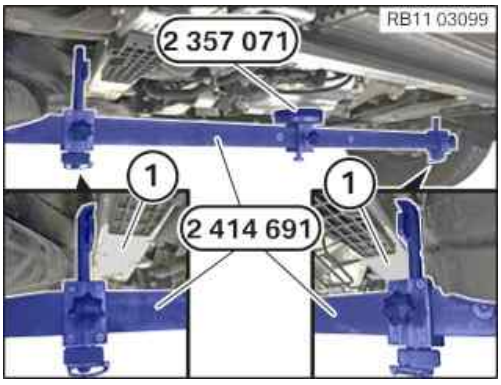
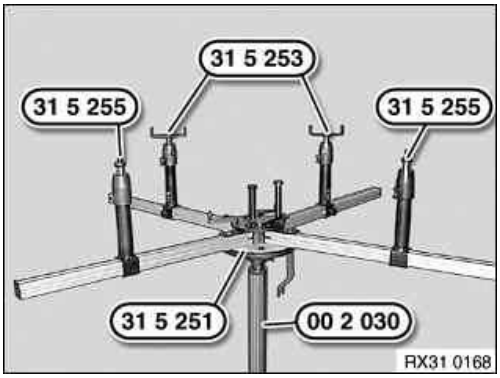
- Tighten the glow element with the special tool **0 491 068 (11 6 050)** or conventional tools.

Glow elements to cylinder head

Glow element		Tightening torque	13 Nm

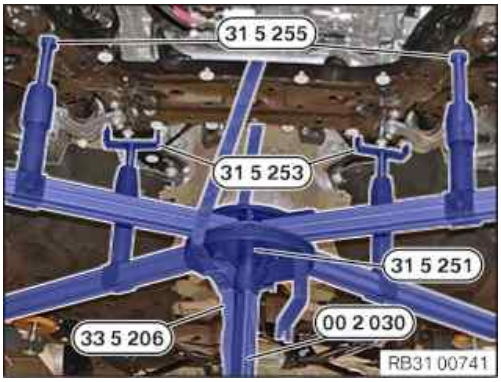


- Disassemble special tool **2 414 691** using special tool **2 357 071**.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

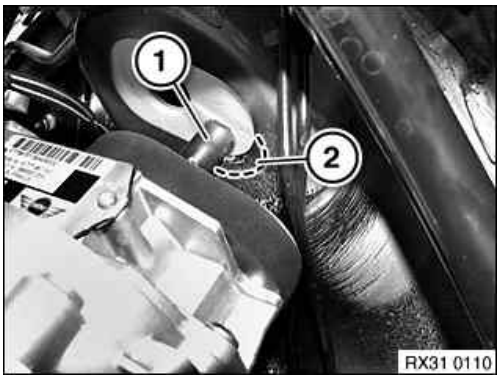
Note: In a profile rail pair, two profile rails are connected to one another by gearing.



- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.



TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!

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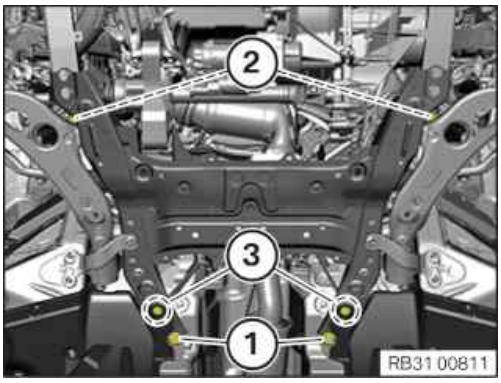


- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and the front axle remove.

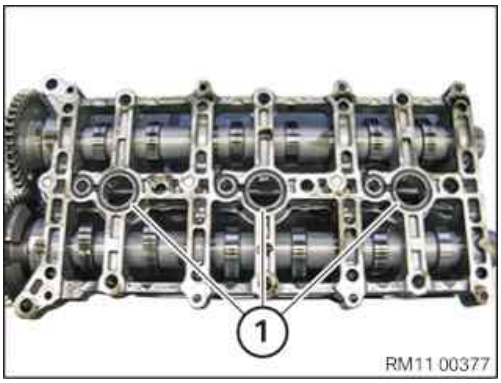
77 – Installing the camshaft support

RISK OF DAMAGE

Damage of the engine and mounted parts.

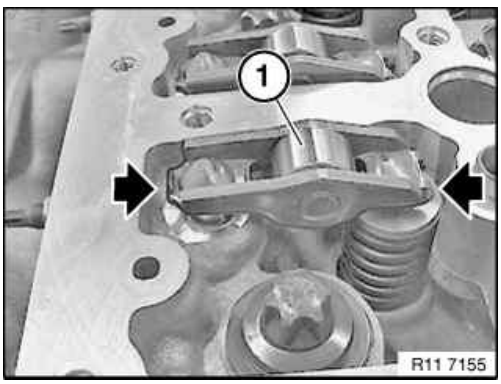
Non-compliance with the instructions for mounting and disassembly may lead to damage to the engine and mounted parts.

- Comply with the regulations for the installation and disassembly.
- Perform work with care.

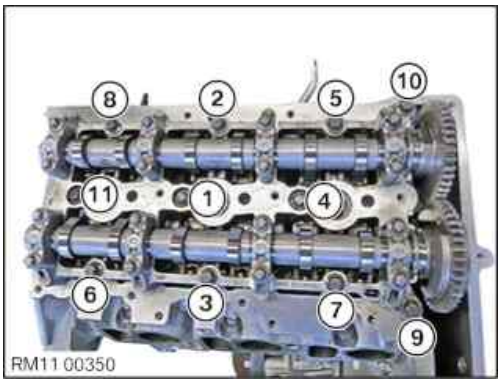


- Renew the seals (1) on the camshaft support.

  Parts: Seals



- Make sure the roller cam followers (1) have the correct mounting orientation.
- Position the camshaft support.



- Tighten the screws of the camshaft support incrementally in the sequence (1) to (11).

Camshaft carrier to cylinder head

M7x35		Tightening torque	13 Nm

78 – Installing the camshaft sprocket on the intake camshaft

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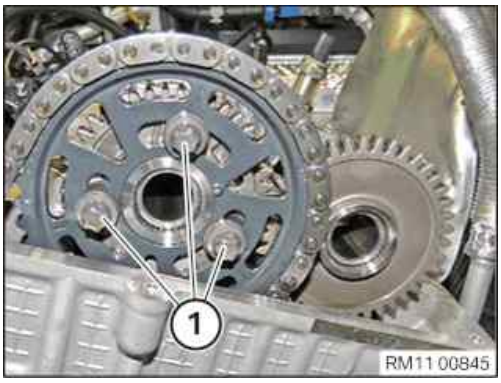
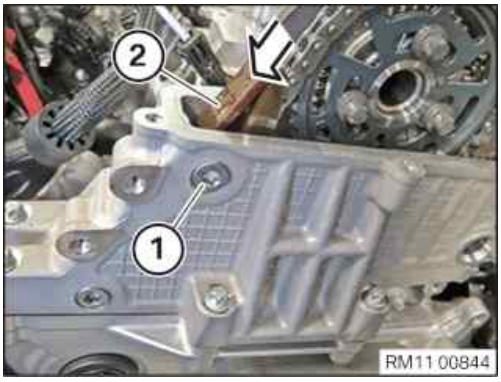


- Position the drive chain on the camshaft sprocket so that the thread of the screw connections are located in the centre of the elongated holes.
- Position the camshaft sprocket on the intake camshaft.
- Merely apply the screws (1) hand-tight so that the camshaft sprocket can still be moved in relation to the intake camshaft.

79 – Install the timing chain guide rail



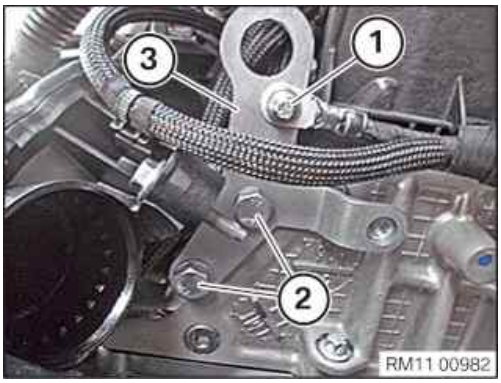
- Position the guide rail (2) in the direction of the arrow.

  Make sure the guide rail (2) is correctly installed at the bottom bearing journal.
- Renew bearing journal (1).

  Parts: Bearing journal
- Tighten the bearing journals (1).

Bearing journal to cylinder head

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm



- Position the mounting bracket (3).
- Tighten down screws (2).

Standard screw connection M8

M8		Tightening torque	19 Nm

- Position the ground cable and tighten the screw (1).

Standard screw connection M6

M6		8 Nm

80 – Installing the chain tensioner piston

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

- Renew sealing ring (1).

  Parts: Sealing ring

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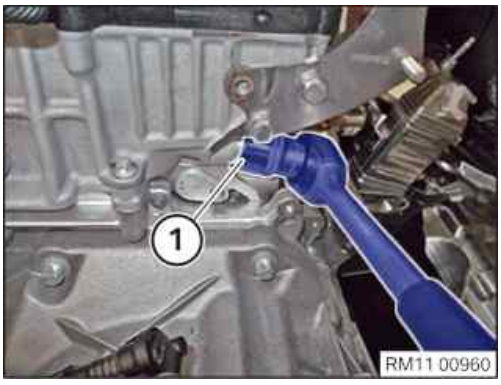
TECHNICAL INFORMATION

The oil chamber must be drained for reuse of the chain tensioner.

- Place chain tensioner on a level support and slowly compress.
- Repeat this procedure twice.

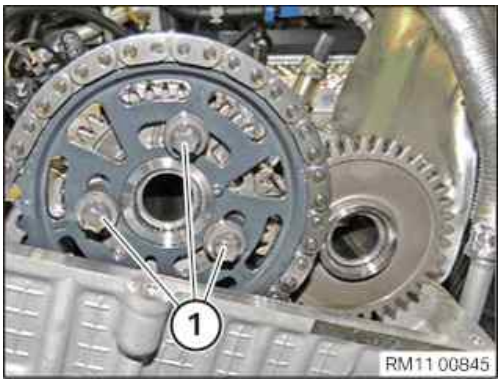


- Install and tighten the chain tensioner piston (1).

Chain tensioner piston to cylinder head

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

81 – Tightening the camshaft sprocket on the intake camshaft



- Tighten the screws (1).

Camshaft sprocket to camshaft

M7x17.			17 Nm

82 – Removing the special tool to secure the exhaust camshaft

- Remove special tool **0 496 112 (11 8 760)** from the exhaust camshaft.

83 – Remove special tool to disconnect the crank shaft

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- Remove special tool **2 288 380**.

84 – Checking camshaft timing

- Remove protective cap (1) from oil sump.

- **Spin the engine twice in the direction of rotation.**

RISK OF DAMAGE

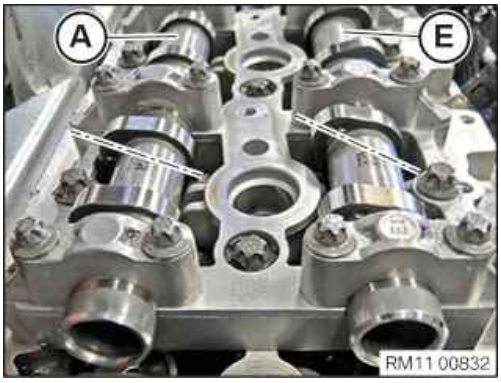
Damage to the engine.

The engine may be damaged if it is manually rotated in the wrong direction.

- Always rotate the engine in the correct direction of rotation by hand: a) Clockwise, facing the vibration damper or b) Counter-clockwise, facing the chain drive. (b) only applies when the rear timing chain is installed.

- Crank the engine on the first cylinder to TDC firing position using special tool **0 493 380 (11 6 480)**.

  Do **not** crank the engine in reverse.



- Make sure the cam on the intake camshaft (E) on the first cylinder is pointing upwards at an angle.
- Make sure the cam on the exhaust camshaft (A) on the first cylinder is pointing towards the outside left at an angle.

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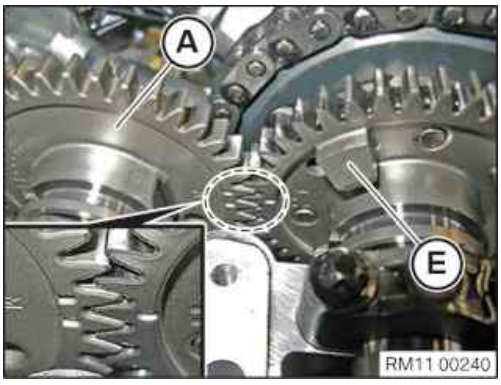
- Slide the special tool **2 288 380** completely into the oil sump until the engine is blocked.
- If disconnecting is not possible, slowly rotate engine in direction of rotation until the special tool **2 288 380** engages in the flywheel.
- Check whether the engine is blocked free of play.



- Make sure the marks on both camshafts (A) and (E) correspond in the highlighted area.

- Place special tool **0 496 112 (11 8 760)** on exhaust camshaft.

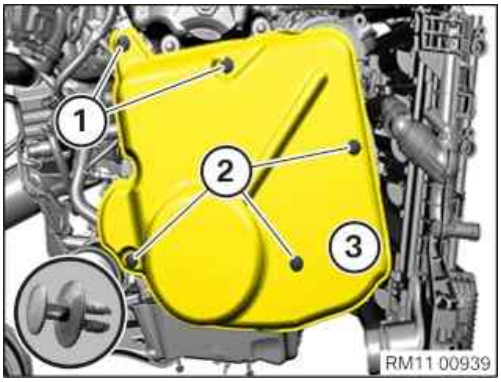
TECHNICAL INFORMATION

If the check finds that the timings are incorrect, the timings must be adjusted.
For additional information, see: 1131 ... Adjust the timings of the camshafts.

- Special tool **0 496 112 (11 8 760)** must lie flush on cylinder head.

- Remove the special tool **2 288 380** to disconnect the crankshaft.
- Install the protective cap (1).

85 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

86 – Installing exhaust manifold

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RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

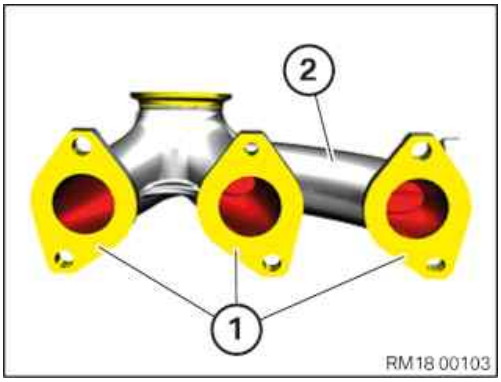
Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

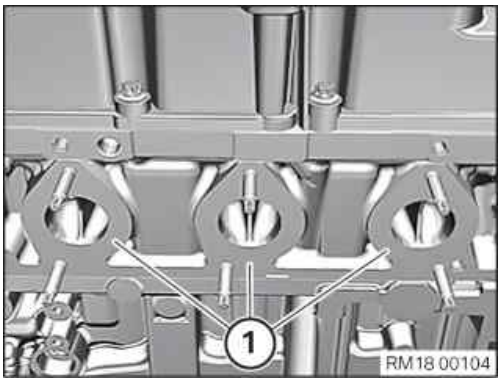
- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

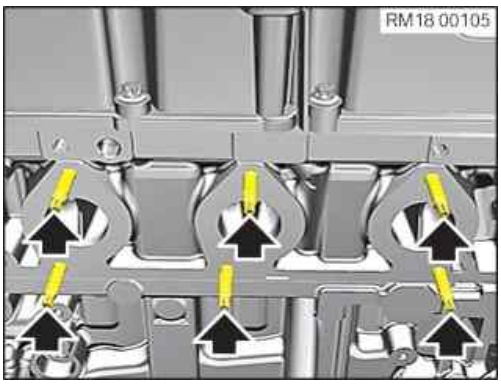
The sealing surfaces must be free from oils, grease and cleaning agents.



- Clean the connection points (1) on the exhaust manifold (2) with the special tool **0 495 102 (11 4 470)**.



- Clean the connection points (1) on the cylinder head with the special tool **0 495 102 (11 4 470)**.



- Check the stud bolts (arrows) on the cylinder head for **correct** fit.

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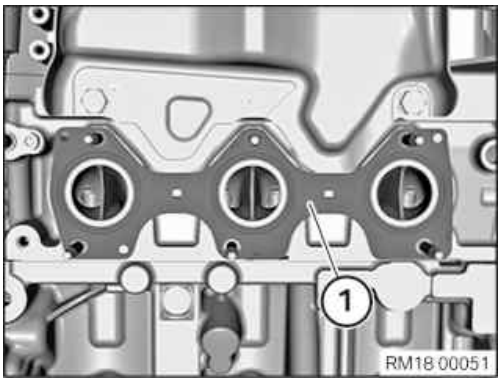
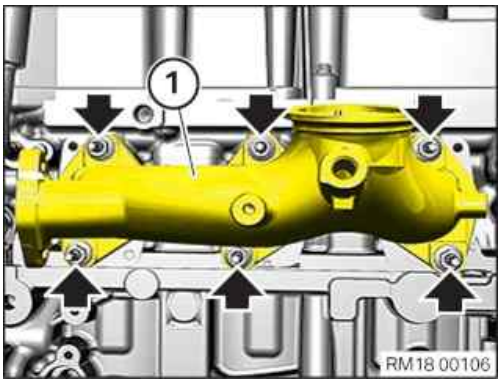


TECHNICAL INFORMATION

The **coated side of the** seal must be mounted facing towards the exhaust manifold.

- Renew the gasket (1).

  Parts: Gasket
- Insert and install the gasket (1).

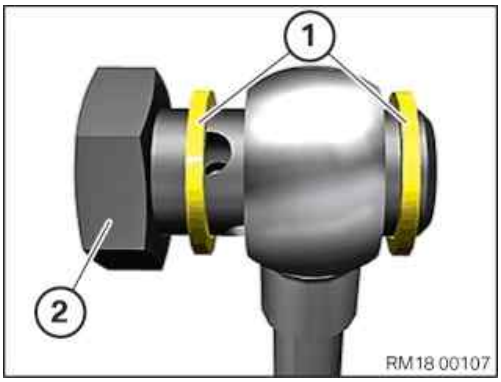


- Insert and install the exhaust manifold (1).
- Renew the nuts (arrows).

  Parts: Nuts
- Hand-tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.
- Tighten the nuts (arrows) on the exhaust manifold (1) evenly from the inside to the outside.

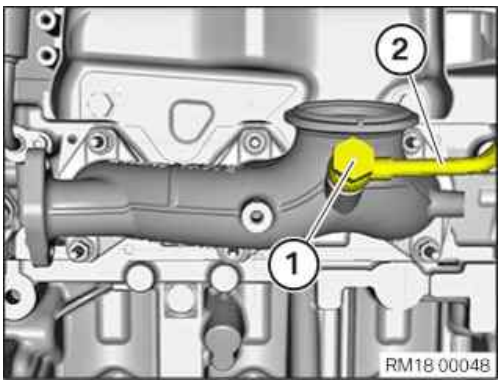
Exhaust manifold to cylinder head

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm



- Renew the sealing rings (1) from the banjo bolt (2).

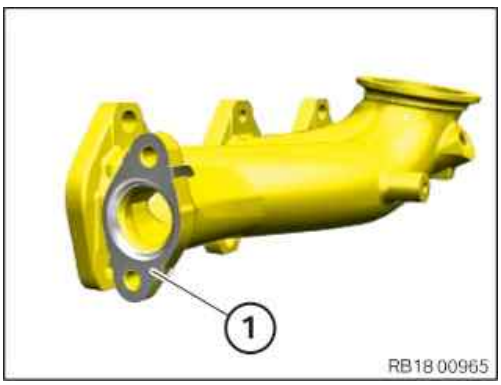
  Parts: Sealing ring



- Insert and install the exhaust gas pressure pipe (2).
- Tighten the banjo bolt (1).

Banjo bolt for exhaust pressure pipe to exhaust manifold

Hollow bolt		Renew sealing rings.	30 Nm



- Renew seal (1) between exhaust-gas recirculation cooler and exhaust manifold.

  Parts: Gasket

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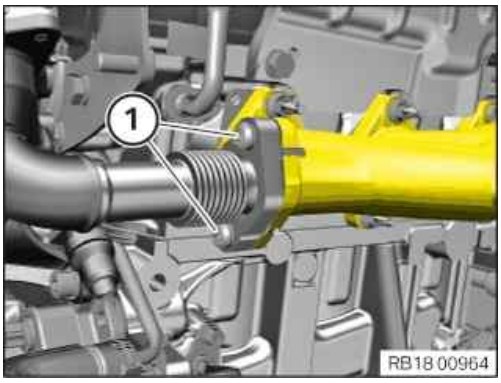

- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

87 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

88 – Installing exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

RISK OF DAMAGE

Damage to the exhaust turbocharger

Inadequate initial filling of exhaust turbocharger leads to dry running.

- Make sure the initial filling is correct when replacing exhaust turbocharger.
- Fill the exhaust turbocharger with the suitable additive (see electronic Parts Catalogue).

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TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

TECHNICAL INFORMATION

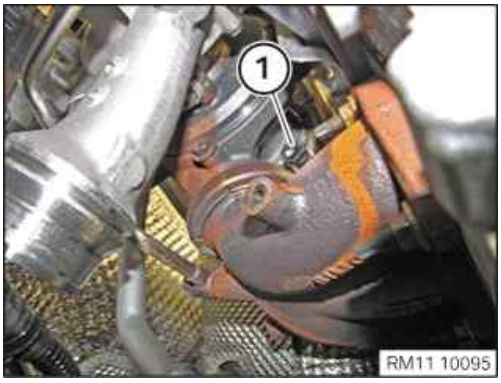
For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger



- Renew gasket.

  Parts: Gasket
- Position seal on exhaust manifold.
- Guide the exhaust turbocharger in from the top and position it.
- **Ensure that gasket is correctly seated.**
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

- Renew sealing rings.

  Parts: Sealing ring
- Position oil feed line with banjo bolt (1) and sealing rings and tighten hand-tight.

  There are 2 sealing rings fitted on the banjo bolt (1).
- Align oil feed line and tighten banjo bolt (1).

  The oil feed line must not sit on the exhaust turbocharger.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

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- Renew gasket.

  Parts: Gasket
- Position oil return line (2) with **seal** on exhaust turbocharger.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Feed in and tighten screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

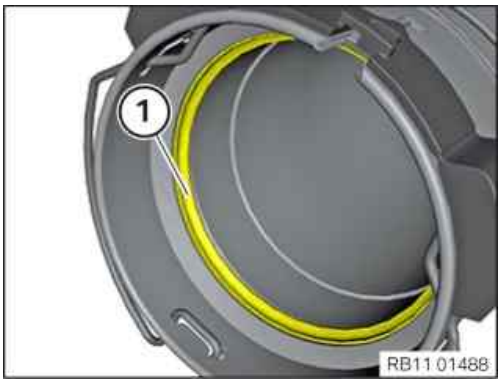
89 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

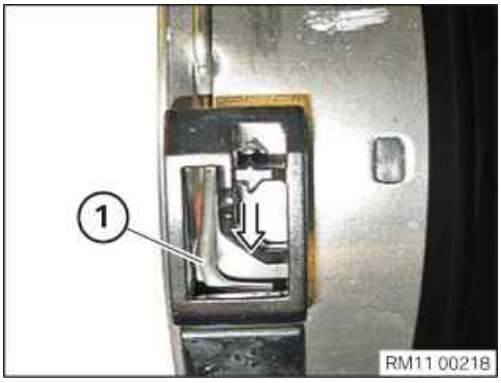
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

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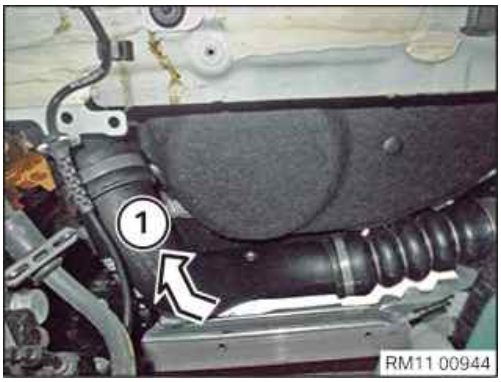
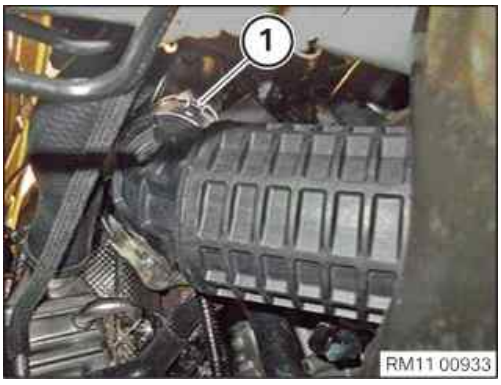
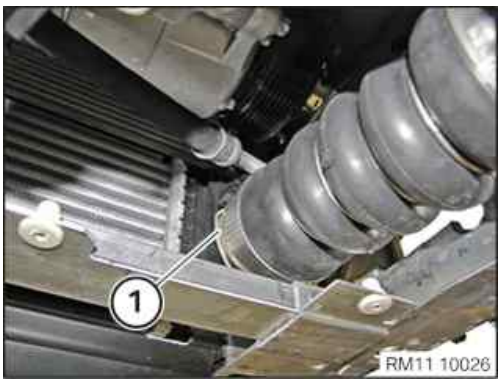


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



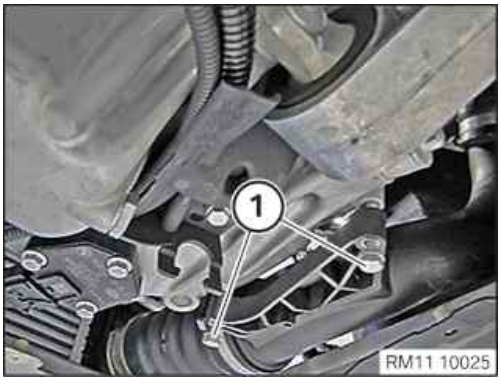
- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm



- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

90 – Installing heat shield on exhaust turbocharger at the rear

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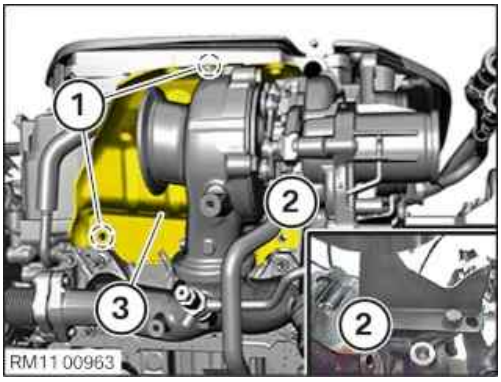
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

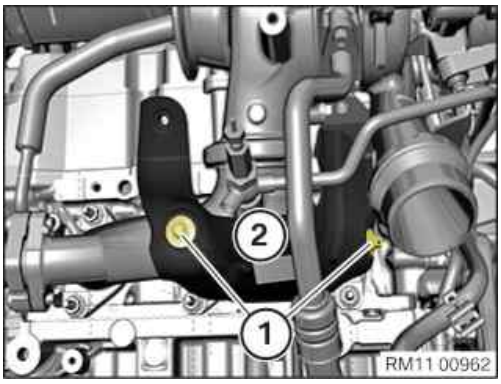
91 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

92 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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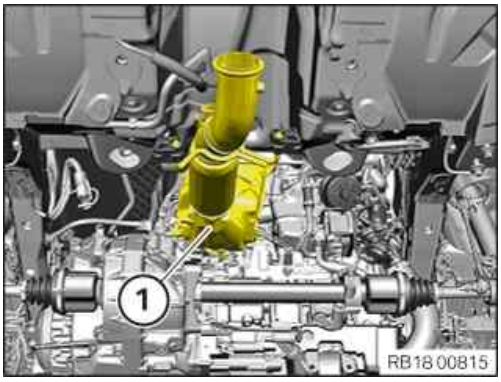
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

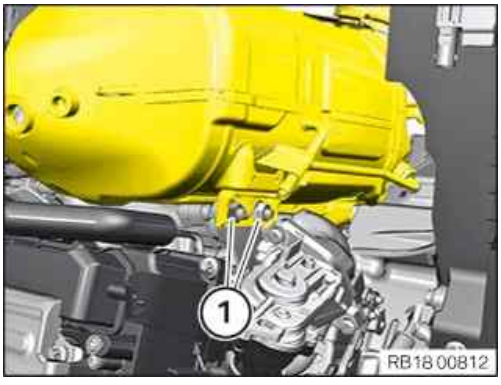
  Parts: Gasket

- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.

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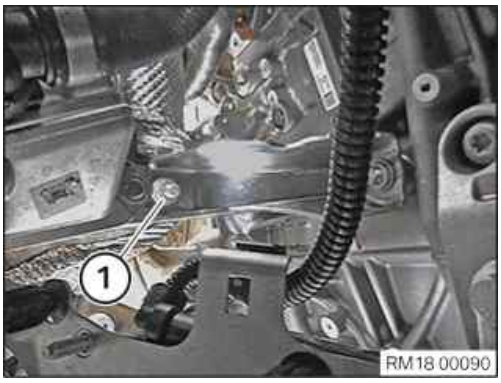


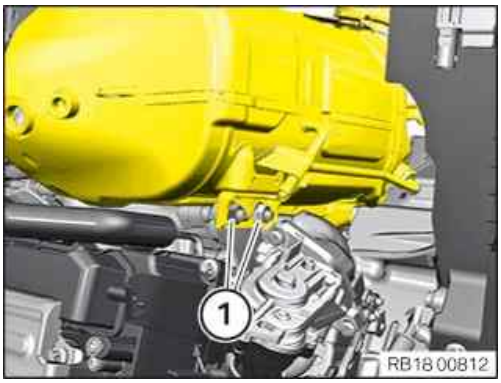
- Tighten the nut (1) hand-tight.

- Remove fitting aid (1) for the flexible tube.

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

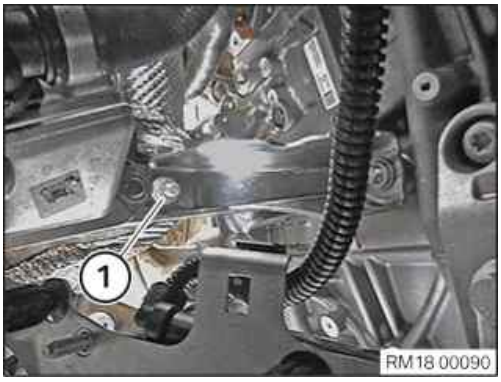
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten nut (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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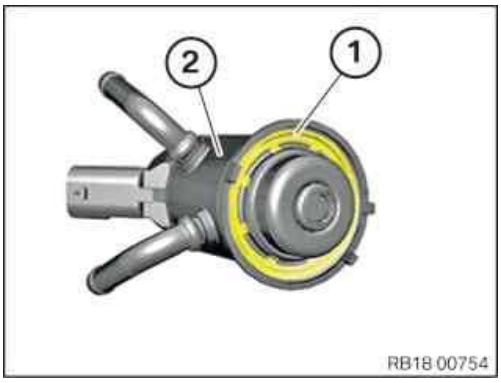
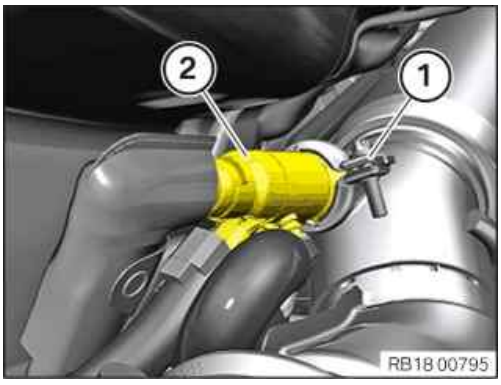


- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

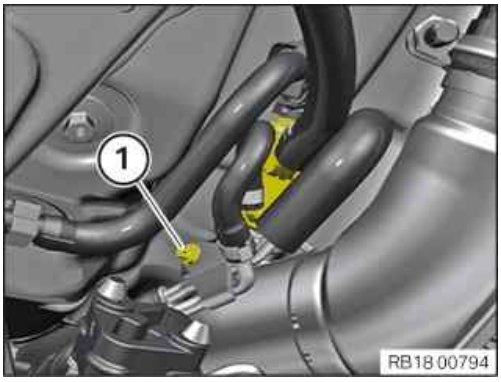


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

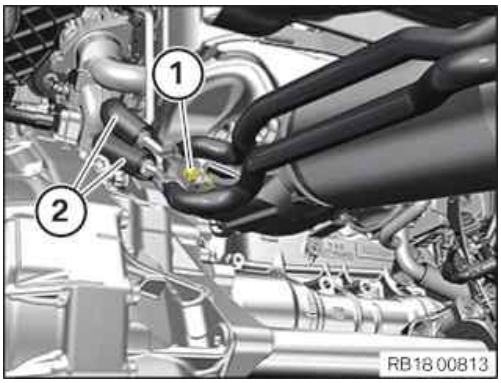
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

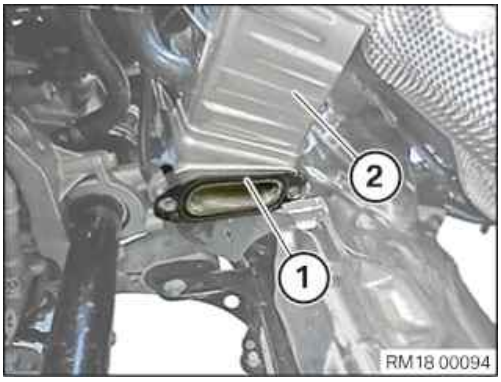
Torx bolt BM6x16		Tightening torque	8 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm



- Replace seal (1) of the low pressure exhaust-gas recirculation cooler (2).

  Parts: Gasket

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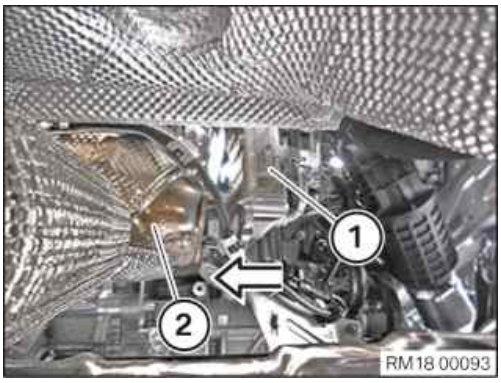
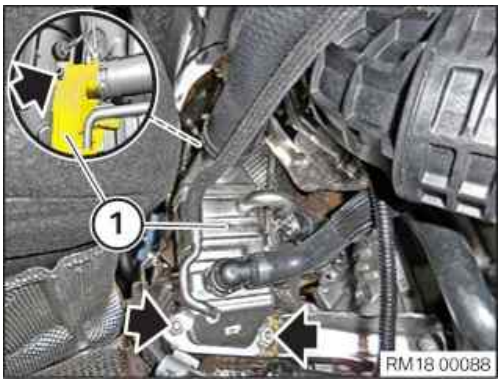


- Feed in and install the low pressure exhaust-gas recirculation cooler (1) in at the diesel particulate filter (2) in the direction of arrow.



- Tighten nuts (arrows) of the low pressure exhaust-gas recirculation coolers (1).

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

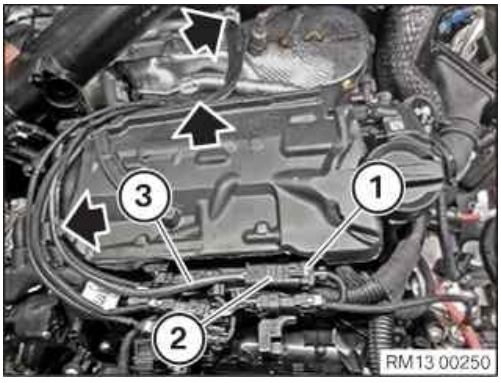
Flange nutM8		Tightening torque	19 Nm

93 – Install the control sensor

- Feed in front oxygen sensor (1) and install.
- Tighten the front oxygen sensor (1) with the special tool **0 491 075 (11 7 030)**.

Control sensor

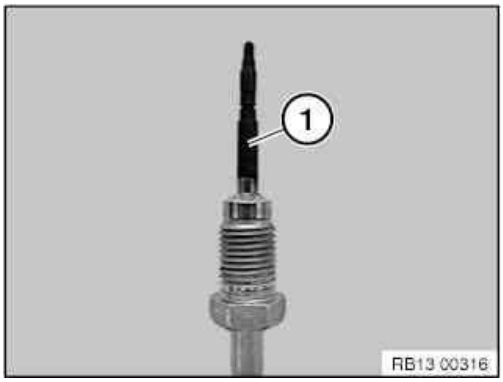
Control sensor		Tightening torque	50 Nm



- Feed in and install cable (3) from the oxygen control sensor into the clamps (arrows).
- Secure connector (2) on holder.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

94 – Install the exhaust-gas temperature sensor on the diesel particulate filter



RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.
- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.

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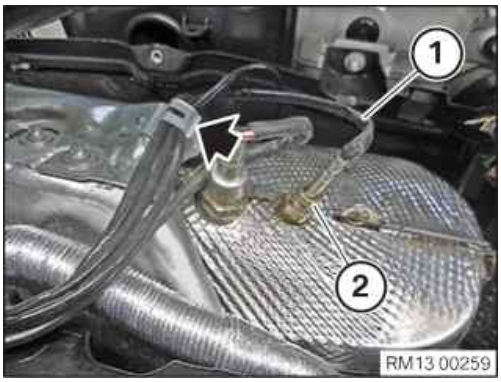


- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

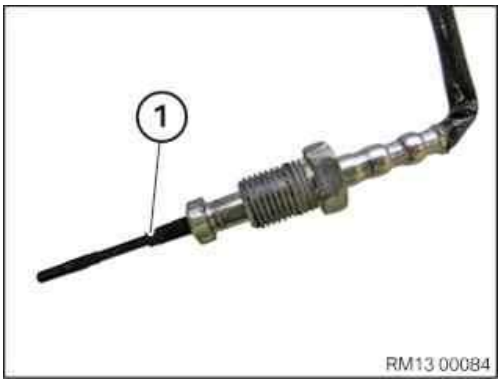
95 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

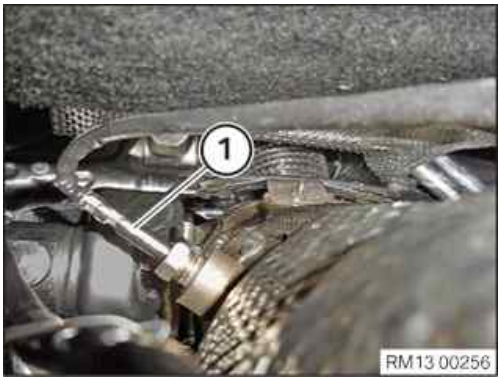
Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.



- Feed in and install the exhaust temperature sensor (1).

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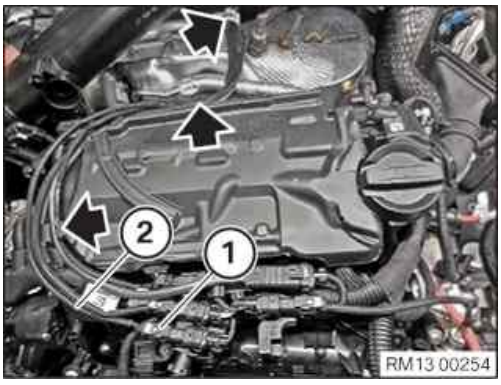
- Tighten the exhaust temperature sensor (1) with conventional tools (2).

Exhaust temperature sensor to diesel particulate filter

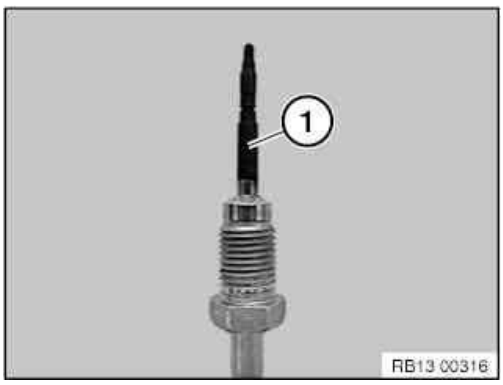
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

96 – Installing exhaust temperature sensor on catalytic converter



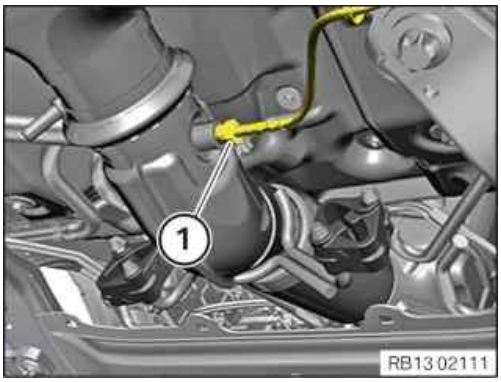
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Secure the cable clips (1).

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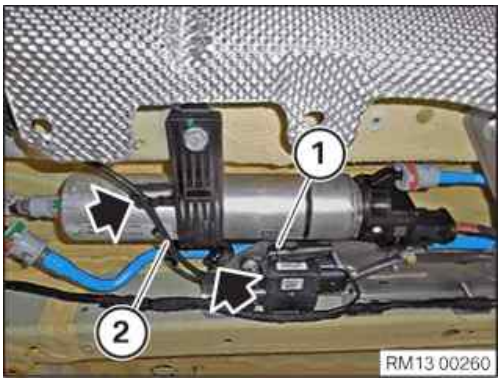
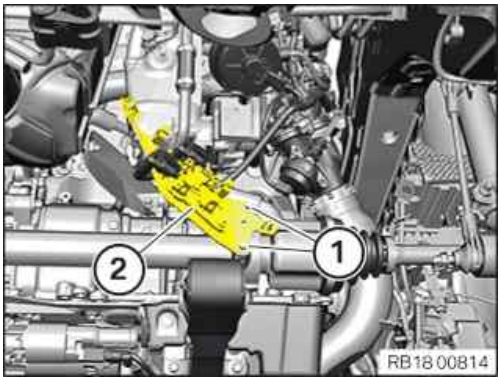


- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

97 – Install holder for oxygen sensor

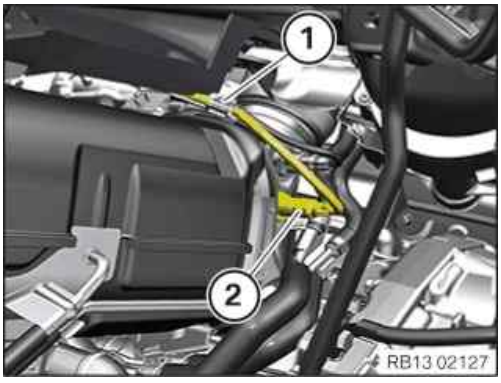


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

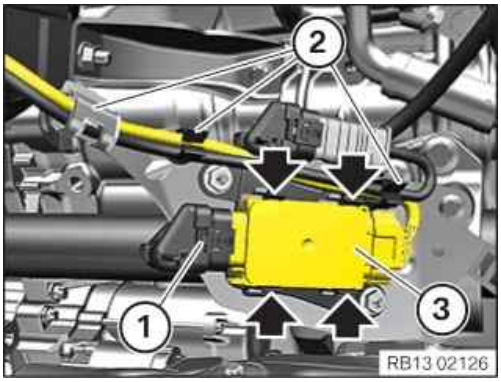
98 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

99 – Install the monitoring sensor

TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

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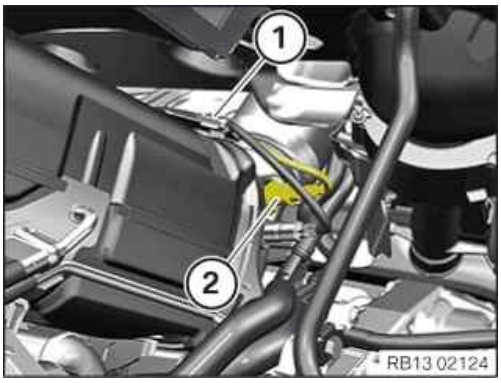
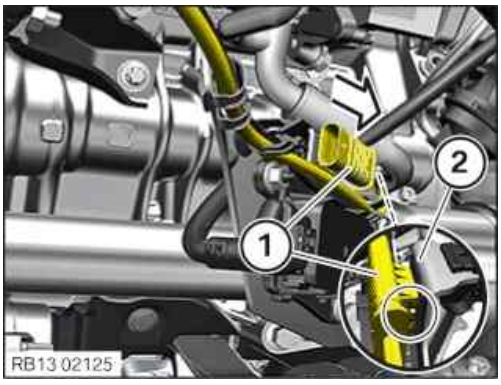


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

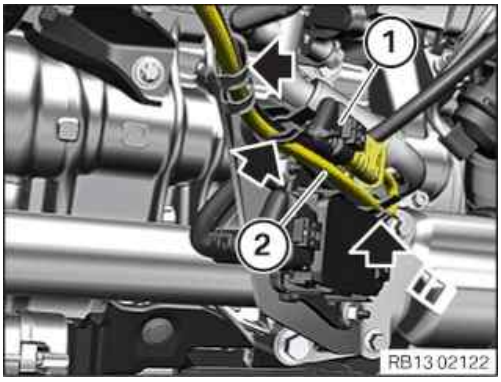
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

100 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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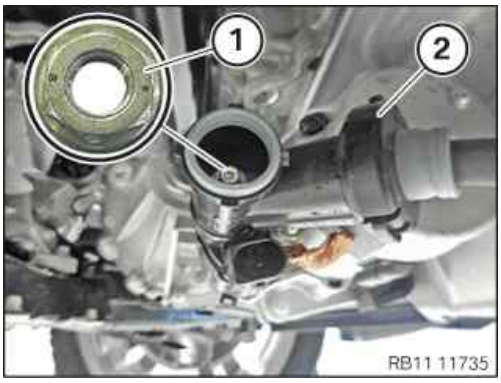


- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

101 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

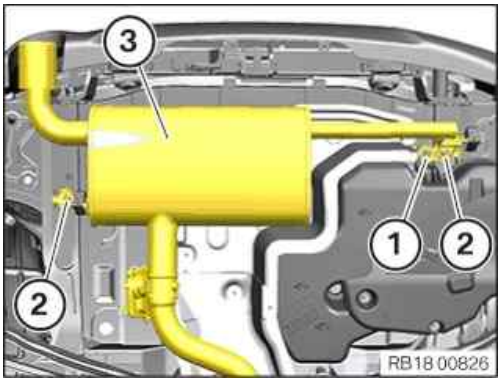
- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert and install the exhaust system (3) with the help of another person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

- Tighten down screw (1).

Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

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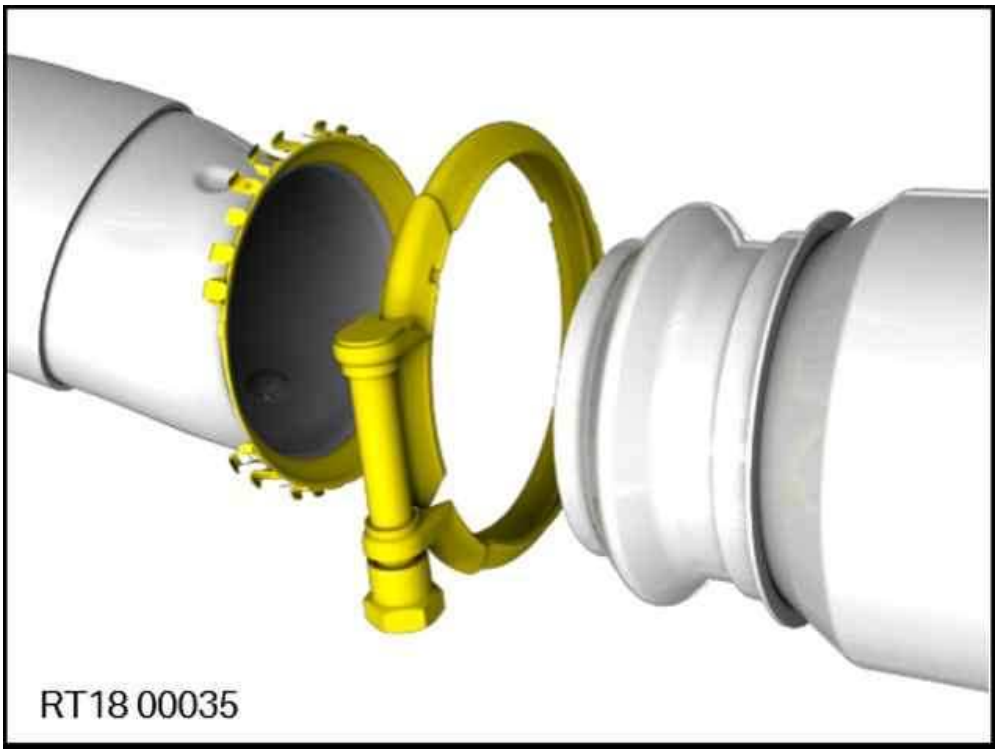
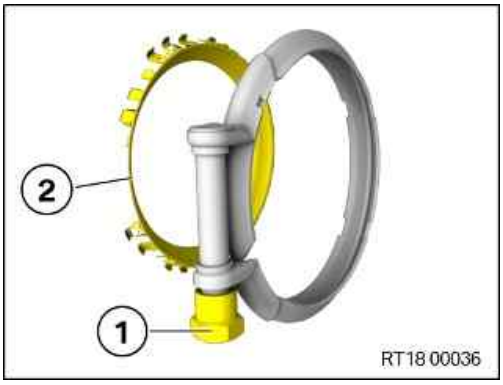
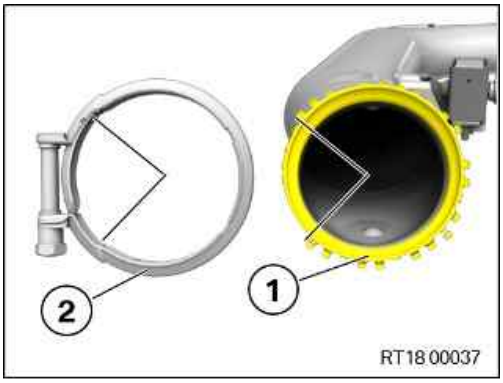
▶ **Install the V-clip**

V-band clamp



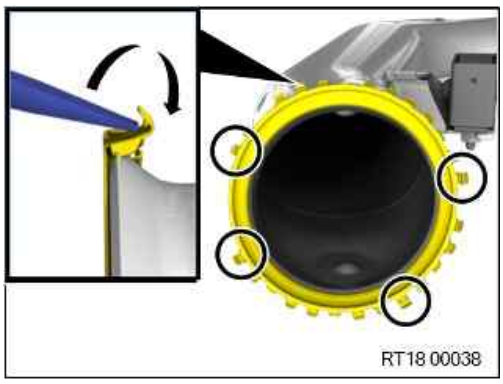


- Unscrew the nut (1) and remove the sealing ring (2).



- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.

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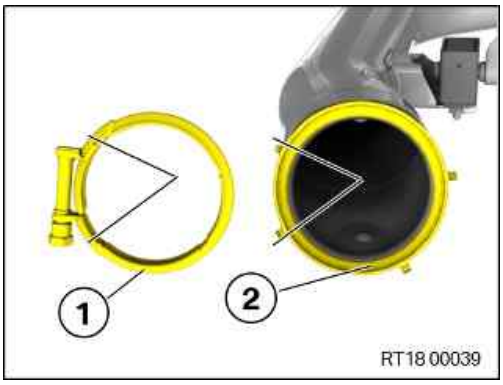
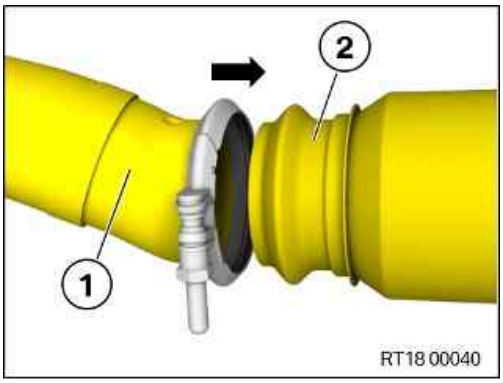
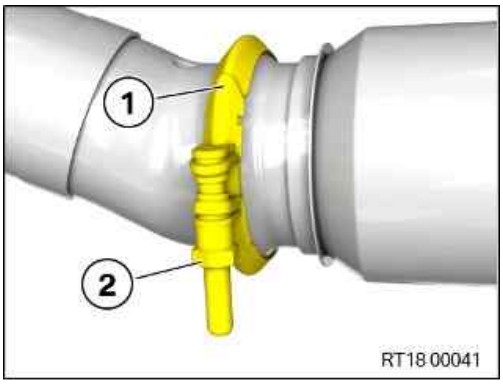


- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



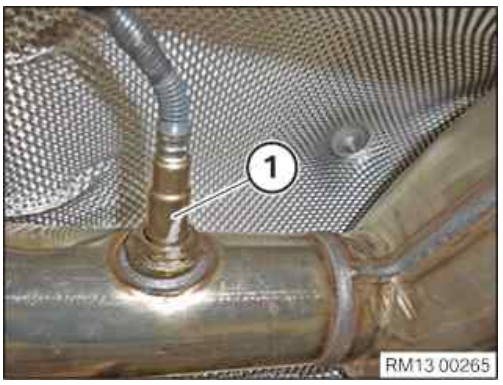
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Guide in, position and tighten the diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

Sensor		Tightening torque	50 Nm

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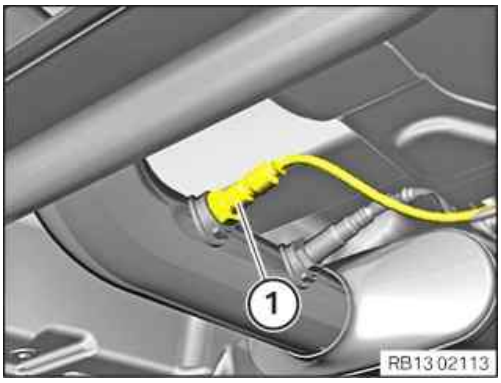
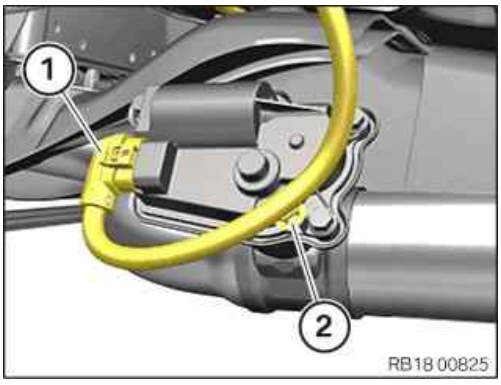


- Guide in, position and tighten the nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

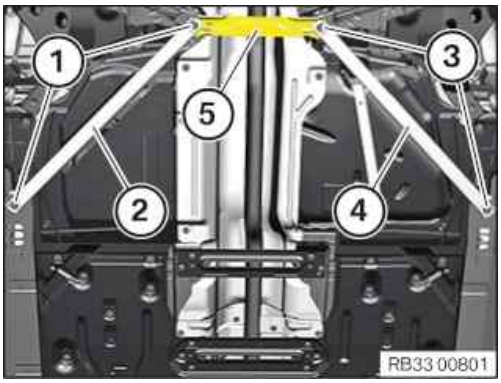
Sensor		Tightening torque	50 Nm



- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

102 – Install the cross-member with torsion struts



- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

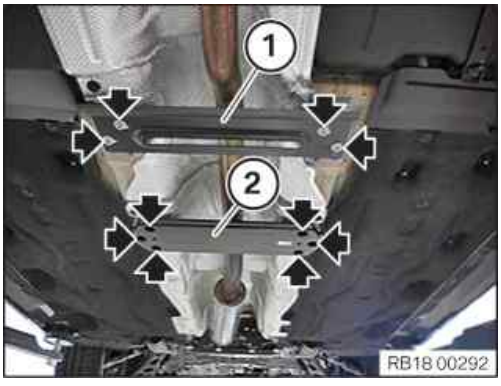
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

103 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

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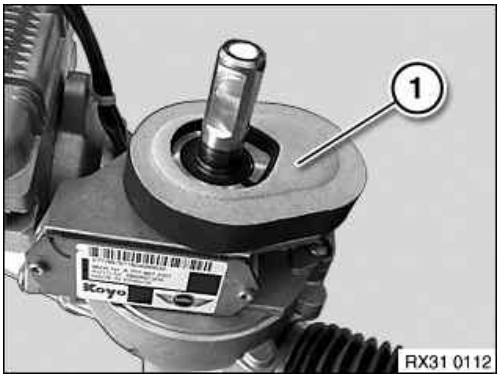
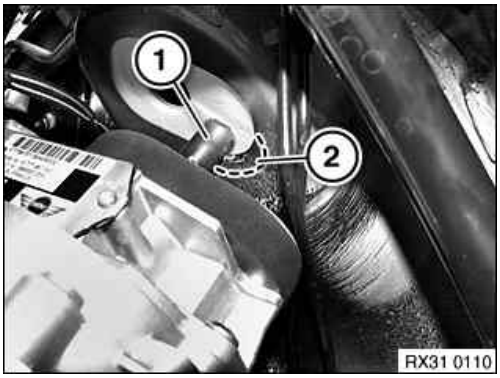
104 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

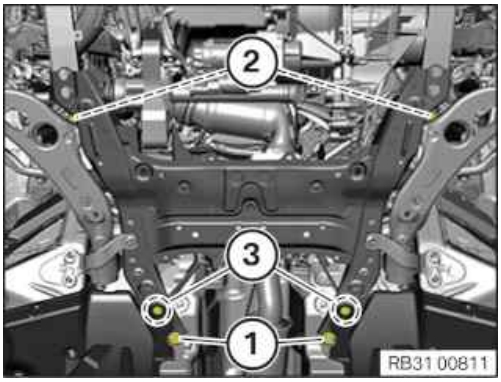


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

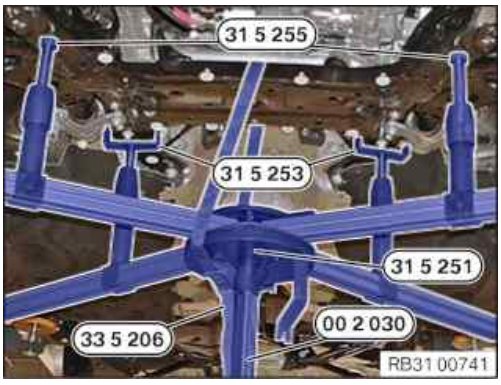
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.

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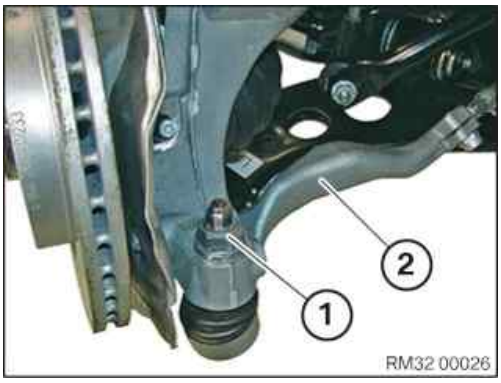


NOTICE

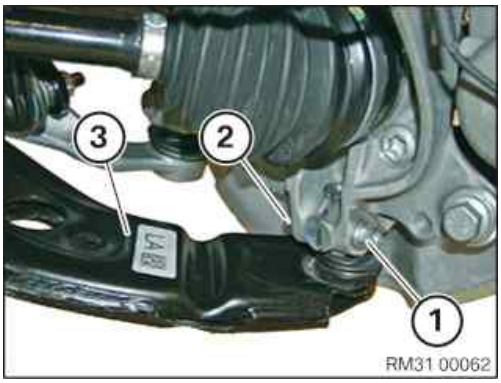
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

105 – Install the mounted parts on the front axle support

NOTICE

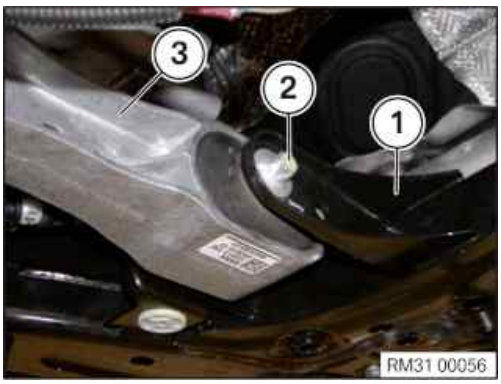
Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °



- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

M12 screw		100 Nm

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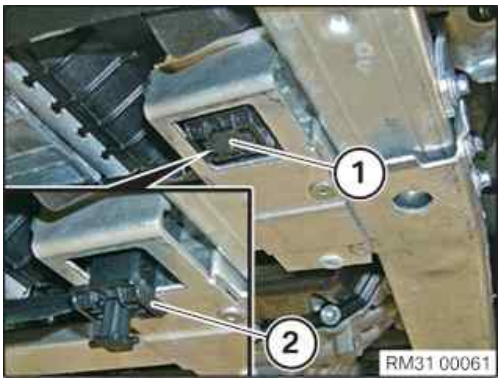
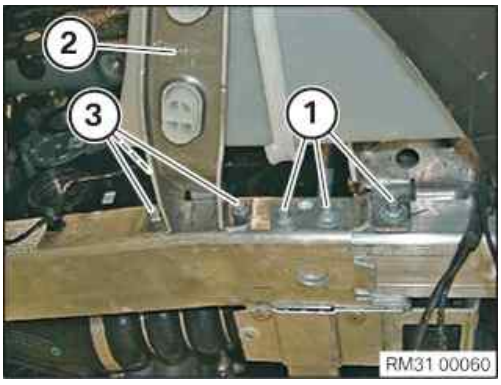


NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

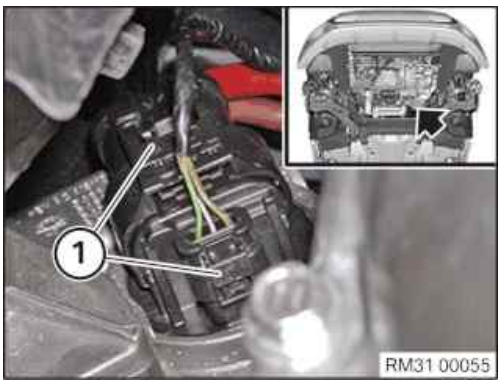
Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

106 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.



- Connect and lock connector (arrow) (1) with the steering gear.

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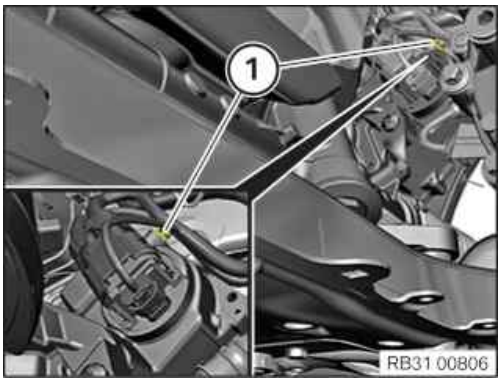
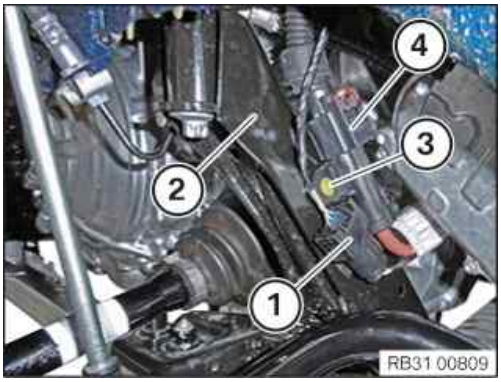


- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

107 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

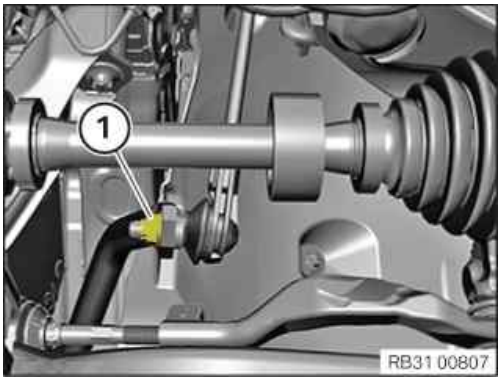
  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

108 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**



- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

109 – With right installation: Securing the cable for the ride height sensor

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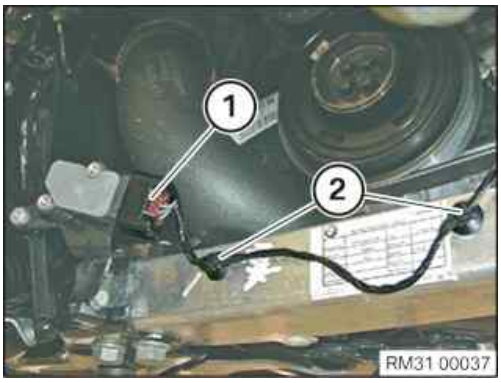


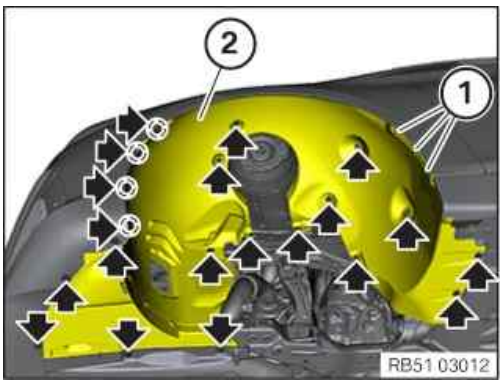
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

110 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▶ **Installing the front wheel arch cover**



- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

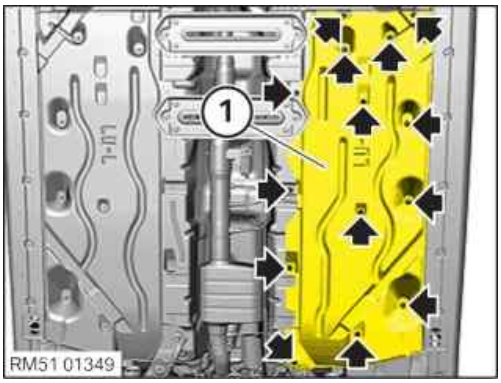
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

111 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

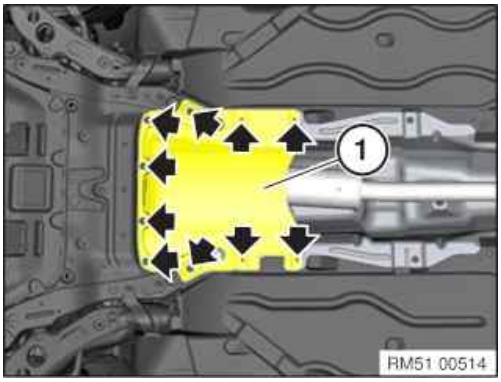
Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

112 – If installed: Installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

113 – Mount the front left and right wheels

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▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

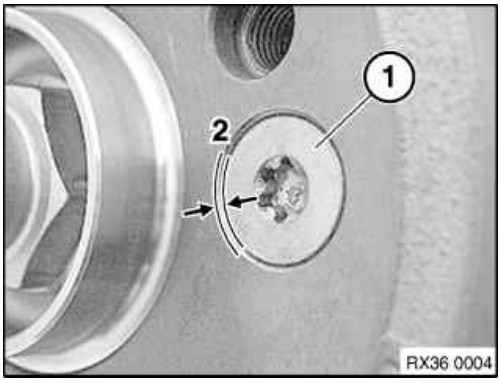
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

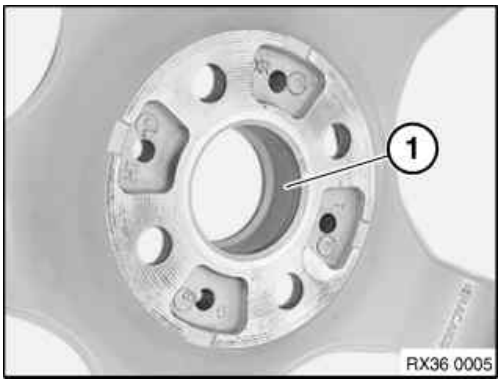
  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

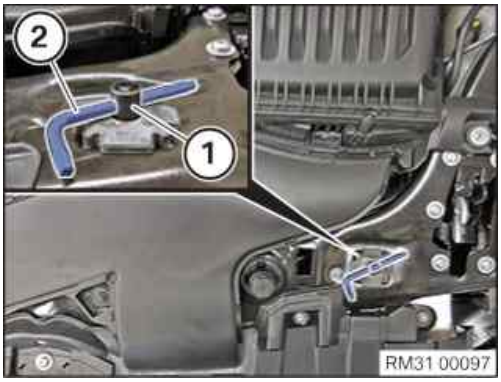
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

114 – Removing fastener for left and right radiator



NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

115 – Secure the steering shaft at the bottom on the steering gear

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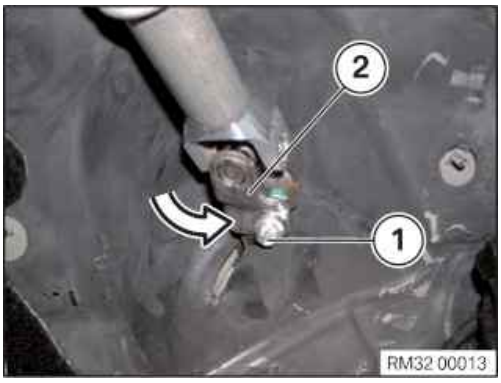
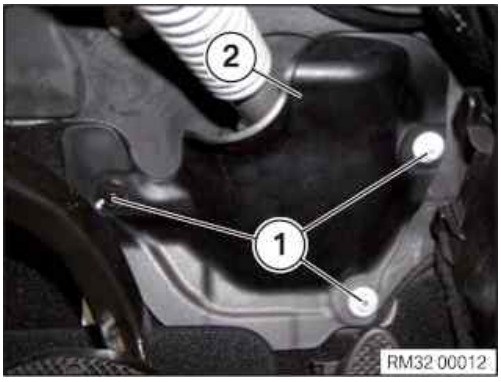


- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm



- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

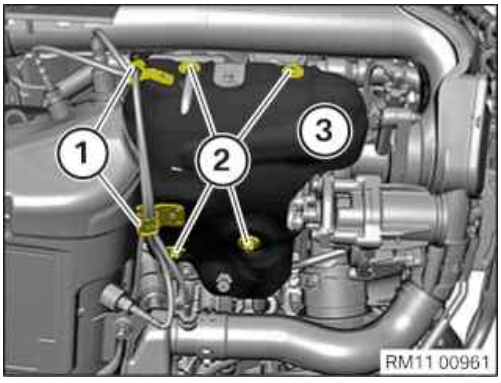
116 – Install the heat shield on the exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



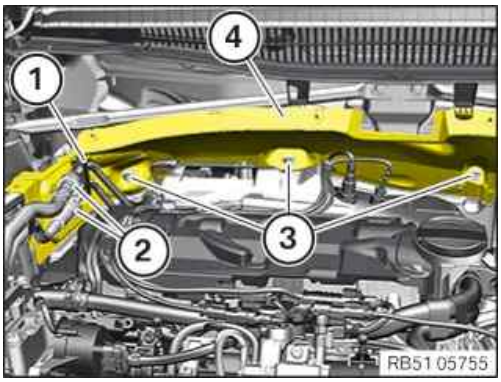
- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

117 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

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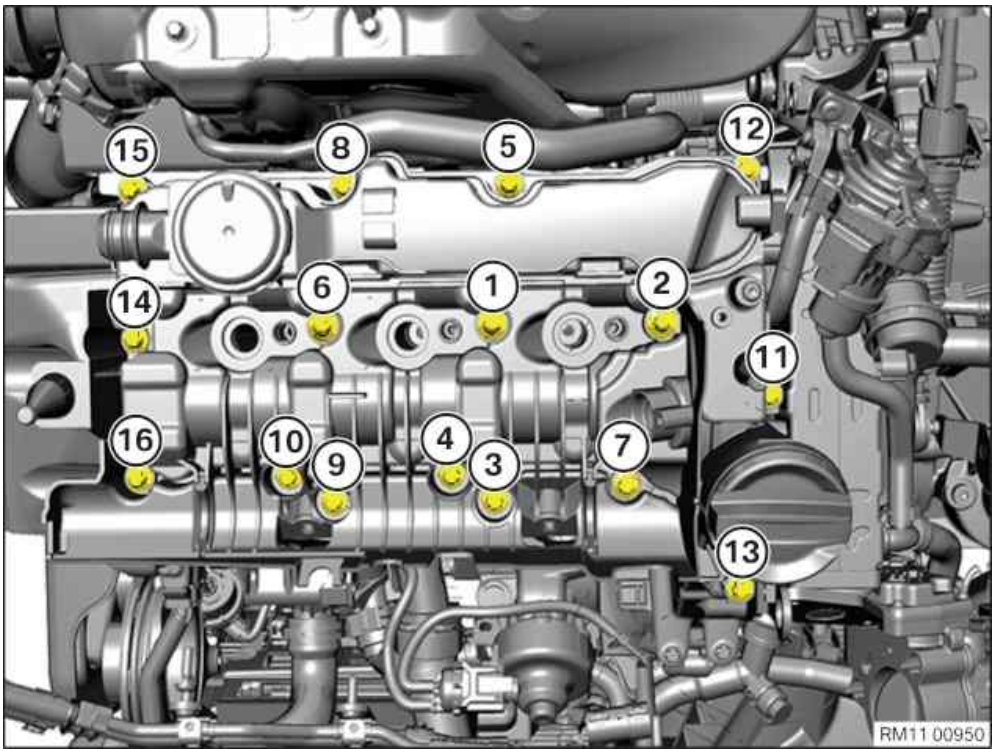
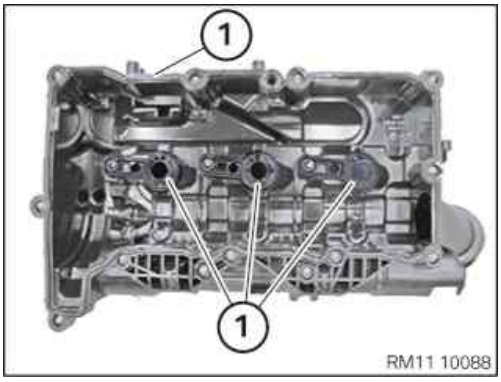
118 – Installing cylinder head cover

Overview: Screw connection of the cylinder head cover

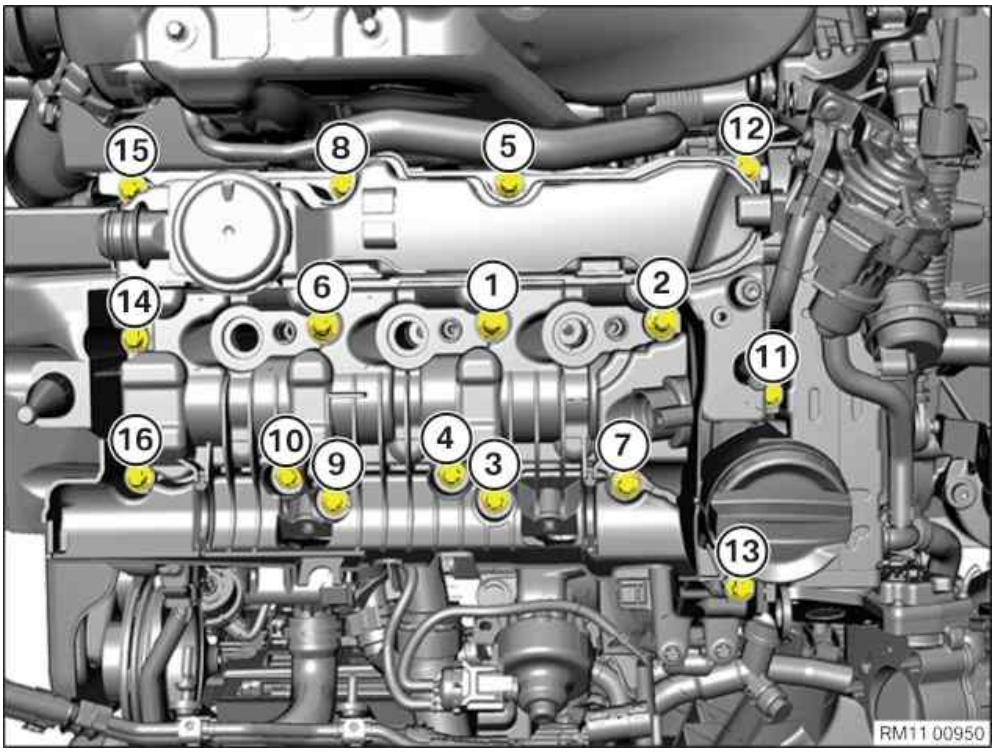


1 to 16 Bolts of the cylinder head cover



- Renew the gasket (1) of the cylinder head cover.

  Parts: Gasket



- Install cylinder head cover.
- Tighten screws in the order (1) to (16).

Cylinder head cover to cylinder head

M6		Tightening torque.	8, Nn

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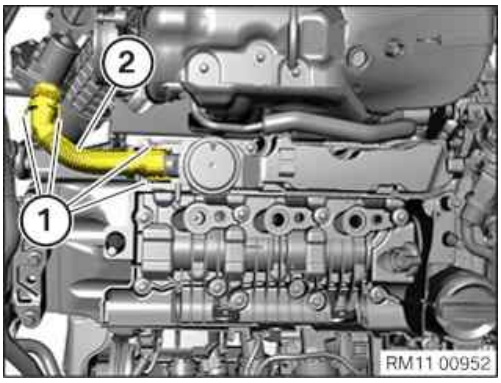
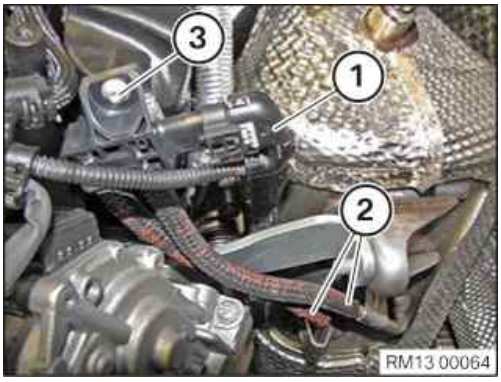


- Install and lock the engine ventilation line (2).

  The locks (1) must engage audibly.

119 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

120 – Installing injectors of injection system

▶ **Cleaning the injector shafts**

CAUTION

Swirling dirt particles caused by compressed air.

Danger of injury!

- Collect dirt particles, e.g. when blowing out, use cloth to do so.

- Wear safety goggles.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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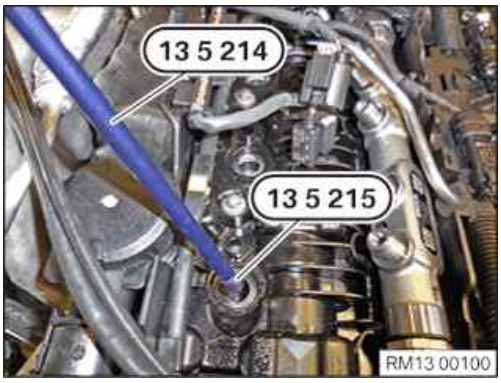
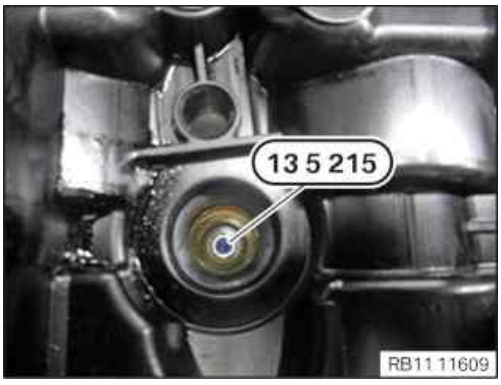


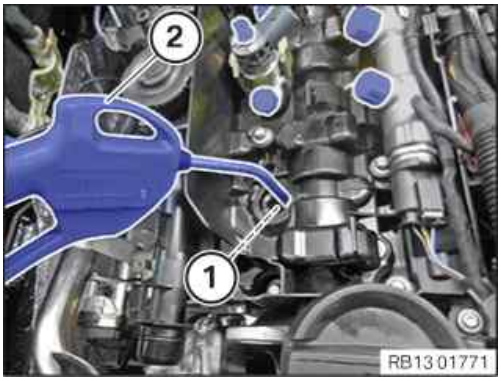
- Check whether the sealing ring remained in the injector shaft and remove the sealing ring as needed.
- Insert the special tool **0 493 763 (13 5 215)** with the special tool **0 493 762 (13 5 214)** from the set of special tools **0 493 758 (13 5 210)** into the injector shaft.
- Remove special tool **0 493 762 (13 5 214)**.



- After insertion, special tool **0 493 763 (13 5 215)** must remain in the injector shaft after cleaning without fail.

- Insert special tool **0 493 758 (13 5 210)** into the injector shaft.

- Move special tool **0 493 758 (13 5 210)** (1) up and down in the injector shaft with rotational movements.
- Feed out special tool **0 493 758 (13 5 210)**(1) from the injector shaft and remove.



- Blow out injector shaft (1) with air gun (2).

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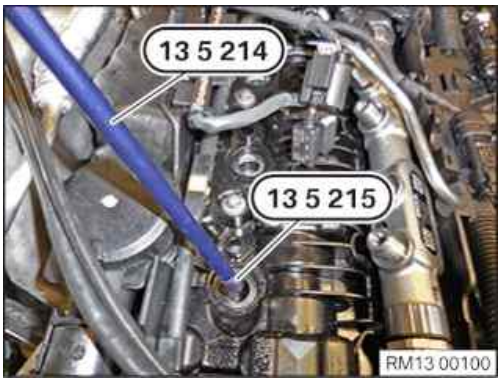


- Feed the special tool **0 493 762 (13 5 214)** into the injector shaft and screw it in with the special tool **0 493 763 (13 5 215)**.
- Feed out special tool **0 493 762 (13 5 214)**with special tool **0 493 763 (13 5 215)** from the injector shaft and remove.

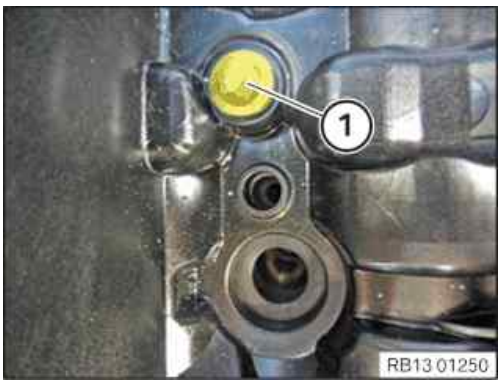
▶ **Check the placement of the clamping claw**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Tighten down screw (1).

  The clamping claw is positioned on the bolt (1).

Clamping claw facing to cylinder head cover

Screw M6		Tightening torque	8 Nm

▶ **Prepare the injector for installation**

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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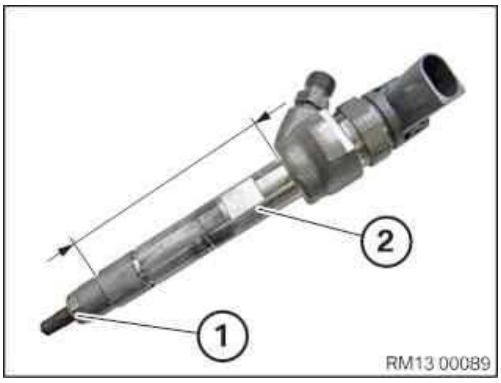


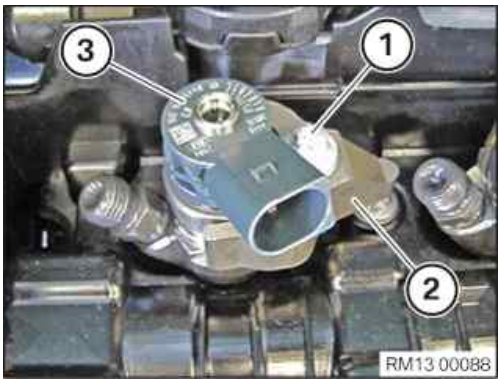
- Renew the copper sealing ring (1) on the injector (2).

  Parts: Copper sealing ring

- Lightly grease the injector in the marked area with heat-resistant grease before installing the injector (2) in the injector shaft.

Expendable materials

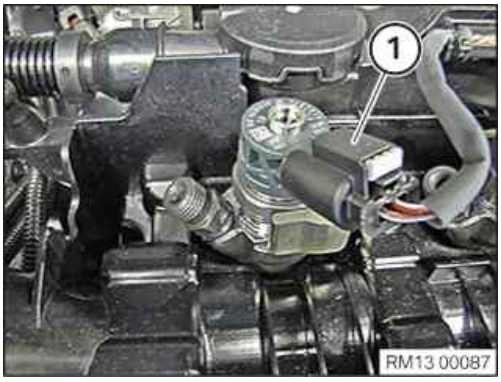
Injector lubricating grease	50 g, Can	83230441070



- Insert and install the injector (3).
- Insert and install the clamping claw (2).
- Tighten down screw (1).

Injector to cylinder head cover

Screw		Jointing torque	8 Nm
		Angle of rotation	120 °



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

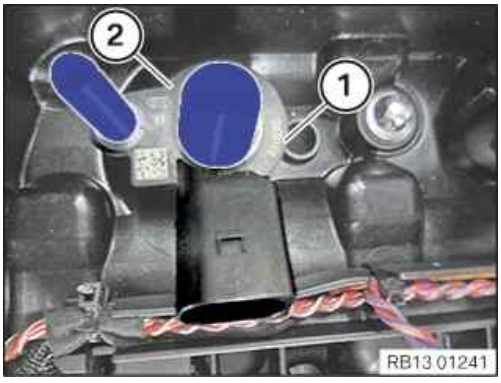
▶ **Replacement: Perform injection quantity compensation**

TECHNICAL INFORMATION

If the DDE control unit or an injector has been replaced, it will also be necessary to carry out injection quantity compensation. The adjustment value (7-position letter/number code) is engraved on each injector.

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Read off the adjustment value (1) on the new injector (2).

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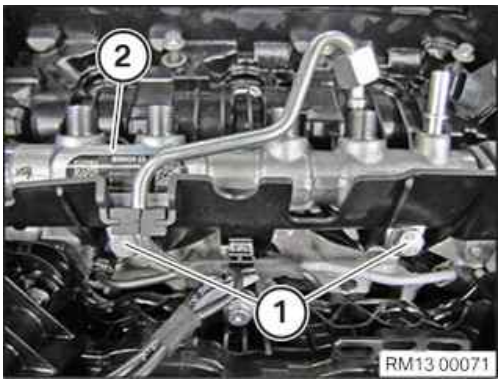
- Connect diagnosis system:
  - Vehicle identification
  - Function selection
  - Service functions
  - Digital diesel electronics (DDE)
  - Adjustment of injectors
  - Testing schedule
- Start service function with the right arrow button.

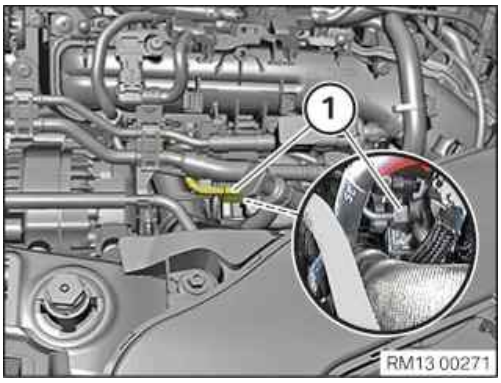
121 – Installing the rail



- Carefully insert and install the rail (2).
- Tighten the screws (1).

Rail on cylinder head cover

Torx screw M8x25		Tightening torque	19 Nm



TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten union nut (1).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

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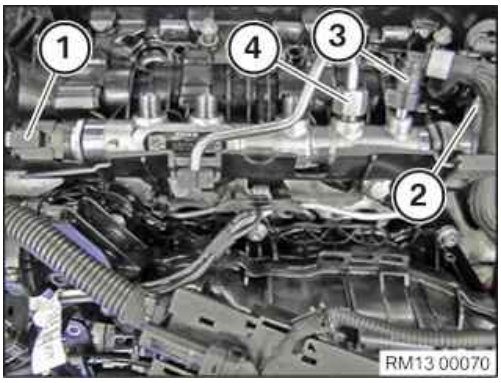

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

- Tighten union nut (4) with special tool **0 495 910 (37 1 152)**.

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Connect and lock fuel line (3).

  Fuel line (3) must engage audibly.
- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

122 – Installing high pressure line between rail and high pressure pump

WARNING

Working on fuel system.

Risk of fire! Danger of explosion!

- When working on the fuel system, make sure that the workbay is sufficiently ventilated, e.g. using extraction unit.
- Tightly seal off open lines and connections; collect any escaping fuel directly at the point of exit.
- No fire, sparks, open flames or smoking.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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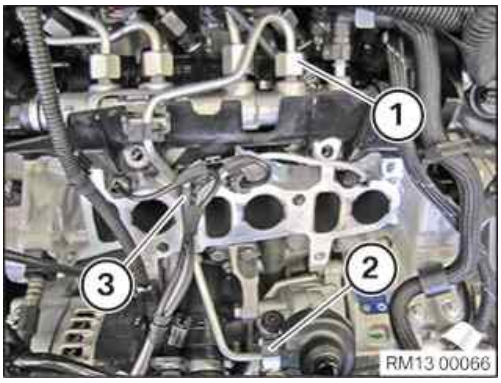

- Remove special tool **2 413 106**.
- Thread in and install the high pressure line (3).
- Make sure that the rubber grommet is positioned correctly in the area of the cylinder head cover.
- Tighten the union nut (1) hand-tight.
- Tighten the union nut (2) hand-tight.
- Ensure that high pressure line (3) is installed without any strain.

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the union nut (1) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

- Tighten the union nut (2) with the special tool **0 495 910 (37 1 152)**.
- Reset the special tool **0 495 910 (37 1 152)** in good time in order to avoid bending high pressure line (3).

High pressure line between high pressure pump and rail

High-pressure pipe		Tightening torque	28 Nm

123 – Installing high pressure lines between rail and injectors

TECHNICAL INFORMATION

If several high pressure lines are removed, ensure that each high pressure line is re-installed in its original installation location. Mark high pressure lines.

TECHNICAL INFORMATION

Reset special tool in early to avoid bending pressure lines.

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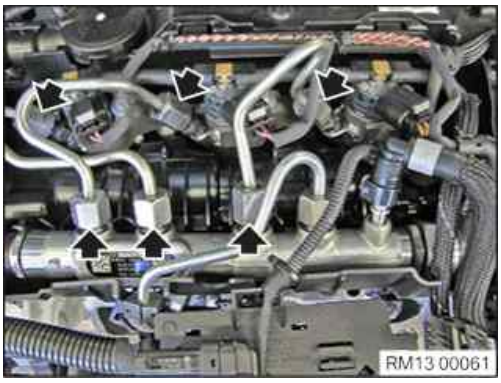

- Remove special tool **2 413 106**.
- Feed in and install the high pressure lines (arrows).
- Hand-tighten the high pressure lines (arrows).

TECHNICAL INFORMATION

Renew high pressure lines when the tightening torque exceeds the maximum of 30 Nm.

- Tighten the high pressure lines (arrows) with the special tool **0 495 910 (37 1 152)**.

High pressure lines between injector and rail

High pressure lines		Tightening torque	28 Nm

- Check the high pressure lines for tightness (**visual inspection**).

124 – Connect the leakage oil line on the injector

- Check the sealing ring (1) for damage and if necessary, renew the leakage oil line .

  Damaged sealing rings may cause malfunctions during fuel pressure build-up.
- Coat the sealing ring (1) with lubricant before connecting the leakage oil line to the injector.

- Feed leakage oil line into injector and install.
- Lock the lock in direction of arrow (1).

  The lock (1) must audibly engage.

125 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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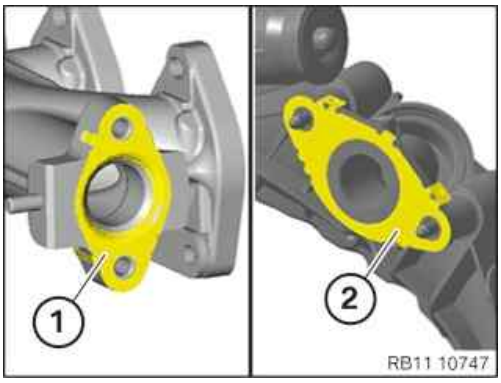
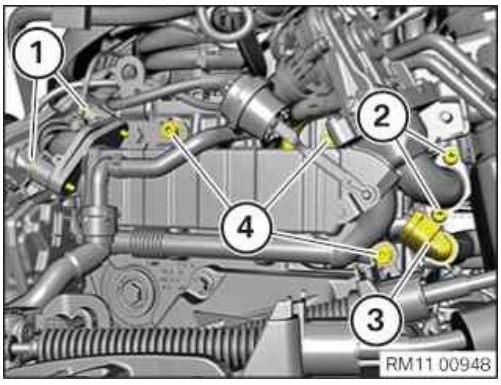


- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket



- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts

- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.

- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm

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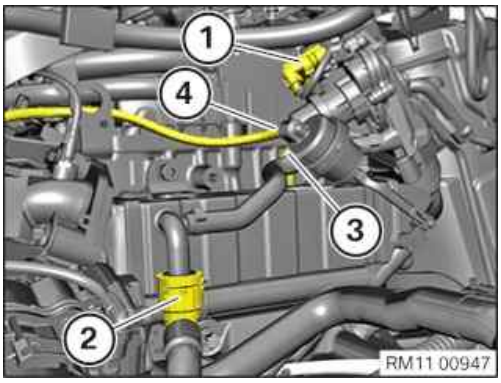


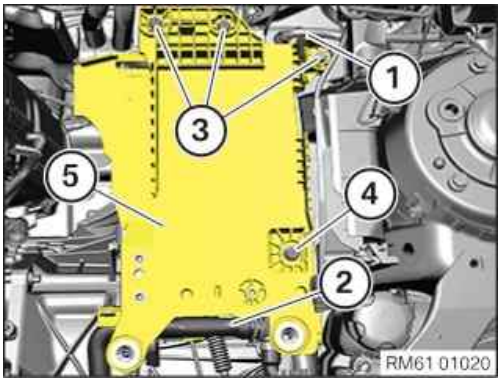
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

126 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

127 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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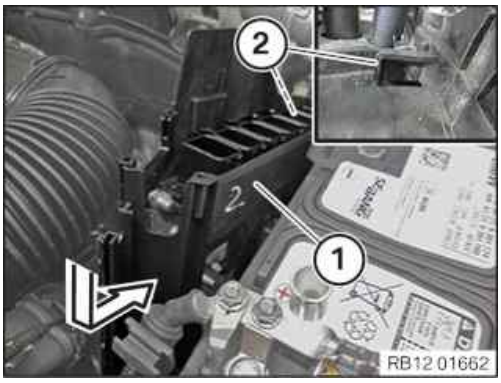
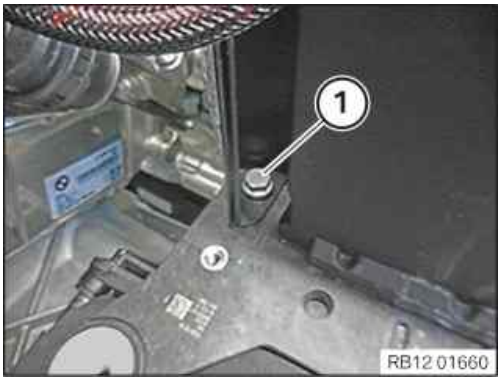


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

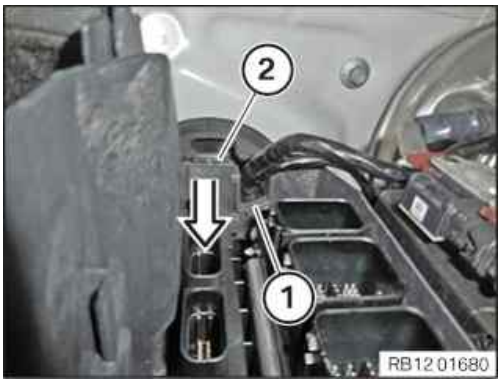
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



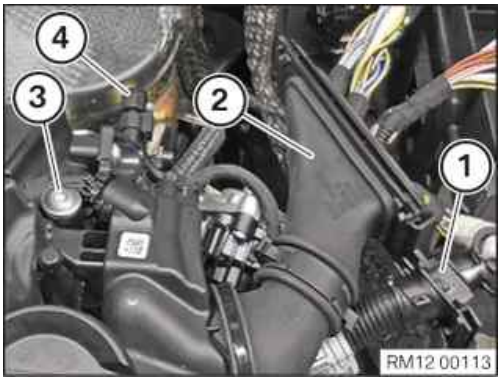
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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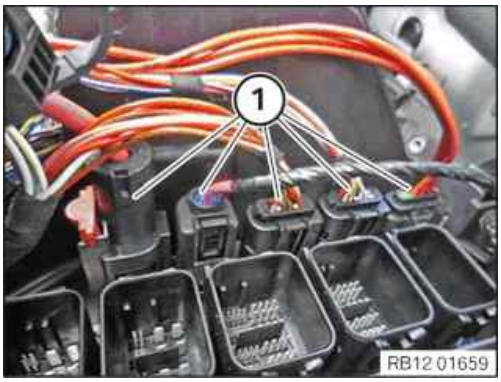
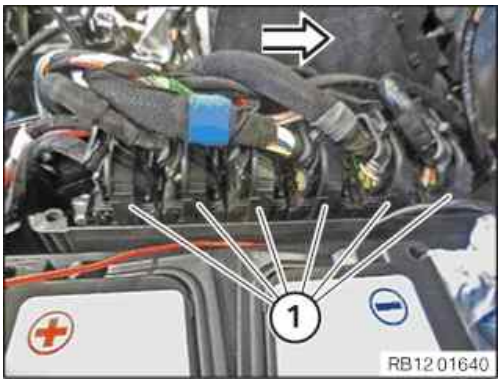
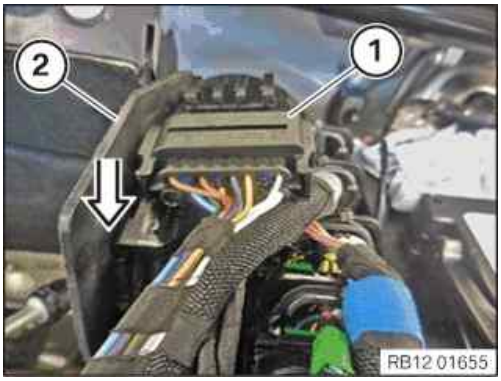


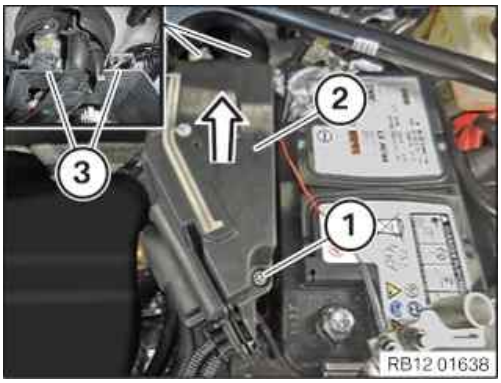
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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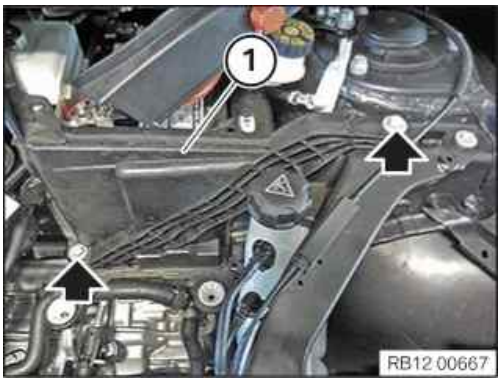


- Feed in and install tension strut (1).
- Tighten screws (arrows).

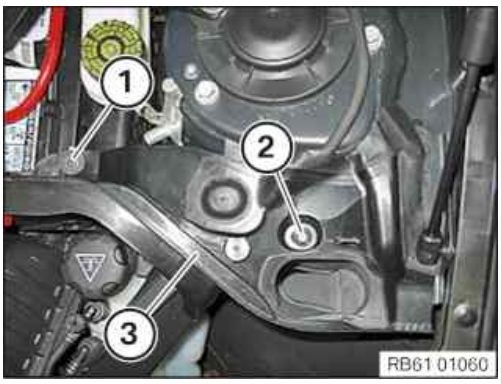
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

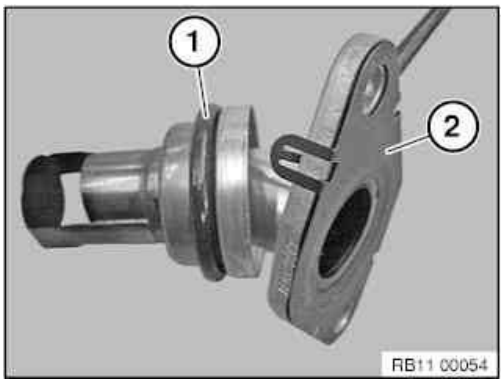


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

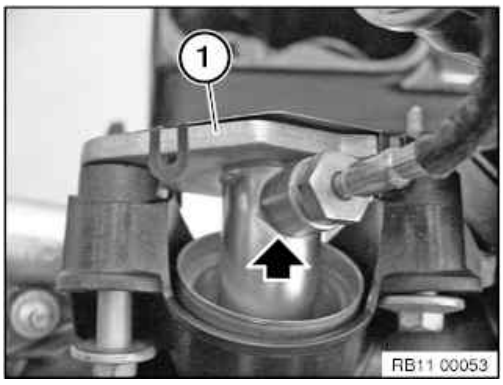
128 – Installing the intake plenum



- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.

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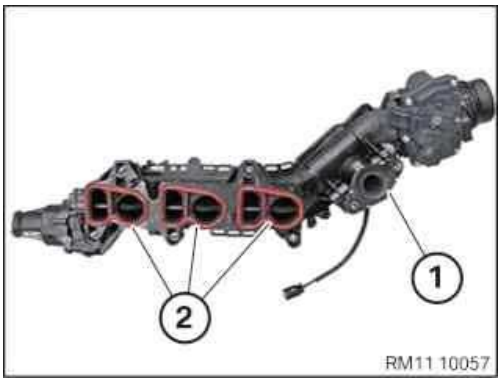
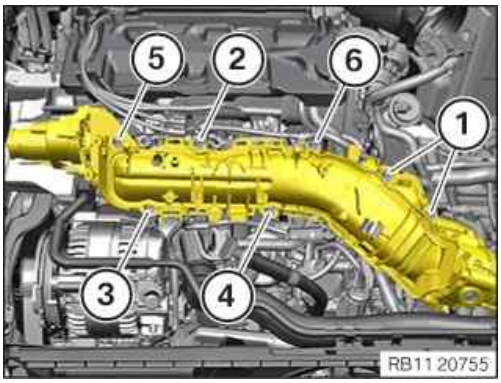


- Renew gaskets (2).

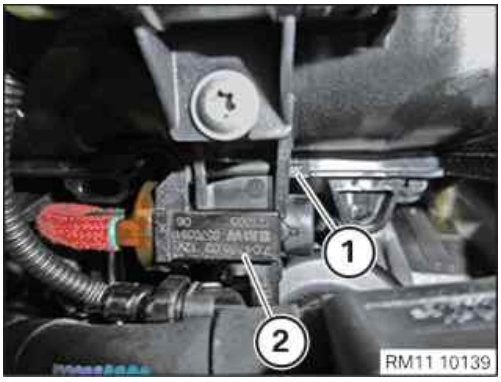
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



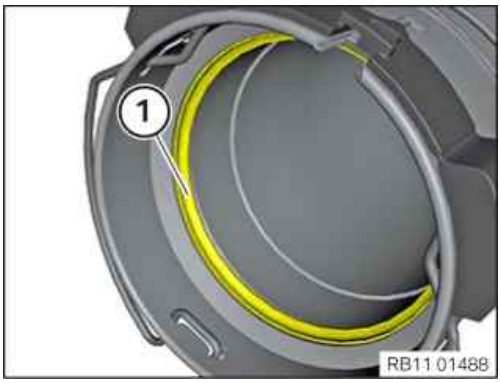
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

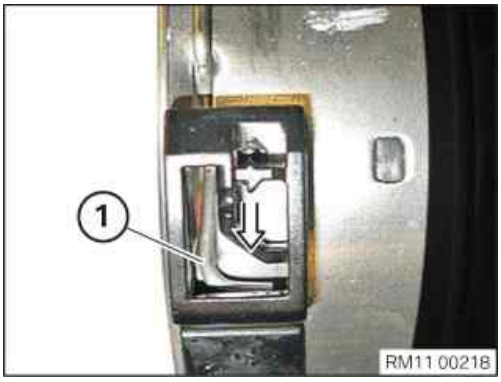


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).

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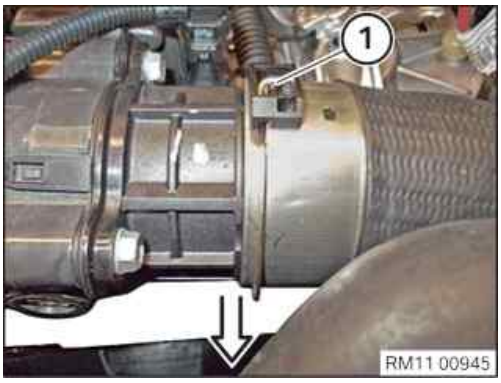
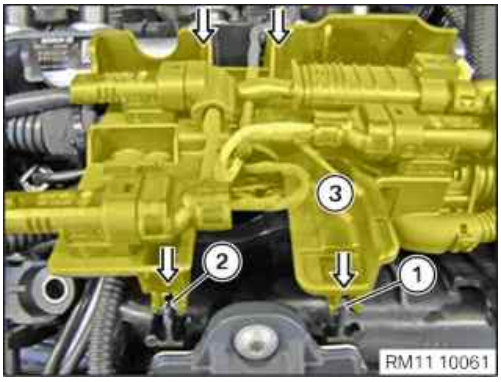


- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

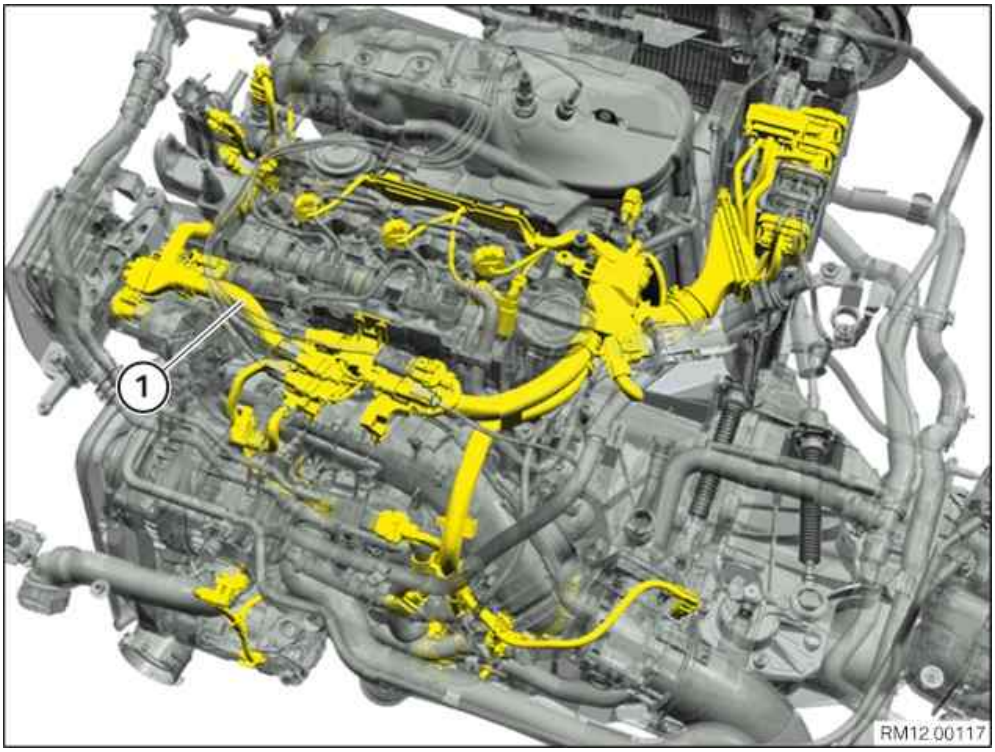
129 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

130 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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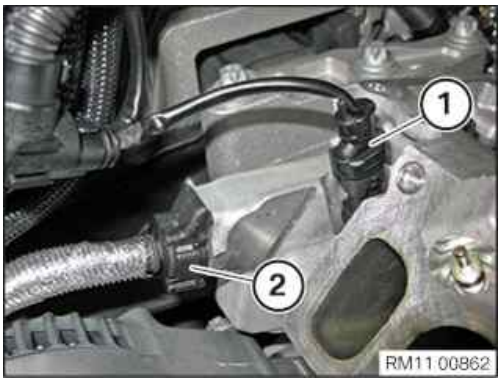
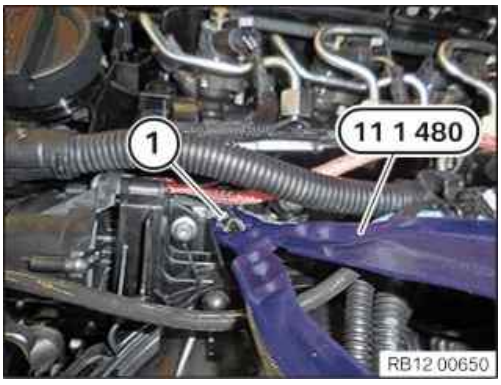
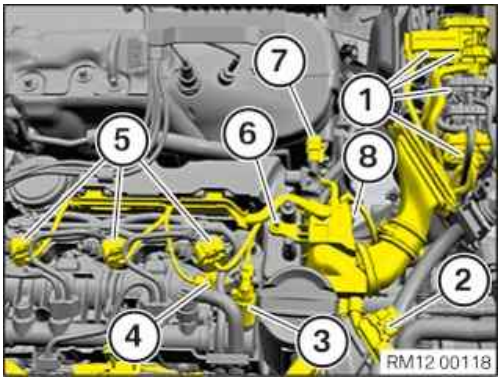


- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

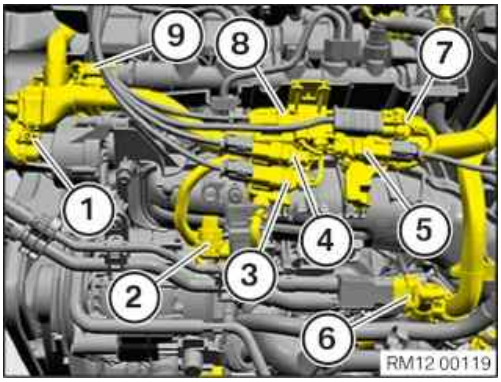


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

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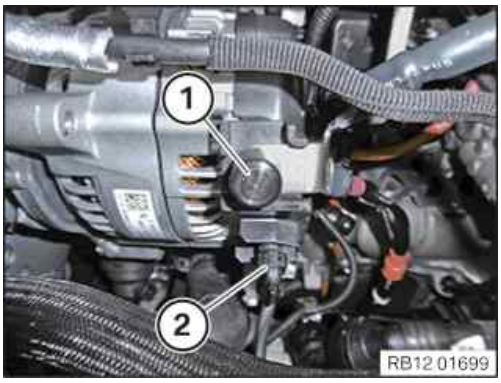
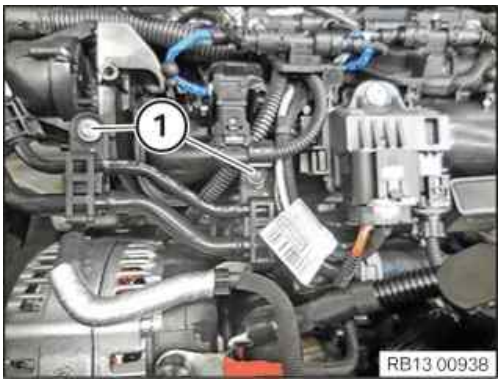


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

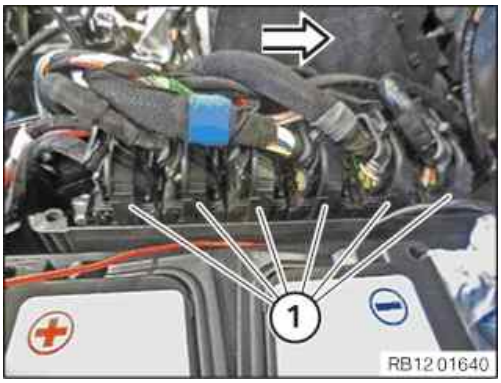


- Position fuel lines.
- Tighten the screws (1).

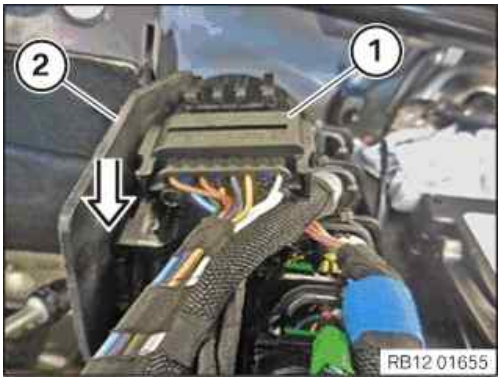
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.

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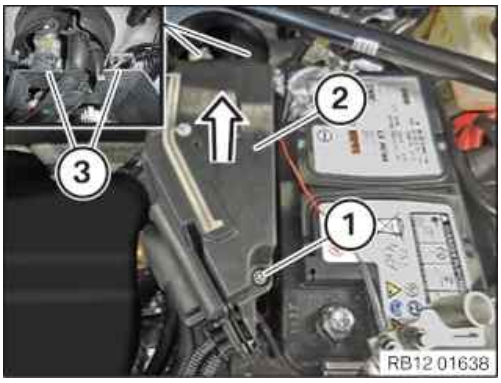
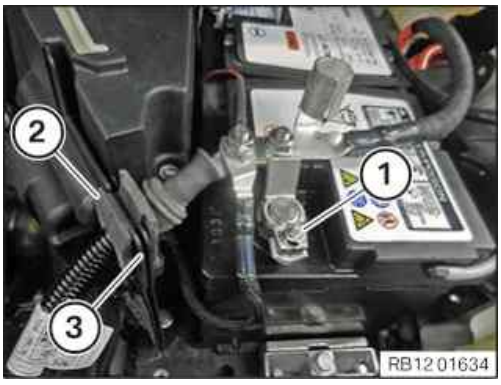


- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

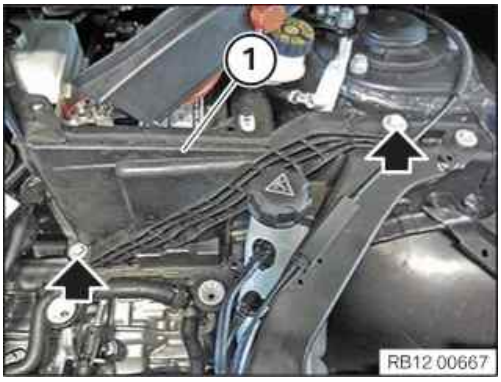
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

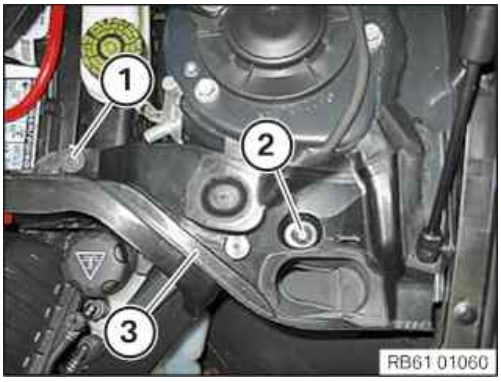
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw			2,8 Nm

131 – Installing clean air pipe

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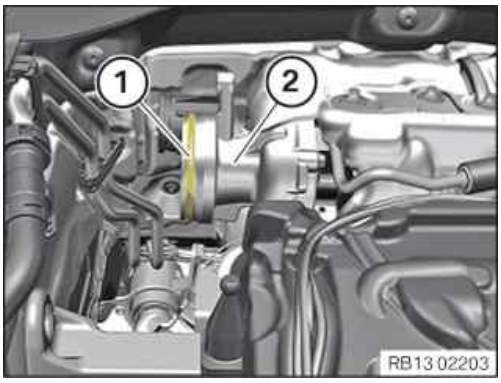
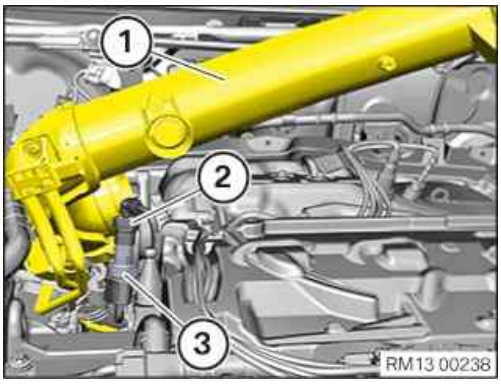


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



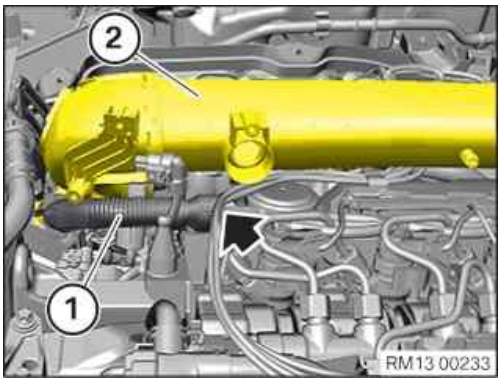
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

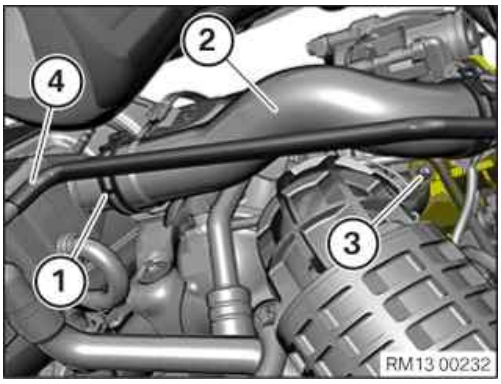
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

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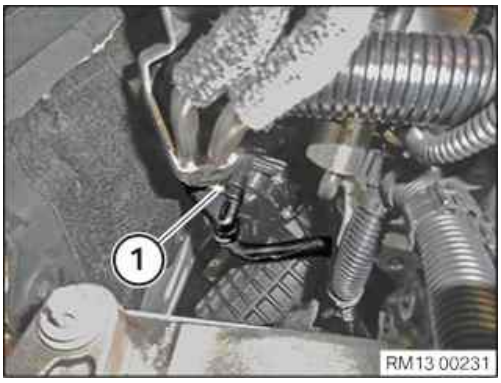
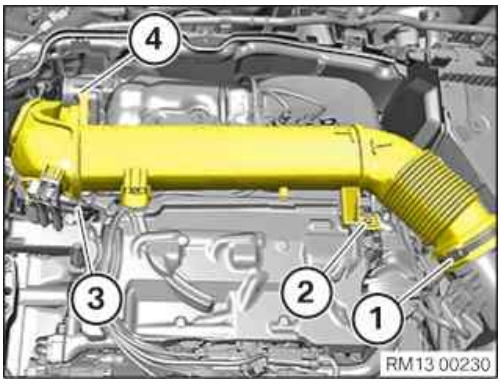


- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

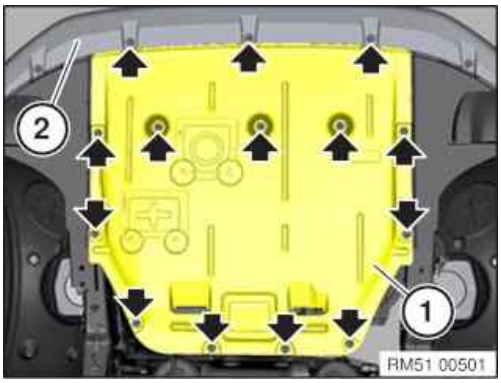
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

132 – Installing the front underbody protection

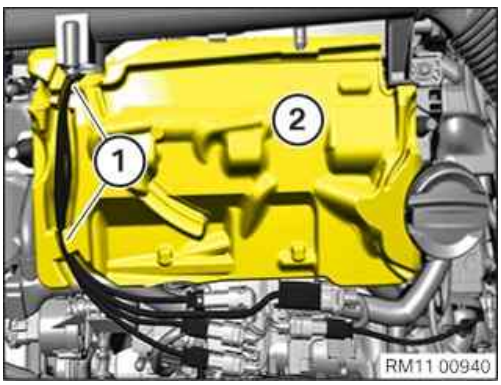


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

133 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

134 – Install resonator

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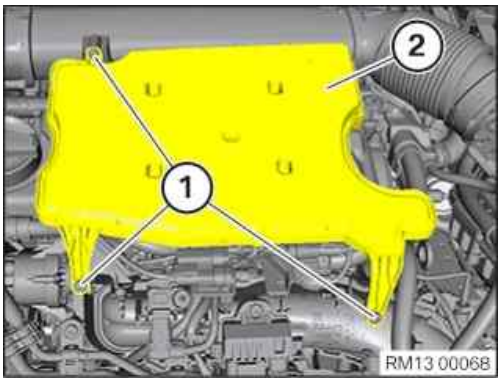

- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

135 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

136 – Install the rear cowl panel cover

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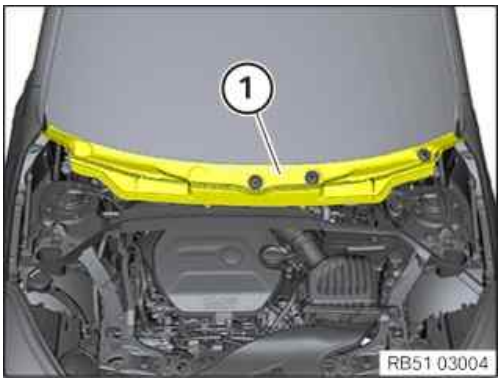
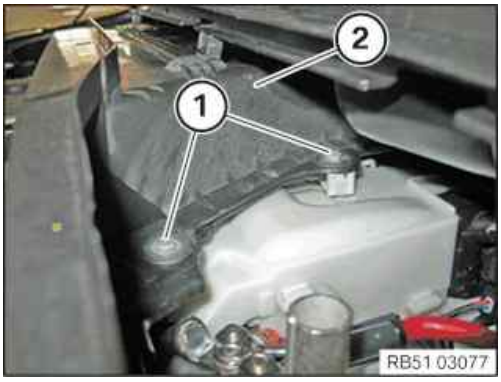


- Feed in and engage the rear cowl panel cover (1).

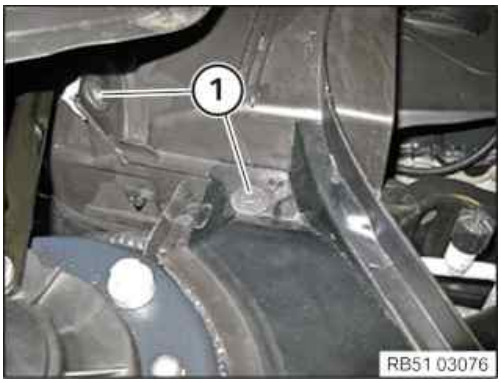
137 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

138 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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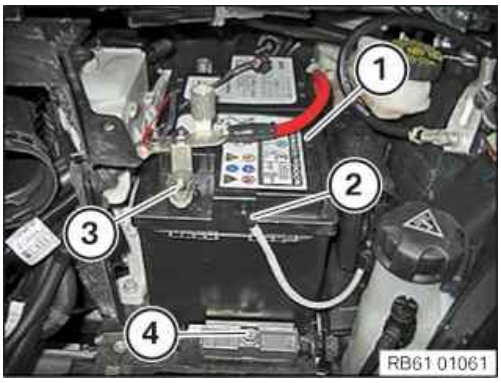


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

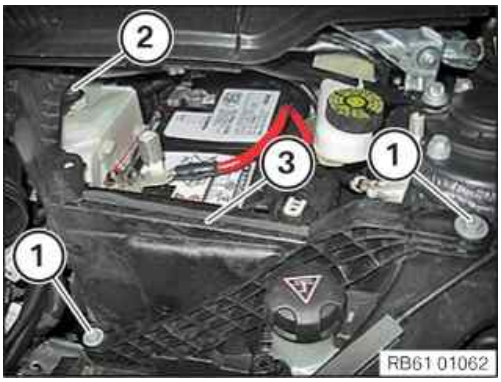
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

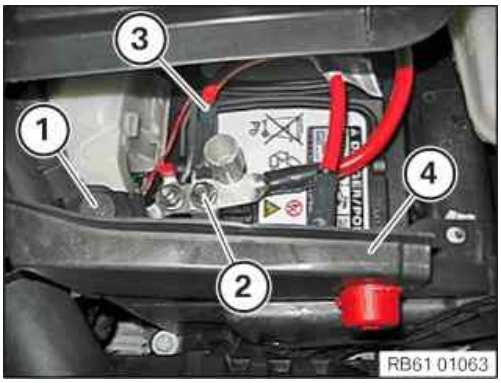
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

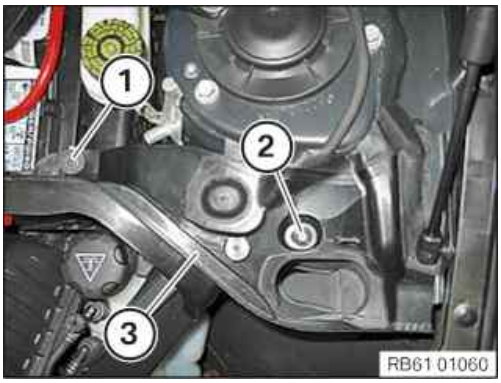
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

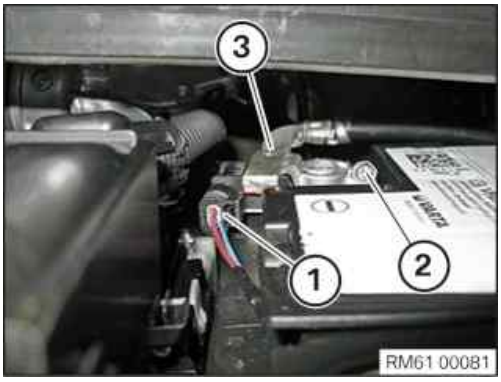
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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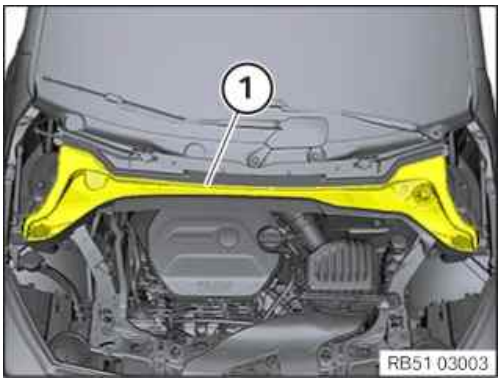
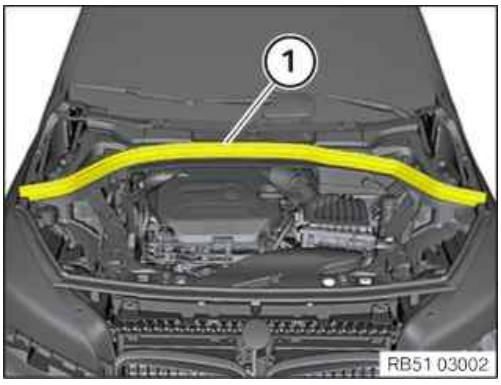


- Feed in the cowl panel cover (1).



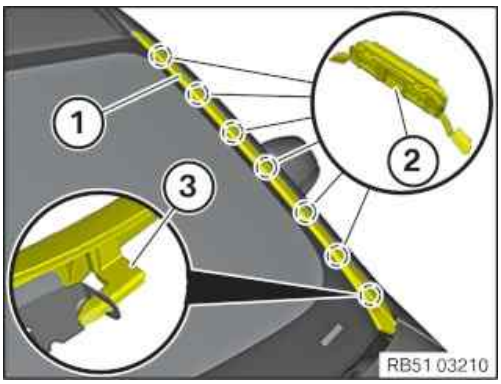
- Press the gasket (1) in a downwards direction.

139 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

140 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

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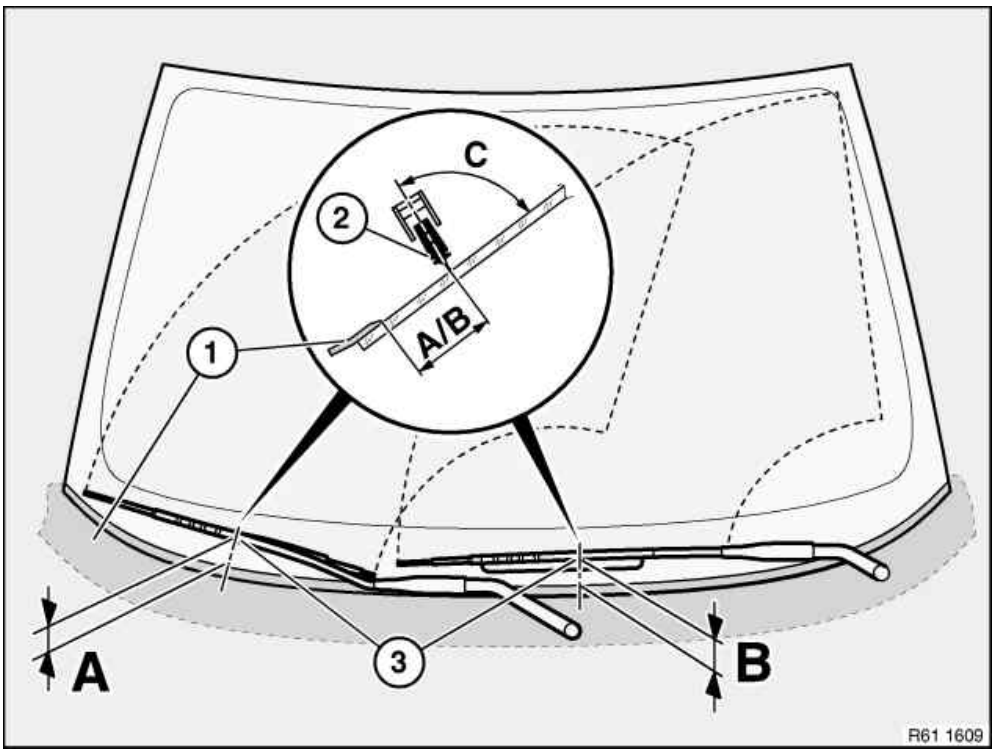
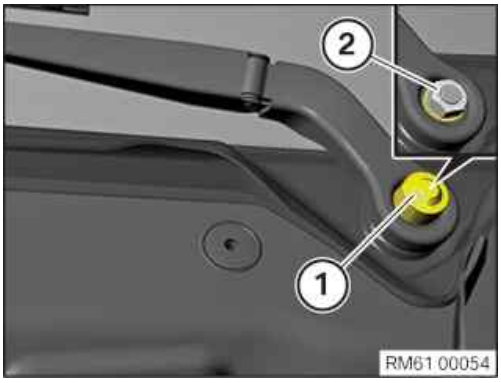
TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

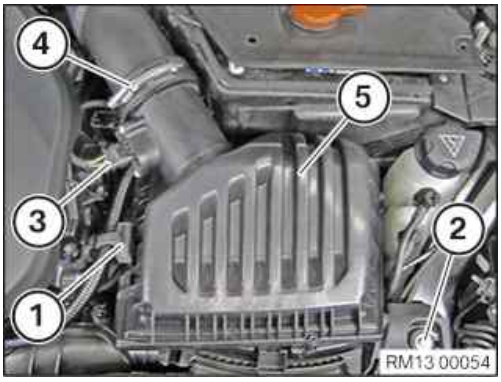
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

141 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

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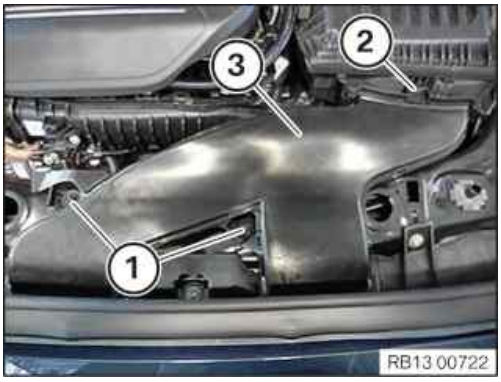
142 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

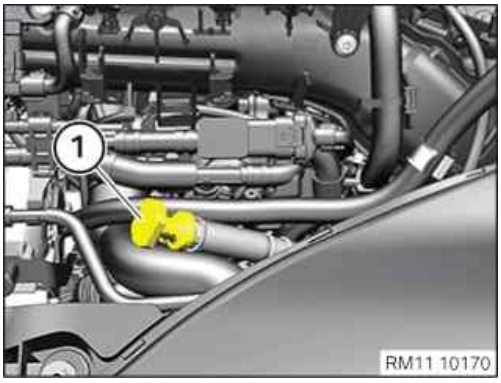
143 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

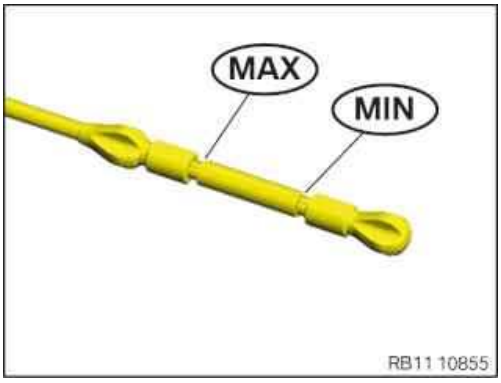


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

144 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Bracing strut to top cross connection — Used in step 32

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 32

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 32

M6x20		Tightening torque	12 Nm

Rear end of front axle support to body — Used in step 67 104

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body — Used in step 67 104

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body — Used in step 67 104 112

Screw		Tightening torque	3 Nm

Special tool to cylinder head — Used in step 67

M8		Tightening torque	21,5 Nm

Cylinder head to crankcase — Used in step 76

M12x1.5	Renew screws.	1. Jointing torque	50 Nm
		2. Angle of rotation	120 °
		3. Angle of rotation	120 °

Cylinder head bolt to timing case cover — Used in step 76

M8x40		Tightening torque	19 Nm

Engine support to cylinder head — Used in step 76

M10X45		Tightening torque	41 Nm

Right engine mount to cylinder head — Used in step 76

M10	Renew screws.	Jointing torque	40 Nm
		Angle of rotation	90 °

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Glow elements to cylinder head

Used in step 76

Glow element		Tightening torque	13 Nm

Camshaft carrier to cylinder head

Used in step 77

M7x35		Tightening torque	13 Nm

Bearing journal to cylinder head

Used in step 79

M16x1.5	Replace bearing journal.	Tightening torque	20 Nm

Standard screw connection M8

Used in step 79

M8		Tightening torque	19 Nm

Standard screw connection M6

Used in step 79

M6			8 Nm

Chain tensioner piston to cylinder head

Used in step 80

NX7 25 mm	Replace sealing ring, oil thread.	Jointing torque	12 Nm
		Angle of rotation	90 °

Camshaft sprocket to camshaft

Used in step 81

M7x17.			17 Nm

Exhaust manifold to cylinder head

Used in step 86

M7	If necessary, renew loose stud bolts.	Tightening torque	11 Nm
	Replace nuts.	Tightening torque	13 Nm

Banjo bolt for exhaust pressure pipe to exhaust manifold

Used in step 86

Hollow bolt		Renew sealing rings.	30 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 86 125

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust turbocharger to exhaust manifold

Used in step 88

V-band clamp		Tightening torque	19 Nm

Oil feed line to exhaust turbocharger

Used in step 88

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

Oil return line to turbocharger

Used in step 88

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase

Used in step 88

M8x16		Tightening torque	22 Nm

Charge air line to crankcase

Used in step 89

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 89

M6		Tightening torque	8 Nm

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Heat shield for exhaust turbocharger

Used in step 90 91 116

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head

Used in step 90

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger

Used in step 92

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder

Used in step 92

M8 hexagon nut		Tightening torque	19 Nm

SCR metering module V-clip to exhaust system

Used in step 92

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter

Used in step 92

Torx bolt BM6x16		Tightening torque	8 Nm

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Used in step 92

Flange nutM8		Tightening torque	19 Nm

Control sensor

Used in step 93

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter

Used in step 94 95

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system

Used in step 96

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft

Used in step 97

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter

Used in step 98

Sensor		Tightening torque	50 Nm

Monitoring sensor

Used in step 99

Sensor		Tightening torque	50 Nm

Starter motor to transmission

Used in step 100

M8x45		Tightening torque	19 Nm

Battery positive lead to starter

Used in step 100

M8		Tightening torque	13,5 Nm

Exhaust system to body

Used in step 101

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body

Used in step 101

Hexagon screw M8x30		Tightening torque	19 Nm

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V-clip to catalytic converter

Used in step 101

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system

Used in step 101

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter

Used in step 101

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting

Used in step 102

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

Front connection carrier to body

Used in step 103

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 103

M8x18		Tightening torque	28 Nm

Track rod end to swivel bearing

Used in step 104

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 104

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 105

M10 screw	Renew screw.	Jointing torque	56 Nm
		Angle of rotation	90 °

Holder with rubber mount to front axle support

Used in step 105

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 105

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 105

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 106

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 108

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 110

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 110

Plastic nut		Tightening torque	3 Nm

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Underbody panelling, side

Used in step 111

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Used in step 111

Plastic nut		Tightening torque	2,6 Nm

Brake disc to front wheel hub

Used in step 113

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

Used in step 113

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 113

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear

Used in step 115

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead

Used in step 115

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead

Used in step 117

Oval-head screw		Tightening torque	5 Nm

Cylinder head cover to cylinder head

Used in step 118

M6		Tightening torque.	8,5 Nm

Differential pressure sensor to holder

Used in step 119

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor

Used in step 119 131

Clamp 15–19mm		Tightening torque	3 Nm

Clamping claw facing to cylinder head cover

Used in step 120

Screw M6		Tightening torque	8 Nm

Injector to cylinder head cover

Used in step 120

Screw		Jointing torque Angle of rotation	8 Nm 120 °

Rail on cylinder head cover

Used in step 121

Torx screw M8x25		Tightening torque	19 Nm

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High pressure line between high pressure pump and rail

Used in step 121 122

High-pressure pipe		Tightening torque	28 Nm

High pressure lines between injector and rail

Used in step 123

High pressure lines		Tightening torque	28 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 125

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 125

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 125

M8x20		Tightening torque	19 Nm

Battery holder to engine support

Used in step 126

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 127

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 127 130

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 127 130

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 127 130

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 127 130

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 127 130

		Tightening torque	3 Nm

Battery cover

Used in step 127 130 138

Screw			2,8 Nm

Intake plenum to cylinder head

Used in step 128

M6		Tightening torque	11 Nm

Positive battery cable to alternator

Used in step 130

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 130

TS6x20		Tightening torque	5 Nm

Exhaust gas pressure sensor

Used in step 131

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

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Clean air pipe to exhaust turbocharger — Used in step 131

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 131

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 131 141

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 132

			3 Nm

Resonator to manifold and clean air pipe — Used in step 134

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 137

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 138

M8 screw		19 Nm

Positive battery terminal — Used in step 138

NutM6		5 Nm

Trailing link — Used in step 138

M8 screw		19 Nm

Positive battery cable to battery terminal — Used in step 138

Nut M8		15,2 Nm

Negative battery terminal (with IBS) — Used in step 138

NutM6		5 Nm

Windscreen wiper arm — Used in step 140

Combination hexagon nut		Tightening torque	35 Nm

Intake silencer housing to lock bridge — Used in step 141

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 142

M6		Tightening torque	8 Nm

Overview of Special Tools

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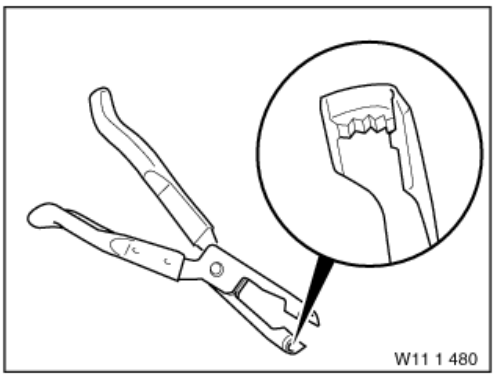
0 490 796 (11 1 480) Pliers



Common	Used in step 20 71
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

0 495 910 (37 1 152) Socket wrench

Common	Used in step 24 25 26 121 122 123
Usage	(Socket wrench)SW19
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

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2 413 106 Fastener

Common Used in step 24 25 122 123

Usage	For avoiding contamination and damage of rail, injectors and high pressure pump.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 16 16 (419)

0 493 321 (13 5 250) Puller

Used in step 27

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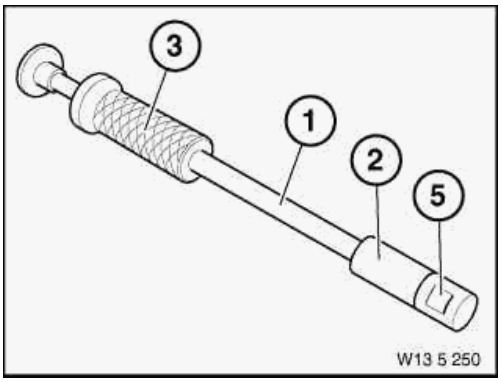

Common

Usage	For removing injector nozzles or injectors from cylinder head
Included in the tool or work	
Storage location	A16
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 338 (13 5 251)		**Rod** (guide rod)	
2	0 493 339 (13 5 252)		**Bush** (Threaded bush)	
3	0 493 340 (13 5 253)		**Weight** (Weight)	
4	0 493 379 (13 5 254)		**Claw** (Clamping claw) For removal of injector nozzles / engine: M57	
5	0 495 579 (13 5 255)		**Adapter** For removing steering shaft on E85. Refer to SI 01 11 06 (265)	

0 493 339 (13 5 252) Bush

Common

Used in step 27

Usage	(Threaded bush)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 340 (13 5 253) Weight

Common

Used in step 27

Usage	(Weight)
Included in the tool or work	0 493 321
Storage location	
Replaced by	
In connection with	
SI-Number	

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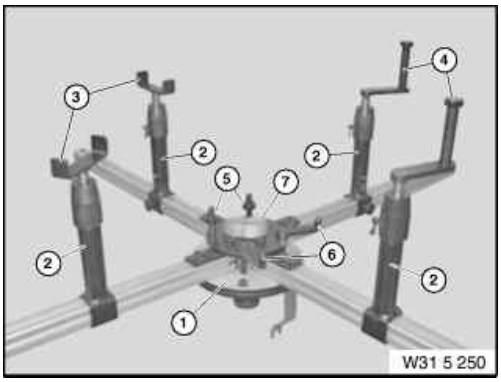
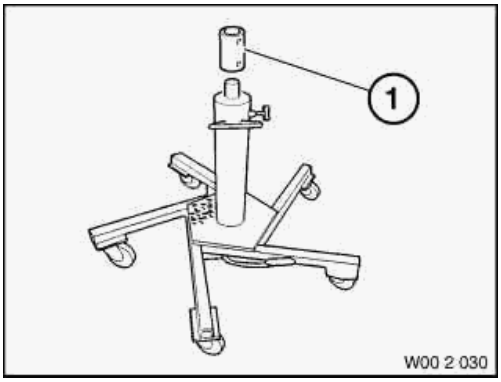
0 495 817 (31 5 251) Basic body



Common Used in step 43 67 76 104

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



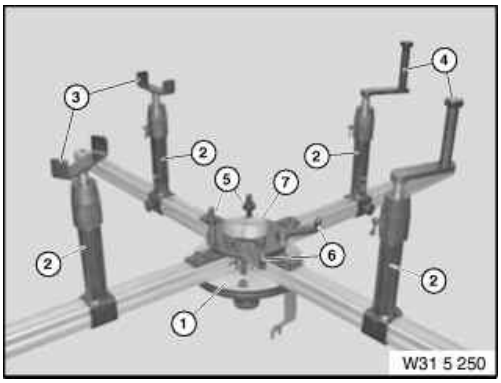
Common Used in step 43 67 76 104

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 821 (31 5 255) Adapter



Common Used in step 43 76

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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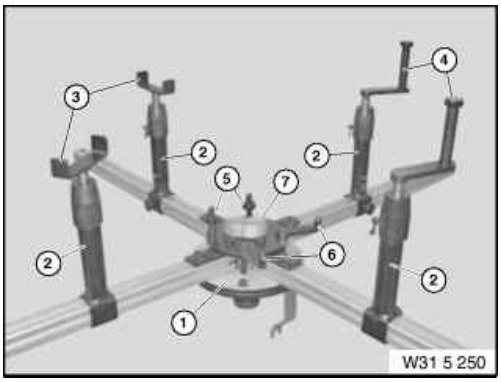
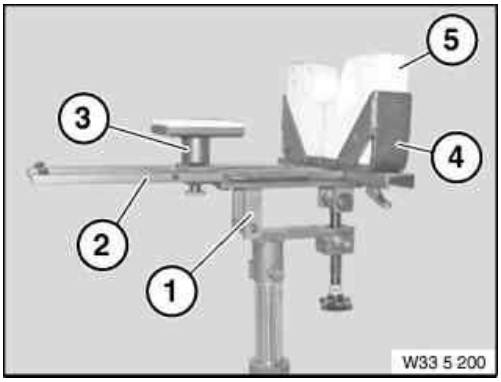
0 495 819 (31 5 253) Adapter



Common	Used in step 43 76
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt



Common	Used in step 43 67 76 104
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

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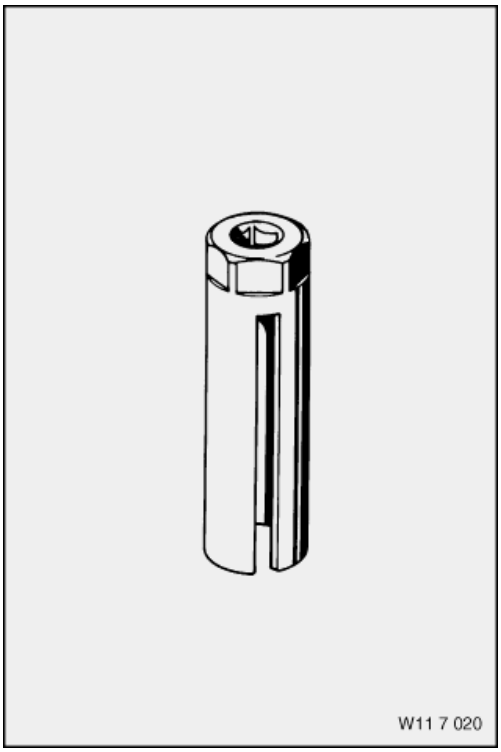
0 491 074 (11 7 020) Socket wrench insert



Common

Used in step 48 49 99

Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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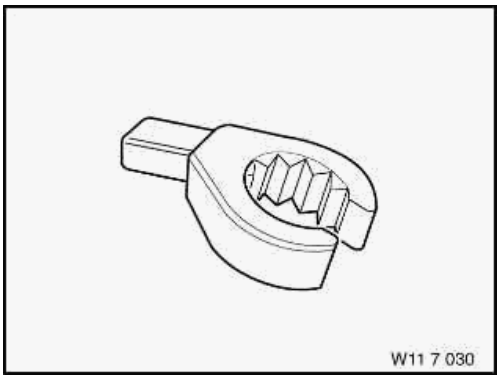
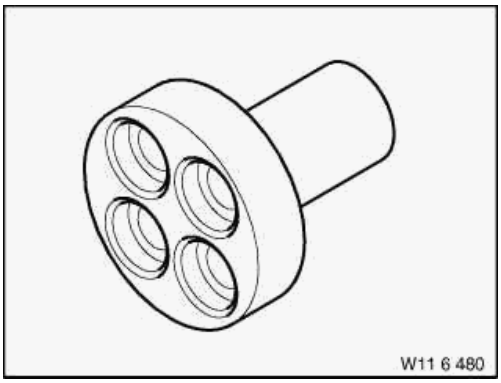
0 491 075 (11 7 030) Socket wrench insert



Common	Used in step 54 93
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

0 493 380 (11 6 480) Connector



Common	Used in step 62 84
Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

2 288 380 Locating stud

Common	Used in step 62 83 84
Usage	For disconnecting the crankshaft at TDC. Contour-graphic silhouette foil is included in delivery specification. Further information on the contour-graphic silhouette foil can be found in service information 00 22 13 (969).
Included in the tool or work	
Storage location	A56
Replaced by	
In connection with	
SI-Number	01 04 14 (071)

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0 496 112 (11 8 760) Gauge

Common	Used in step 62 82 84
Usage	For securing camshaft at TDC.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

2 414 691 Support

Common	Used in step 67 76
Usage	To support the engine when the engine support is removed.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	2357071
SI-Number	01 12 16 (406)

2 357 071 Panel

Common	Used in step 67 76
Usage	Additional mounting plate for lifting table MHT 1200. Delivery quantity: 1 piece. During the course of the changeover from BMWi to iPerformance, a tool changeover also takes place from campaign to warehouse.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	Table lift MHT 1200 81222184136
SI-Number	01 21 13 (987)

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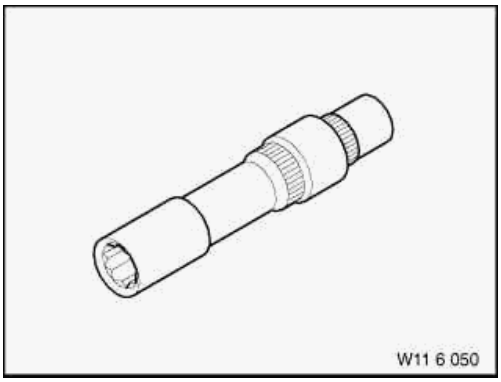
0 491 068 (11 6 050) Socket wrench insert



Common	Used in step 67 76
Usage	(Wrench socket AF 10) bi-hexagon/glow elements
Included in the tool or work	
Storage location	B10
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 459 012 Holder

Common	Used in step 67 76
Usage	For removing and installing the cylinder head. Contour-graphic silhouette foil is included in the delivery specification.
Included in the tool or work	
Storage location	A58
Replaced by	
In connection with	
SI-Number	01 07 17 (487)

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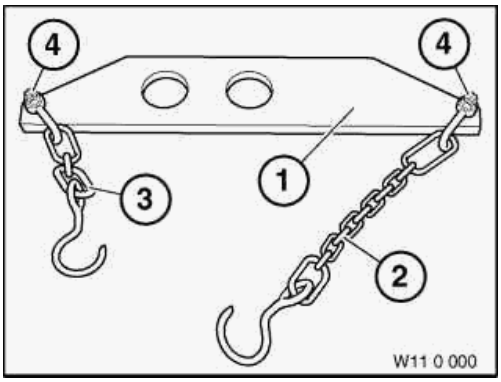
0 490 561 (11 0 000) Lifting gear



Common

Used in step 67 76

Usage	(Hoisting gear) For removing and installing engines. As of 08/2011 only available as a complete set. Delivered with TÜV inspection certificate and operating instructions. No delivery of separate parts.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 13 94 (888)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
4	0 490 565 (11 0 009)		**Shackle** (Shackle) 2 pieces. As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
1	0 490 562 (11 0 001)		**Lifting gear** (Cross member) As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
2	0 490 563 (11 0 002)		**Chain** (Chain) Version: long As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	
3	0 490 564 (11 0 003)		**Chain** (Chain) Version: short As of 08/2001, only available as a complete set via 11 0 000 = 0490561. Delivered with TÜV inspection certificate and operating instructions.	

0 494 362 (11 9 000) Device

Used in step 67 70

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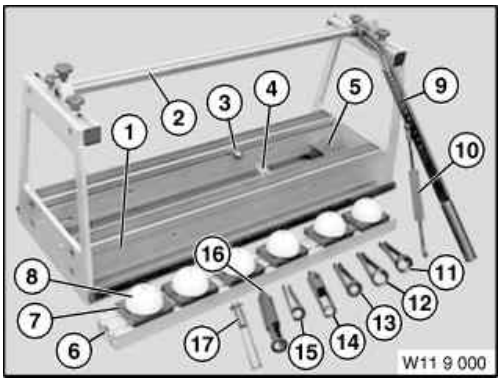

Common

Usage	(Cylinder head expander tool)
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	002300 = 0495187
SI-Number	01 03 02 (833)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 494 366 (11 9 001)		**Device**	
6	0 494 371 (11 9 006)		**Insert** (Aluminium strip)	
11	0 494 376 (11 9 012)		**Basket** (Valve spring cage) Engine M41, M51, S50	
17	0 495 028 (11 9 017)		**Basket** (Valve spring cage) Engine N52	
2	0 494 367 (11 9 002)		**Rod**	
3	0 494 368 (11 9 003)		**Adapter** (Sliding block)	
4	0 494 369 (11 9 004)		**Tab**	
5	0 494 370 (11 9 005)		**Quick fastener**	
7	0 494 372 (11 9 007)		**Shaped part** (shaped part)	
8	0 494 373 (11 9 008)		**Shaped part** (Shaped part) Shaped part made of plastic	
9	0 494 374 (11 9 009)		**Lever**	
10	0 494 375 (11 9 011)		**Hook**	
12	0 494 377 (11 9 013)		**Basket** (Valve spring cage) Engine M43, M73	
13	0 494 378 (11 9 014)		**Basket** (Valve spring cage) Engine M44, M52, M54, M56, M62, S52, S54, S62	
14	0 494 379 (11 9 015)		**Basket** (Valve spring cage) Engine M47, M47TU, M57, M57TU, N40, N42, N62, N73	
15	0 494 380 (11 9 016)		**Basket** (Valve spring cage) Engine M21, M40	

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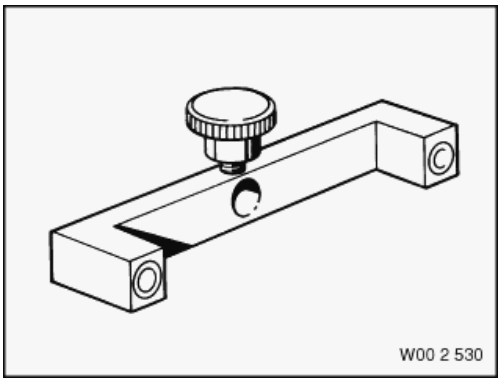
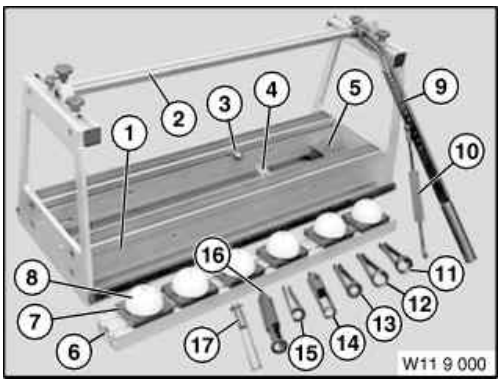
0 490 185 (00 2 530) Bridge



Common	Used in step 68
Usage	(Measuring bridge) For determining the piston projection (Diesel)
Included in the tool or work	
Storage location	A3
Replaced by	
In connection with	
SI-Number	

0 494 366 (11 9 001) Device



Common	Used in step 70 73
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 187 (00 2 300) Assembly stand

Used in step 70 73

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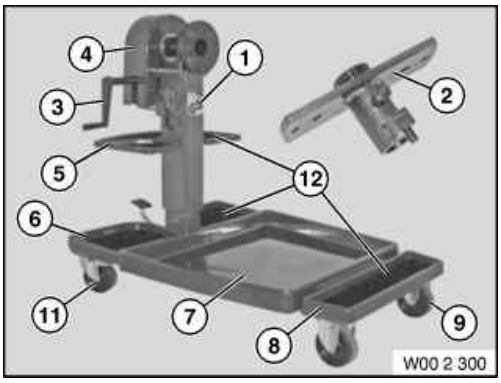

Common

Usage	Assembly stand with universal flange for mounting engines from S85
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 25 04 (155)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 188 (00 2 301)		**Assembly stand** available only as complete assembly stand 83 30 0 495 187.	
2	0 495 189 (00 2 302)	**2 299 563**	**Tool** (Universal flange). Do not use any more!!! Technically locked. Replaced with a new flange with material number 83 30 2 299 563. All flanges delivered until the end of 2011 will be replaced at no charge. From 2012, only the new flange will be supplied. Also applies to the complete engine mounting stand 00 2 300.	
3	0 495 200 (00 2 303)		**Crank**	
4	0 495 201 (00 2 304)		**Cover** (Protective hood)	
5	0 495 202 (00 2 305)		**oddments tray** (Oddments tray for small parts)	
6	0 495 203 (00 2 306)		**Shaped element** (Rear shaped pan)	
7	0 495 204 (00 2 307)		**Collection pan** (Oil collection pan)	
8	0 495 205 (00 2 308)		**Shaped element** (Front shaped pan)	
9	0 495 206 (00 2 309)		**Wheel** (Front wheel (without stop))	
10	0 495 207 (00 2 311)		**Wheel** (Rear wheel (with stop))	
11	0 495 208 (00 2 312)		**Mat** (Checker mat set)	
2	2 299 563		**Adapter** New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.	

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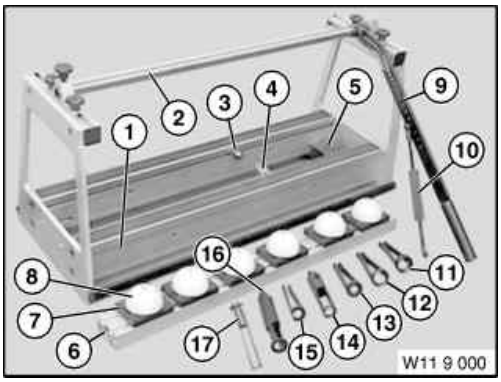
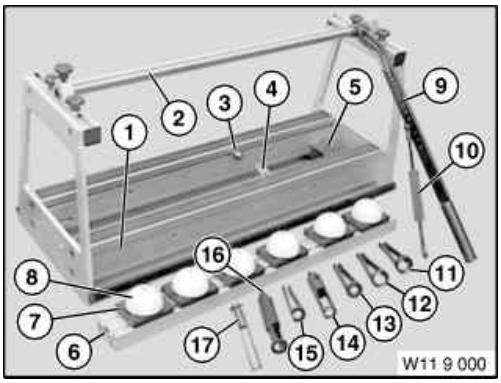
0 494 371 (11 9 006) Insert



Common	Used in step 70
Usage	(Aluminium strip)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 372 (11 9 007) Shaped part

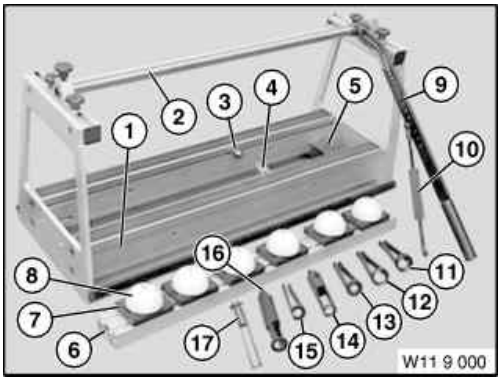


Common	Used in step 70
Usage	(Shaped part)
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 373 (11 9 008) Shaped part

Common	Used in step 70
Usage	(Shaped part) Shaped part made of plastic
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 494 370 (11 9 005) Quick fastener



Common	Used in step 70 73
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 494 374 (11 9 009) Lever

Common	Used in step 70 73
Usage	
Included in the tool or work	0 494 362
Storage location	
Replaced by	
In connection with	
SI-Number	

0 496 143 (11 8 840) Basket

Common	Used in step 70 73
Usage	(Valve spring cage) For removing and fitting the valves.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

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0 495 105 (11 4 480) oddments tray

Common

Used in step 70

Usage	(Boards (2 pieces)) For setting down the individual components of the cylinder head.
Included in the tool or work	
Storage location	Individual
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 106 (11 4 481)		**oddments tray** (Board, intake side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	
2	0 495 107 (11 4 482)		**oddments tray** (Board, exhaust side) Discontinued, only available as part of complete special tool 11 4 480 = 83 30 0 495 105	

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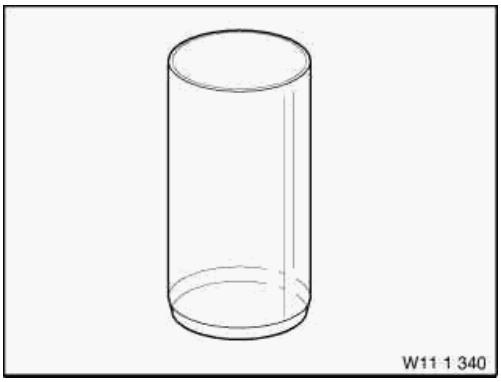
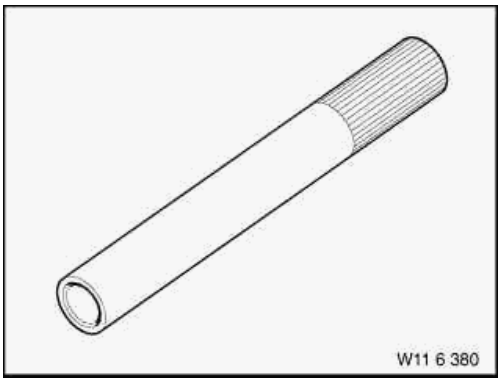
0 490 746 (11 1 380) Holding sleeve



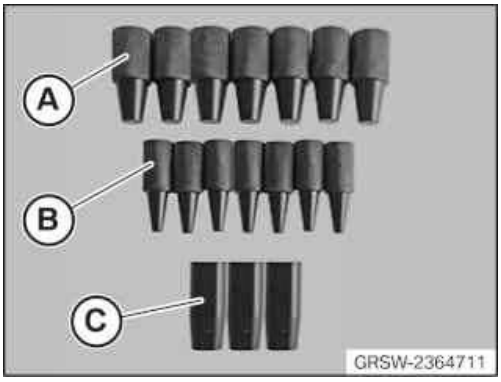
Common	Used in step 72
Usage	(Assembly sleeve) For fitting the valve stem seal, diameter 7 mm
Included in the tool or work	
Storage location	individual
Replaced by	
In connection with	
SI-Number	

0 493 249 (11 6 380) Bush



Common	Used in step 72
Usage	For fitting valve stem seal
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 98 (306)

2 364 711 Plug



Common	Used in step 74
Usage	For closing the pressure oil holes for cleaning the cylinder head sealing surfaces.
Included in the tool or work	
Storage location	C20
Replaced by	
In connection with	
SI-Number	01 50 14 (203)

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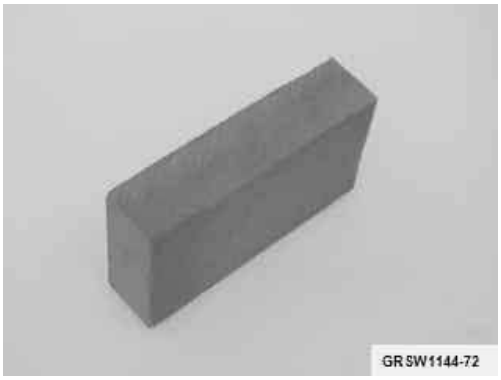
0 495 103 (11 4 471) Scraper

Common	Used in step 74
Usage	
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

0 495 104 (11 4 472) Extractor



Common	Used in step 74
Usage	(grindstone)
Included in the tool or work	0 495 102
Storage location	C52
Replaced by	
In connection with	
SI-Number	

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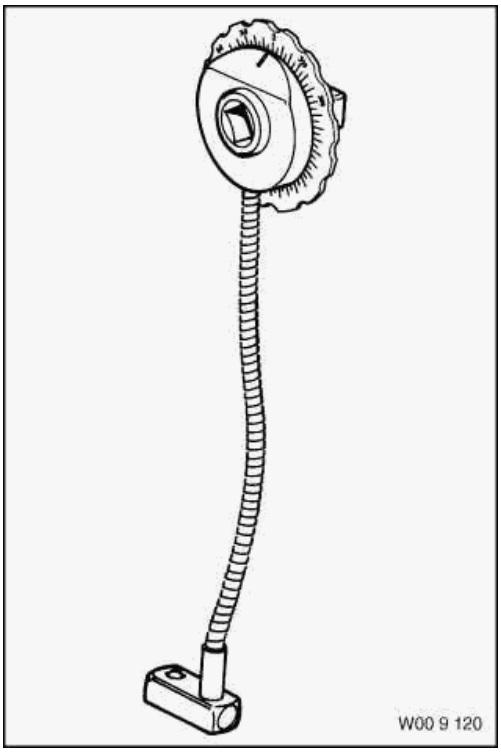
0 490 504 (00 9 120) Torque angle measuring dial



Common Used in step 76

Usage	For torsion angle adjustment of cylinder head bolts (all engines) And reinforcement plate front axle support E46
Included in the tool or work	
Storage location	A4
Replaced by	
In connection with	
SI-Number	

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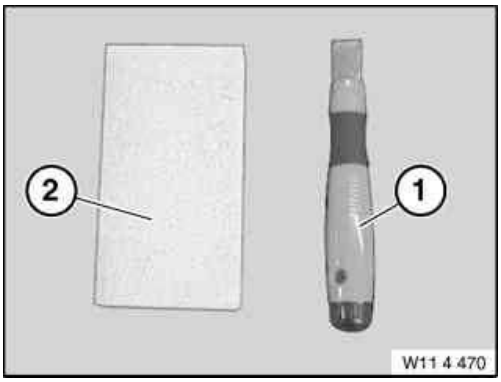
0 495 102 (11 4 470) Tool



Common Used in step 86

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

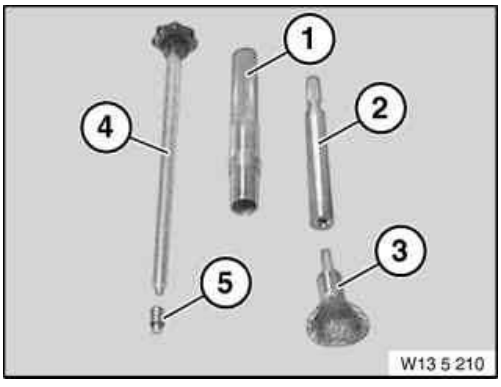
Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

2 344 011 Tool

Common Used in step 113

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

0 493 763 (13 5 215) Plug



Common Used in step 120

Usage	(Seal plug)
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

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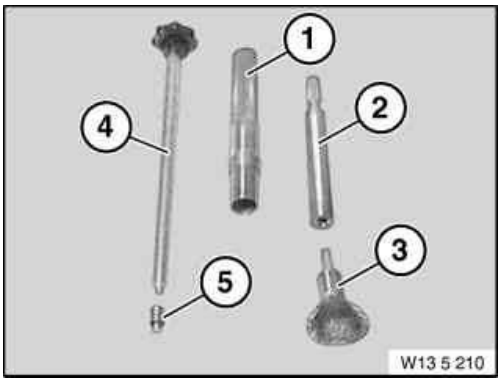
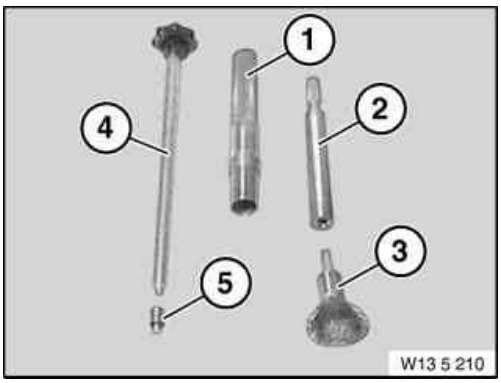
0 493 762 (13 5 214) Rod



Common	Used in step 120
Usage	(Mounting rod) For the seal plug
Included in the tool or work	0 493 758
Storage location	
Replaced by	
In connection with	
SI-Number	

0 493 758 (13 5 210) Tool



Common	Used in step 120
Usage	(Cleaning set) For injector channels
Included in the tool or work	
Storage location	B4
Replaced by	
In connection with	
SI-Number	01 05 00 (574)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 493 759 (13 5 211)		**Holding sleeve** (Guide sleeve)	
2	0 493 760 (13 5 212)		**Holder** (Brush holder)	
3	0 493 761 (13 5 213)		**Brush head**	
4	0 493 762 (13 5 214)		**Rod** (Mounting rod) For the seal plug	
5	0 493 763 (13 5 215)		**Plug** (Seal plug)	

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 34
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud

Common	Used in step 34
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 34
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 34
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 34
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 228 (36 1 331) Wheel stud

Common	Used in step 34
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 34
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 34
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

2 299 563 Adapter

Common	Used in step 70 73
Usage	New adapter for the engine assembly stand. Replacement for 83 30 0 495 189 - 00 2 302.
Included in the tool or work	0 495 187
Storage location	
Replaced by	
In connection with	
SI-Number	

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Overview Technical Data

Valve underprotrusion	Used in step 68
	0,8 (0,7 - 0,9) mm

Cylinder head flatness	Used in step 69
Maximum lengthwise deviation from flatness	0,10 mm
Maximum transverse deviation from flatness	0,05 mm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	19 125
EGR controller	19 125
Troubleshooting on the exhaust turbocharger	88

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 138
61 12 ... Notes on intelligent battery sensor (IBS)	1 138
61 00 ... Notes for disconnecting and connecting battery	1 138

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	16 27 28 48 49 51 52 53 54
11 65 020 Turbocharger damage due to blocked oil supply lines	88
11 65 ... Test steps in the event of turbocharger damage	88
17 00 008 Draining and topping up coolant for high-temperature circuit	144
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	144
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	144
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	144
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	144
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	144
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	144
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	144
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	144
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	144
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	144
17 00 039 Bleeding cooling system (B37, B47)	144
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	144
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	144
17 00 008 Draining and topping up the high-temperature coolant circuit	144
17 00 008 Draining and topping up the high-temperature coolant circuit	144
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	144
17 00 008 Draining and topping up the high-temperature coolant circuit	144
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	144
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	144
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	144
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	144
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	144

Operating materials	Used in step
2.0 Grease for wheel centring	113

Parts

Parts required

Designation	Used in step
Chain tensioner piston seal on cylinder head	80
Exhaust-gas recirculation cooler seal on exhaust manifold	125
Exhaust-gas recirculation cooler seal on intake plenum	125

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11 34 560 Replacing all valve stem seals (B37C)

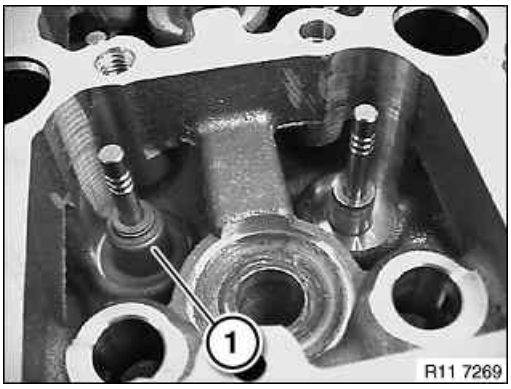
Special tools required:

- 11 1 480
- 11 6 380

Necessary preliminary tasks:

- Remove valve springs

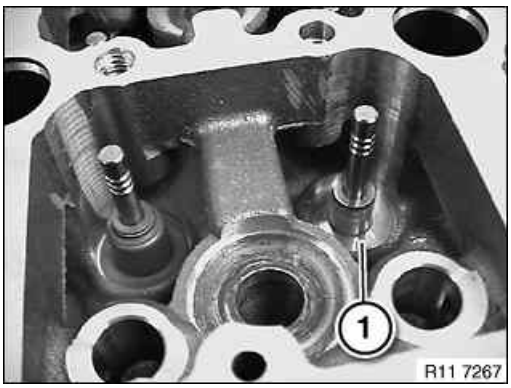
Removal:



Tap open valve stem seal (1) with special tool 11 1 480 or with a size 13 or 14 hexagon bit.

Remove valve stem seal (1) with turning and pulling motions.

Installation:



Installation note:
The contact surface (1) must be clean.

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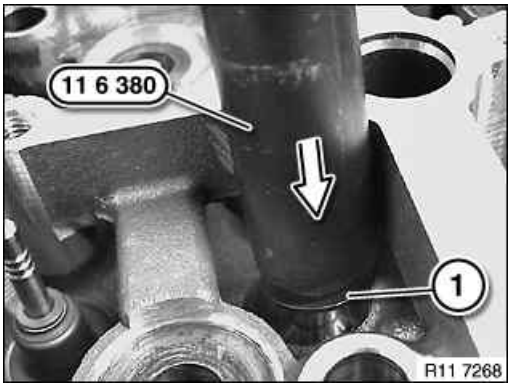

Installation note:
Before installing the valve stem seals, the **assembly sleeve must** be fitted on the valve stem! **Risk of damage** to the sealing lip!

Press on valve stem seal (1) to stop using special tool 11 6 380 in direction of arrow.

Required follow-up work:

- Install valve springs
- Assemble engine

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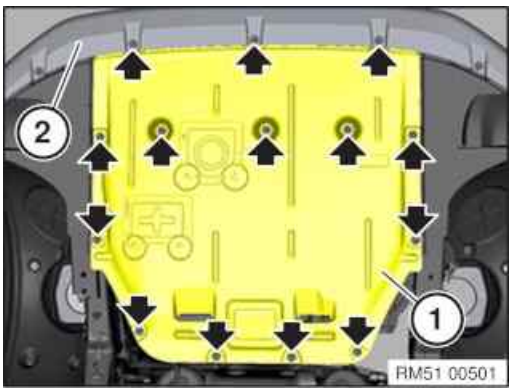
11 40 000 Checking engine oil pressure

PRELIMINARY WORK

1 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

MAIN WORK

2 – Checking the oil pressure

WARNING

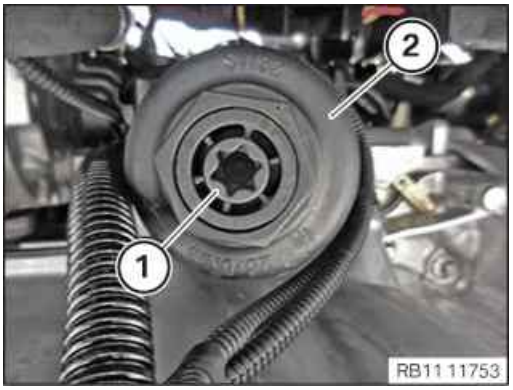
Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Undo the oil drain plug (1) on the oil filter cover (2).
- Feed out and remove oil drain plug (1).
- Catch and dispose of emerging engine oil.

- Renew oil drain plug (1) with the sealing ring (2).

  Parts: Oil drain plug, sealing ring

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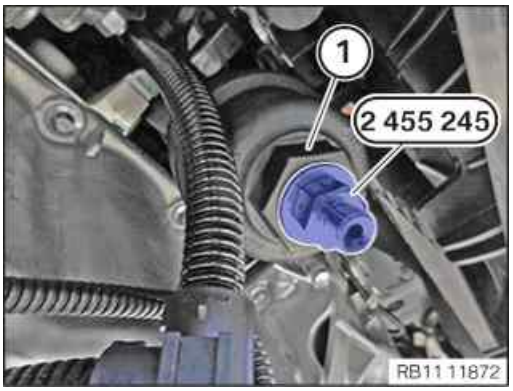
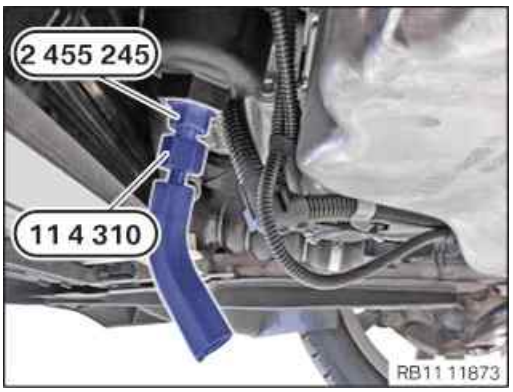
- Apply a thin coating of oil on the sealing rings on the special tool .



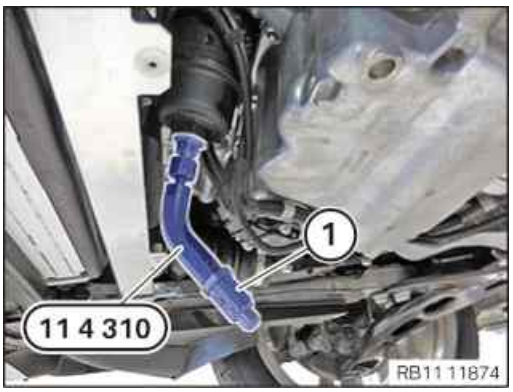
- Thread in the special tool at the oil filter cover (1) and install.
- Tighten the special tool on the oil filter cover (1).

Special tool to oil filter cover

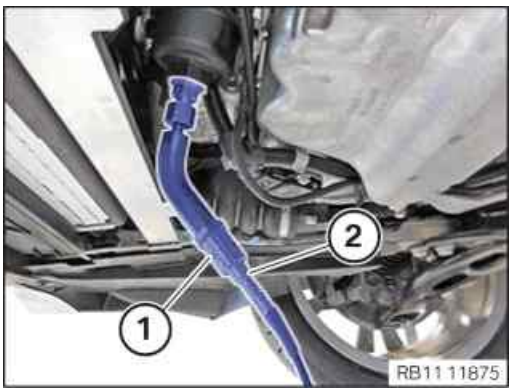
Special tool		Tightening torque	6 Nm



- Connect special tool **0 496 623 (11 4 310)** to special tool .



- Slightly grease gasket on the pressure sensor (1) **(part number: 81 31 2 357 801 and 81 38 0 431 592)**.
- Manually tighten the pressure sensor (1) **(part number: 81 31 2 357 801 and 81 38 0 431 592)** in the special tool **0 496 623 (11 4 310)**.



- Connect and lock the connecting cable (2) on the pressure sensor (1).
- Connecting cable (2) and pressure sensor (1)**(part number: 81 31 2 357 801 or 81 38 0 431 592)** with the Integrated Measurement Interface Box (IMIB) (81 38 2 295 937).

▸ **Check engine oil level**

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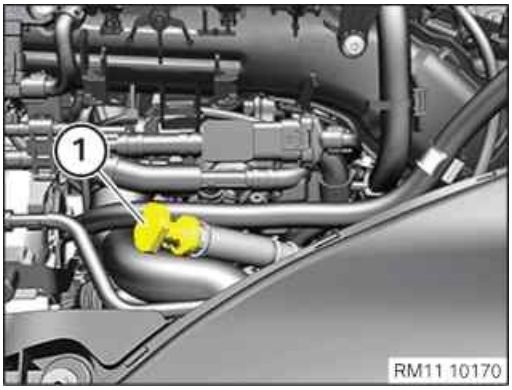
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▷ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

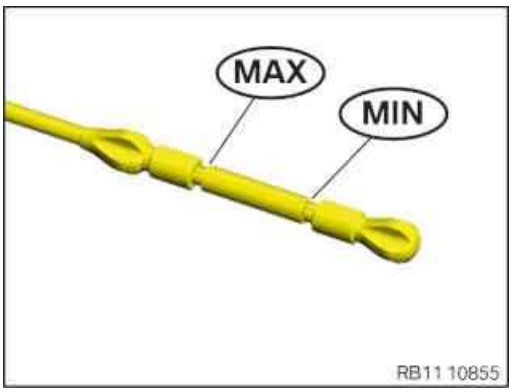


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



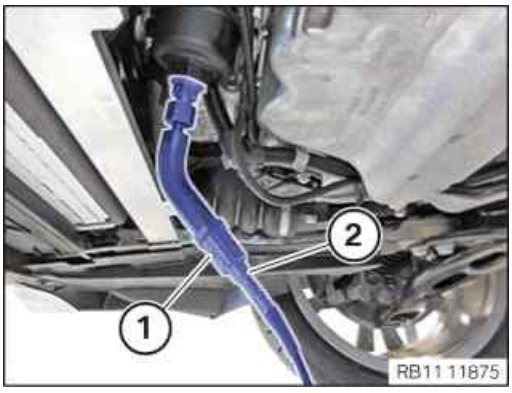
TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

◁

- Check oil pressure.
- Observe diagnosis instructions.



- Unlock and disconnect the connecting cable (2) from the pressure sensor (1).

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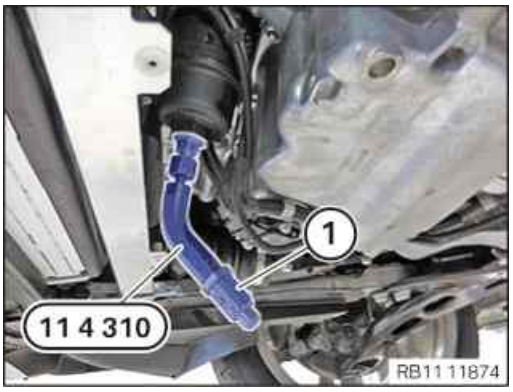
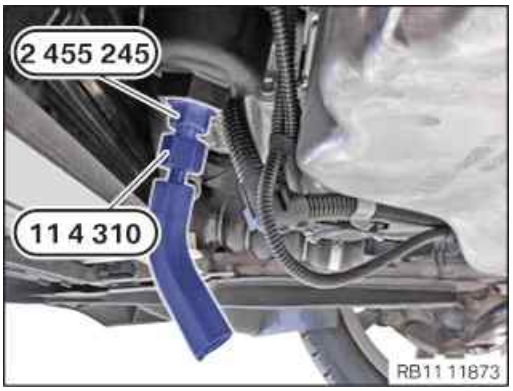
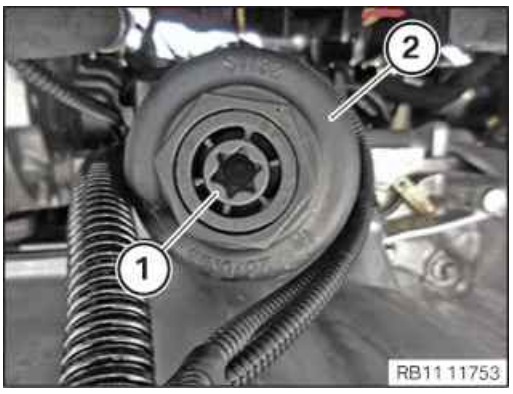


- Thread out the pressure sensor (1) from the special tool **0 496 623 (11 4 310)** and remove.



- Thread out the special tool **0 496 623 (11 4 310)** from the special tool and remove.

- Thread out the special tool from the oil filter cover (1) and remove.



- Feed in and install new oil drain plug (1).
- Tighten new oil drain plug (1) on the oil filter cover (2).

Oil drain plug to oil filter cover

	Renewoil drain plug.	Tightening torque	6 Nm

POSTPROCESSES

3 – Installing the front underbody protection

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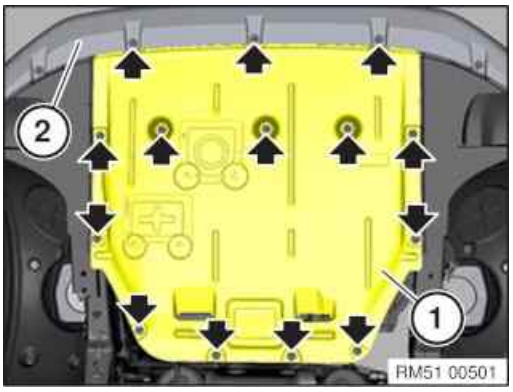


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

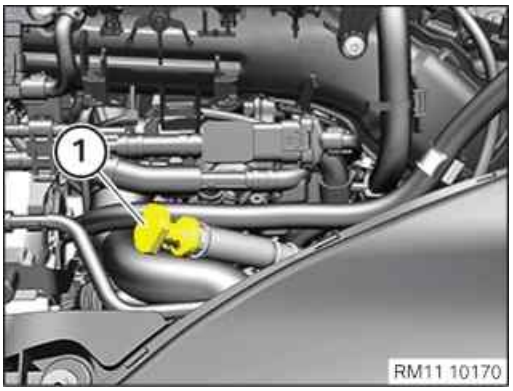
4 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

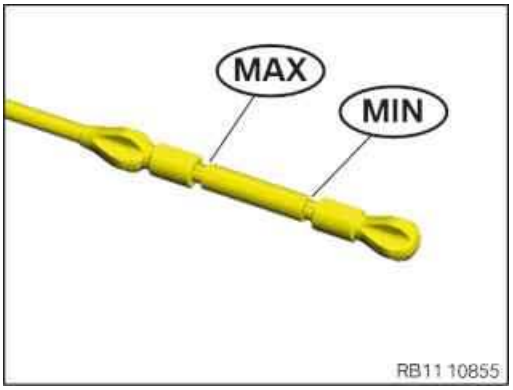


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

Additional Information

Overview of Tightening Torques

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Special tool to oil filter cover Used in step 2

Special tool		Tightening torque	6 Nm

Oil drain plug to oil filter cover Used in step 2

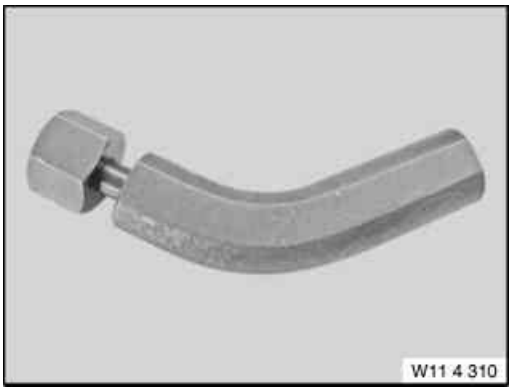
	Renewoil drain plug.	Tightening torque	6 Nm

Underbody protection front Used in step 3

			3 Nm

Overview of Special Tools

0 496 623 (11 4 310) Adapter



Common Used in step 2

Usage	For fuel pressure check. For variable camshaft timing control VANOS with Integrated Measurement Interface Box IMIB (100 bar sensor in delivery specification). In combination with 11 5 360.
Included in the tool or work	
Storage location	B26
Replaced by	
In connection with	11 5 360 = 0495130
SI-Number	01 27 09 (598)

Overview Technical Data

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11 40 000 Checking engine oil pressure (B37C)

Special tools required:

- 2 289 603
- 11 4 310

Necessary preliminary tasks:

- Remove underbody protection

Removal:

Remove oil drain plug (1).
Drain oil.

Parts: Replace screw (2) with O-ring (1).
Install and tighten screw (2).
Tightening torque: 11 42 6AZ.

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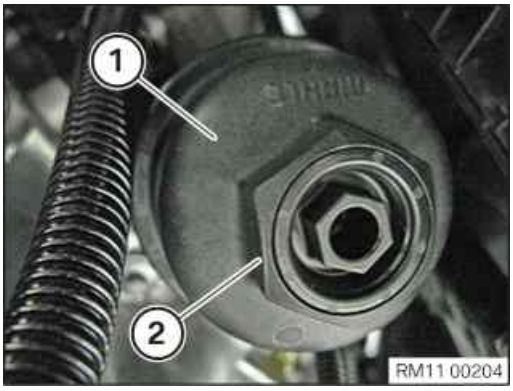

Undo oil filter cover (1) at hexagon head (2).

Checking engine oil pressure with diagnosis tester:

Remount filter element (1) in the special tool 2 289 603 .

Remount O-ring (2) if necessary.

Screw special tool 2 289 603 with oil filter element into the oil filter housing (1).

Tightening torque: 11 42 1AZ.

Connect special tools 2 289 603 and 11 4 310 .

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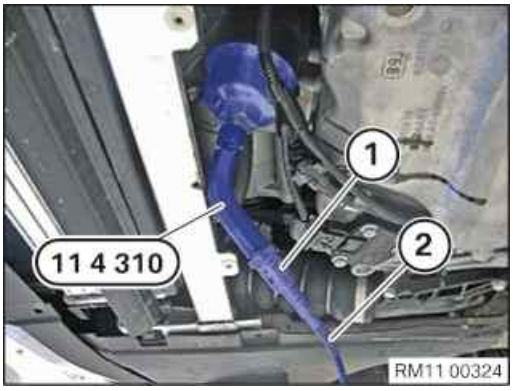


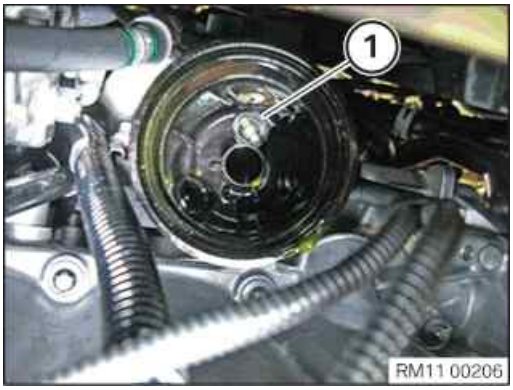
Lightly oil O-ring at the pressure sensor (1), (100 bar, order number: **0 431 592**).

Screw pressure sensor (1) hand-tight into special tool 11 4 310 .

Connect connecting cable (2) of **I**ntegrated **M**easurement **I**nterface **B**ox (IMIB) to pressure sensor (1).

Run the corresponding test module.

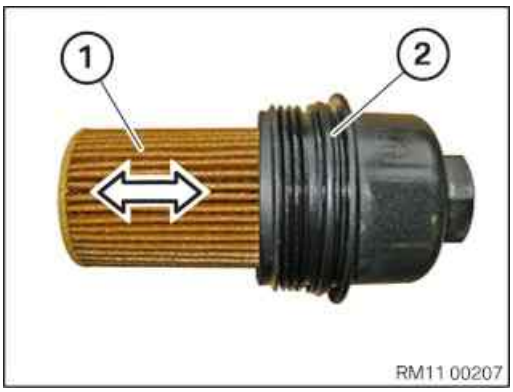
INSTALLATION:



Stop engine.

Remove the special tools.

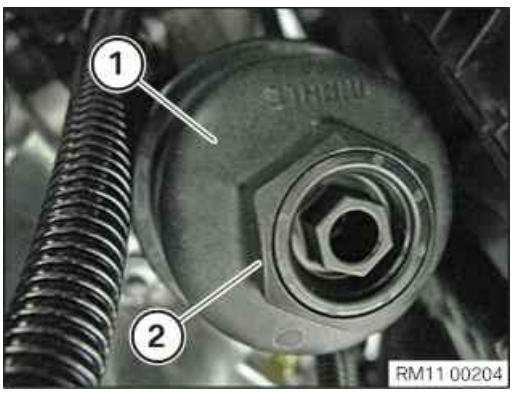
Check the freedom of movement of the non-return valve (1).



Part: Replace O-ring (2).

Insert the oil filter element (1) into the oil filter cover.

Replace O-ring (2) and oil it with engine oil.



Install oil filter cover (1) and tighten at hexagon head (2).

Tightening torque: 11 42 1AZ.

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Concluding tasks:

- Install underbody protection.
- Vehicle horizontal.
- Allow engine to run briefly and stop.
- Check oil level and correct if necessary.

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11 40 000 Checking engine oil pressure (B37D)

Special tools required:

- 2 289 603
- 11 4 310

Necessary preliminary work:

- Remove oil filter .

Remount filter element (1) in the special tool 2 289 603 .
Remount O-ring (2) if necessary.

Screw in special tool 2 289 603 with filter element to 25 Nm.

Checking engine oil pressure with diagnosis tester

Connect special tool 11 4 310 and special tool 2 289 603 .
Lightly oil O-ring at pressure sensor (0 431 592).
Screw pressure sensor (0 431 592) hand-tight into special tool 11 4 310 .
Connect connecting cable of IMIP to pressure sensor (0 431 592).

Follow diagnosis instruction.

Required follow-up work:

- Install oil filter.
- Remove all special tools.
- Reassemble vehicle and set in horizontal position.
- Switch off engine, wait approx. 5 minutes and then check engine oil level.
- Top up engine oil if necessary.

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11 41 000 Removing and installing or replacing oil/vacuum pump (B37C)

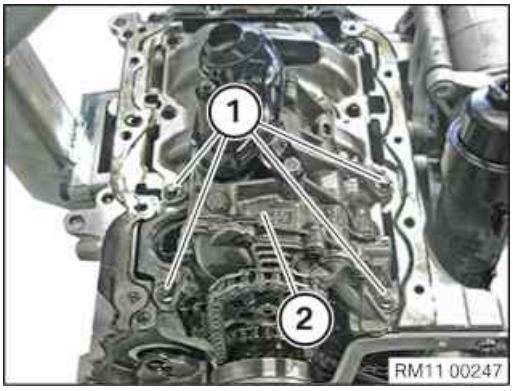
Important!

It is possible to remove and install the oil/vacuum pump **without** removing the transmission.

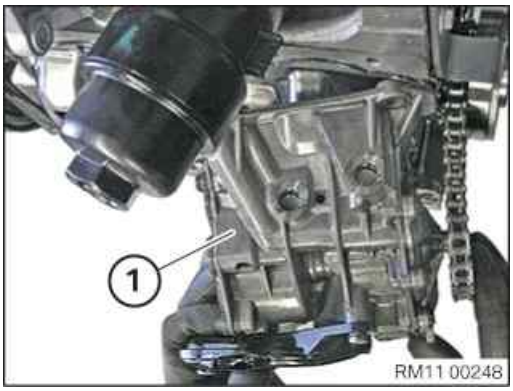
Necessary preliminary tasks:

- Removing oil sump.

REMOVAL:



Release screws (1) of oil/vacuum pump (2).



Remove oil/vacuum pump (1).

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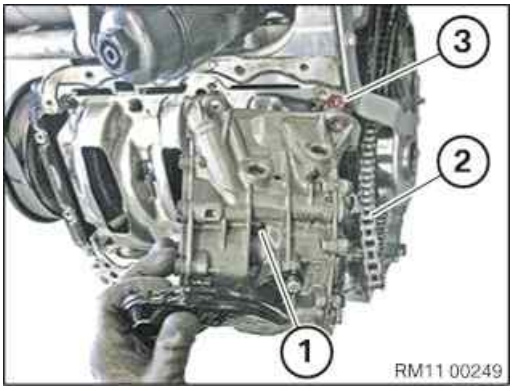
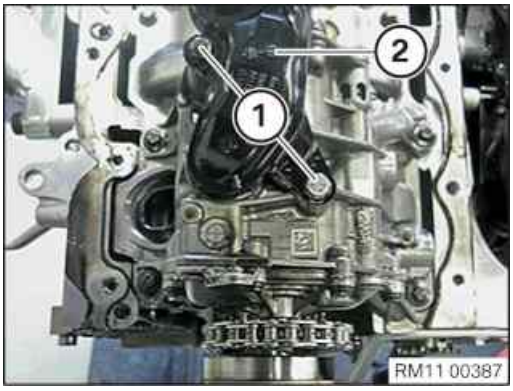


Feed oil/vacuum pump (1) out of drive chain (2) and remove.

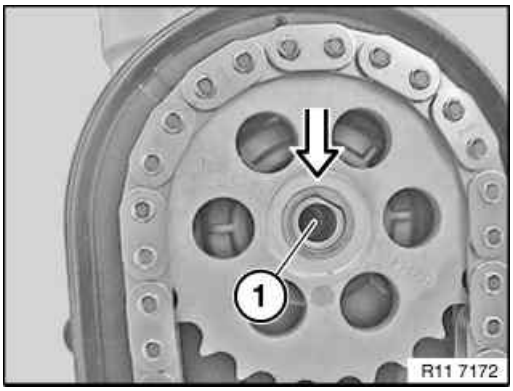


Replacement:

Release screws (1). Remount intake pipe (2).

Tighten down screws (1).

Tightening torque: 11 41 1AZ.

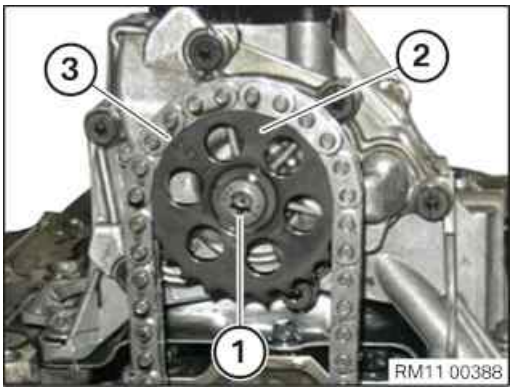


Replacement: Important!

Pay attention to mounting flats (1) on oil pump (see arrow).

The label "Front" must be visible.

Note:
Figure N47.



Replacement:

Important!

Screw (1) has left-hand thread.

"Front" (3) must be readable.

Hold down camshaft sprocket (2) with a suitable tool. Release screw (1). Remount camshaft sprocket.

Parts: Replace screw (1).

Mount camshaft sprocket (2) and hold down with a suitable tool. Tighten screw (1).

Tightening torque: 11 41 4AZ.

INSTALLATION:

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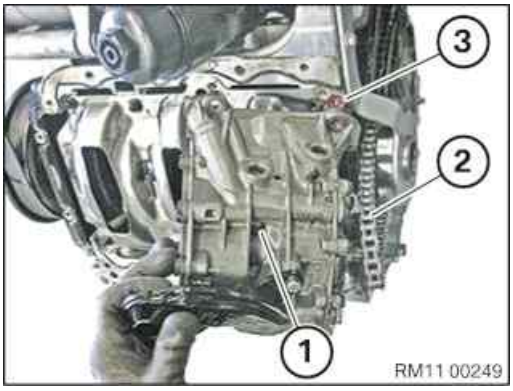
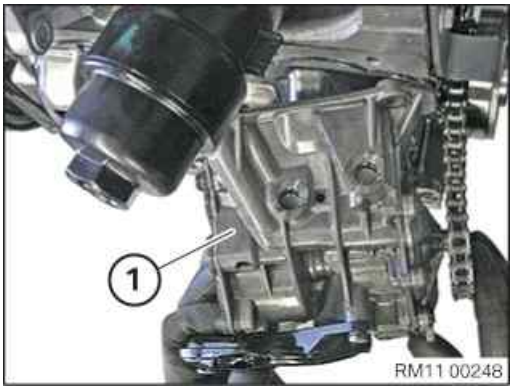


Important!

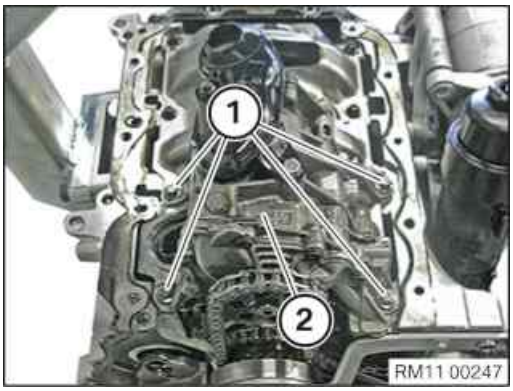
Sealing ring (3) must not be damaged or missing.

Check centring bushes for damage, replace if necessary.

Feed oil/vacuum pump (1) into drive chain (2).



Install oil/vacuum pump (1).



Tighten down screws (1) of oil/vacuum pump (2).

Tightening torque: 11 41 2AZ.

Required follow-up work:

- Install oil sump.

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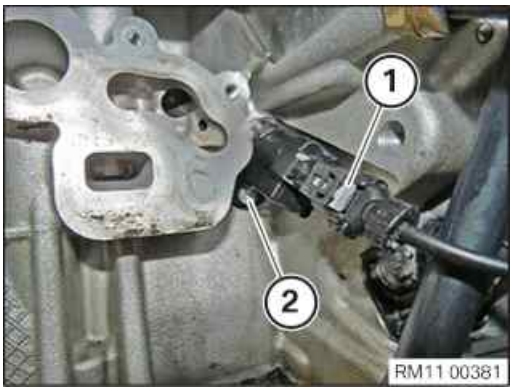
11 41 115 Removing and installing/replacing hydraulic valve (B37C)

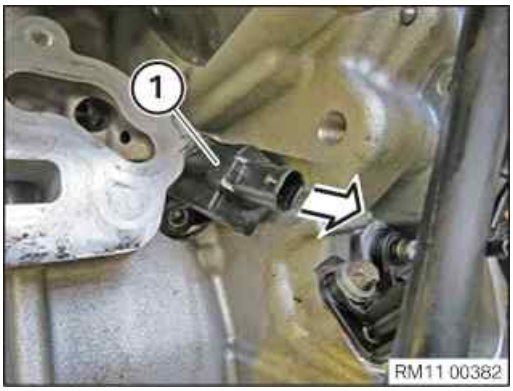
Necessary preliminary tasks:

- Remove full-flow oil filter.

Removal:

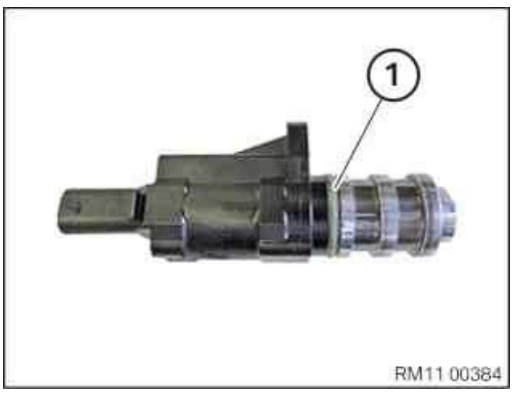


Unlock and disconnect the connector (1).
Release screw (2).



Remove hydraulic valve (1) in direction of arrow.

Installation:



Parts: Replace O-ring (1).
Oil O-ring (1).

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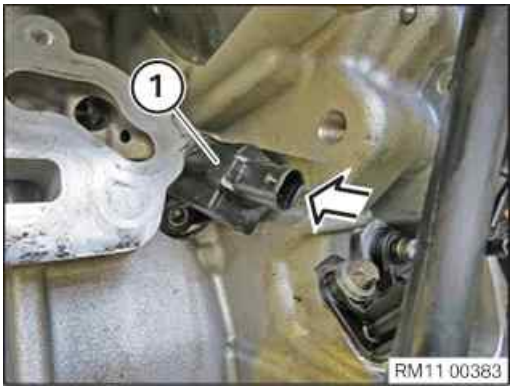
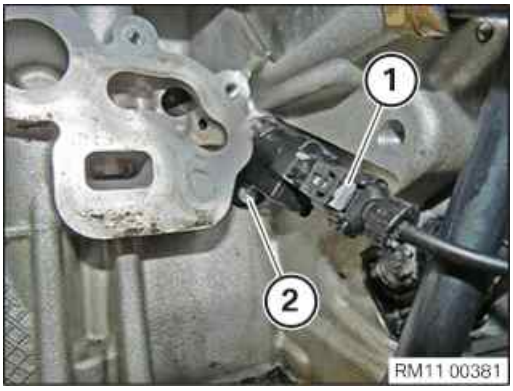


Install hydraulic valve (1) in direction of arrow.



Tighten screw (2).
Tightening torque: 11 00 2AZ.
Connect the plug (1).

Required follow-up work:

- Install full-flow oil filter.
- Assemble engine.

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11 41 115 Removing and installing/replacing hydraulic valve for oil-pressure control

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

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1 – Disconnecting all battery earth leads

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

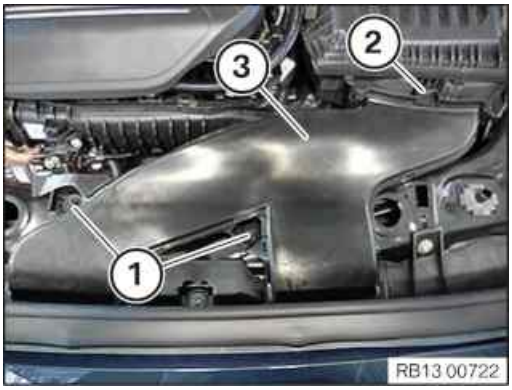
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

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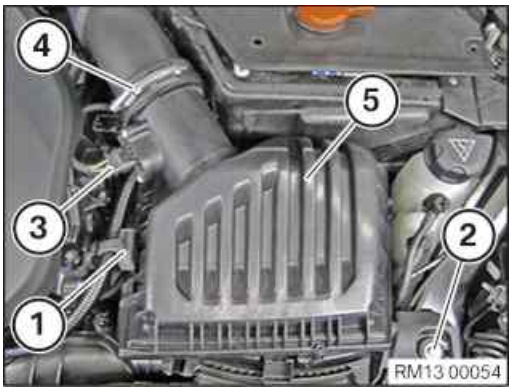
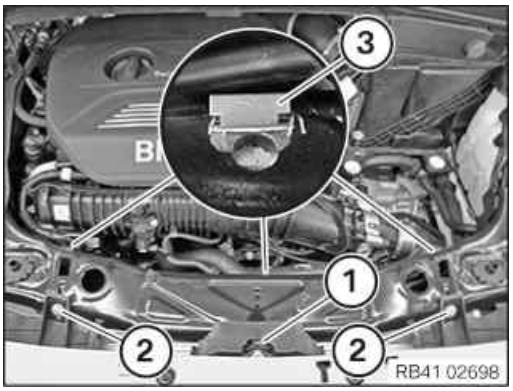
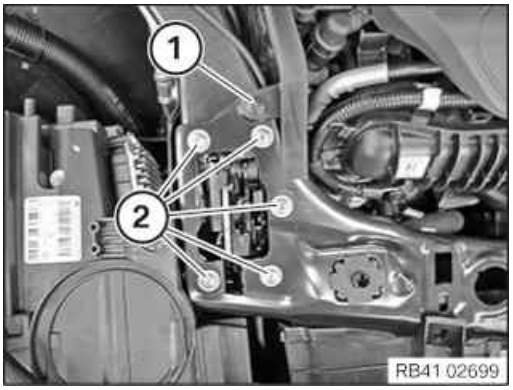


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

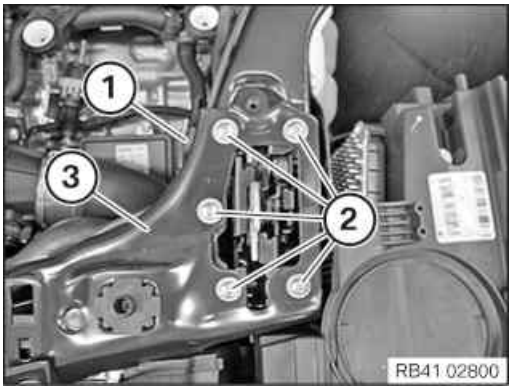
5 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

6 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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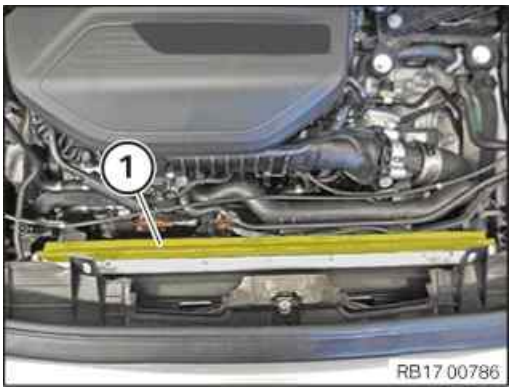
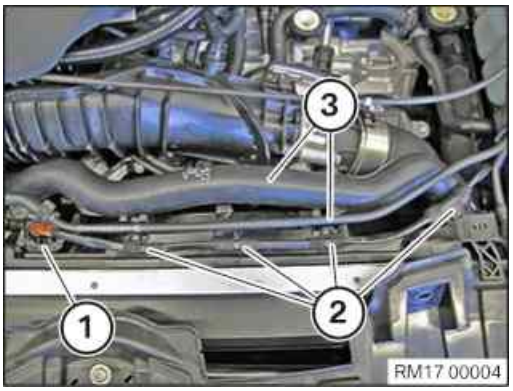
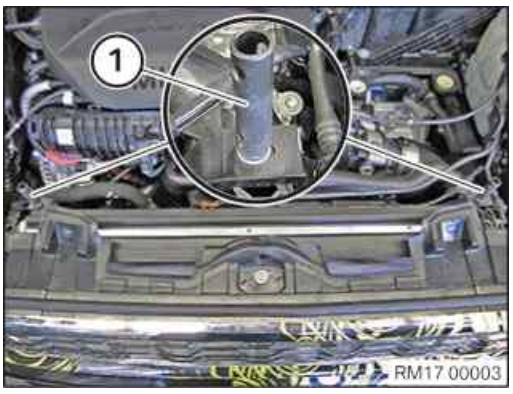


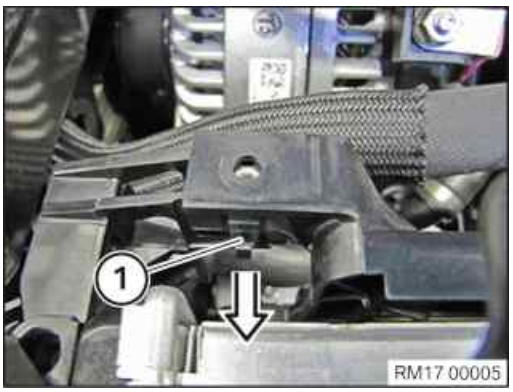
- Feed out and remove the sealing (1) from the radiator.



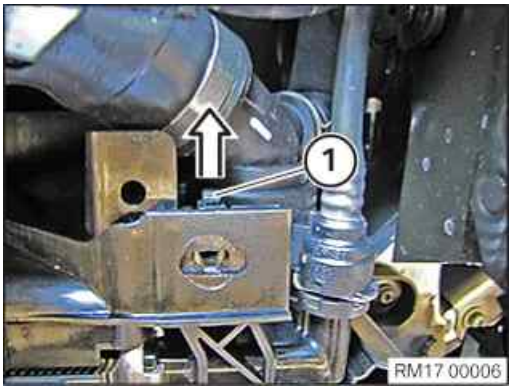
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

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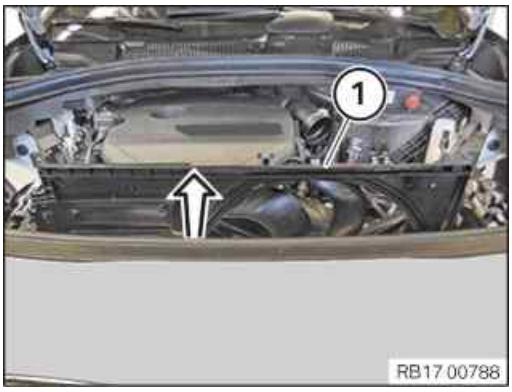
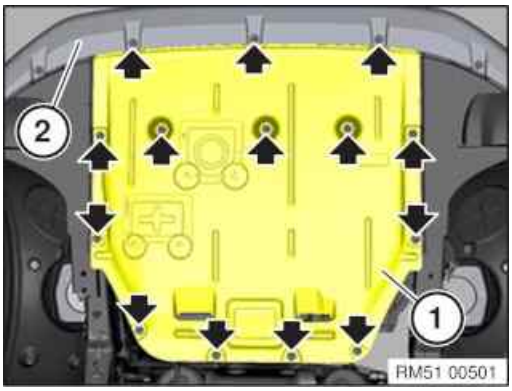


- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

8 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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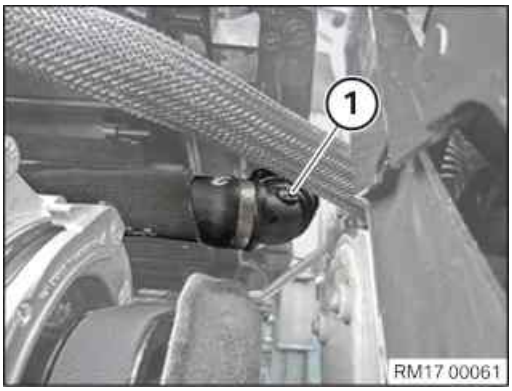
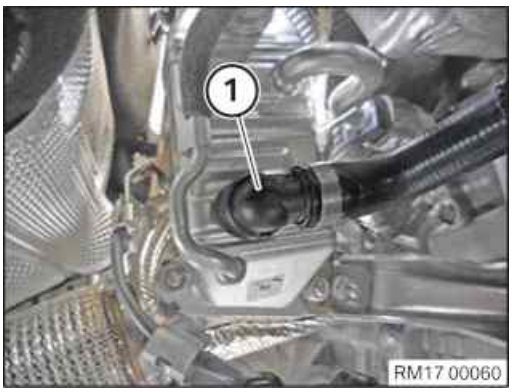
- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

9 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

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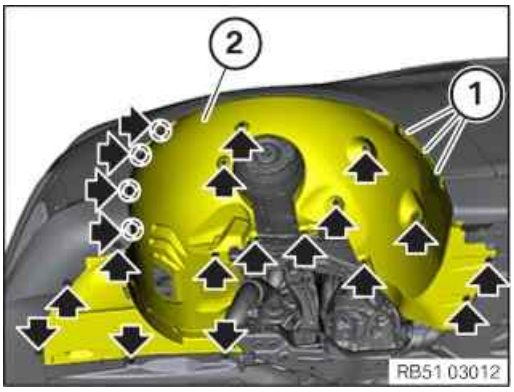
10 – Removing the front right wheel arch cover



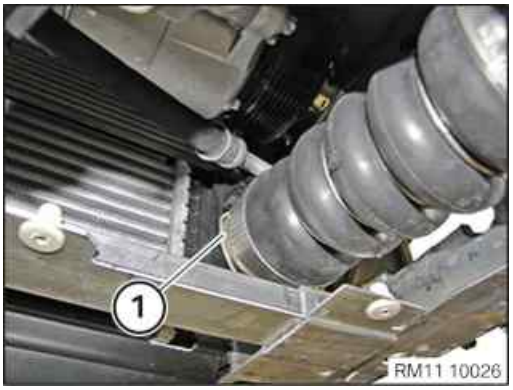
- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

11 – Remove right charge-air line

- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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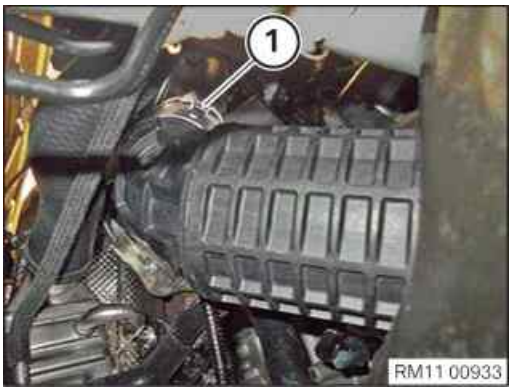
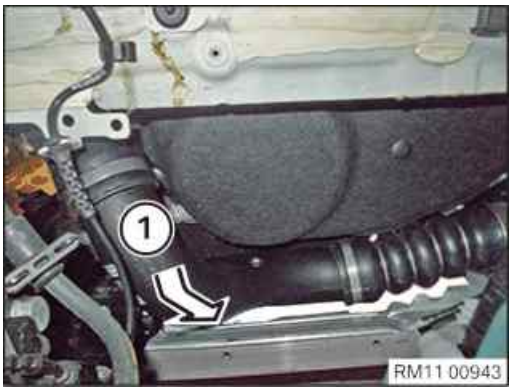
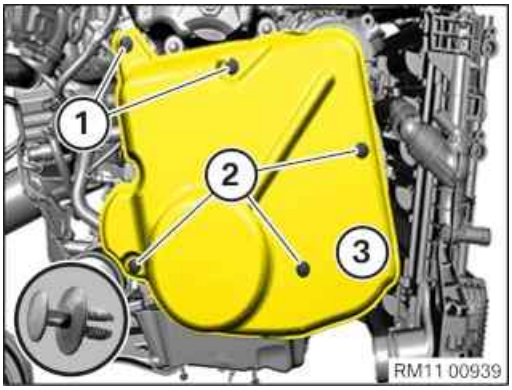


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

12 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

13 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

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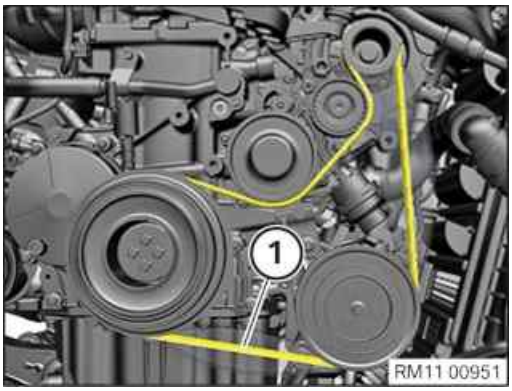
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

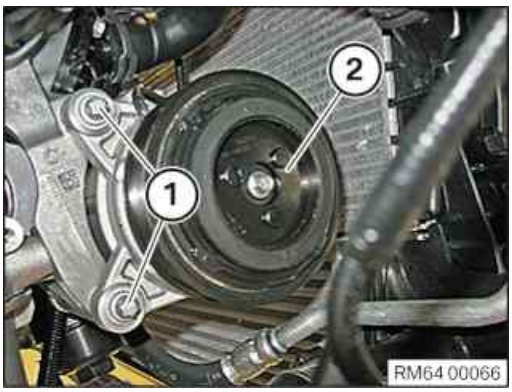
The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.

14 – Releasing air conditioning compressor



- Protect the air conditioning compressor (2) from falling.
- Loosen screws (1).
- Slide the air conditioning compressor (2) out and set it aside.

15 – Undoing the oil drain plug on the oil filter cover

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

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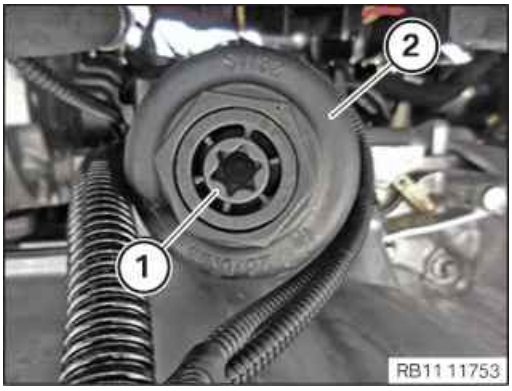
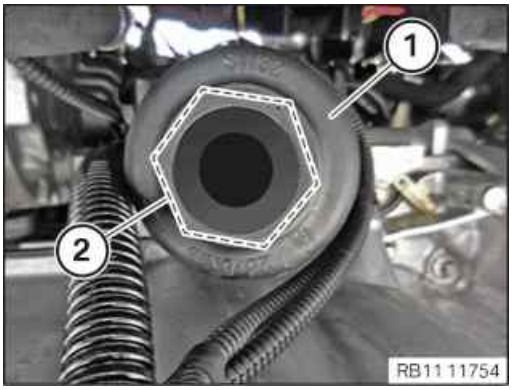
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Undo the oil drain plug (1) on the oil filter cover (2).
- Feed out and remove oil drain plug (1).
- Catch and dispose of emerging engine oil.

16 – Releasing the oil filter cover

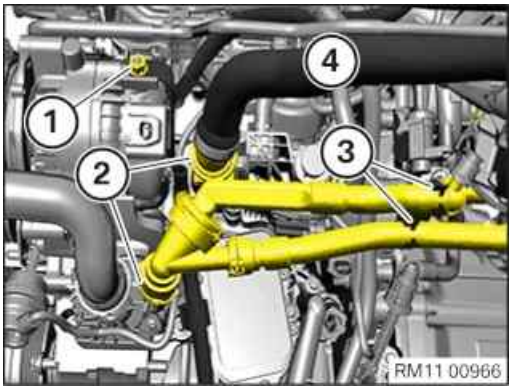


- Release oil filter cover (1) from hexagon head (2).

17 – Remove full-flow oil filter.

TECHNICAL INFORMATION

Make sure that there are no particles or impurities in the medium openings. Coolant or foreign substances in the oil can cause engine damage such as damage to the connecting rod bearing.



- Loosen the nut (1) of the positive battery cable on the alternator.
- Open unlocking mechanisms (2).
- Release the coolant pipe (3) from the holder, pull off and set it aside.
- Detach the coolant hose (4) and set it aside.
- Catch and dispose of escaping coolant.

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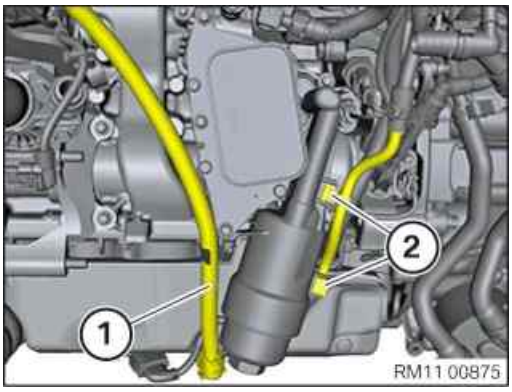
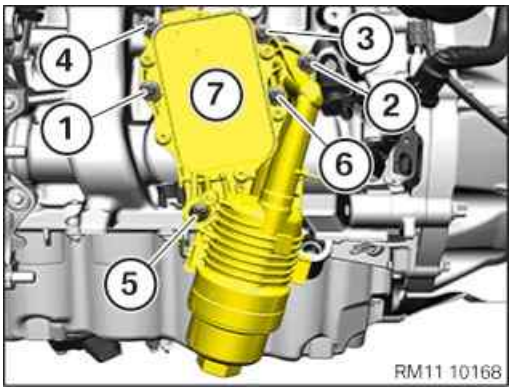


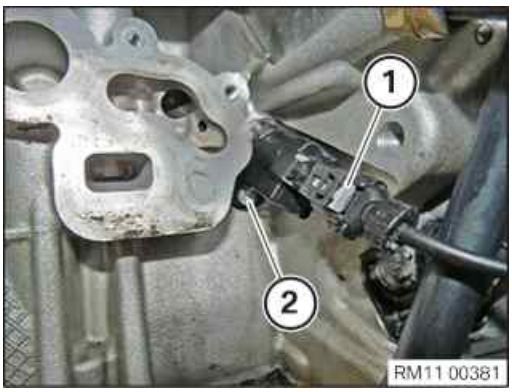
- Release the positive battery cable (1) from the clamp on the full-flow oil filter.
- Release the engine wiring harness (2) from the full-flow oil filter.



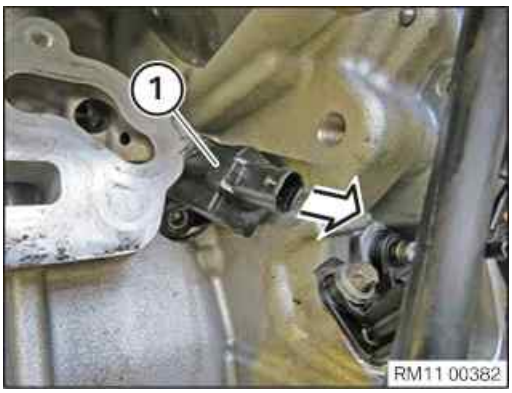
- Loosen screws in the order (6) to (1).
- Guide out and remove the full-flow oil filter (7).

MAIN WORK

18 – Removing the hydraulic valve for the oil pressure control



- Unlock and disconnect connector (1).
- Loosen screw (2).



- Remove the hydraulic valve (1) in the direction of the arrow.

19 – Installing the hydraulic valve for the oil pressure control

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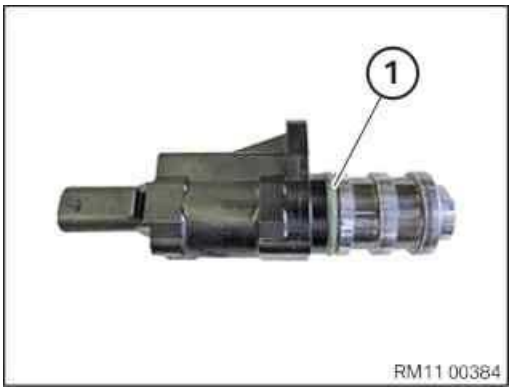
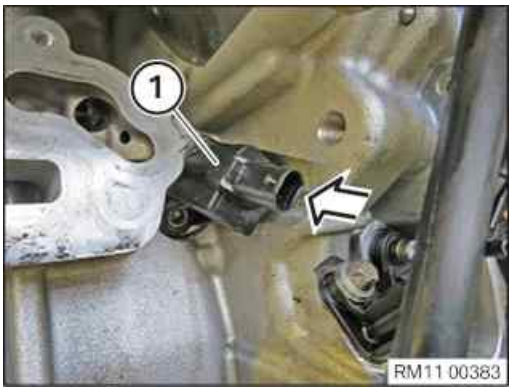
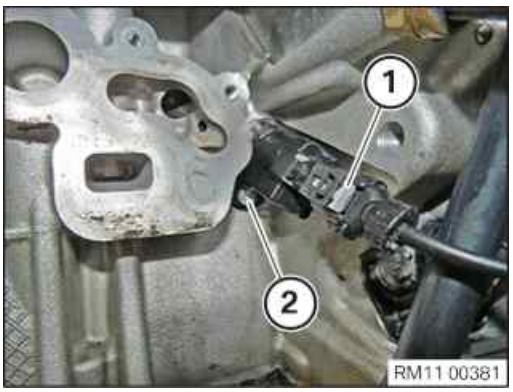


- Renew O-ring (1).

  Parts: O-ring
- Oil O-ring (1).



- Install the hydraulic valve (1) in the direction of the arrow.



- Tighten down screw (2).

Hydraulic valve to crankcase

M6 x 18		Tightening torque	8 Nm

- Connect connectors (1) and lock.

POSTPROCESSES

20 – Install full-flow oil filter

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

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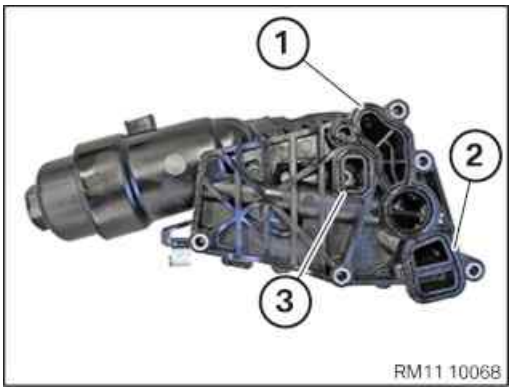
- Clean the sealing residue off the sealing surface on the crankcase (1) using the special tool **0 495 102 (11 4 470)**.



- Remove seals (1), (2) and (3) with a suitable tool.
- Clean the sealing residue from the full-flow oil filter.
- Renew gaskets (1), (2) and (3).

  Parts: Sealing kit
- Install seals (1), (2) and (3).

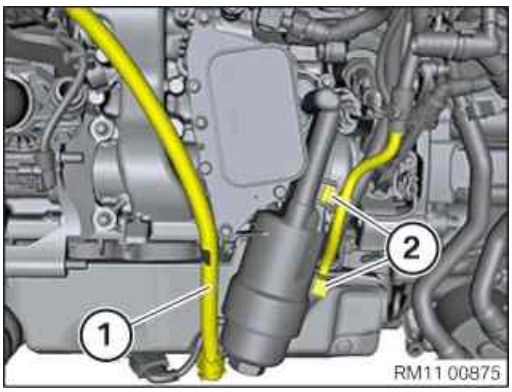
- Crank the engine twice with the special tool **0 493 380 (11 6 480)** in direction of rotation.

- Have a cleaning cloth ready.
- Catch any engine oil leaking from the oil duct of the crankcase (1) and dispose of this.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Secure positive battery cable (1) in the clamp on the full-flow oil filter.
- Secure engine wiring harness (2) on full-flow oil filter.

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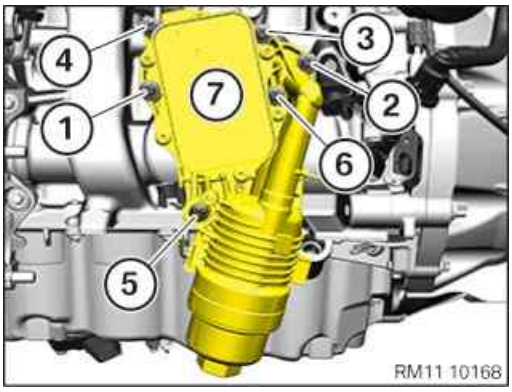
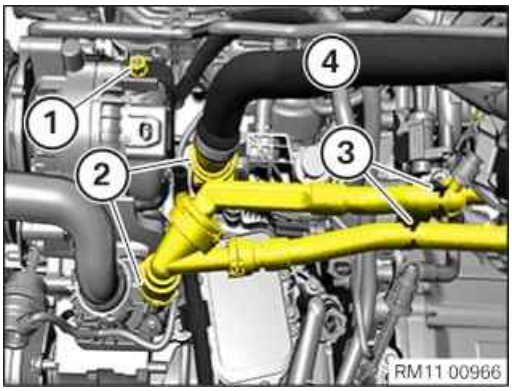


- Feed in and install the full-flow oil filter (7).
- Make sure seals are correctly seated.
- Tighten screws (1) to (6) on full-flow oil filter (7).

Full-flow oil filter to crankcase

Screw M6	Observe tightening sequence.	Jointing torque	8 Nm
		Tighten down	8 Nm



- Connect positive battery cable to alternator.
- Tighten nut (1).

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Secure coolant pipe (3) in the holder.
- Connect coolant pipe (3) on the thermostat and lock.
- Connect and lock coolant hose (4).

  The locks (2) must engage audibly.

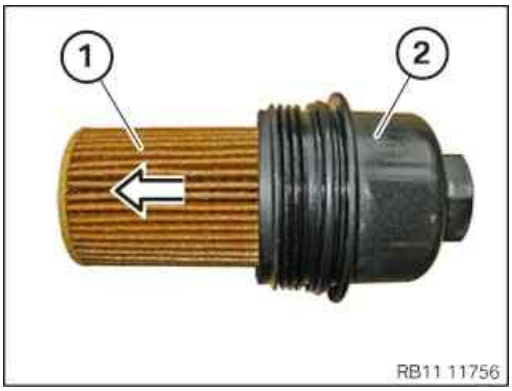
21 – Replace oil filter element

RISK OF DAMAGE

Contaminant or foreign body.

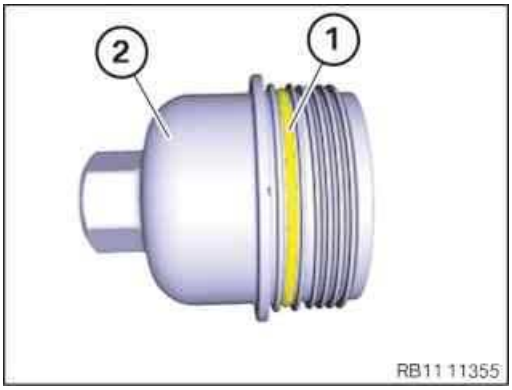
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Guide the fuel filter element (1) out of the fuel filter cover (2) in the direction of the arrow and remove.
- Renew the oil filter element (1).

  Parts: Oil filter element



- Guide the sealing ring (1) out at the oil filter cover (2) and remove.
- Renew sealing ring (1).

  Parts: Sealing ring

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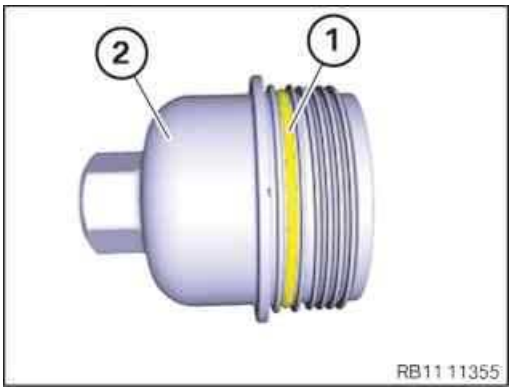
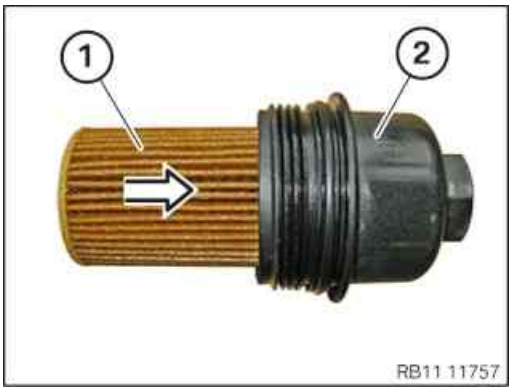


- Feed in and install new sealing ring (1) on the oil filter cover (2).
- Coat new sealing ring (1) with engine oil.



- Feed in and install the new oil filter element (1) on the oil filter cover (2) in the direction of the arrow.
- Make sure the oil filter element (1) engages audibly at the oil filter cover (2).

TECHNICAL INFORMATION

Elastomers (O-rings) must not come into contact with brake cleaner. Before installing the O-rings, the thread must be free from grease and cleaning agents. Allow the brake cleaner to flash off or blow dry with compressed air.

- Clean thread (1).

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Make sure that the thread (1) is completely free of engine oil and brake cleaner.

- Coat new sealing ring (2) of the oil drain plug (1) with engine oil.

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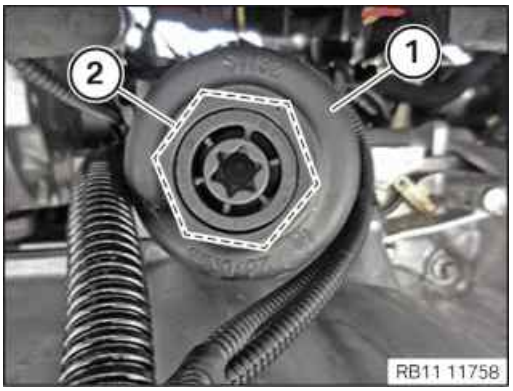
- Tighten oil drain plug (1) hand-tight.

22 – Tightening the oil filter cap



- Feed in and install oil filter cover (1).
- Tighten oil filter cover (1) at the hexagon head (2).

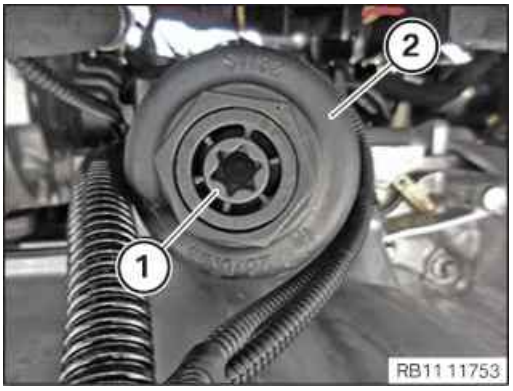
Oil filter cover to oil filter housing

S88.5 x 3	*Newsealing ring, lightly oiled.*	Tightening torque	27 Nm

23 – Tightening the oil drain plug on the oil filter cover

- Renew oil drain plug (1) with the sealing ring (2).

  Parts: Oil drain plug, sealing ring



- Feed in and install the oil drain plug (1).
- Tighten the oil drain plug (1) on the oil filter cover (2).

Oil drain plug to oil filter cover

	Renewoil drain plug.	Tightening torque	6 Nm

24 – Tighten the air conditioning compressor

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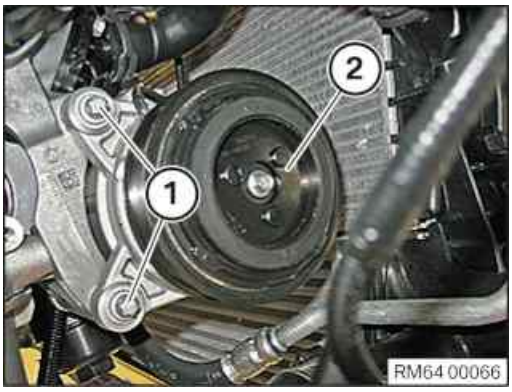


- Position the air conditioning compressor (2).
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

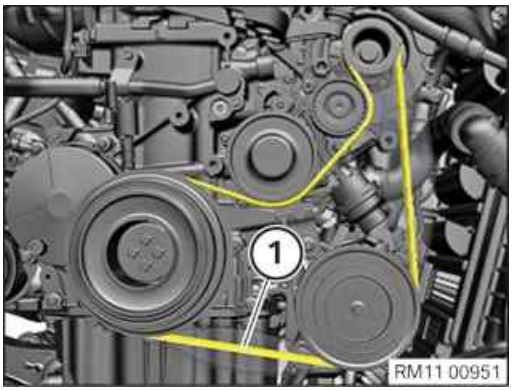
25 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

26 – Install the acoustic cover for the engine at the front

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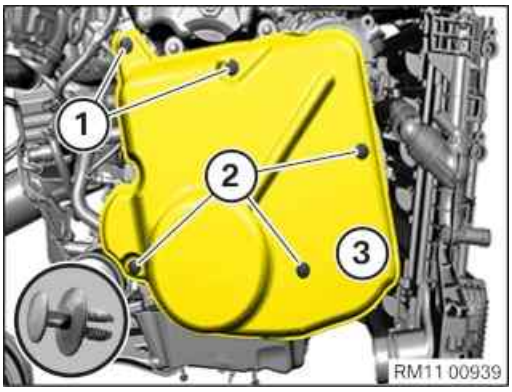


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

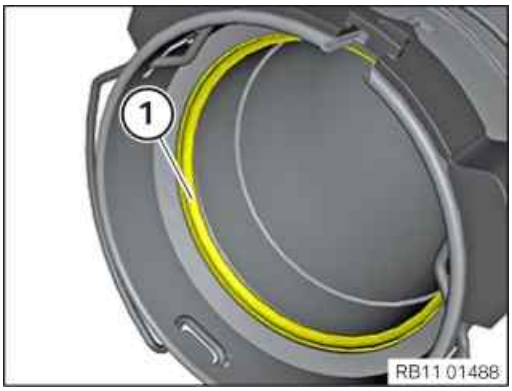
27 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

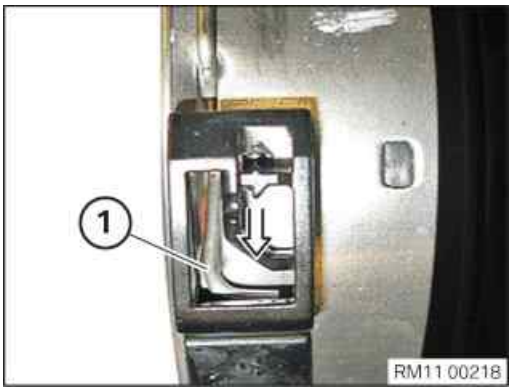
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

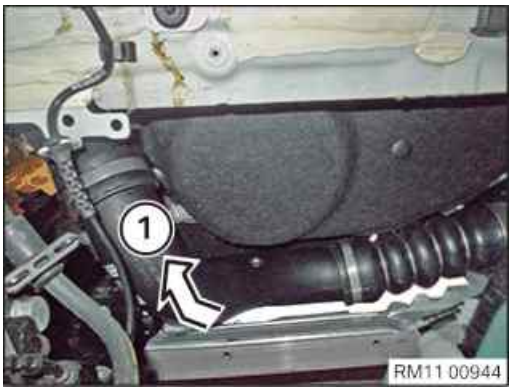


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.

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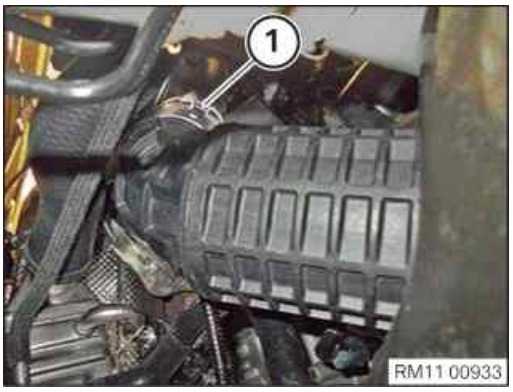
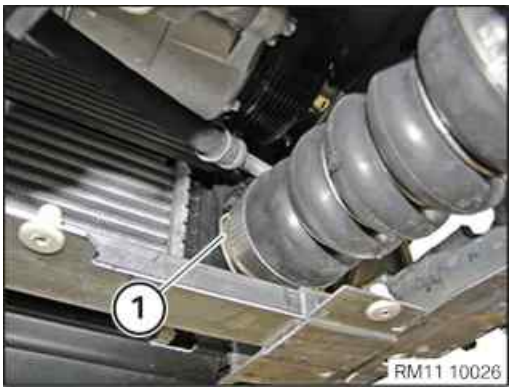


- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

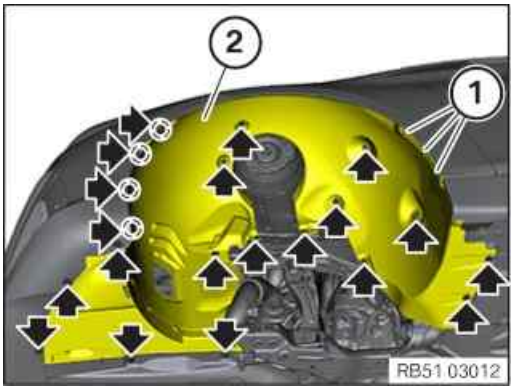
M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

28 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

29 – Installing the front right wheel

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▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

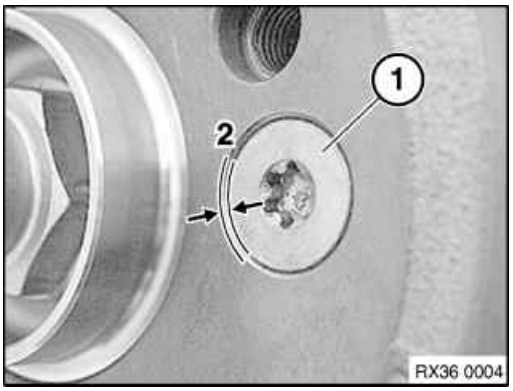
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

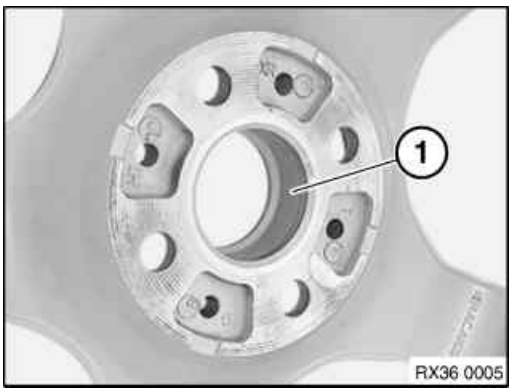


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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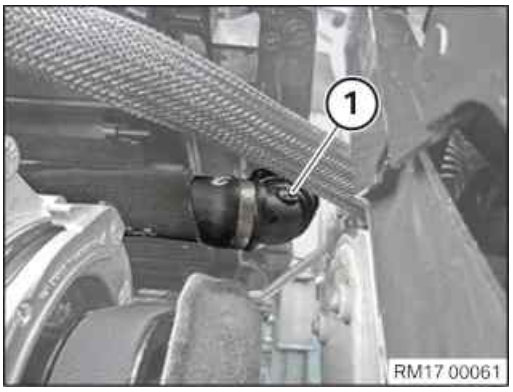
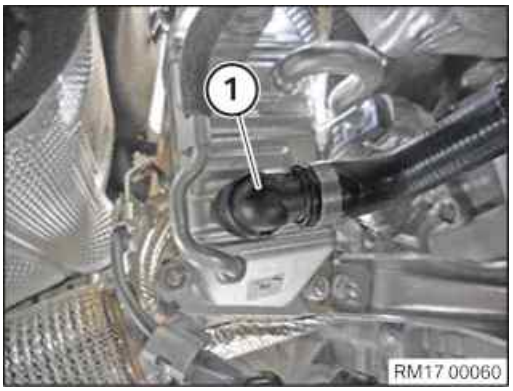
30 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

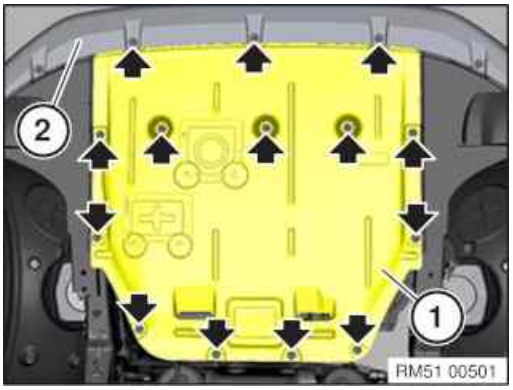


- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

31 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

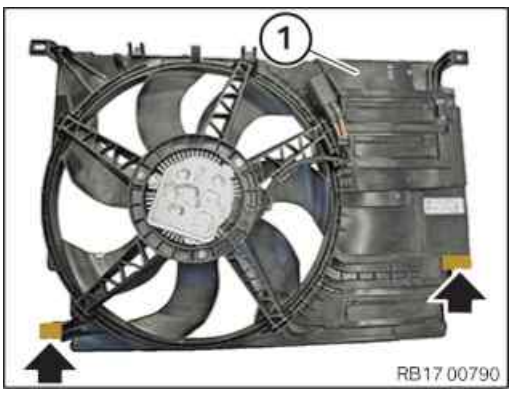
Underbody protection front

			3 Nm

32 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.

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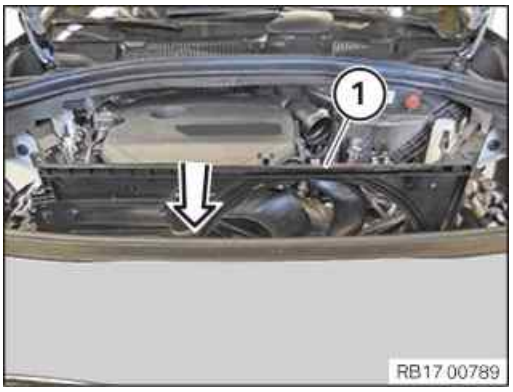
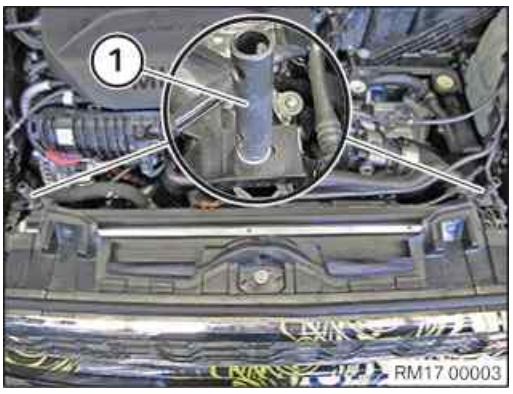


- Feed in and install the fan cowl (1) in the direction of the arrow.

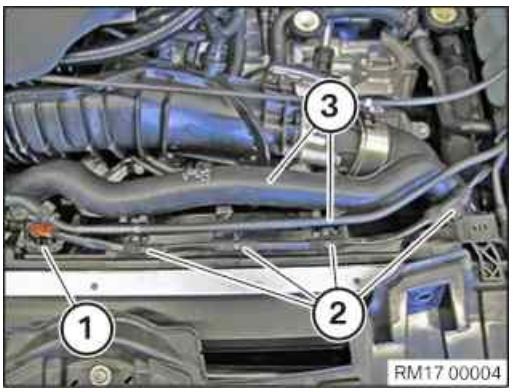
- Lock the left and right locks (arrows).



- Tighten the screws (1).

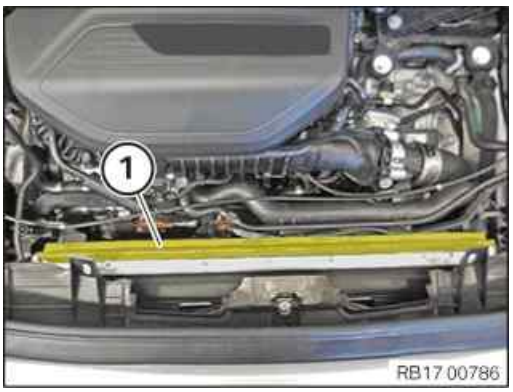
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



- Guide the sealing (1) on the radiator in and install it.

33 – Install cross connection

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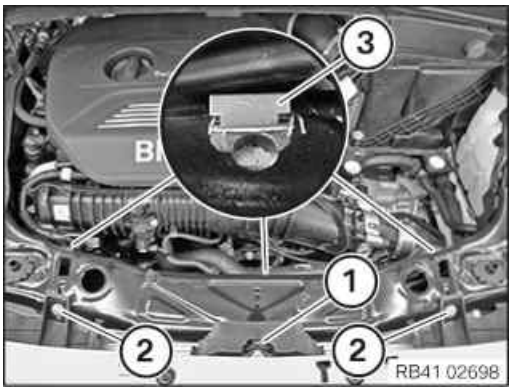


- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

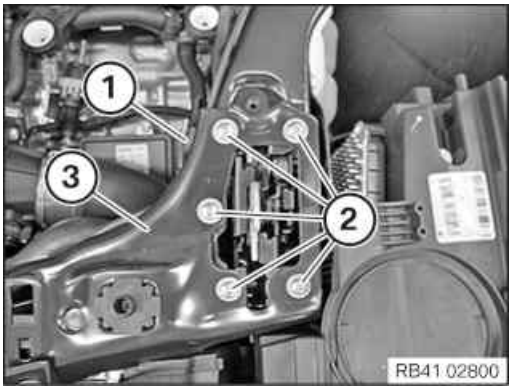
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

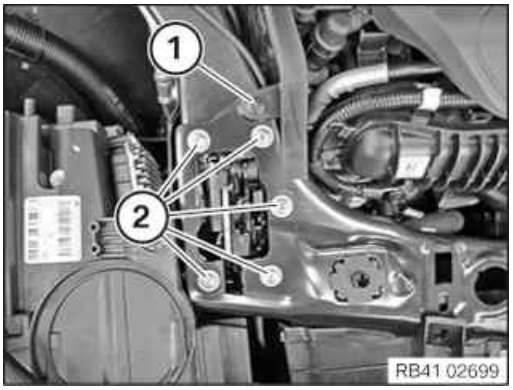


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



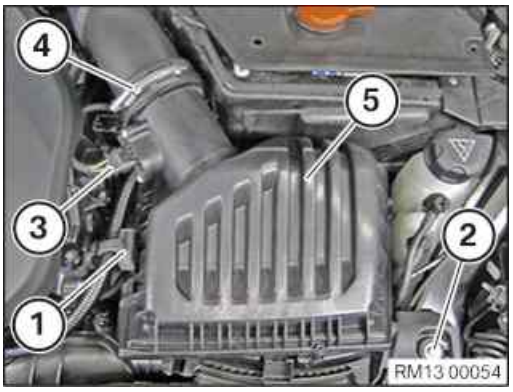
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

34 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

35 – Install the intake neck for the intake filter housing

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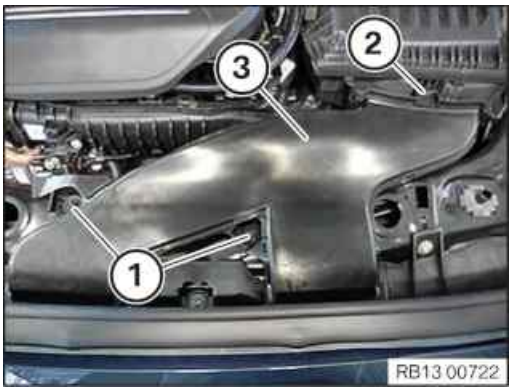

- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

36 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

37 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

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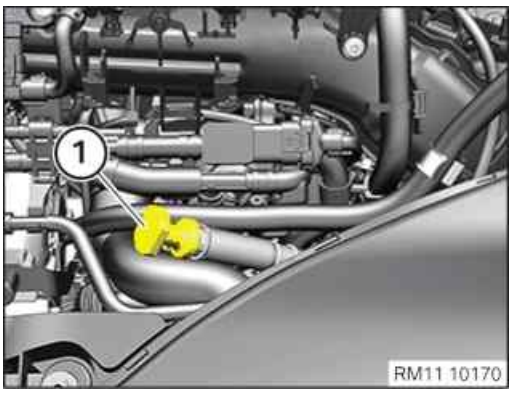
▸ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

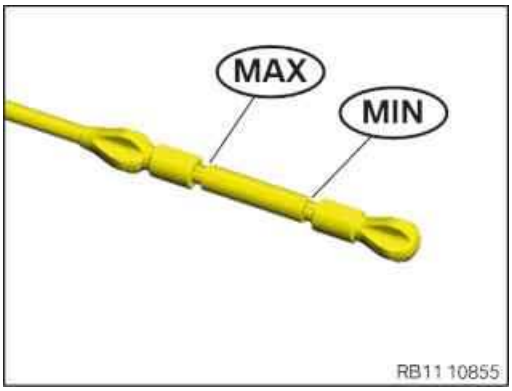


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

38 – Disconnecting all battery earth leads

- See additional information.

39 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Hydraulic valve to crankcase			Used in step 19
M6 x 18		Tightening torque	8 Nm

Full-flow oil filter to crankcase			Used in step 20
Screw M6	Observe tightening sequence.	Jointing torque	8 Nm
		Tighten down	8 Nm

Positive battery cable to alternator			Used in step 20
M8		Tightening torque	19 Nm

Oil filter cover to oil filter housing			Used in step 22
S88.5 x 3	*Newsealing ring, lightly oiled.*	Tightening torque	27 Nm

Oil drain plug to oil filter cover			Used in step 23
	Renewoil drain plug.	Tightening torque	6 Nm

Air conditioning compressor in component carrier			Used in step 24
M10		Tightening torque	38 Nm

Charge air line to crankcase			Used in step 27
M6x25		Tightening torque	5 Nm

Charge air duct to oil sump			Used in step 27
M6		Tightening torque	8 Nm

Wheel arch cover			Used in step 28
Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub			Used in step 29
M8	Renew screw.		16 Nm

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Wheel bolts — Used in step 29

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front — Used in step 31

			3 Nm

Fan cowl on radiator — Used in step 32

M6X12		Tightening torque	6 Nm

Bracing strut to top cross connection — Used in step 33

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 33

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 33

M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge — Used in step 34

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 34

Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 35

M6		Tightening torque	8 Nm

Overview of Special Tools

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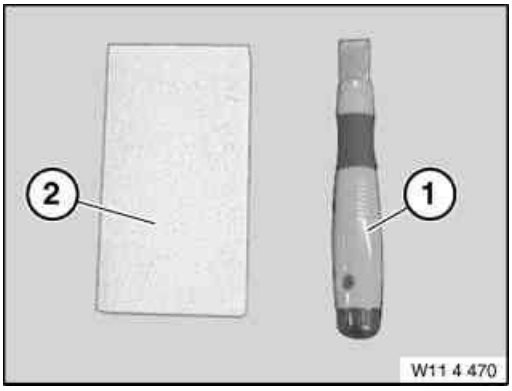
0 495 102 (11 4 470) Tool



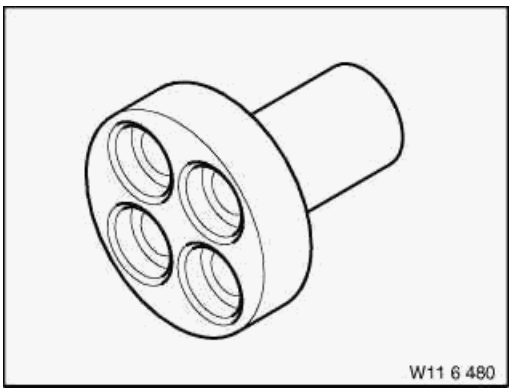
Common Used in step 20

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 493 380 (11 6 480) Connector



Common Used in step 20

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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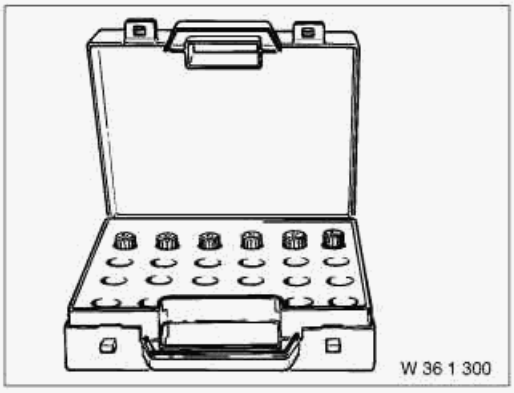
2 344 011 Tool

Common	Used in step 29
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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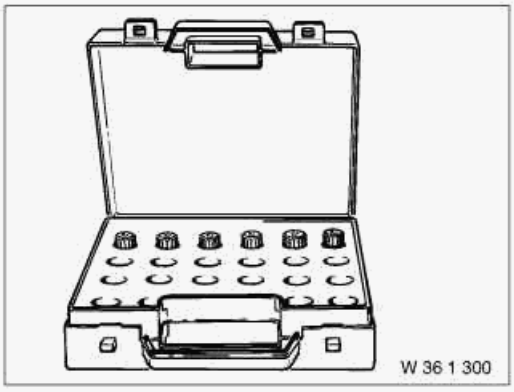
0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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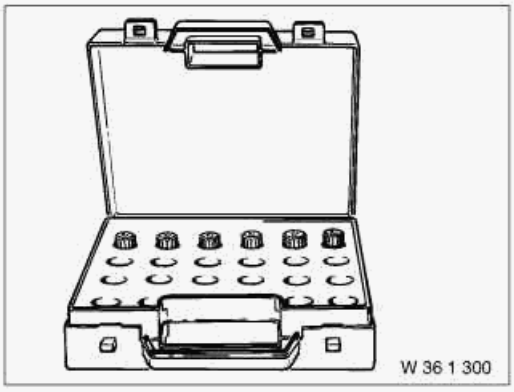
0 495 228 (36 1 331) Wheel stud



Common	Used in step 9
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 9
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 9
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

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Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38
61 20 900 Disconnecting and connecting battery earth lead	1 38
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Operating materials	Used in step
2.0 Grease for wheel centring	29

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11 42 020 Removing and installing/replacing full-flow oil filter completely

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

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1 – Disconnecting all battery earth leads

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

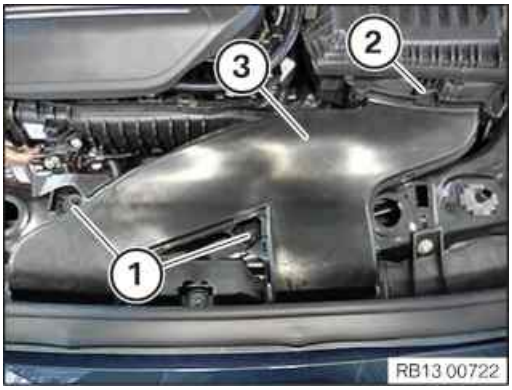
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

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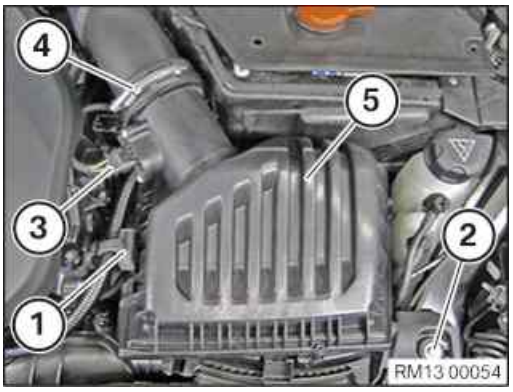
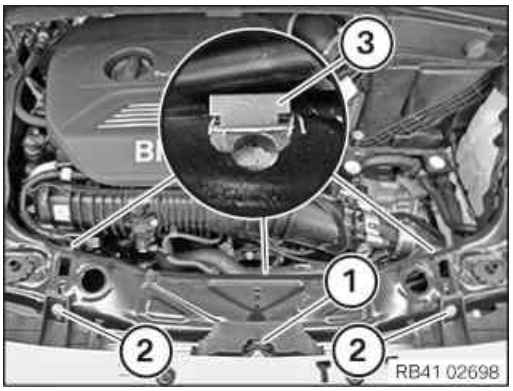
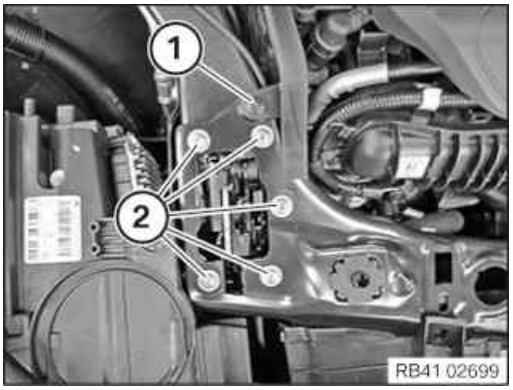


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

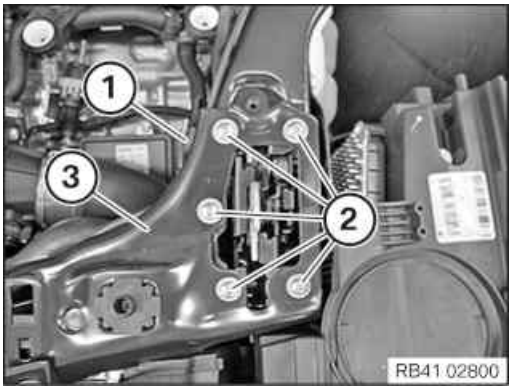
5 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

6 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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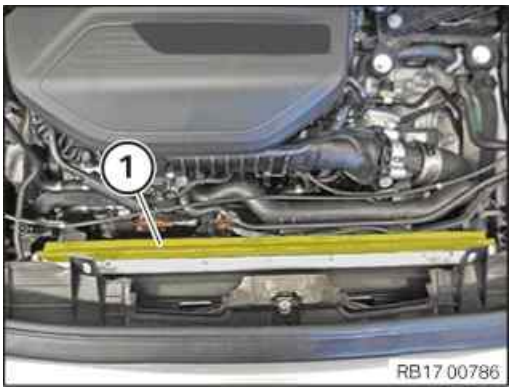
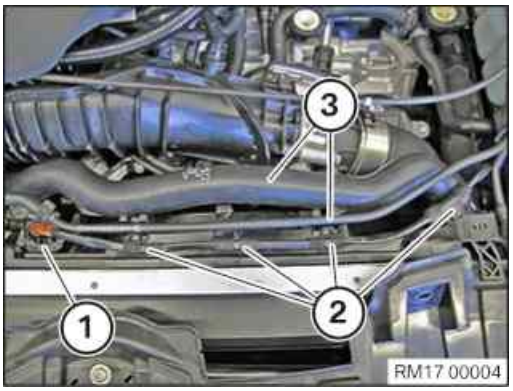
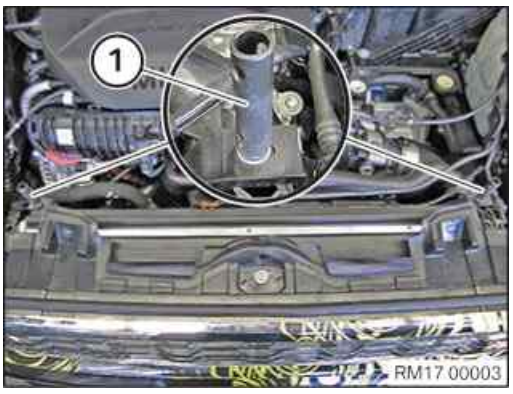


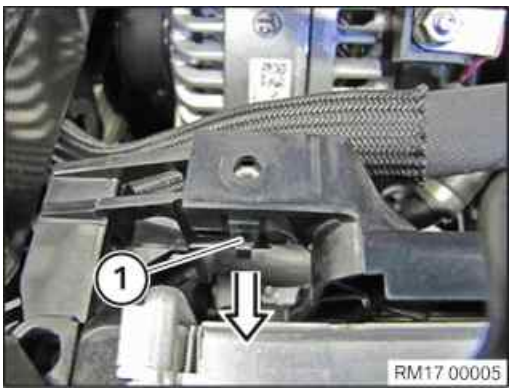
- Feed out and remove the sealing (1) from the radiator.



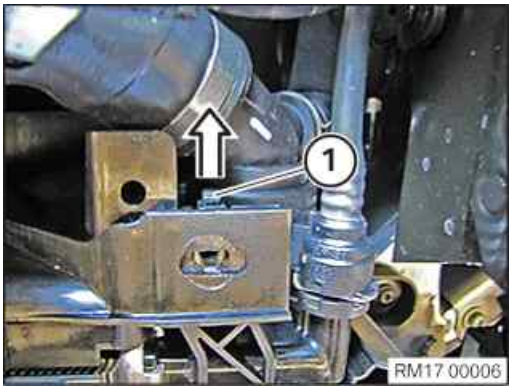
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

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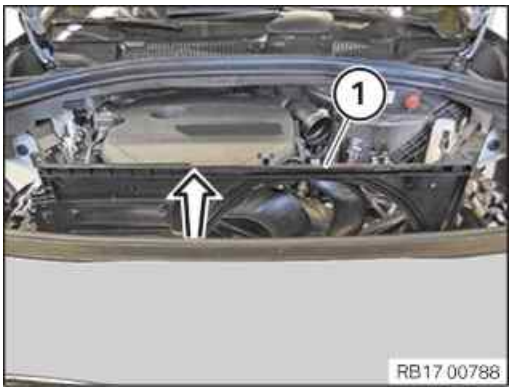
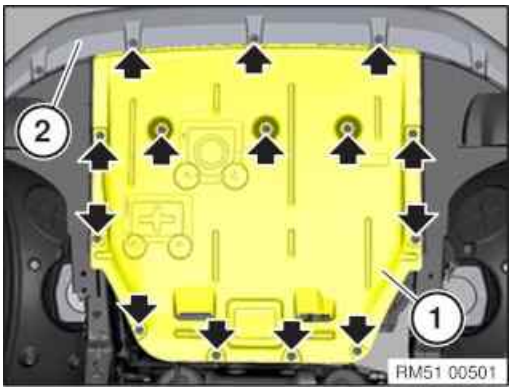


- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

8 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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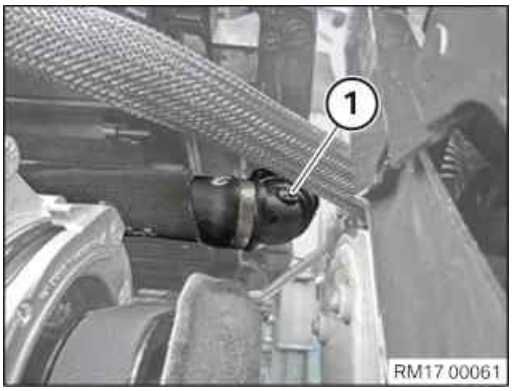
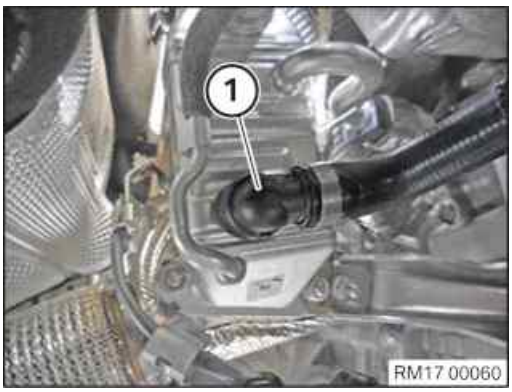
- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

9 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

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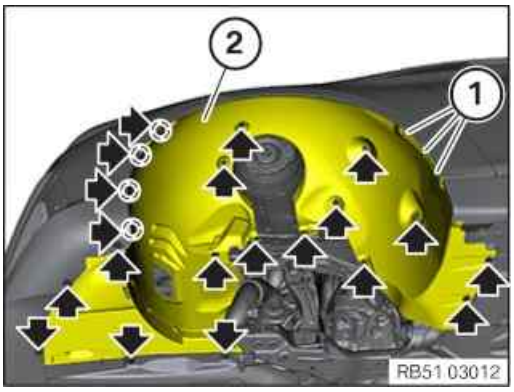
10 – Removing the front right wheel arch cover



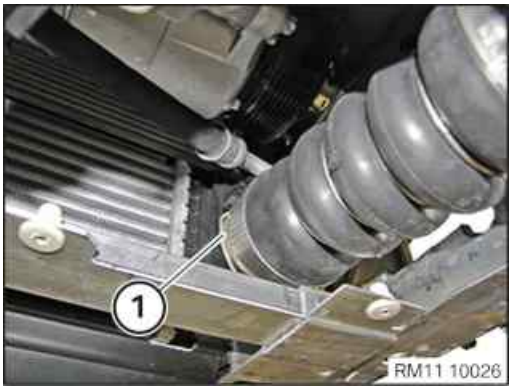
- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

11 – Remove right charge-air line

- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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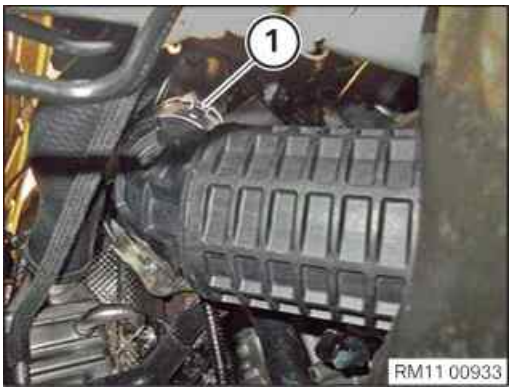
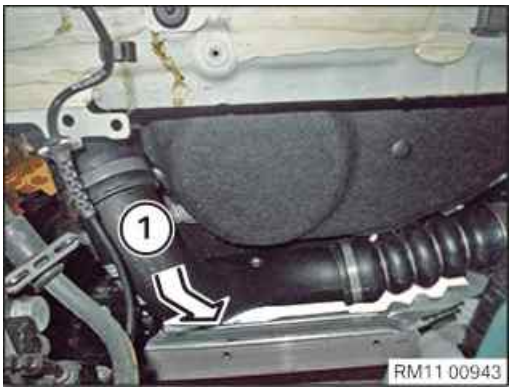
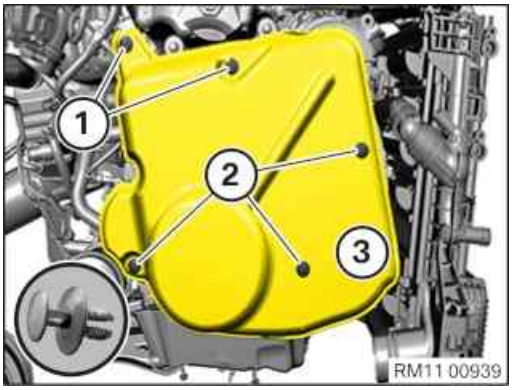


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

12 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

13 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

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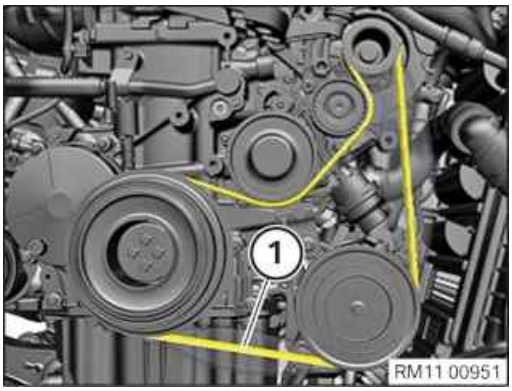
TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

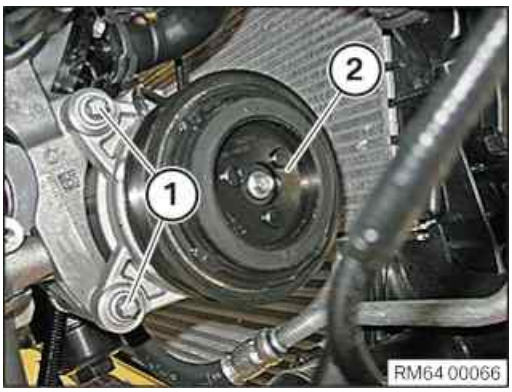
The drive belt must be replaced if contaminated with coolant- and oil residues.

- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .



- Guide out the drive belt for the alternator (1) and remove it.

14 – Releasing air conditioning compressor



- Protect the air conditioning compressor (2) from falling.
- Loosen screws (1).
- Slide the air conditioning compressor (2) out and set it aside.

15 – Undoing the oil drain plug on the oil filter cover

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

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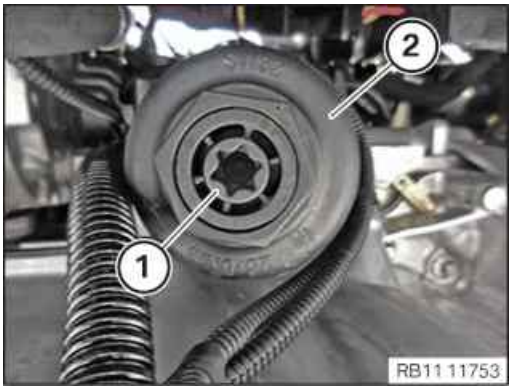
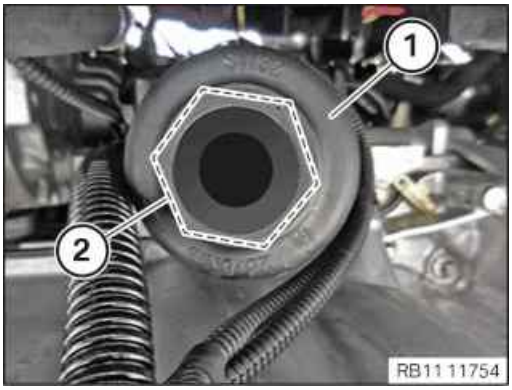
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Undo the oil drain plug (1) on the oil filter cover (2).
- Feed out and remove oil drain plug (1).
- Catch and dispose of emerging engine oil.

16 – Releasing the oil filter cover



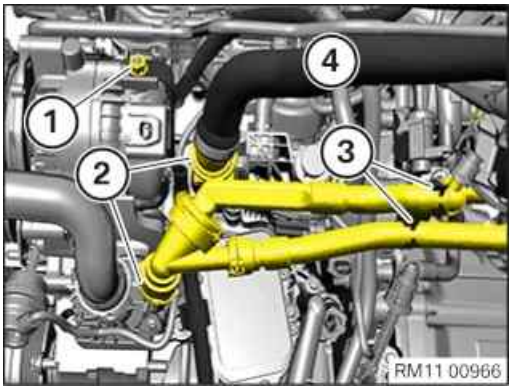
- Release oil filter cover (1) from hexagon head (2).

MAIN WORK

17 – Remove full-flow oil filter.

TECHNICAL INFORMATION

Make sure that there are no particles or impurities in the medium openings. Coolant or foreign substances in the oil can cause engine damage such as damage to the connecting rod bearing.



- Loosen the nut (1) of the positive battery cable on the alternator.
- Open unlocking mechanisms (2).
- Release the coolant pipe (3) from the holder, pull off and set it aside.
- Detach the coolant hose (4) and set it aside.
- Catch and dispose of escaping coolant.

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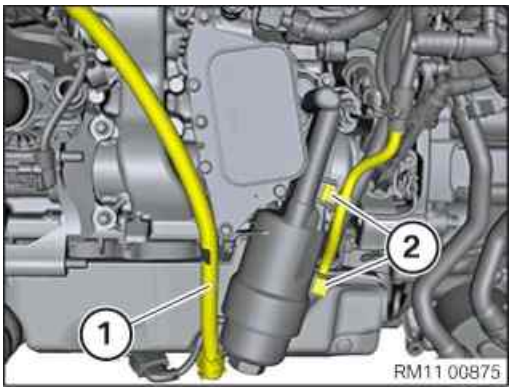
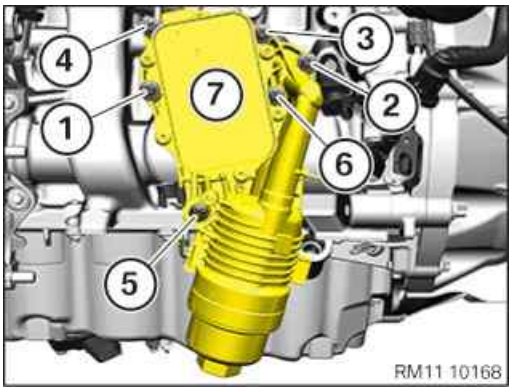


- Release the positive battery cable (1) from the clamp on the full-flow oil filter.
- Release the engine wiring harness (2) from the full-flow oil filter.



- Loosen screws in the order (6) to (1).
- Guide out and remove the full-flow oil filter (7).

18 – Install full-flow oil filter

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean the sealing residue off the sealing surface on the crankcase (1) using the special tool **0 495 102 (11 4 470)**.

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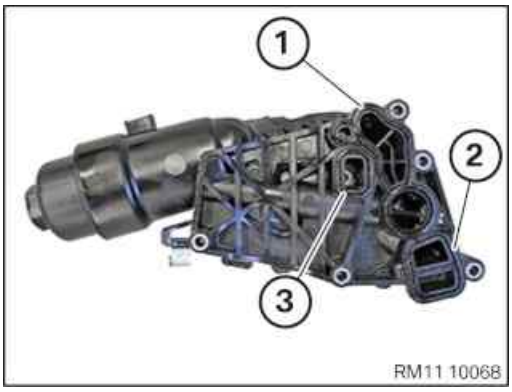


- Remove seals (1), (2) and (3) with a suitable tool.
- Clean the sealing residue from the full-flow oil filter.
- Renew gaskets (1), (2) and (3).

  Parts: Sealing kit
- Install seals (1), (2) and (3).

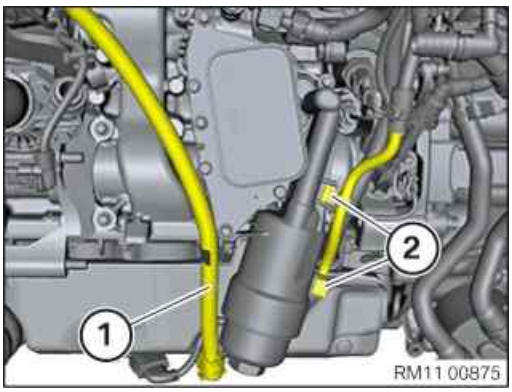
- Crank the engine twice with the special tool **0 493 380 (11 6 480)** in direction of rotation.

- Have a cleaning cloth ready.
- Catch any engine oil leaking from the oil duct of the crankcase (1) and dispose of this.

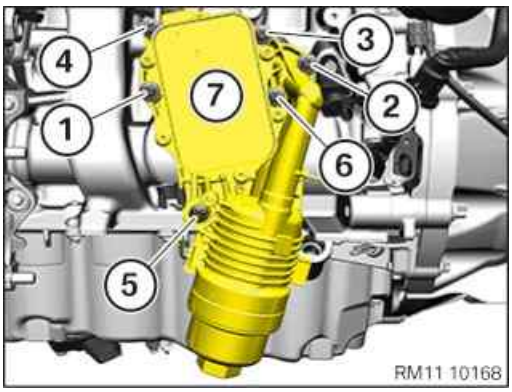
TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Clean sealing surface (1).



- Secure positive battery cable (1) in the clamp on the full-flow oil filter.
- Secure engine wiring harness (2) on full-flow oil filter.



- Feed in and install the full-flow oil filter (7).
- Make sure seals are correctly seated.
- Tighten screws (1) to (6) on full-flow oil filter (7).

Full-flow oil filter to crankcase

Screw M6	Observe tightening sequence.	Jointing torque	8 Nm
		Tighten down	8 Nm

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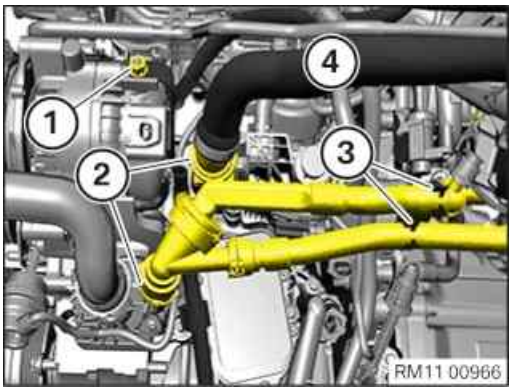


- Connect positive battery cable to alternator.
- Tighten nut (1).

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Secure coolant pipe (3) in the holder.
- Connect coolant pipe (3) on the thermostat and lock.
- Connect and lock coolant hose (4).

  The locks (2) must engage audibly.

POSTPROCESSES

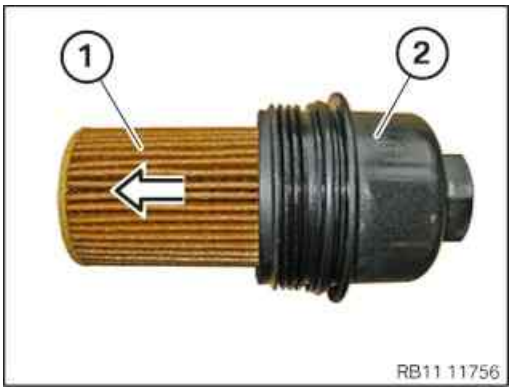
19 – Replace oil filter element

RISK OF DAMAGE

Contaminant or foreign body.

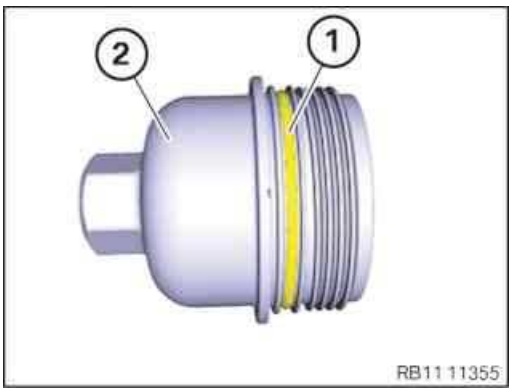
Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Guide the fuel filter element (1) out of the fuel filter cover (2) in the direction of the arrow and remove.
- Renew the oil filter element (1).

  Parts: Oil filter element



- Guide the sealing ring (1) out at the oil filter cover (2) and remove.
- Renew sealing ring (1).

  Parts: Sealing ring

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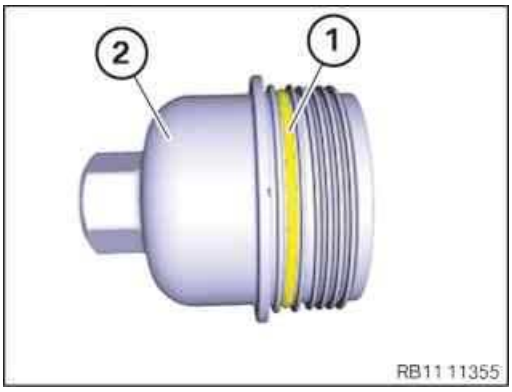
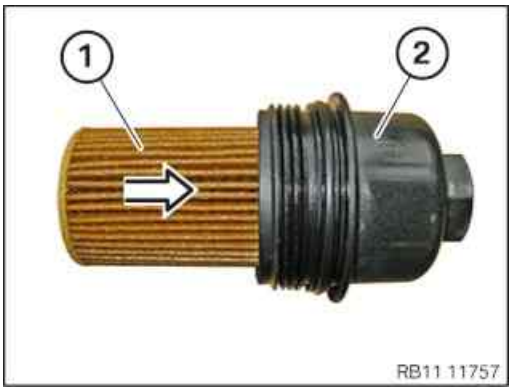


- Feed in and install new sealing ring (1) on the oil filter cover (2).
- Coat new sealing ring (1) with engine oil.



- Feed in and install the new oil filter element (1) on the oil filter cover (2) in the direction of the arrow.
- Make sure the oil filter element (1) engages audibly at the oil filter cover (2).

TECHNICAL INFORMATION

Elastomers (O-rings) must not come into contact with brake cleaner. Before installing the O-rings, the thread must be free from grease and cleaning agents. Allow the brake cleaner to flash off or blow dry with compressed air.

- Clean thread (1).

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Make sure that the thread (1) is completely free of engine oil and brake cleaner.

- Coat new sealing ring (2) of the oil drain plug (1) with engine oil.

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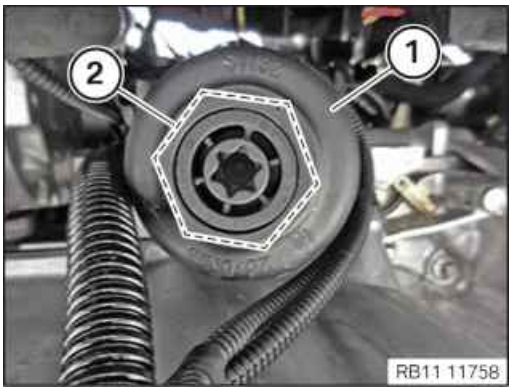
- Tighten oil drain plug (1) hand-tight.

20 – Tightening the oil filter cap



- Feed in and install oil filter cover (1).
- Tighten oil filter cover (1) at the hexagon head (2).

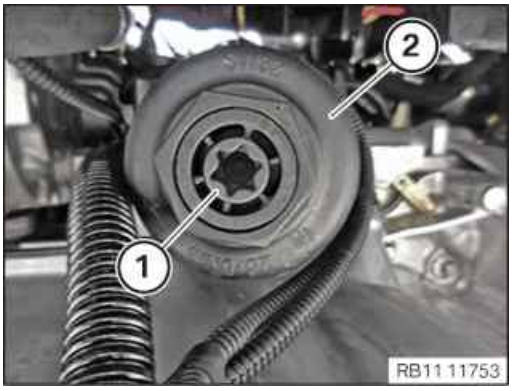
Oil filter cover to oil filter housing

S88.5 x 3	*Newsealing ring, lightly oiled.*	Tightening torque	27 Nm

21 – Tightening the oil drain plug on the oil filter cover

- Renew oil drain plug (1) with the sealing ring (2).

  Parts: Oil drain plug, sealing ring



- Feed in and install the oil drain plug (1).
- Tighten the oil drain plug (1) on the oil filter cover (2).

Oil drain plug to oil filter cover

	Renewoil drain plug.	Tightening torque	6 Nm

22 – Tighten the air conditioning compressor

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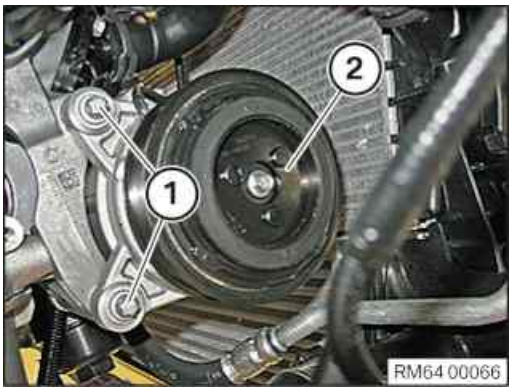


- Position the air conditioning compressor (2).
- Tighten the screws (1).

Air conditioning compressor in component carrier

M10		Tightening torque	38 Nm

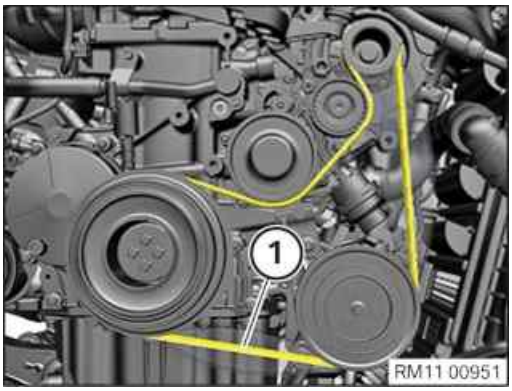
23 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

24 – Install the acoustic cover for the engine at the front

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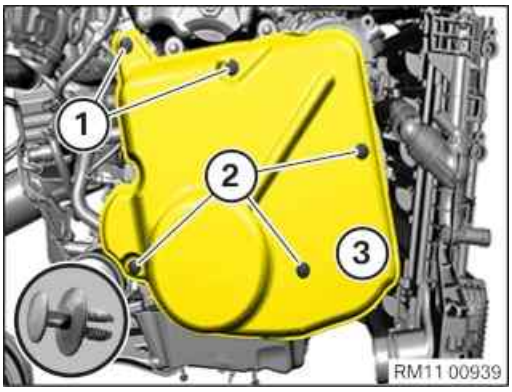


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

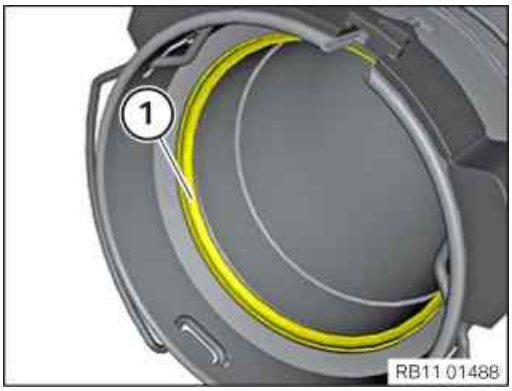
25 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

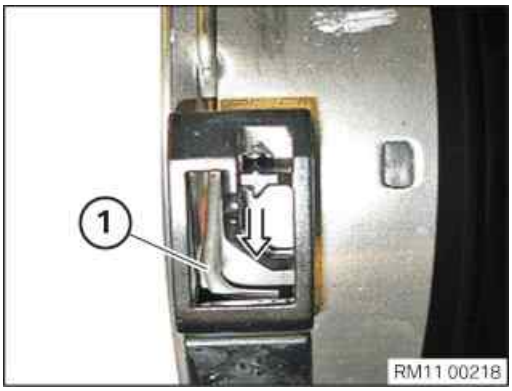
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

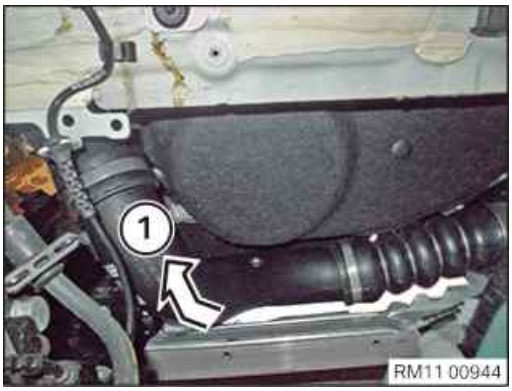


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.

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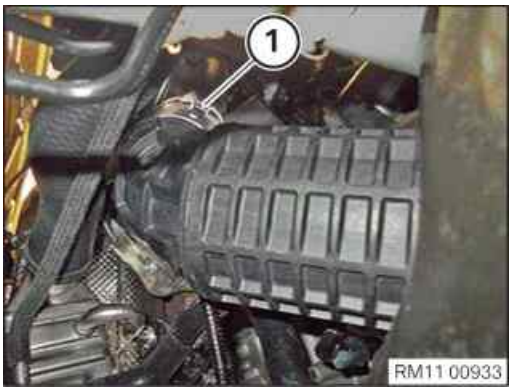
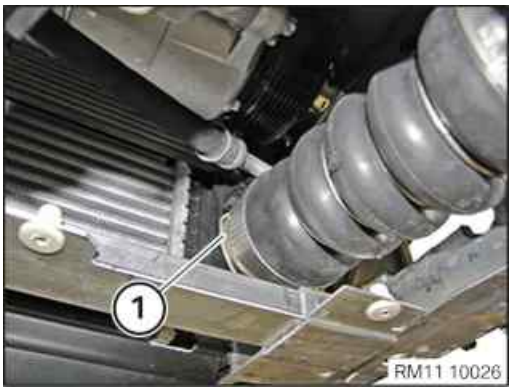


- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

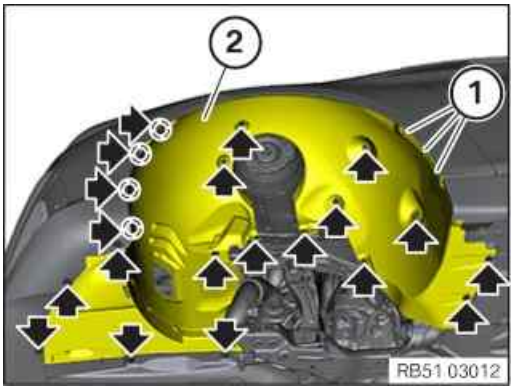
M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

26 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

27 – Installing the front right wheel

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▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

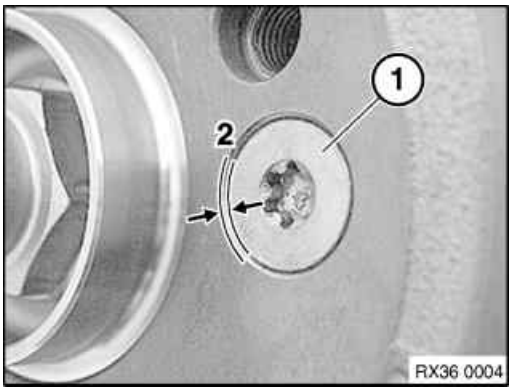
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

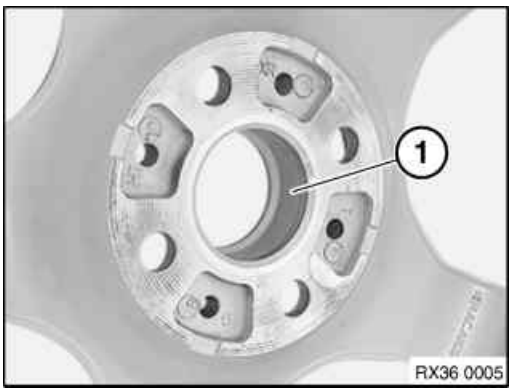


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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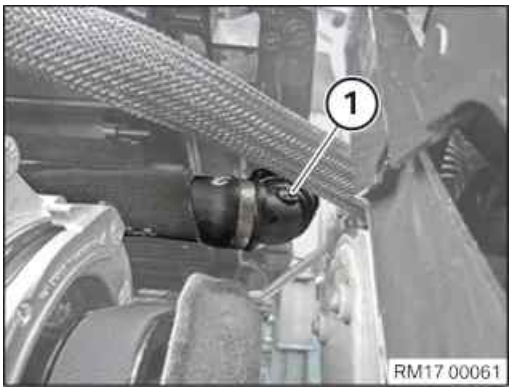
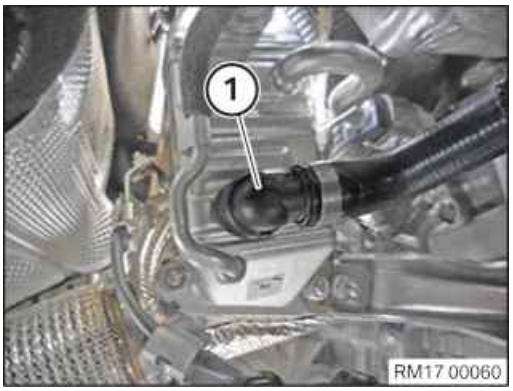
28 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

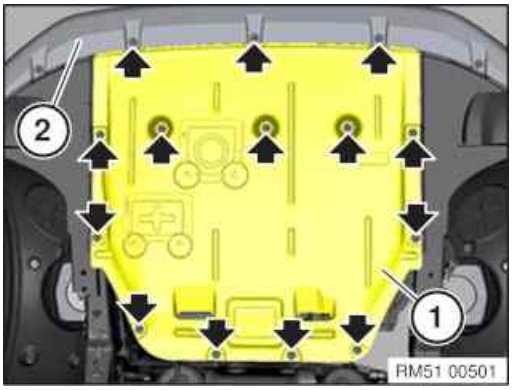


- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

29 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

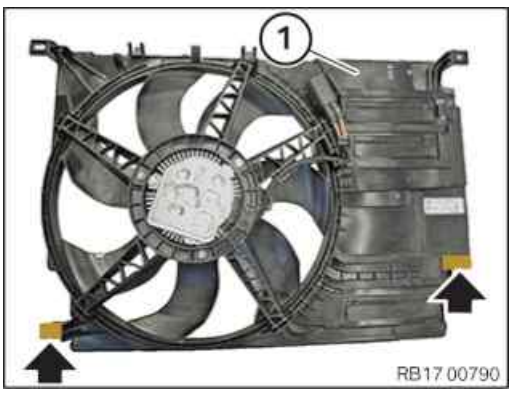
Underbody protection front

			3 Nm

30 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.

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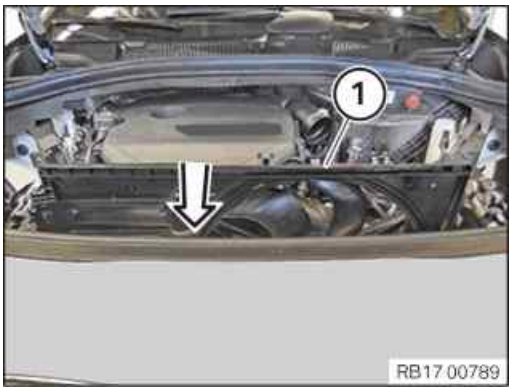
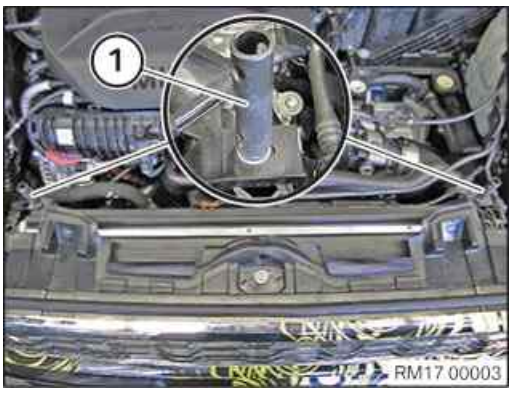


- Feed in and install the fan cowl (1) in the direction of the arrow.

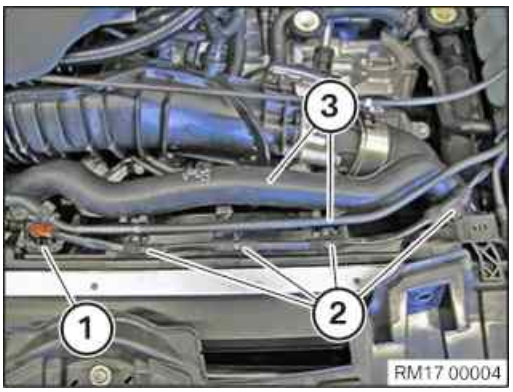
- Lock the left and right locks (arrows).



- Tighten the screws (1).

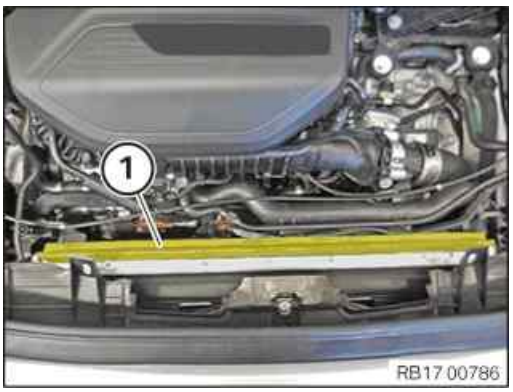
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



- Guide the sealing (1) on the radiator in and install it.

31 – Install cross connection

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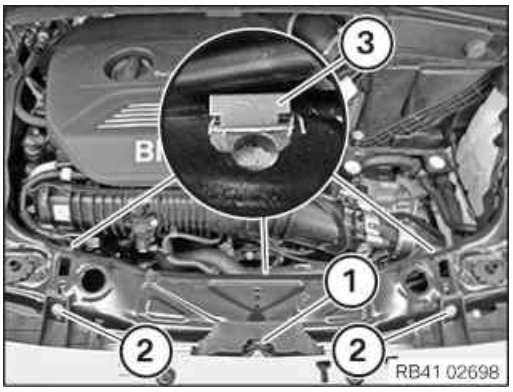


- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

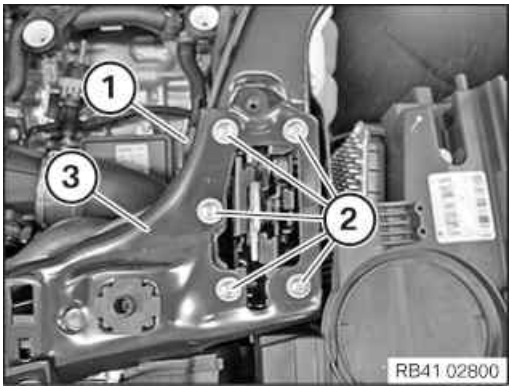
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

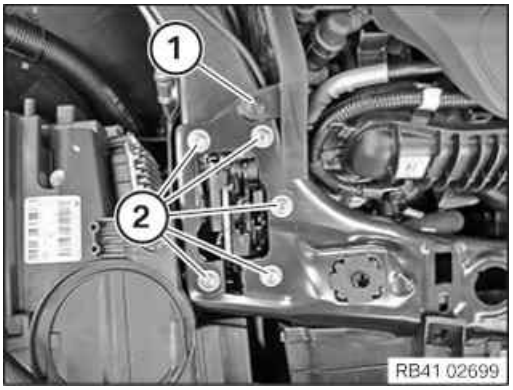


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



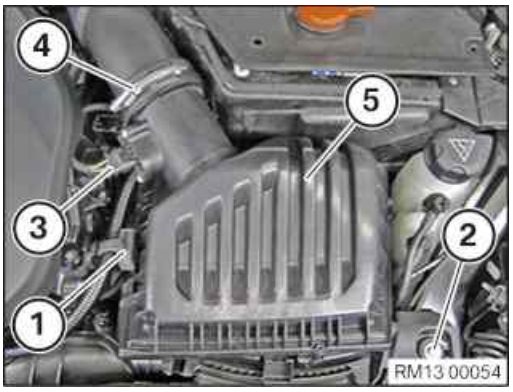
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

32 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

33 – Install the intake neck for the intake filter housing

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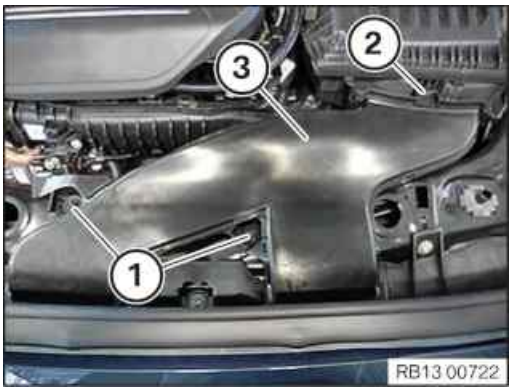

- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

34 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

35 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

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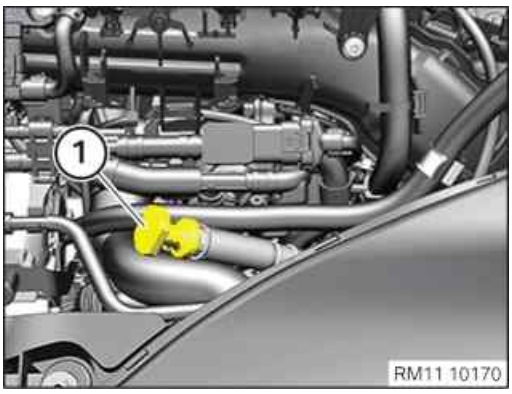
▸ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

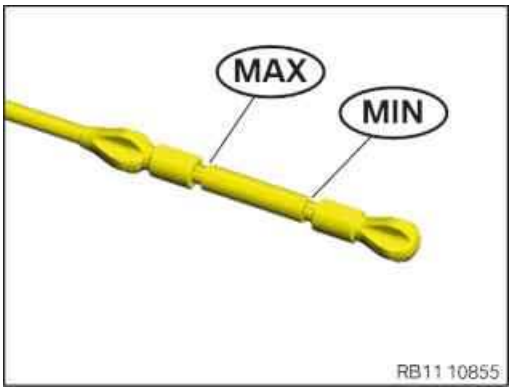


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

36 – Disconnecting all battery earth leads

- See additional information.

37 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Full-flow oil filter to crankcase — Used in step 18

Screw M6	Observe tightening sequence.	Jointing torque	8 Nm
		Tighten down	8 Nm

Positive battery cable to alternator — Used in step 18

M8		Tightening torque	19 Nm

Oil filter cover to oil filter housing — Used in step 20

S88.5 x 3	*Newsealing ring, lightly oiled.*	Tightening torque	27 Nm

Oil drain plug to oil filter cover — Used in step 21

	Renewoil drain plug.	Tightening torque	6 Nm

Air conditioning compressor in component carrier — Used in step 22

M10		Tightening torque	38 Nm

Charge air line to crankcase — Used in step 25

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump — Used in step 25

M6		Tightening torque	8 Nm

Wheel arch cover — Used in step 26

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub — Used in step 27

M8	Renew screw.		16 Nm

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Wheel bolts — Used in step 27

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front — Used in step 29

			3 Nm

Fan cowl on radiator — Used in step 30

M6X12		Tightening torque	6 Nm

Bracing strut to top cross connection — Used in step 31

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 31

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 31

M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge — Used in step 32

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 32

Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 33

M6		Tightening torque	8 Nm

Overview of Special Tools

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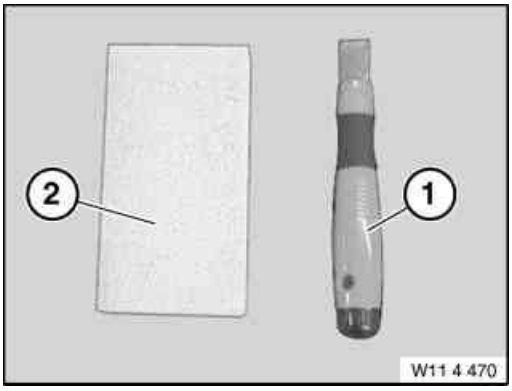
0 495 102 (11 4 470) Tool



Common

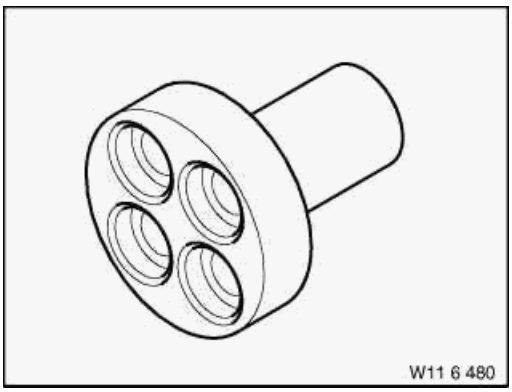
Used in step 18

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

0 493 380 (11 6 480) Connector



Common

Used in step 18

Usage	For turning over engine at crankshaft hub (vibration absorber) when adjusting valve timing
Included in the tool or work	
Storage location	B2
Replaced by	
In connection with	
SI-Number	01 11 98 (338)

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2 344 011 Tool

Common	Used in step 27
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 9
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 9
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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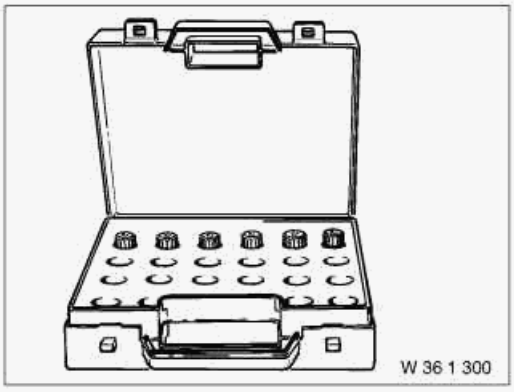
0 495 225 (36 1 327) Wheel stud



Common	Used in step 9
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 9
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 9
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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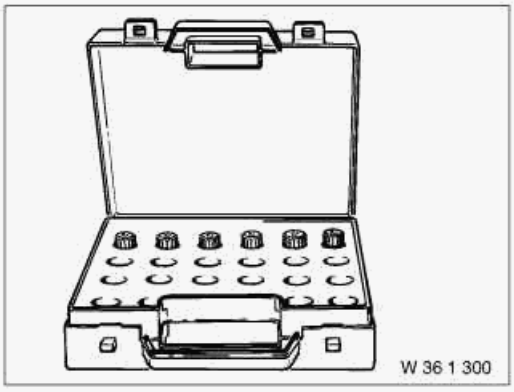
0 495 228 (36 1 331) Wheel stud



Common	Used in step 9
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 9
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 9
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

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61 20 900 Disconnecting and connecting battery earth lead	1 36
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61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 36
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Operating materials	Used in step
2.0 Grease for wheel centring	27

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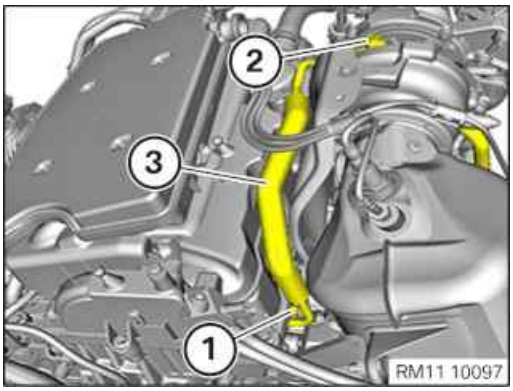
11 42 200 Removing and installing/replacing oil feed line (B37C)

Necessary preliminary tasks:

- Remove clean air pipe.
- Remove exhaust-gas recirculation cooler

Removal:

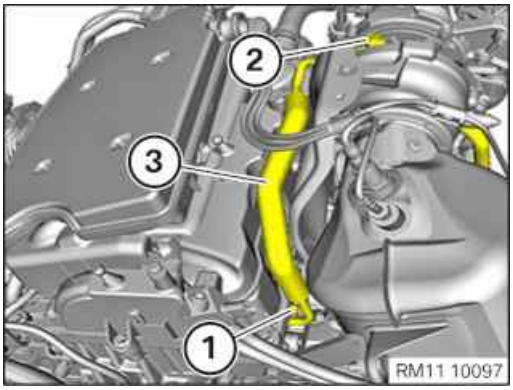


Release screw (1).

Unfasten banjo bolt (2).

Remove the oil feed line (3).

Installation:



Install oil feed line (3).

Tighten banjo bolt (2).

Tightening torque 11 42 5AZ.

Parts: Replace sealing rings.

Tighten screw (1).

Part: Replace O-ring.

Tightening torque 11 42 2AZ.

Required follow-up work:

- Install exhaust-gas recirculation cooler.
- Install clean air pipe.

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11 42 210 Removing and installing/replacing oil return line (B37C)

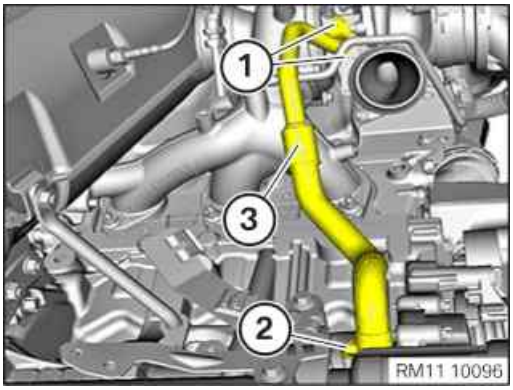
Necessary preliminary tasks:

- Remove front underbody protection
- Remove clean air pipe

Removal:

Release screws (1).
Remove heat shield (2).

Release screw (1).
Release screw (2).
Remove heat shield (3).



Release screws (1).
Release screw (2).
Remove oil return line (3).

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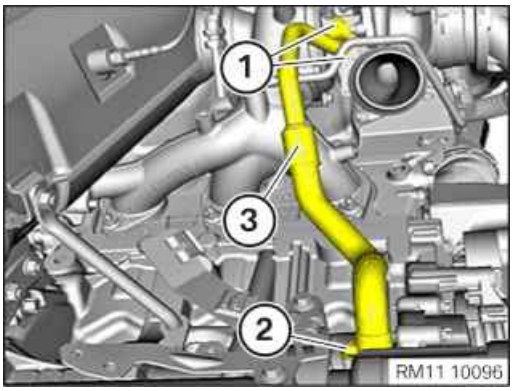
Installation:



Position oil return line (3).
Tighten down screws (1).
Part: Replace O-ring.
Tightening torque 11 42 4AZ.
Tighten screw (2).
Part: Replace O-ring.
Tightening torque 11 42 3AZ.

Install heat shield (3).
Tighten screw (1).
Tighten screw (2).

Install heat shield (2).
Tighten down screws (1).

Required follow-up work:

- Install front underbody protection
- Install clean air pipe

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11 42 020 Removing and installing/replacing the full-flow oil filter (B37C)

Special tools required:

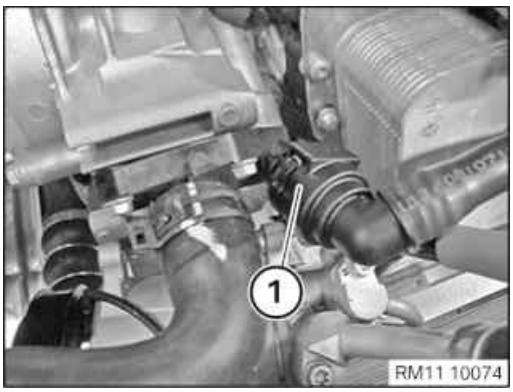
- 11 4 470
- 11 6 480

Necessary preliminary tasks:

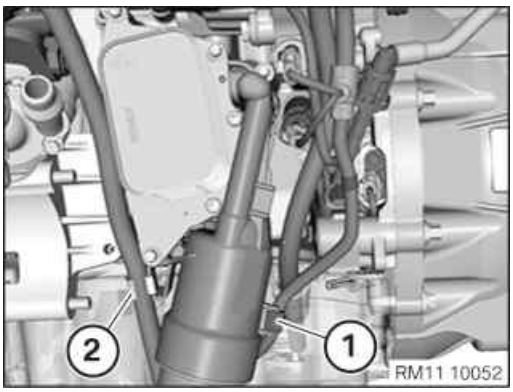
- Disconnect battery negative lead.
- Drain off oil.
- Remove fan cowl.
- Remove underbody protection
- Drain coolant.
- Release A/C compressor and place to one side.

Removal:

Unlock and detach coolant hose (1).



Unlock and detach coolant hose (1).



Unclip wiring harness (1).
Unclip positive wire (2).

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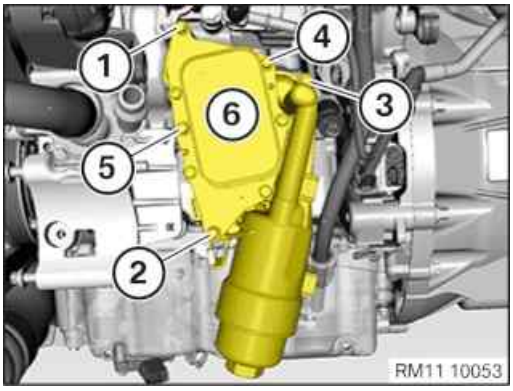


Release screws in the sequence **5 - 1**.

Remove full-flow oil filter (6).

Installation:

Important!

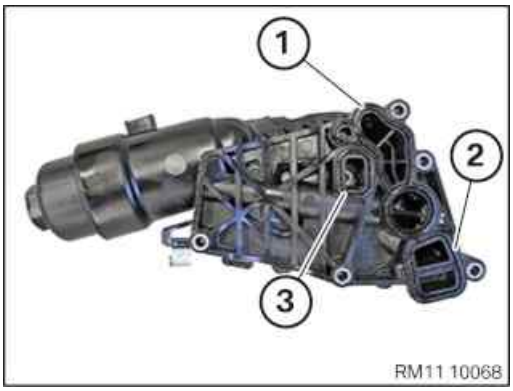
Clean away gasket residues from the crankcase and full-flow oil filter with the special tool 11 4 470 .

Do not use any metal-cutting tools (e.g. emery cloth).

No particles/foreign material may enter the media openings.

Foreign particles in the oil cause damage to the connecting rod bearing/engine.

Crank engine with special tool11 6 480 until engine oil exits from the oil channels in the area of the full-flow oil filter.



Note:
All sealing surfaces and gaskets must be cleaned and free of oil.

Replace gaskets (1, 2 and 3).

When replacing, remount oil-to-water heat exchanger.

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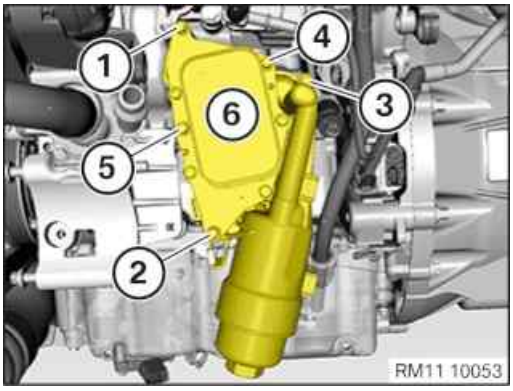
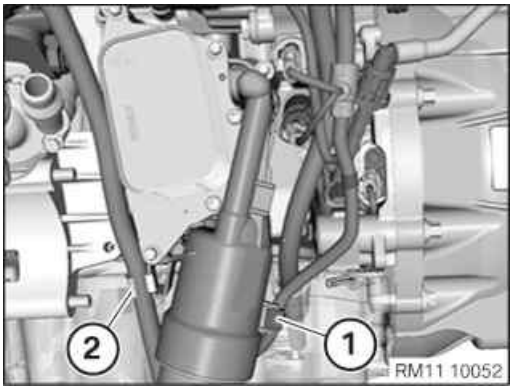


Position full-flow oil filter (6).

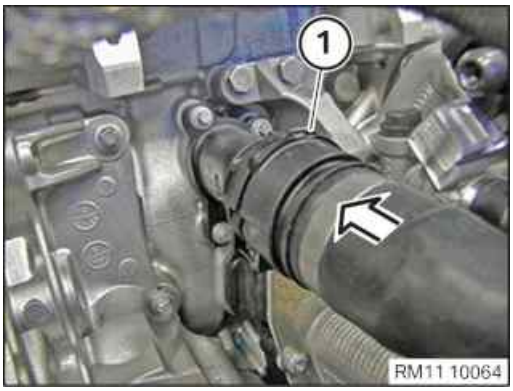
Tighten screws in the sequence **1 - 5**.

Tightening torque: 11 42 7AZ.



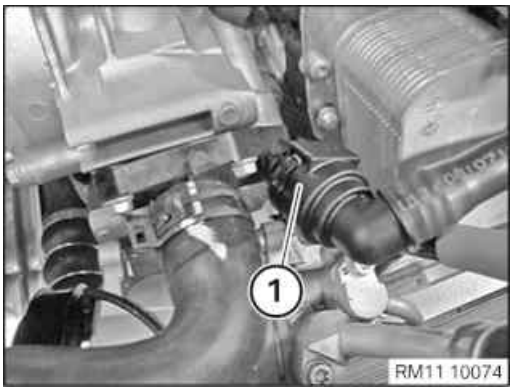
Clip in wiring harness (1).

Clip in positive wire (2).



Connect coolant hose (1).

Lock must snap audibly into place.



Connect coolant hose (1).

Lock must snap audibly into place.

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Required follow-up work:

- Secure air conditioning compressor.
- Install fan cowl.
- Install underbody protection.
- Top up coolant.
- Top up oil.
- Connect battery earth lead.

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11 42 200 Removing and installing/sealing or replacing oil feed line for exhaust turbocharger

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Maintain conditions of absolute cleanliness.

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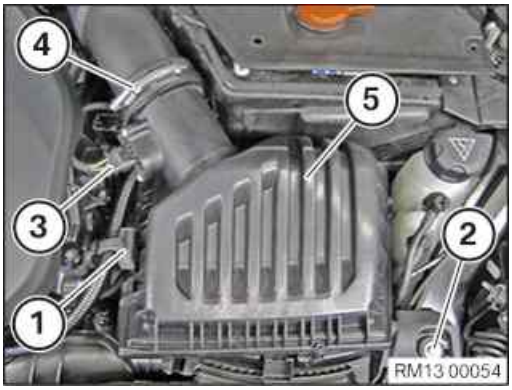
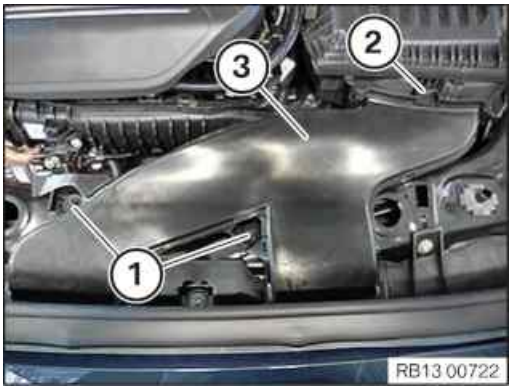
1 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

3 – Remove vehicle battery

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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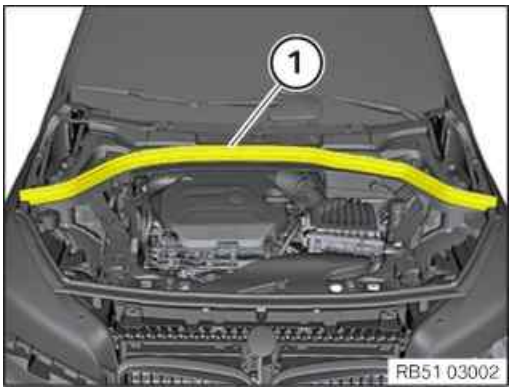
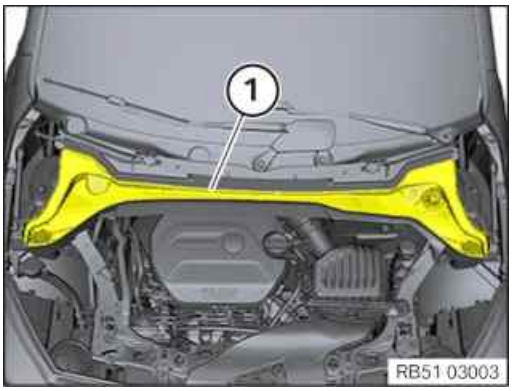
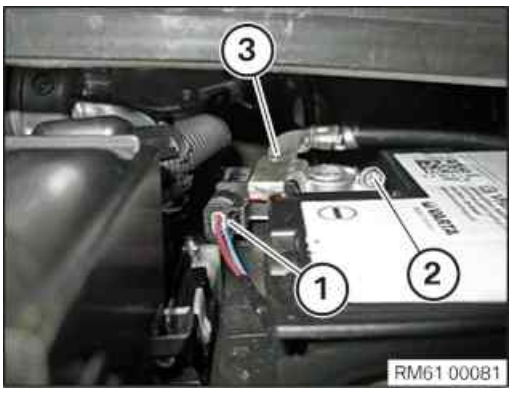


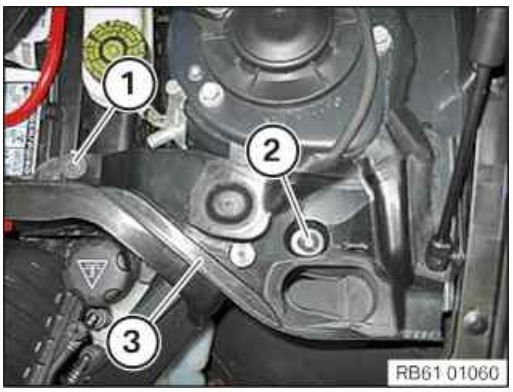
- pull off gasket (1) upwards.



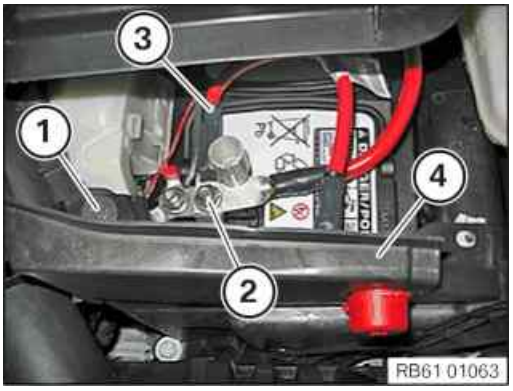
- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.

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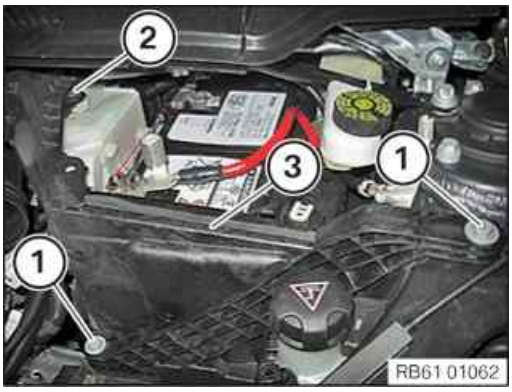
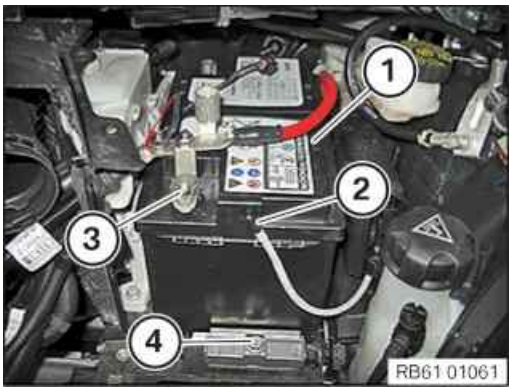


- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

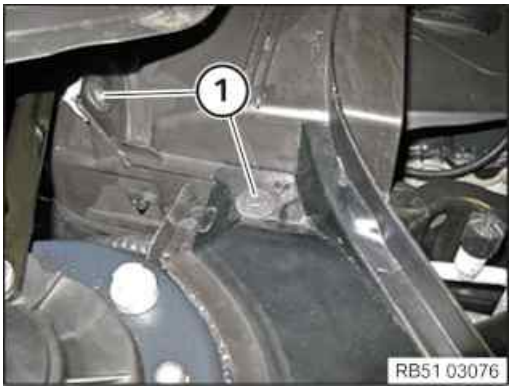
Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

4 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).

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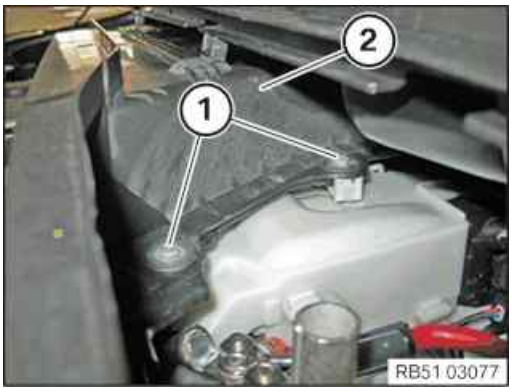


- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

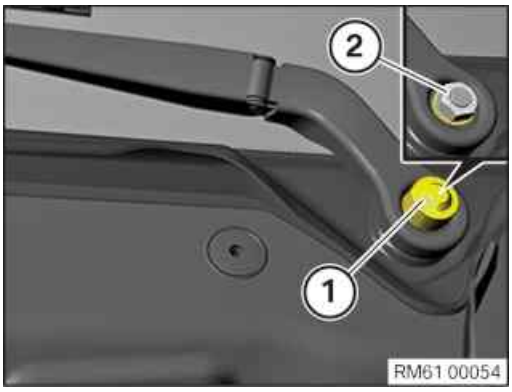
▶ **Remove the wiper arm**

RISK OF DAMAGE

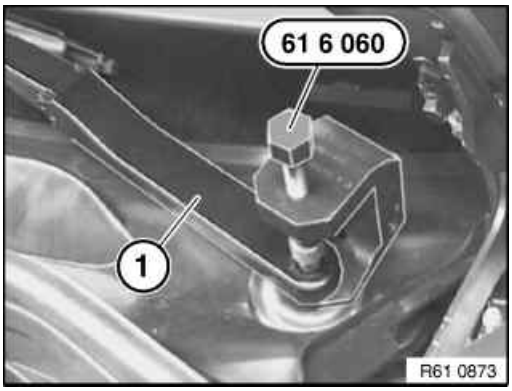
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

6 – Remove the gutter strip on the windscreen on the left and right

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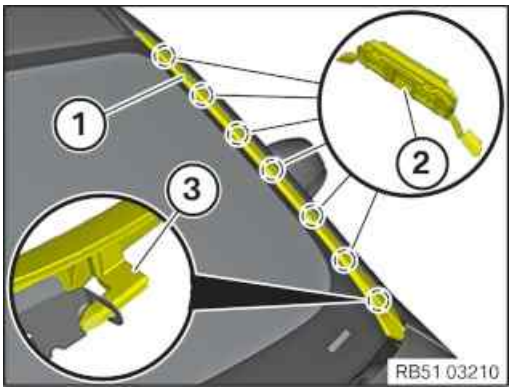
NOTICE

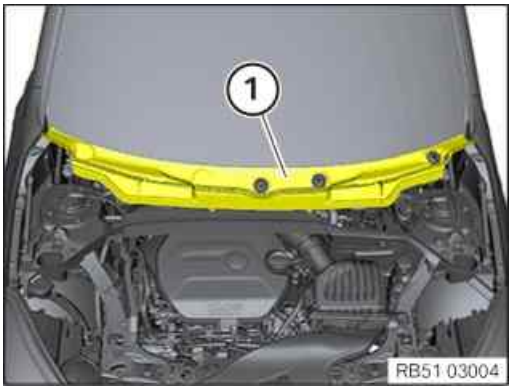
Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

7 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

8 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

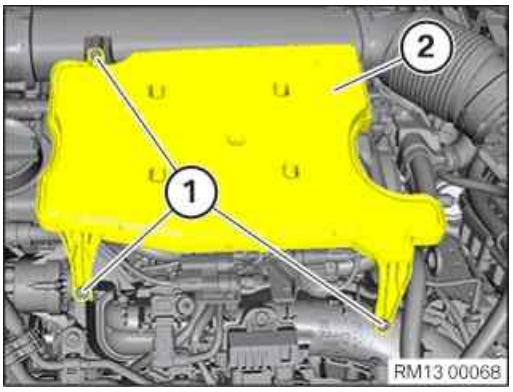
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

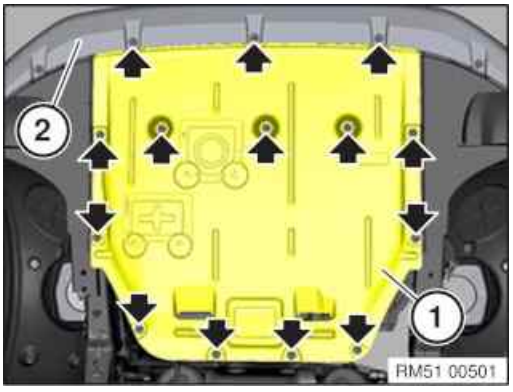
- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator



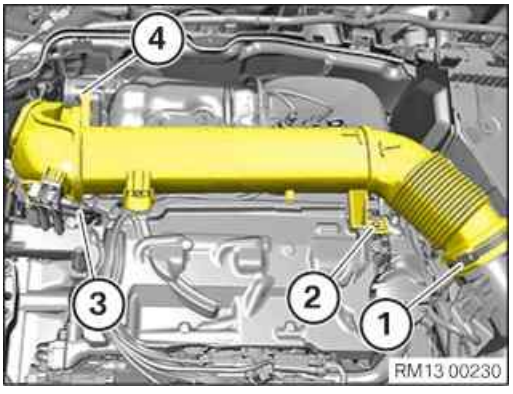
- Loosen screws (1).
- Guide out and remove the resonator (2).

10 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

11 – Removing clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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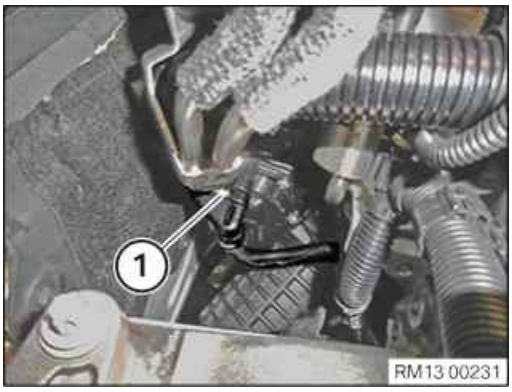
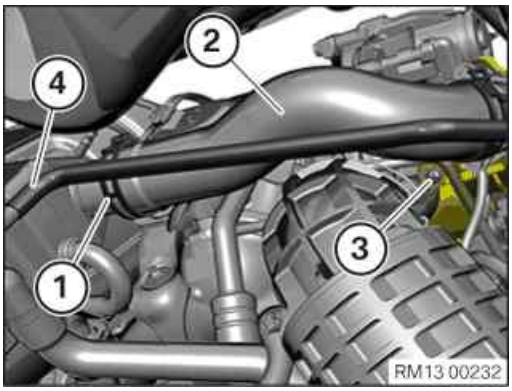
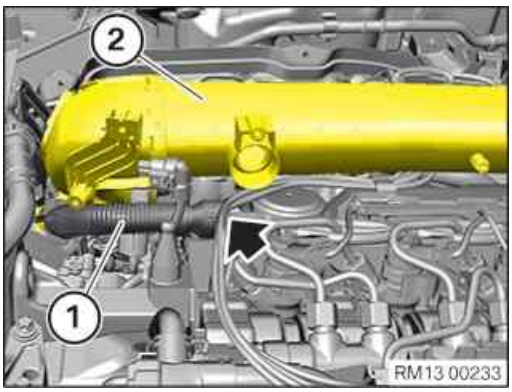


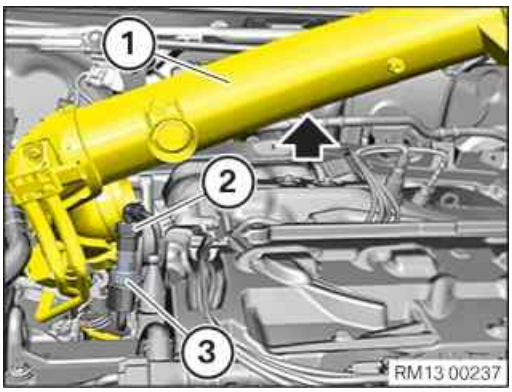
- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).



- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

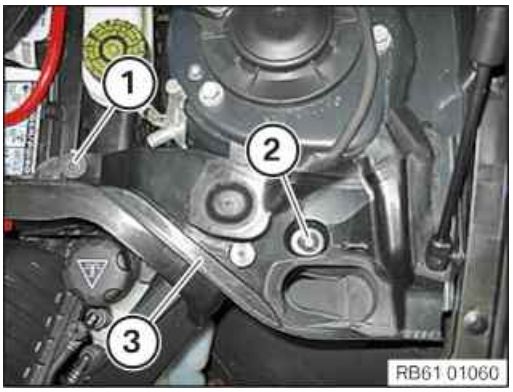
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

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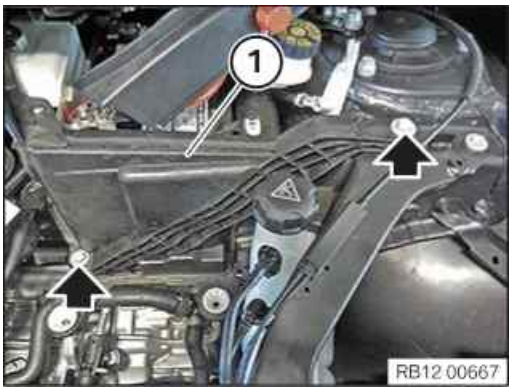
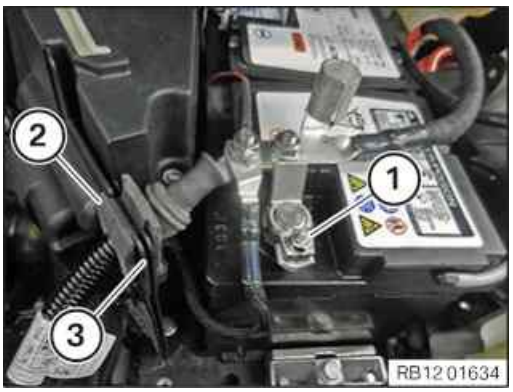
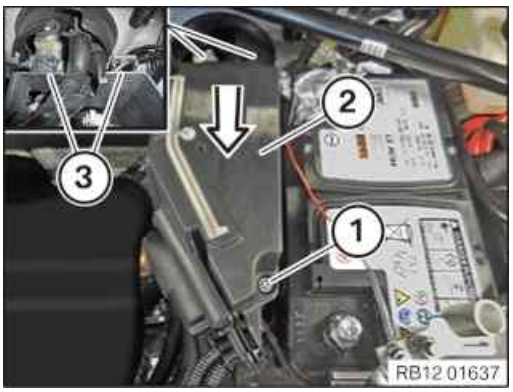
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



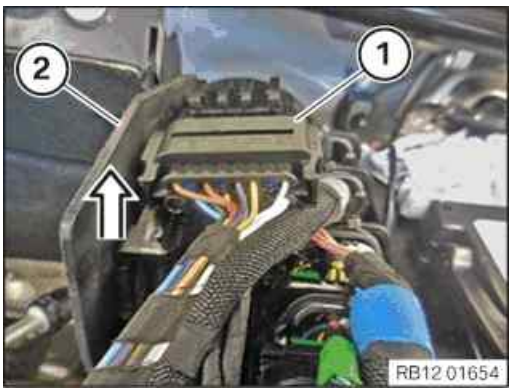
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

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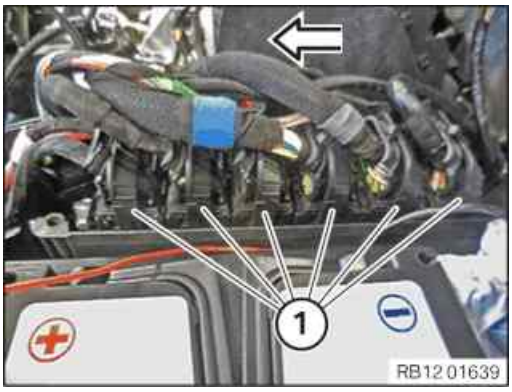
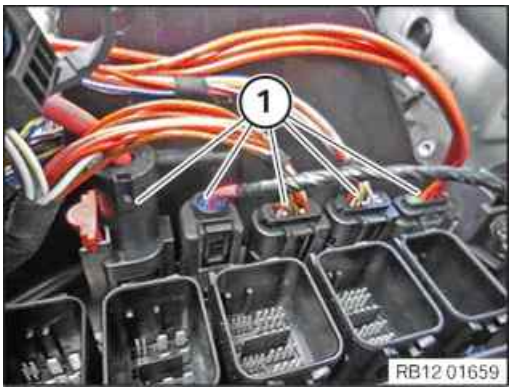
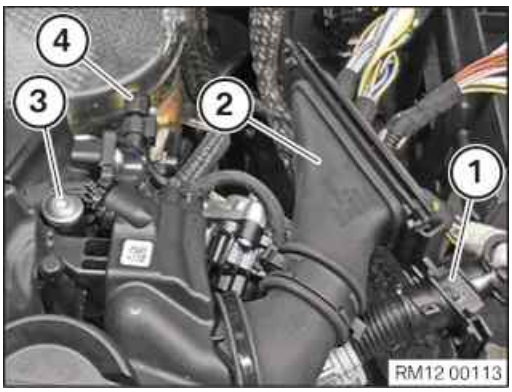


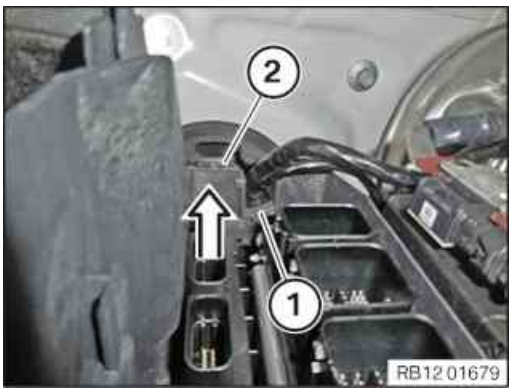
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



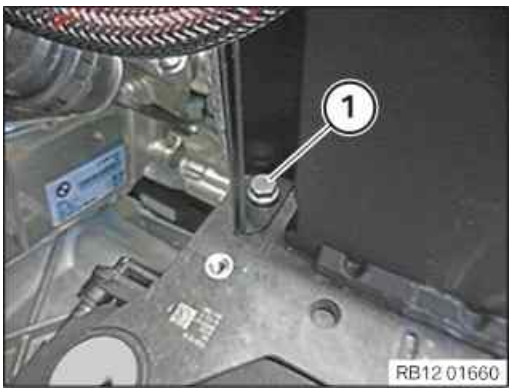
- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).

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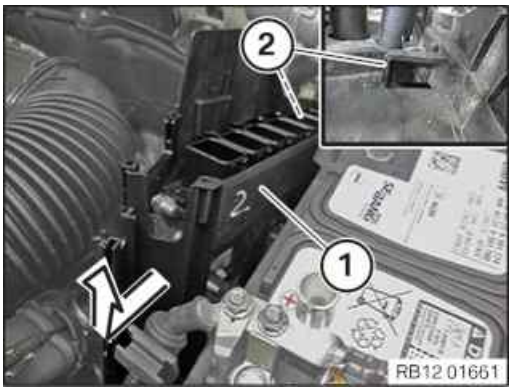
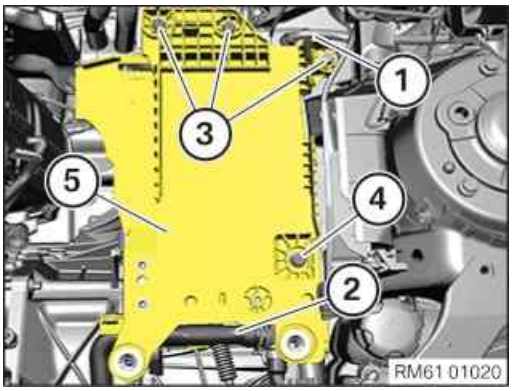


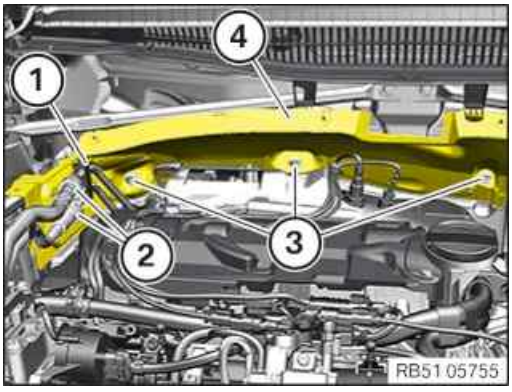
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

13 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

14 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

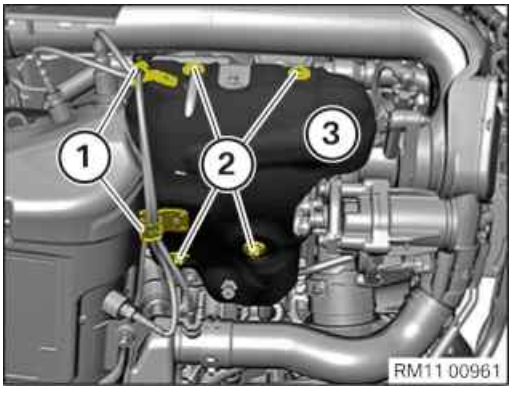
15 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).

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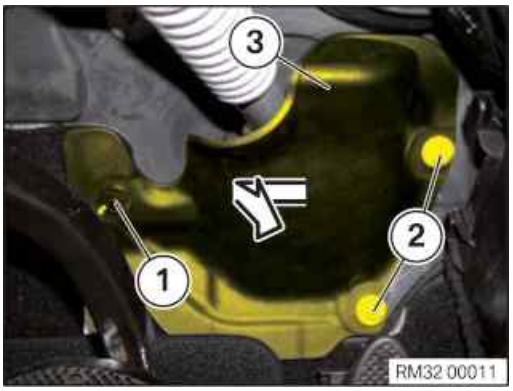
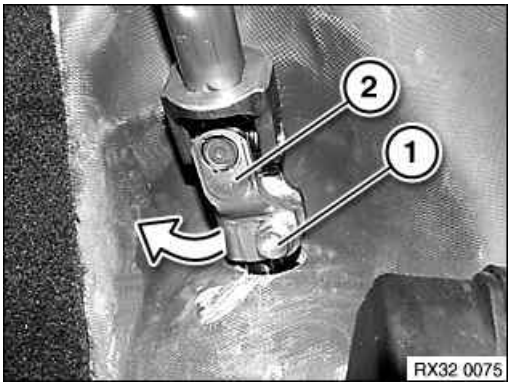
16 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

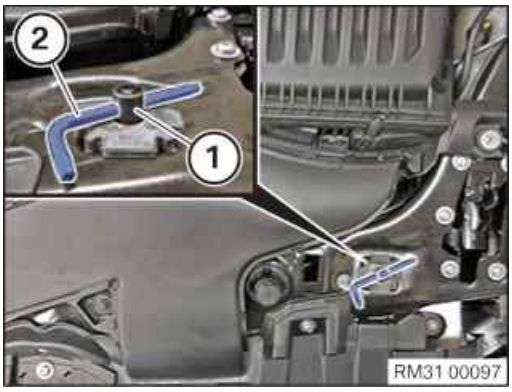
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

17 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

18 – Remove the front left and right wheel

▶ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

19 – If installed: Removing rear underbody protection

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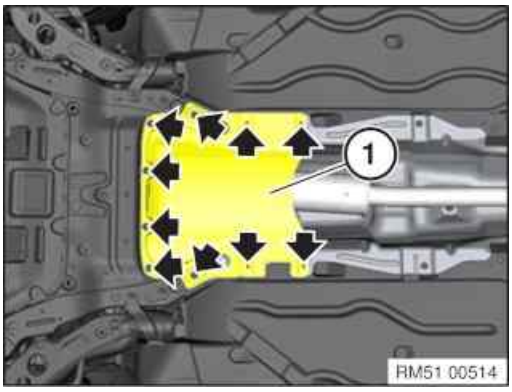
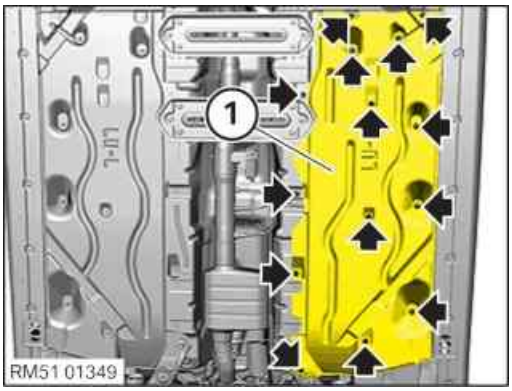


- Remove screws (arrows).
- Remove the rear underbody protection (1).

20 – Removing right underbody panelling



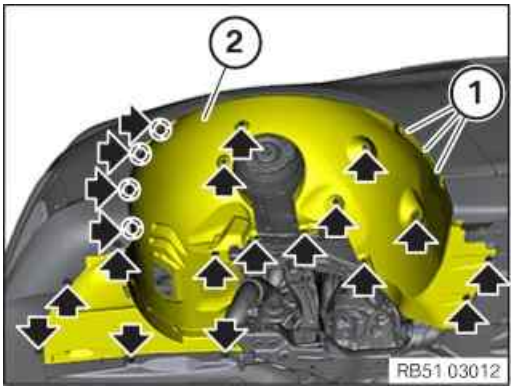
- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

21 – Removing front left and right wheel arch cover

NOTICE

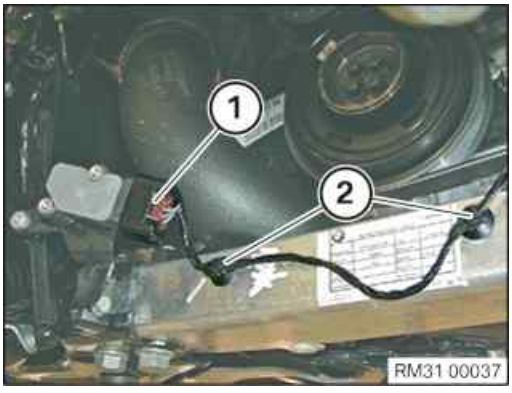
Perform the operations on the left and right side.

▸ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

22 – With right installation: Detaching ride height sensor cable



- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

23 – Releasing anti-roll bar on left and right from anti-roll bar link

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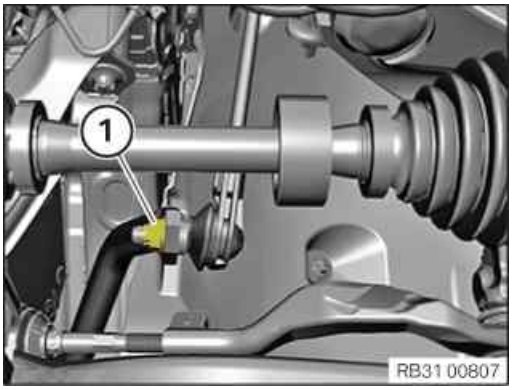
23 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**

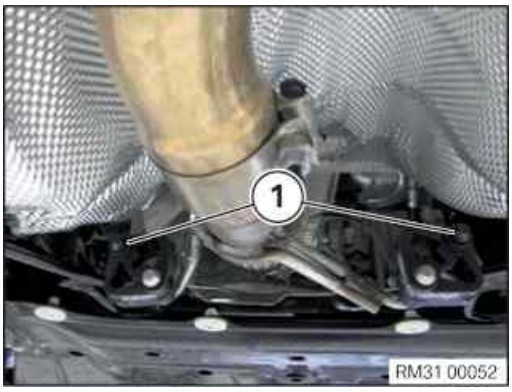


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

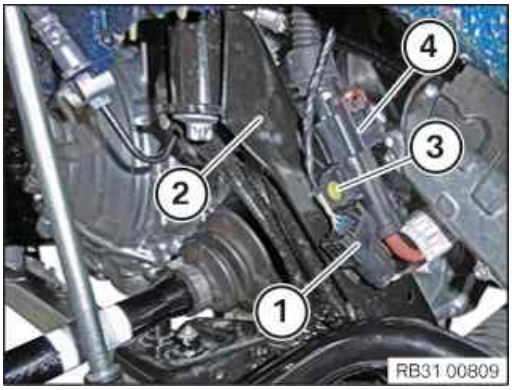
24 – Detaching rubber mount from front axle support



- Spray rubber mount (1) with lubricant and release from holder on front axle support.

25 – Disconnecting plug connections from steering gear

▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

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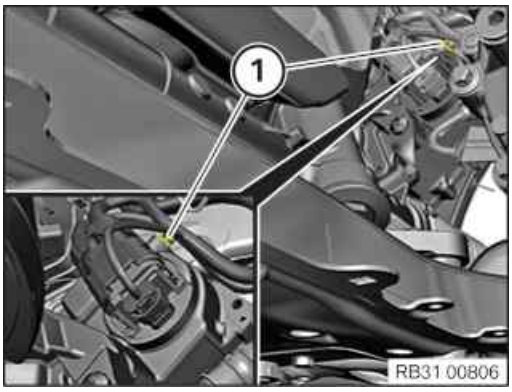
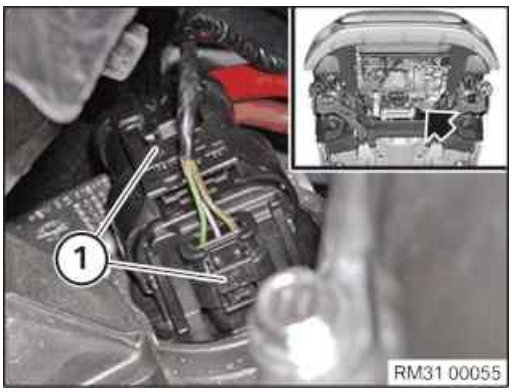


- Disconnect wiring harness (1) from steering gear.

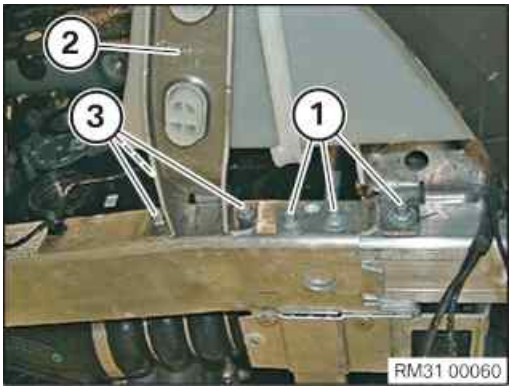
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

26 – Releasing the mounted part from the front axle support

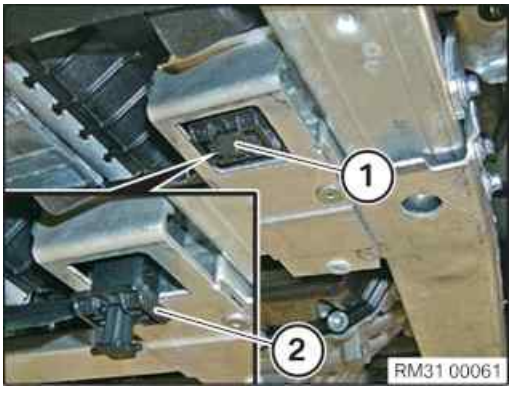


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).

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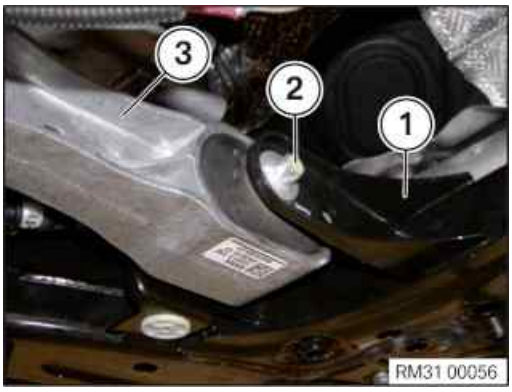


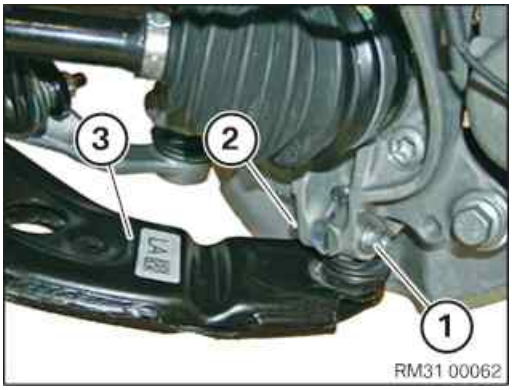
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

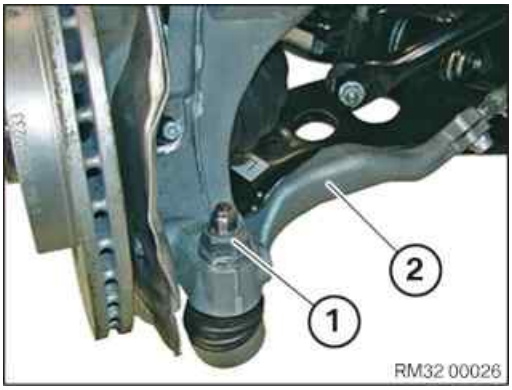
27 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

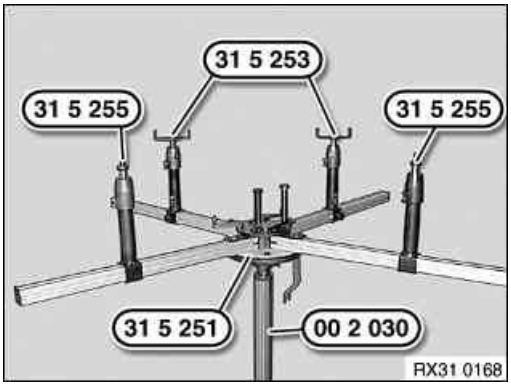
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

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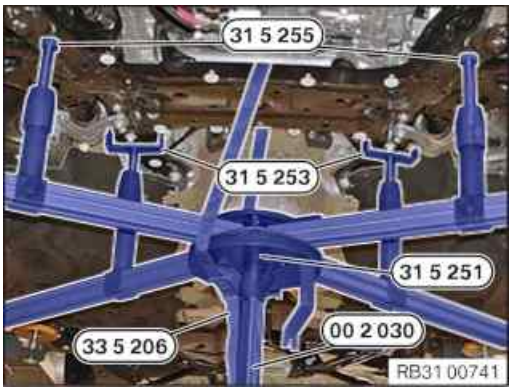
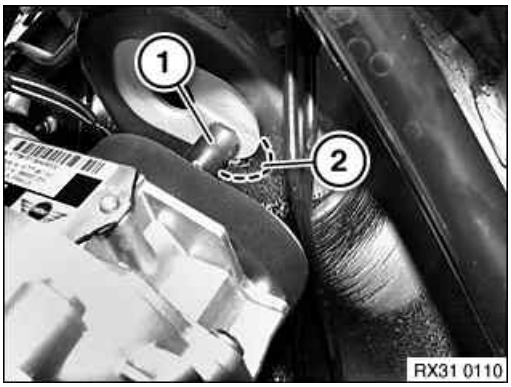


- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

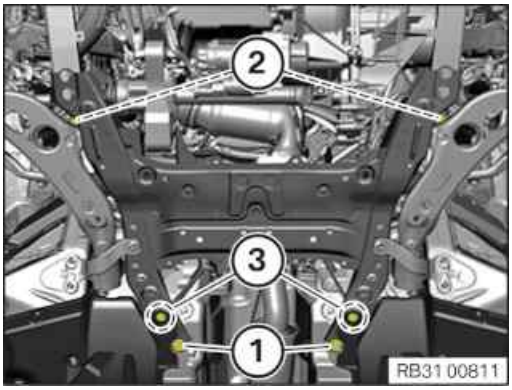


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

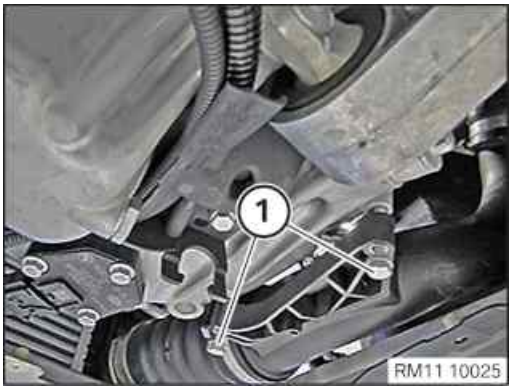
TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.

For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

28 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.

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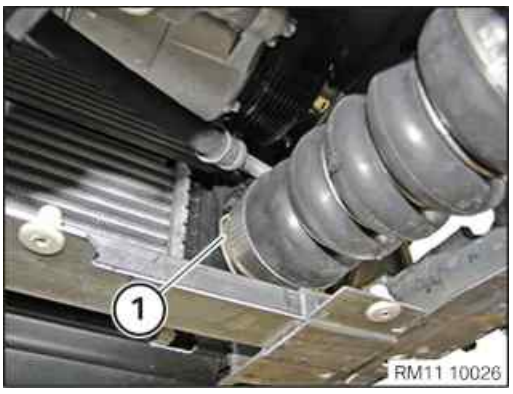
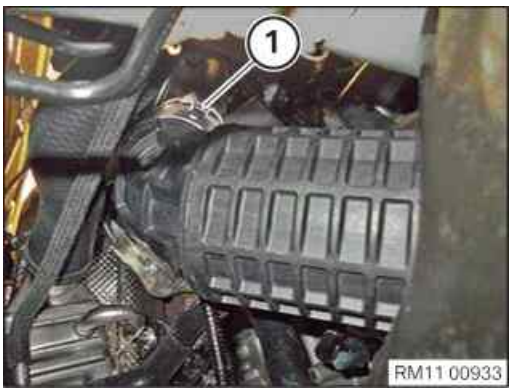
- Detach charge air duct screw connection (1) on crankcase.

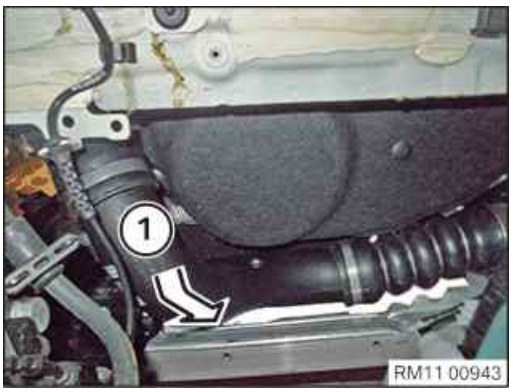
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

29 – Removing the connecting support from the tunnel in front and back

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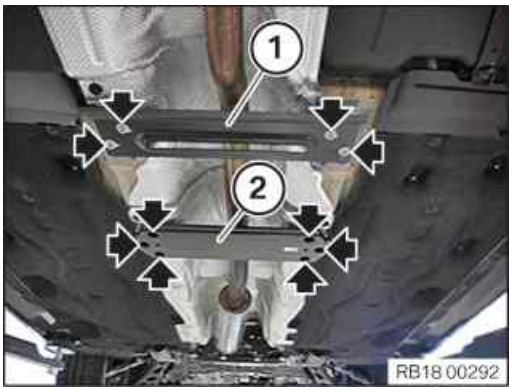
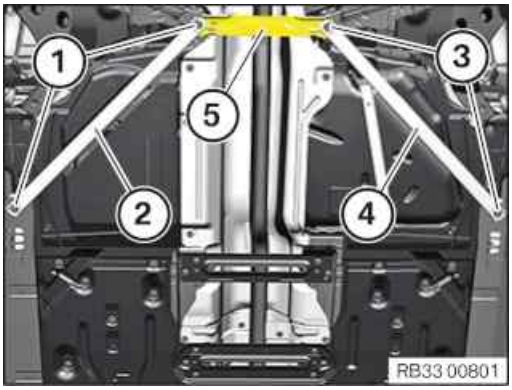


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

30 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

31 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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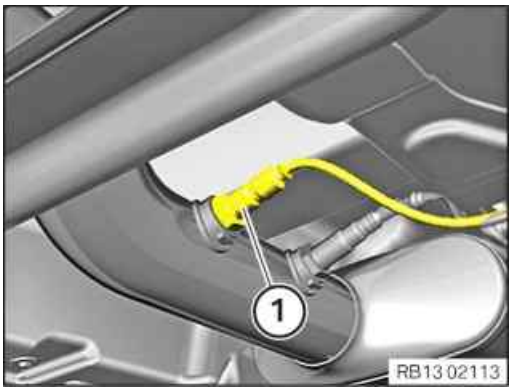
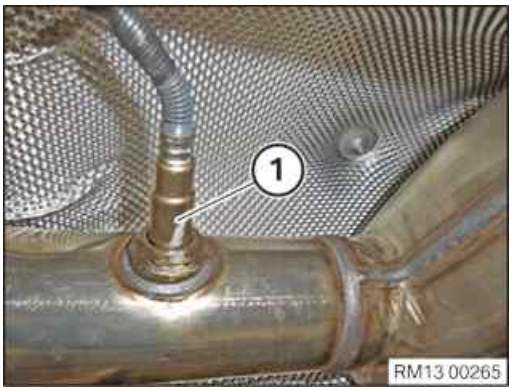
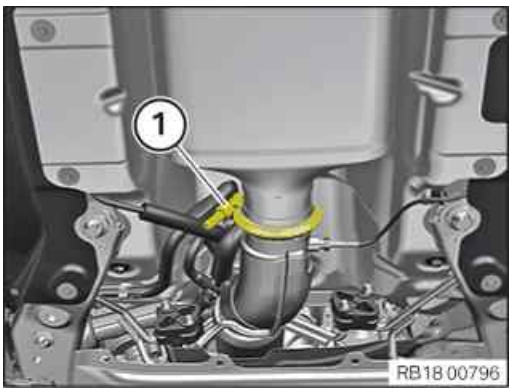


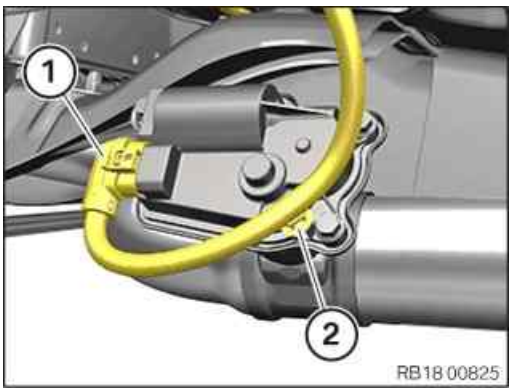
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



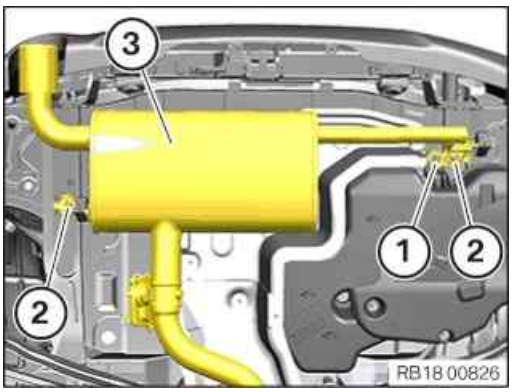
- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Unlock and disconnect connector (1).
- Loosen clamp (2).



- Loosen screw (1).
- Loosen nuts (2).
- Lower the exhaust system (3) with an auxiliary person, guide out and remove.

32 – Removing starter motor

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

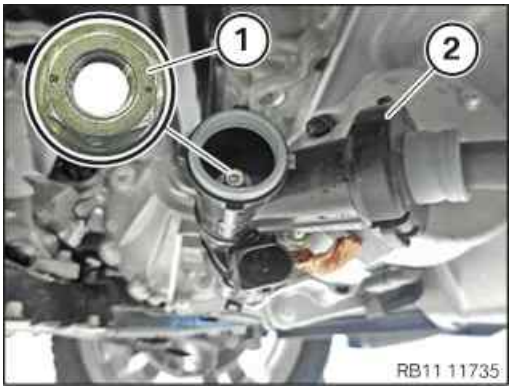
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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- Loosen screws (1).
- Feed out starter motor and remove.

33 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

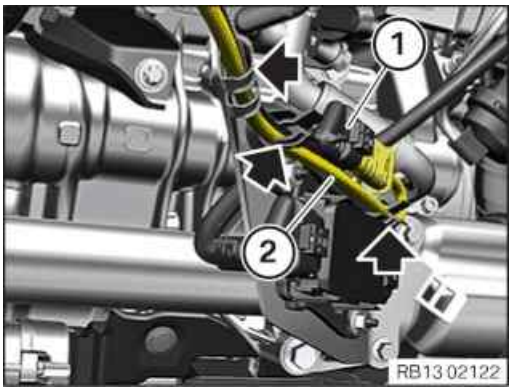
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).

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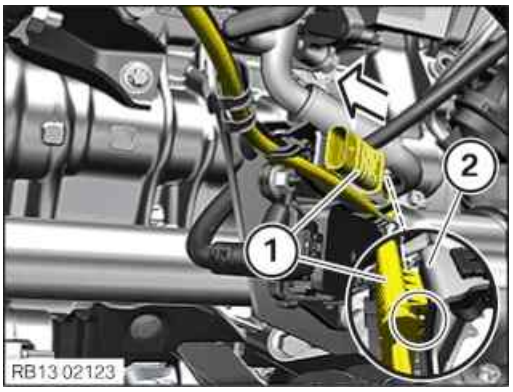
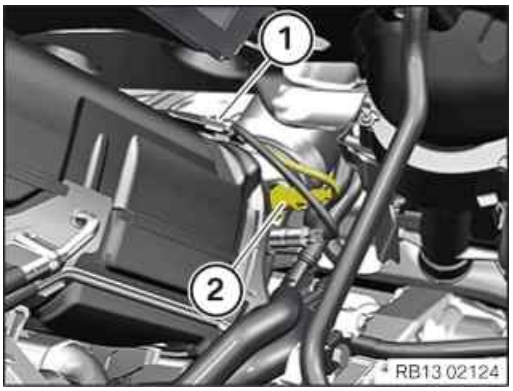


- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

34 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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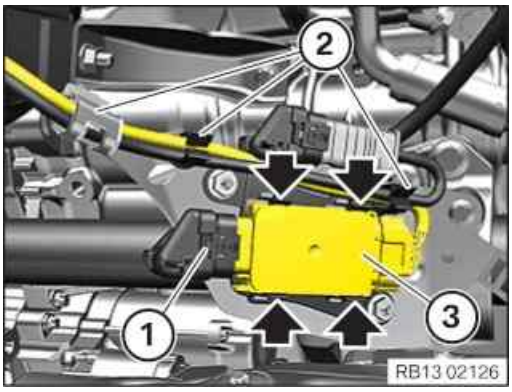
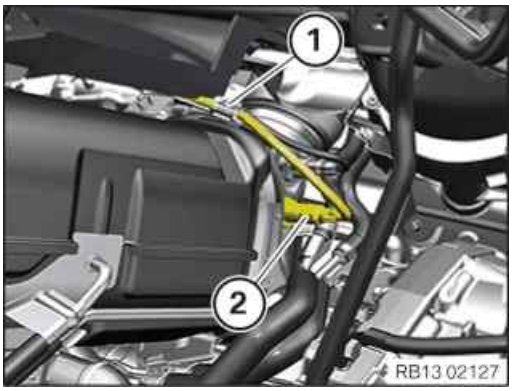
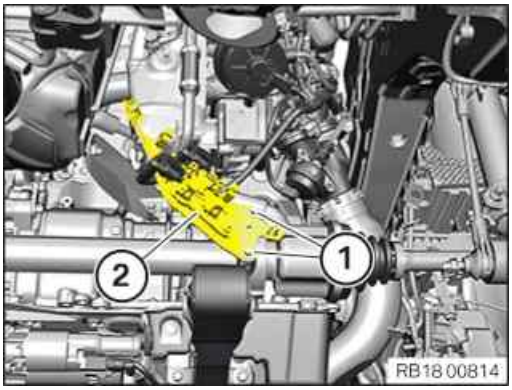


- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

35 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

36 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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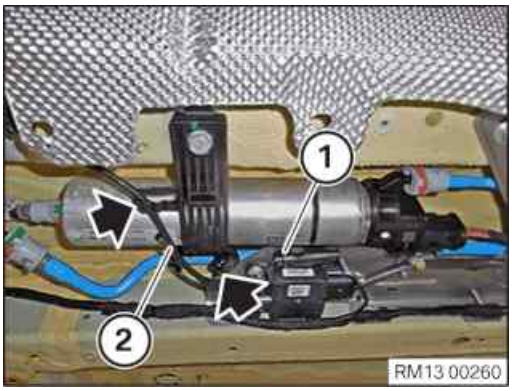
RISK OF DAMAGE

Electrostatic discharge.

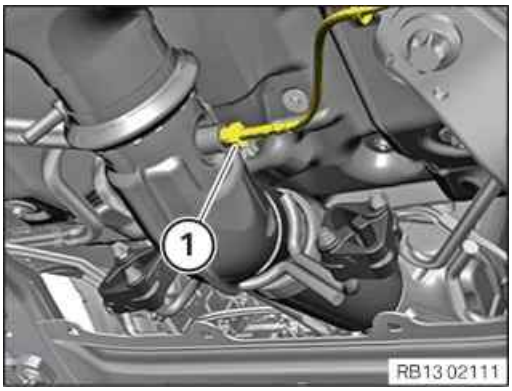
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

37 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

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WARNING

Hot surfaces.

Risk of burning!

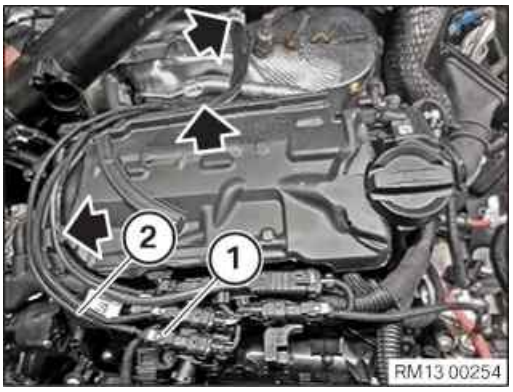
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Feed the cable (2) from the temperature sensor out of the clamps (arrows) and remove it.

- Release the exhaust temperature sensor (1) with conventional tools (2).

- Feed out and remove exhaust temperature sensor (1).

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and disconnect the plug connection (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

39 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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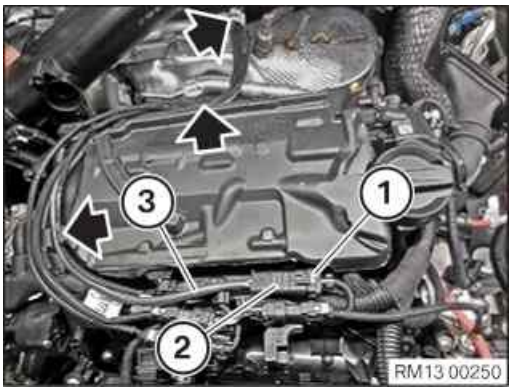
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Detach the connector (2) from the holder .
- Feed out and remove cable (3) out of the oxygen control sensor from the clamps (arrows).

- Release the front oxygen control sensor (1) using special tool **0 491 075 (11 7 030)**.
- Feed out and remove the control sensor (1).

40 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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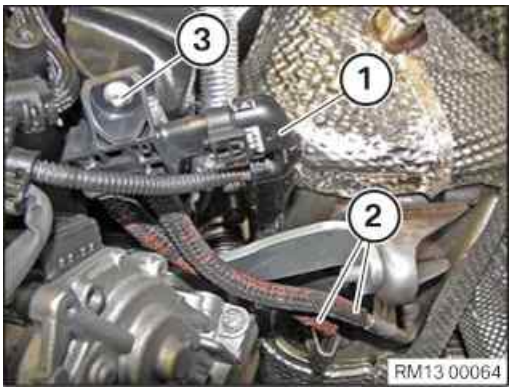


- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

41 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

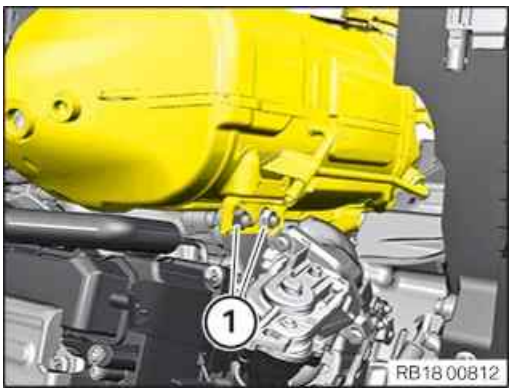
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen nuts (1).

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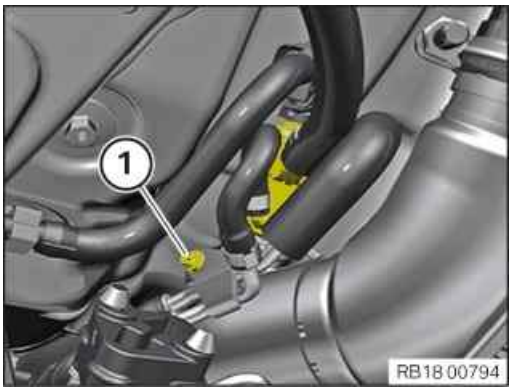
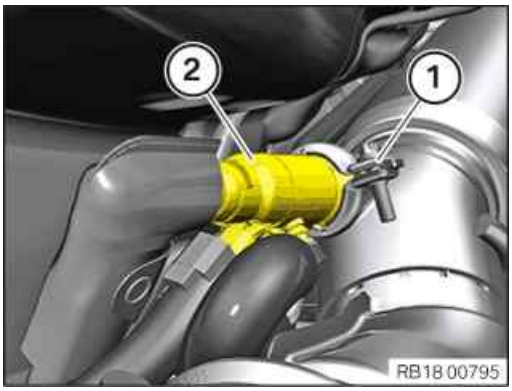
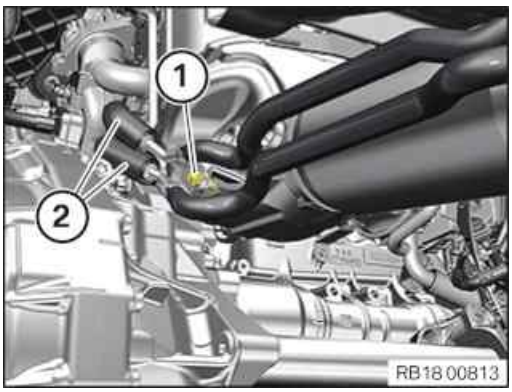


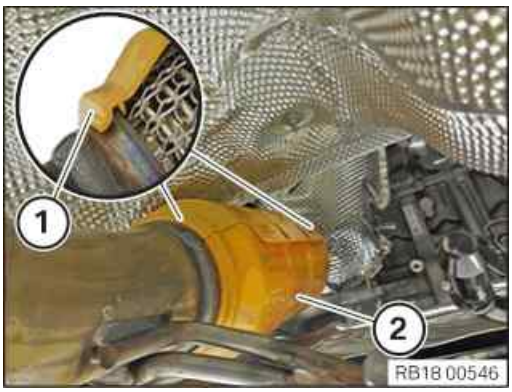
- Loosen screw (1).



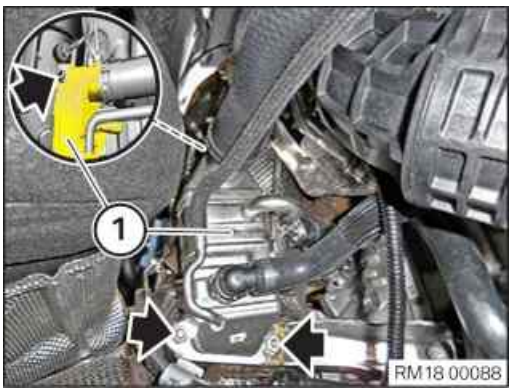
- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Detach nuts (arrows) from low pressure exhaust-gas recirculation cooler (1).

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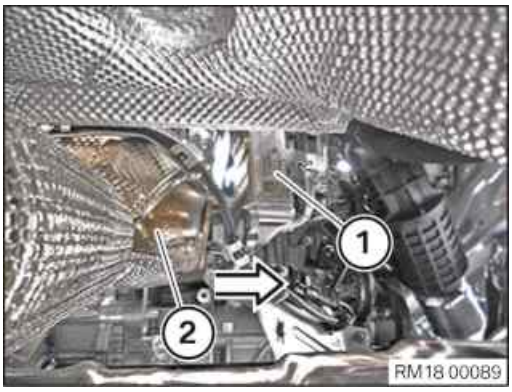
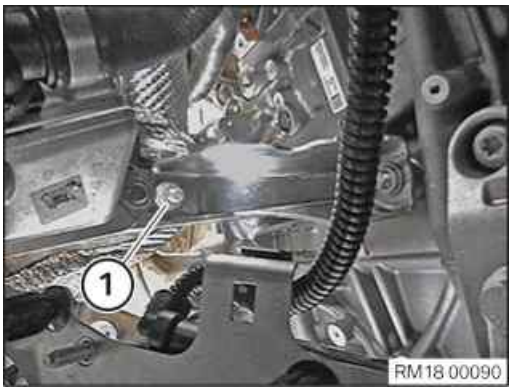
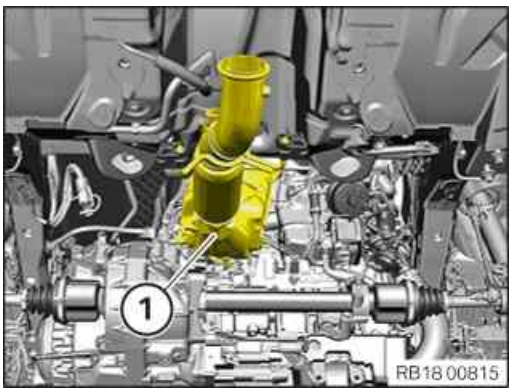


- Feed out low pressure exhaust-gas recirculation cooler (1) from diesel particulate filter (2) in direction of arrow and set aside.



- Unfasten nut (1).



- Feed out diesel particulate filter (1) toward the bottom and remove.

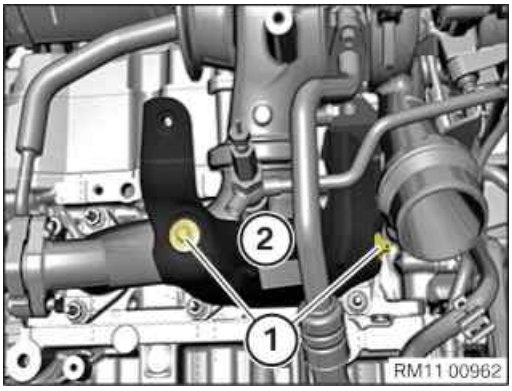
42 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

43 – Removing heat shield from rear exhaust turbocharger

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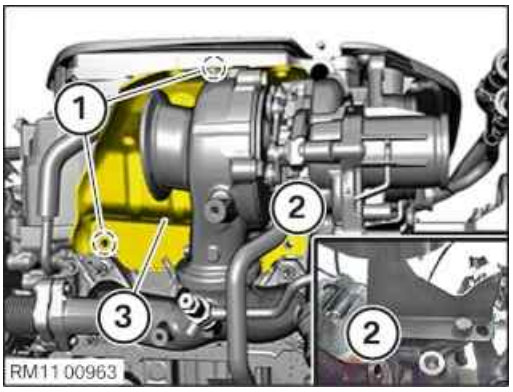
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

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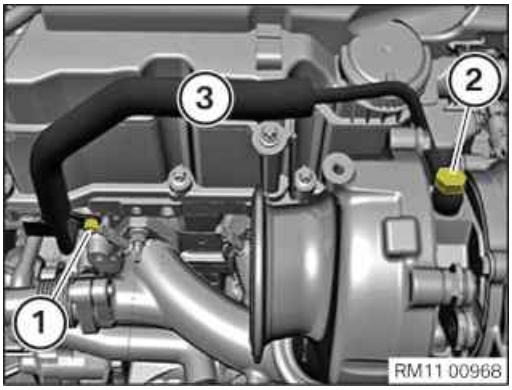
MAIN WORK

44 – Remove the oil feed line for the exhaust turbocharger

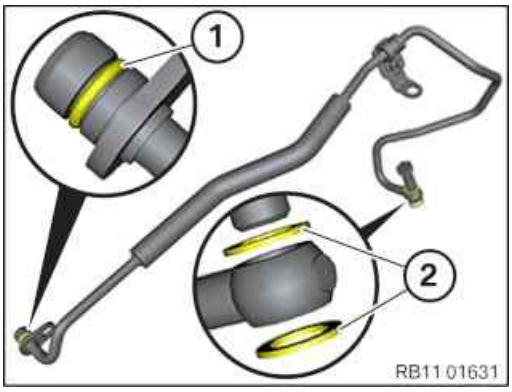
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Loosen screw (1).
- Unscrew the banjo bolt (2).
- Pull the oil feed line (3) out of the cylinder head, guide it out and remove it.

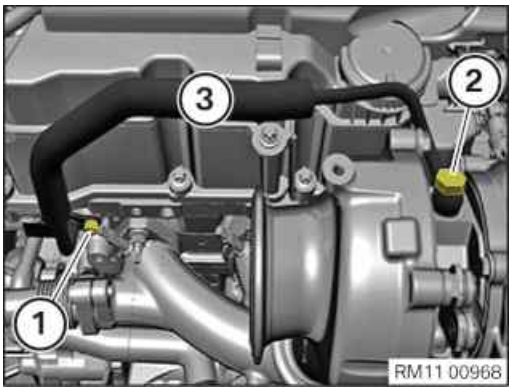
45 – Install the oil feed line for the exhaust turbocharger



- Check the O-ring (1) for damage and replace the oil feed line as needed.

  Parts: Oil feed line
- Renew the sealing rings (2).

  Parts: Sealing ring



- Feed in oil feed line (3) and position.
- Position and tighten the screw (1).

Oil feed line on cylinder head

M6x12		Tightening torque	8 Nm

- Fit and tighten the banjo bolt (2).

  The sealing rings must be positioned correctly.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

POSTPROCESSES

46 – Installing heat shield on exhaust turbocharger at the rear

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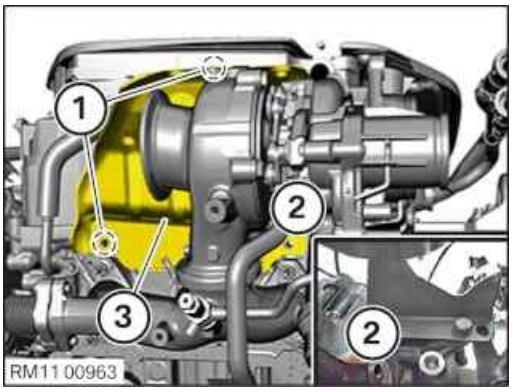
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

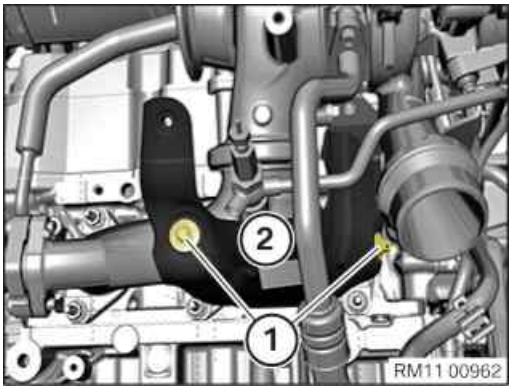
47 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

48 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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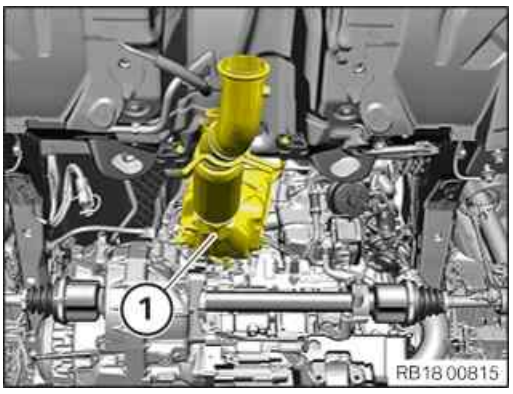
- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

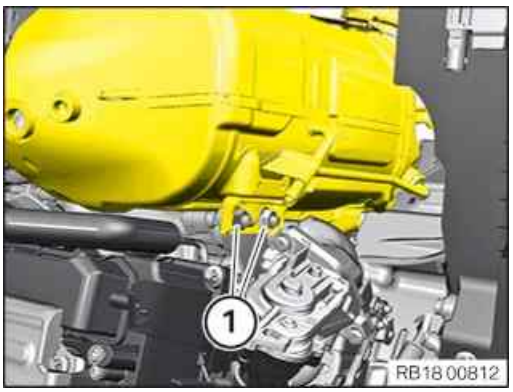
  Parts: Gasket

- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.



- Carefully insert and install the diesel particulate filter (1).

- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.

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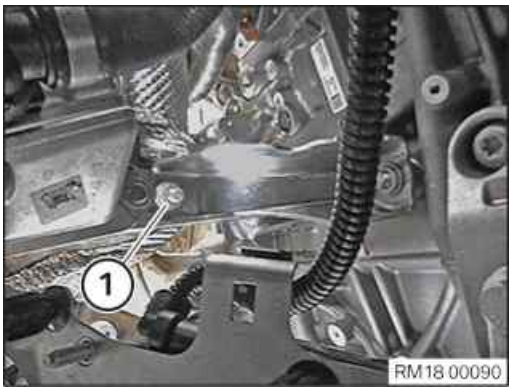


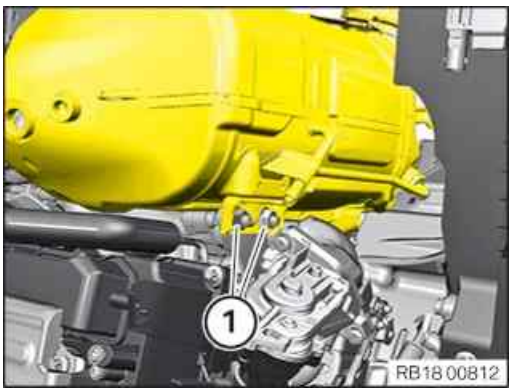
- Tighten the nut (1) hand-tight.

- Remove fitting aid (1) for the flexible tube.

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

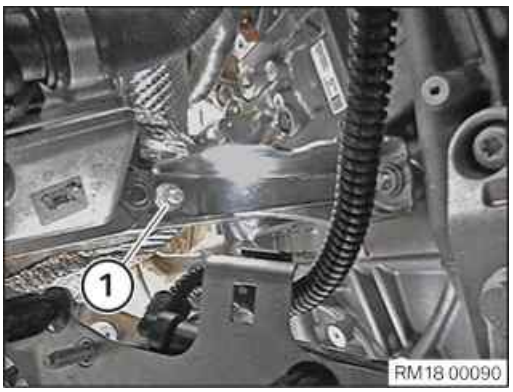
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Tighten nut (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm

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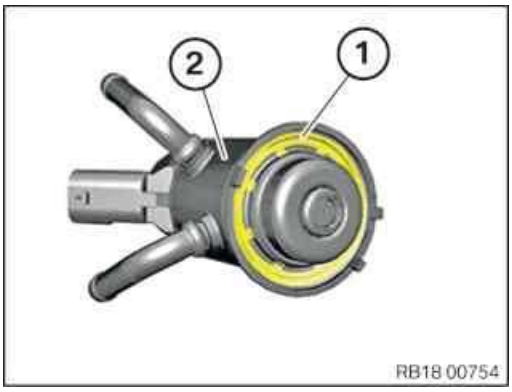
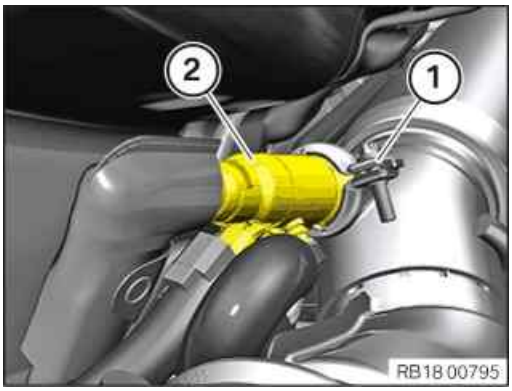


- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

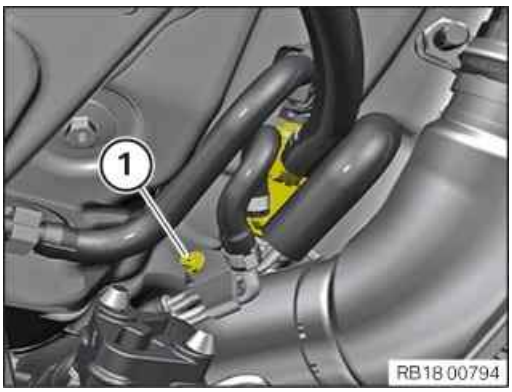


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

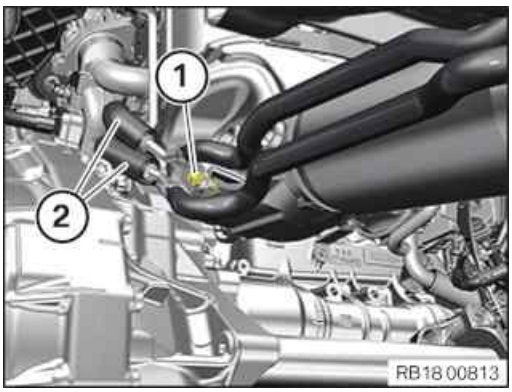
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

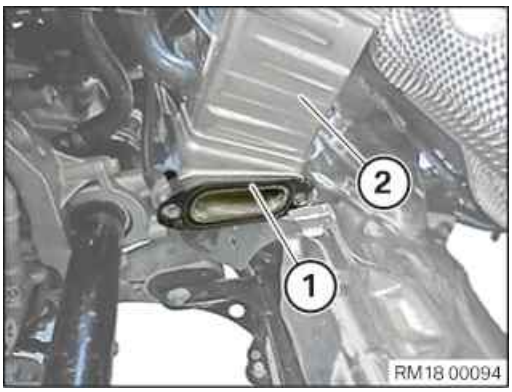
Torx bolt BM6x16		Tightening torque	8 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm



- Replace seal (1) of the low pressure exhaust-gas recirculation cooler (2).

  Parts: Gasket

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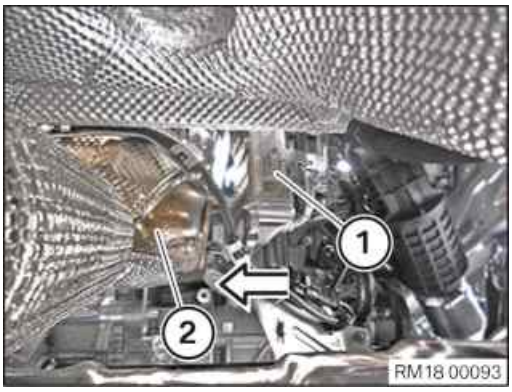
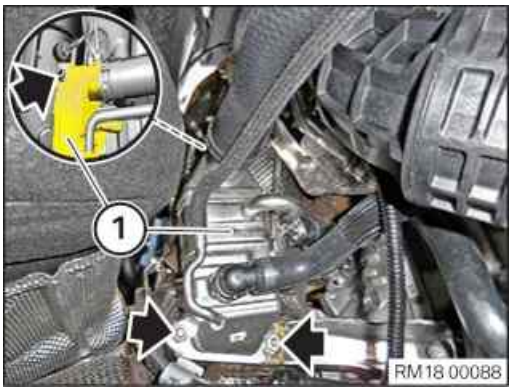


- Feed in and install the low pressure exhaust-gas recirculation cooler (1) in at the diesel particulate filter (2) in the direction of arrow.

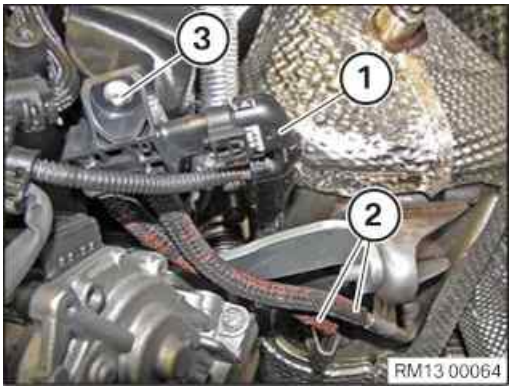


- Tighten nuts (arrows) of the low pressure exhaust-gas recirculation coolers (1).

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Flange nutM8		Tightening torque	19 Nm

49 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

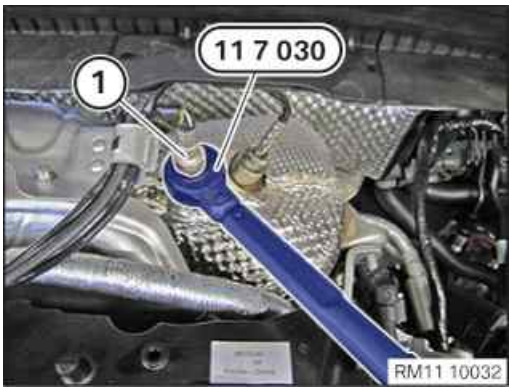
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

50 – Install the control sensor



- Feed in front oxygen sensor (1) and install.
- Tighten the front oxygen sensor (1) with the special tool **0 491 075 (11 7 030)**.

Control sensor

Control sensor		Tightening torque	50 Nm

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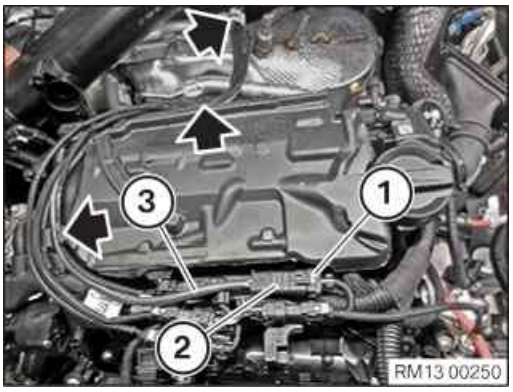
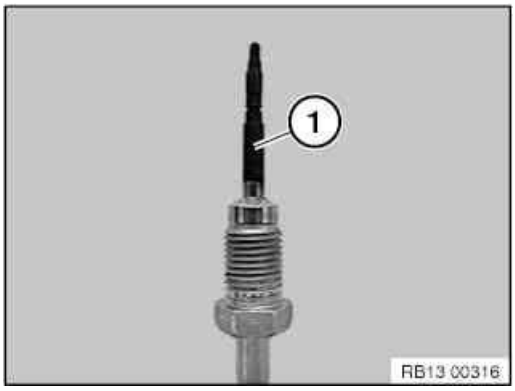


- Feed in and install cable (3) from the oxygen control sensor into the clamps (arrows).
- Secure connector (2) on holder.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

51 – Install the exhaust-gas temperature sensor on the diesel particulate filter



RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.

- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).

- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

52 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

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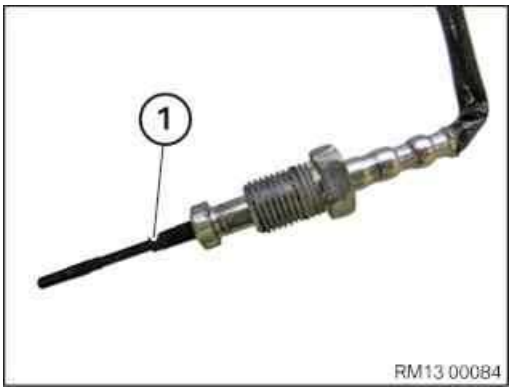
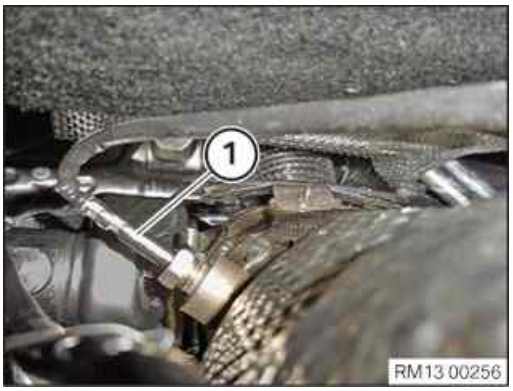


- Make sure the gauge tip (1) is not damaged during installation.

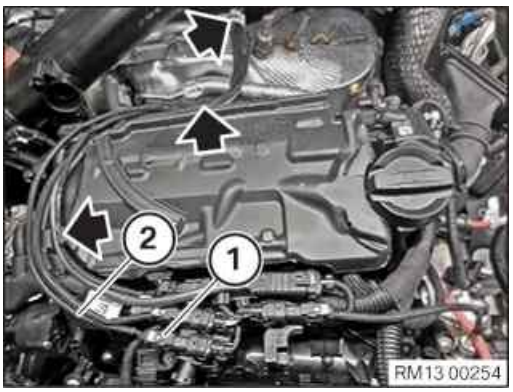


- Feed in and install the exhaust temperature sensor (1).

- Tighten the exhaust temperature sensor (1) with conventional tools (2).

Exhaust temperature sensor to diesel particulate filter

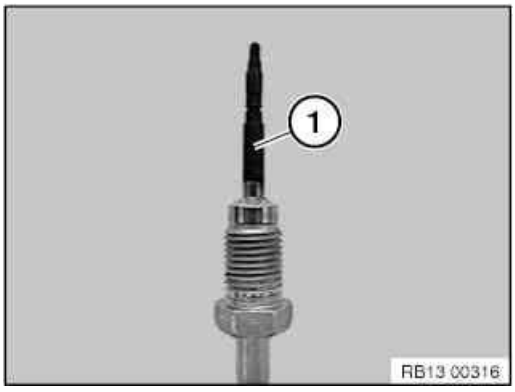
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

53 – Installing exhaust temperature sensor on catalytic converter



RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.

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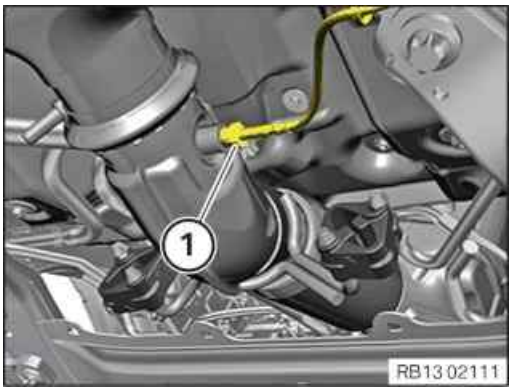
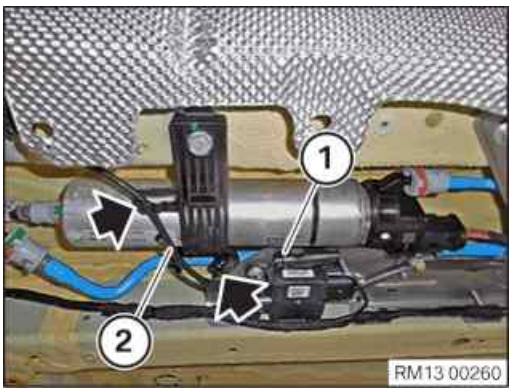


- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

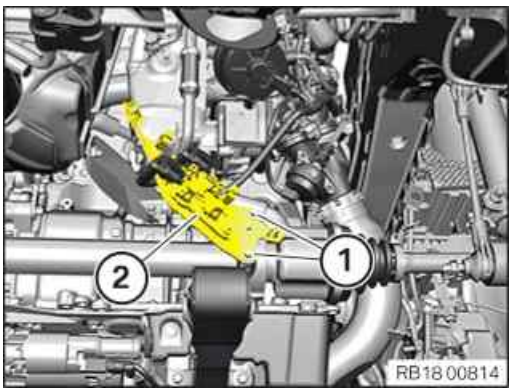
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

54 – Install holder for oxygen sensor

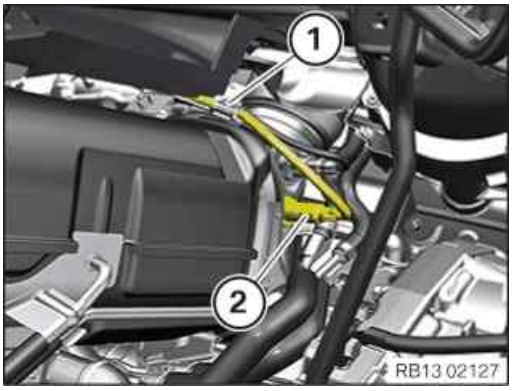


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

55 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm

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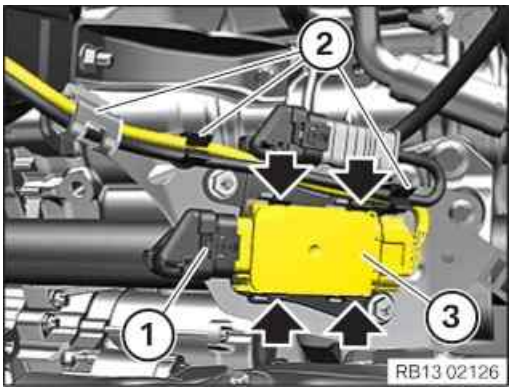


- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

56 – Install the monitoring sensor

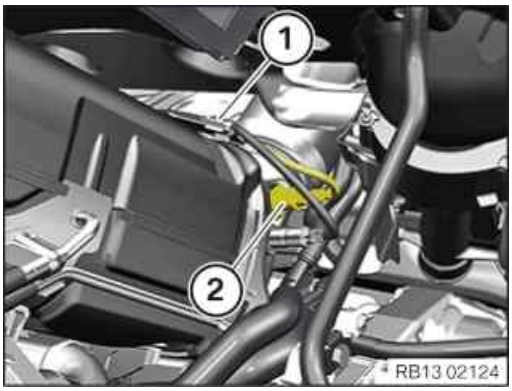
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

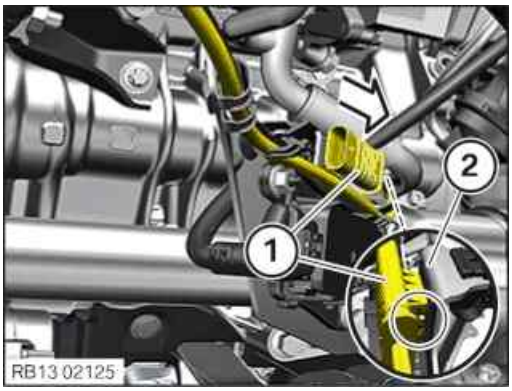


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

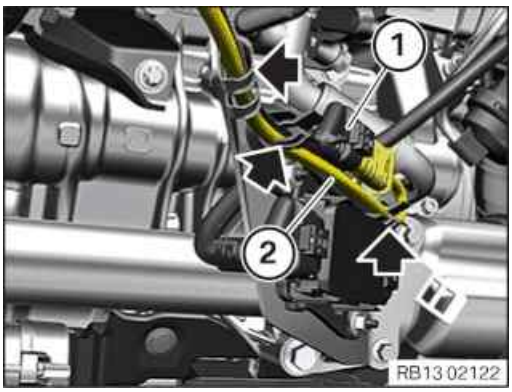
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

57 – Installing starter motor

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CAUTION

Improper routing of the positive battery cable.

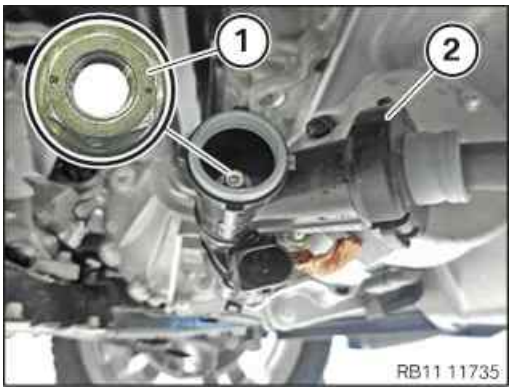
Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

58 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

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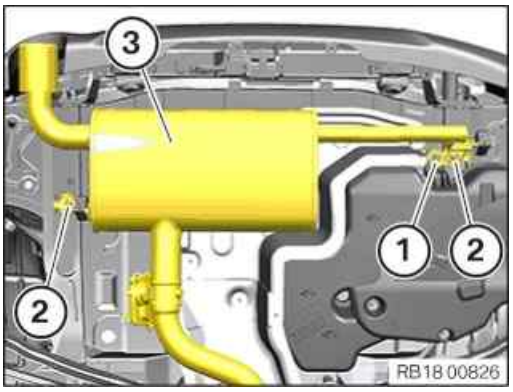
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.



- Insert and install the exhaust system (3) with the help of another person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

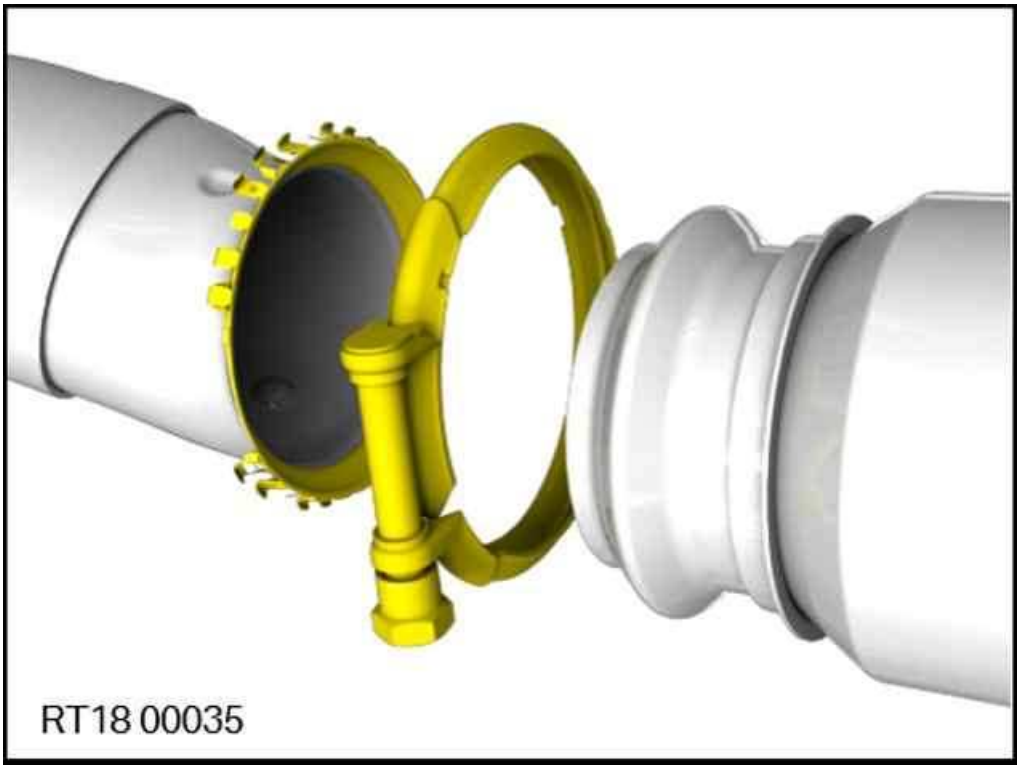
- Tighten down screw (1).

Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

▸ **Install the V-clip**

V-band clamp



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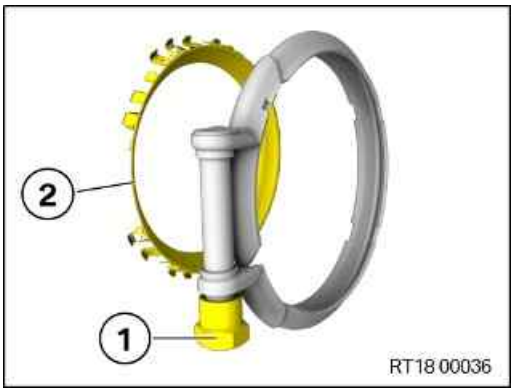
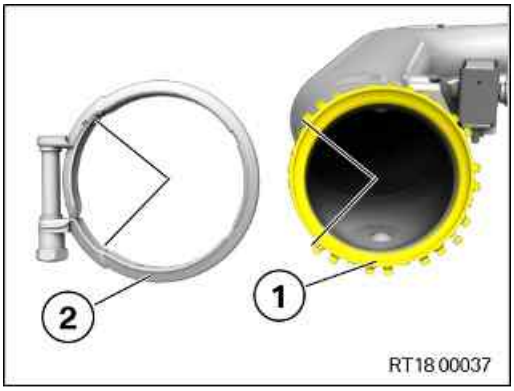
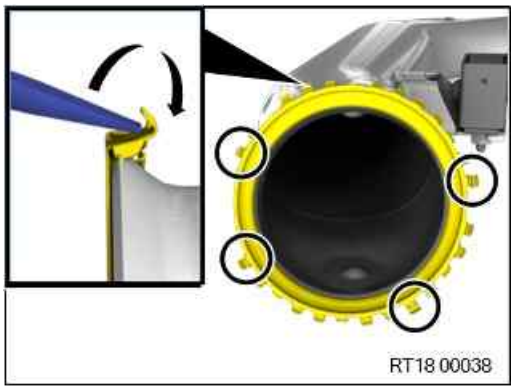


- Unscrew the nut (1) and remove the sealing ring (2).

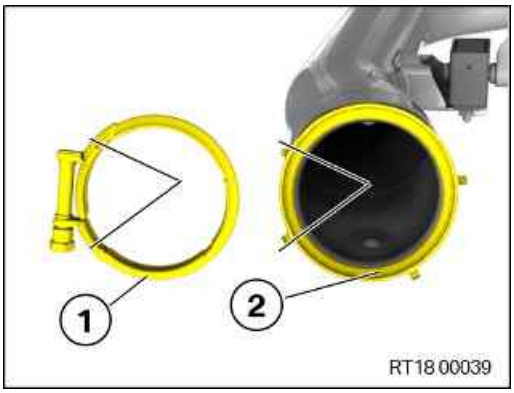


- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.



- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).

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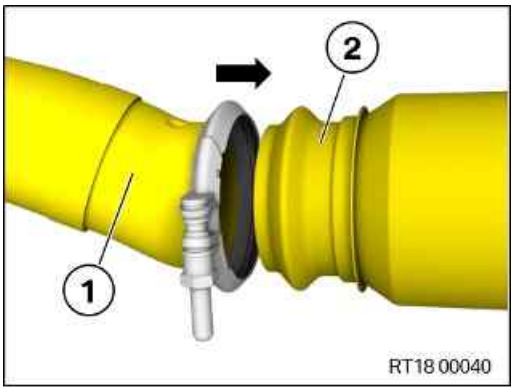
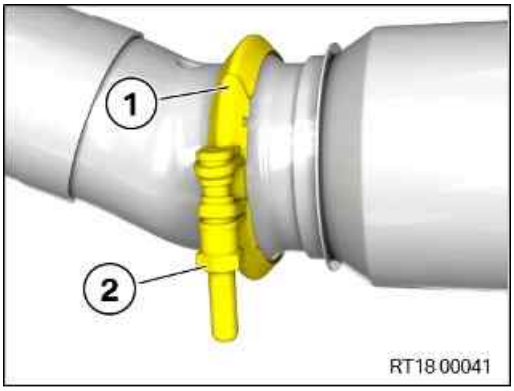


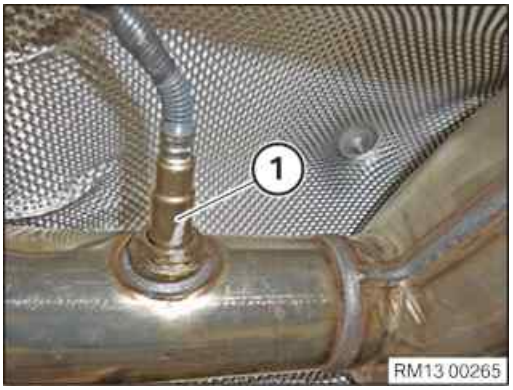
- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.



- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

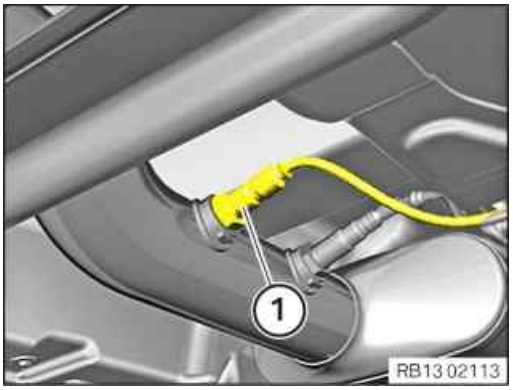
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Guide in, position and tighten the diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

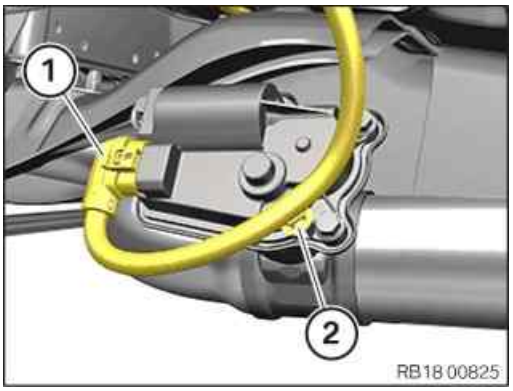
Sensor		Tightening torque	50 Nm



- Guide in, position and tighten the nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

59 – Install the cross-member with torsion struts

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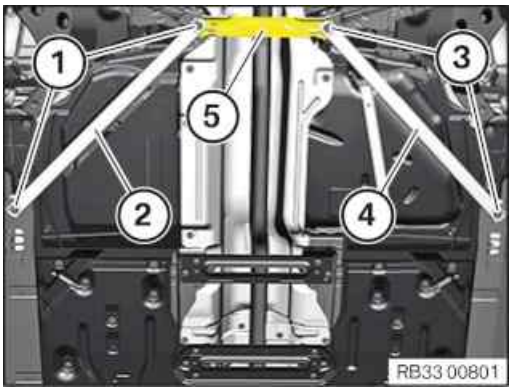


- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

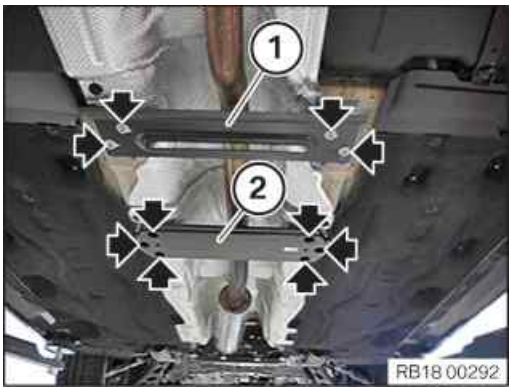
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

60 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

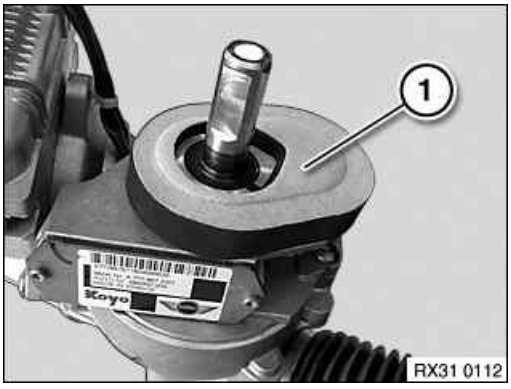
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

61 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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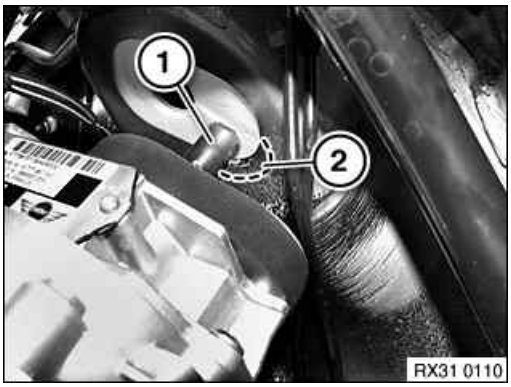
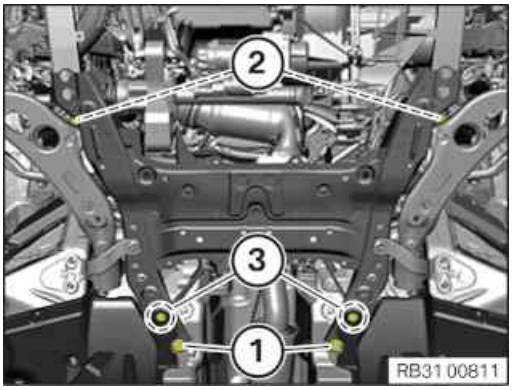


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

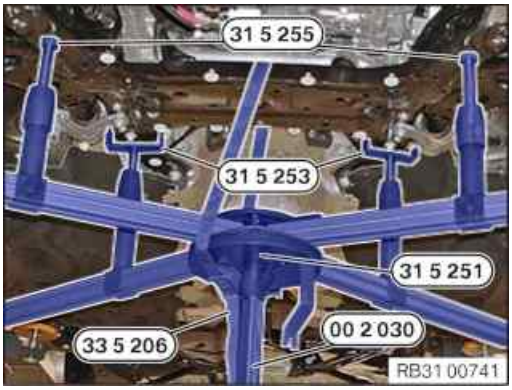
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.

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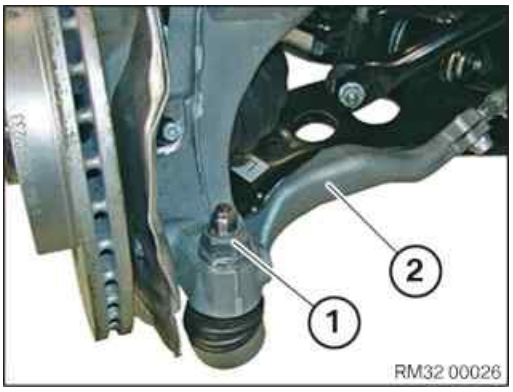


NOTICE

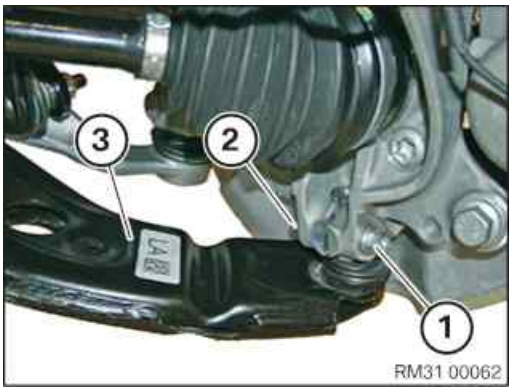
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

62 – Install the mounted parts on the front axle support

NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

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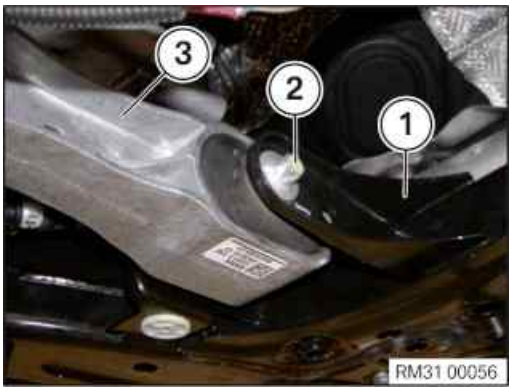
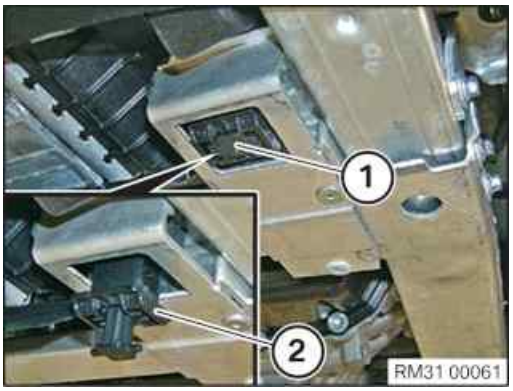


- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

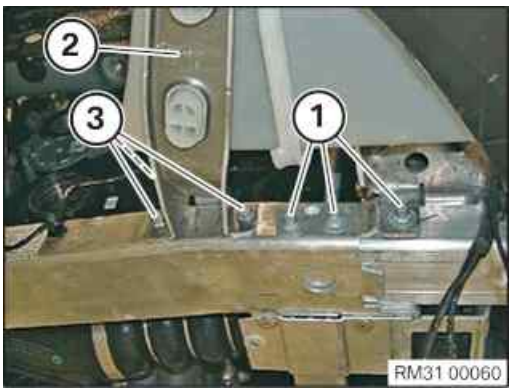
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

63 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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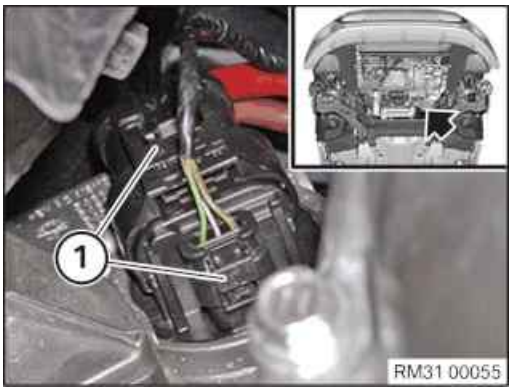
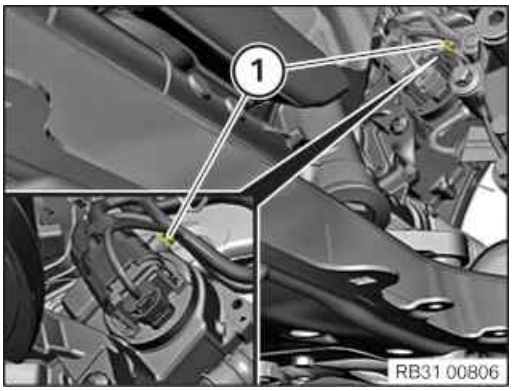
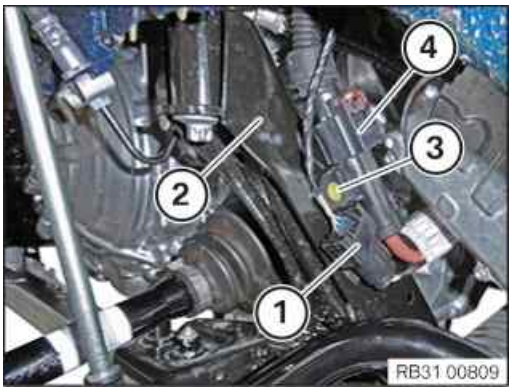


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▶ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

64 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

65 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Fastening anti-roll bar on the anti-roll bar link**

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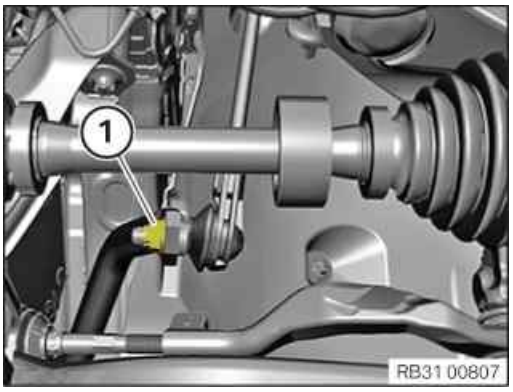


- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

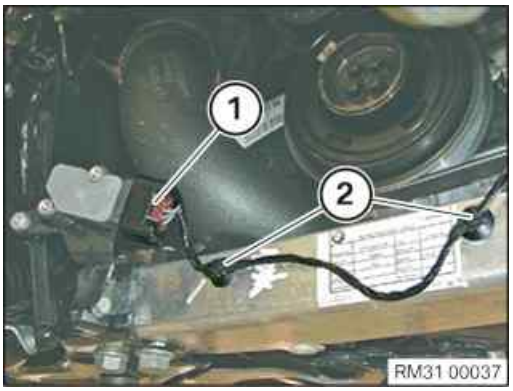
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

66 – With right installation: Securing the cable for the ride height sensor



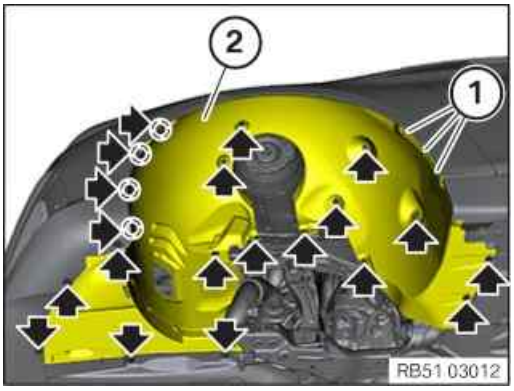
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

67 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

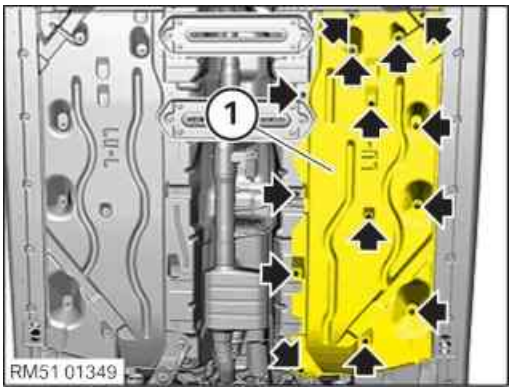
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

68 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

69 – If installed: Installing underbody protection at rear

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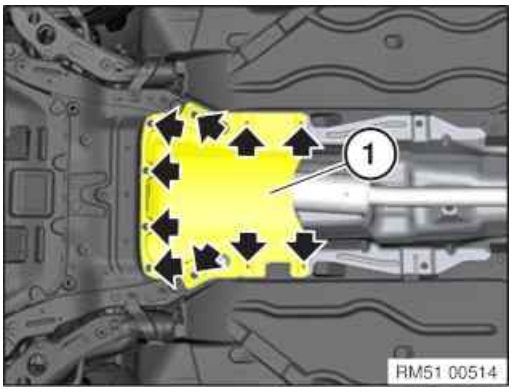
69 – If installed: installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

70 – Mount the front left and right wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

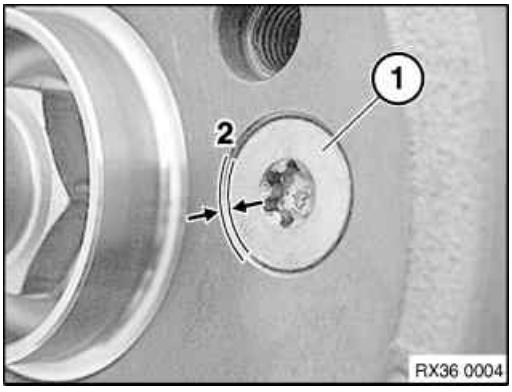
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm

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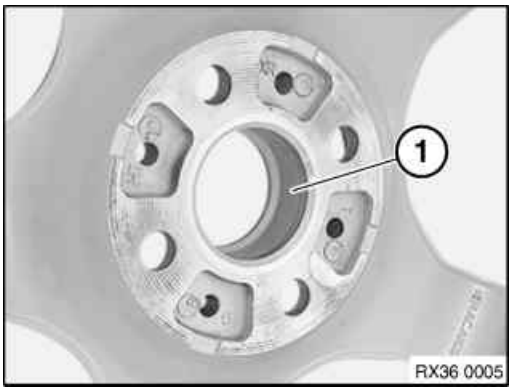

- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

◁

TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.		
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Check	140 Nm

71 – Removing fastener for left and right radiator

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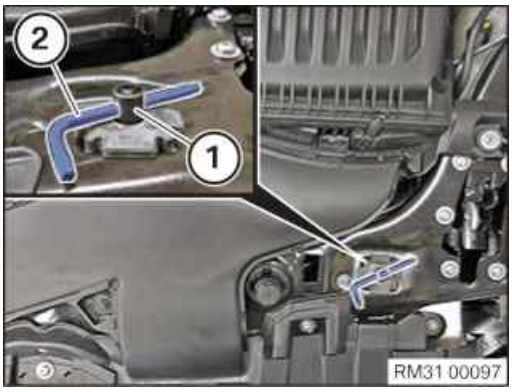
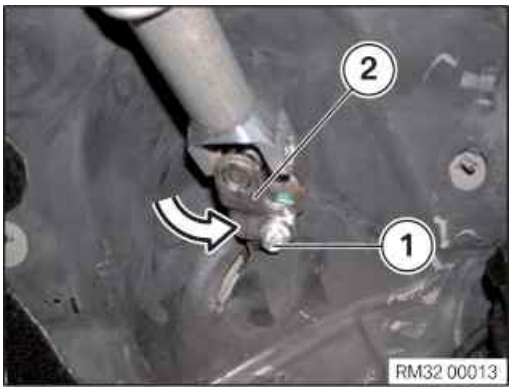


NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

72 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

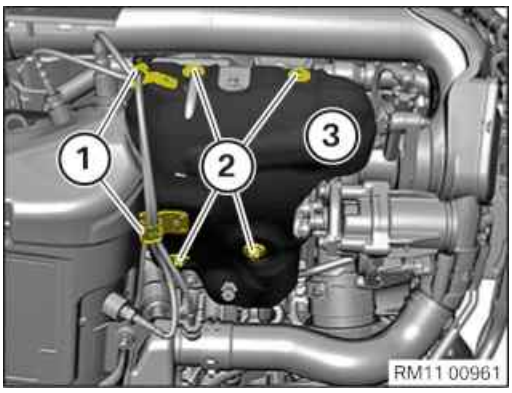
73 – Install the heat shield on the exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

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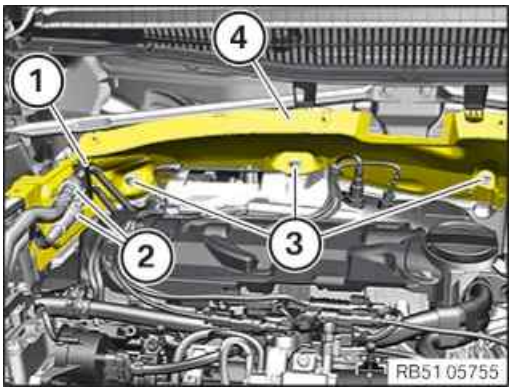
74 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

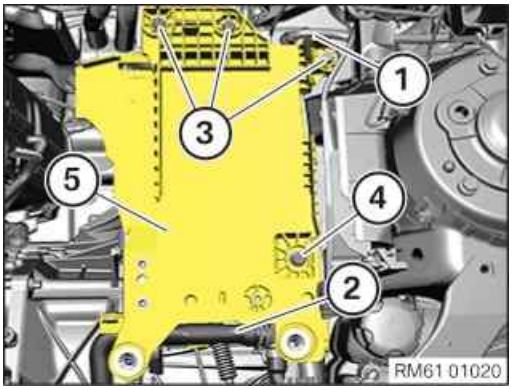
Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

75 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

76 – Install electronics box

Prerequisite

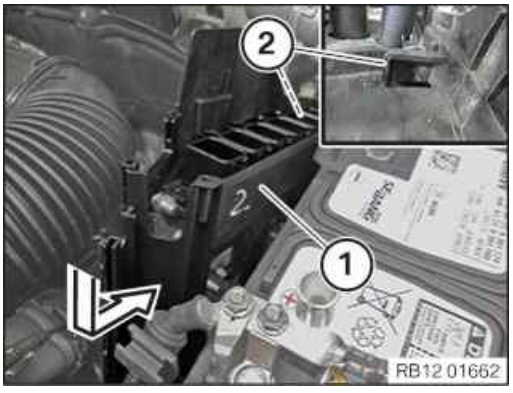
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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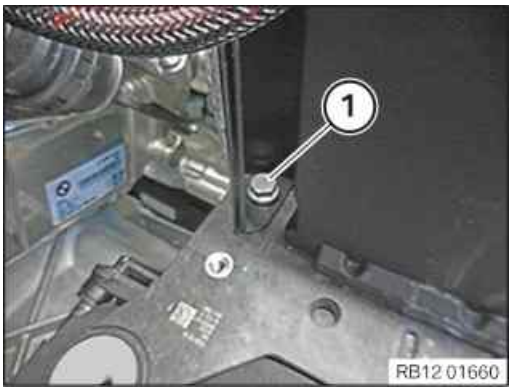
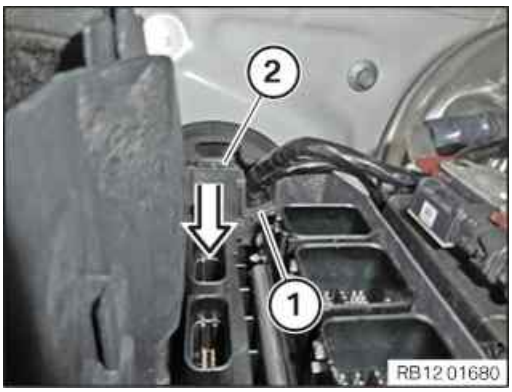
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



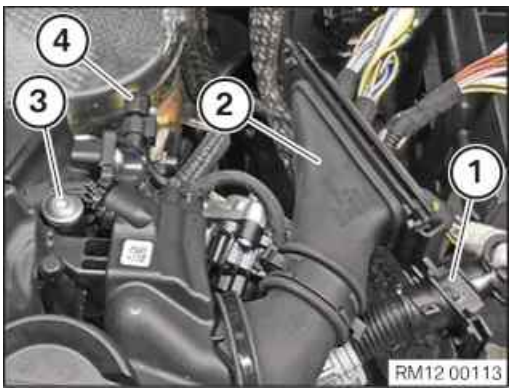
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

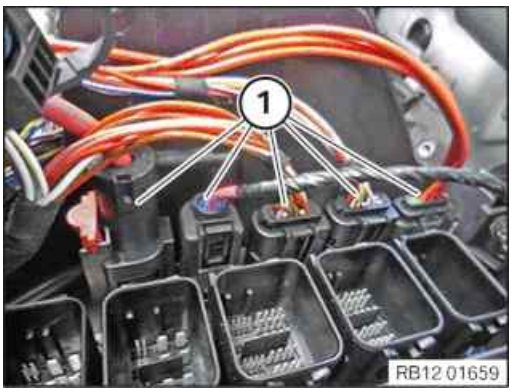


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

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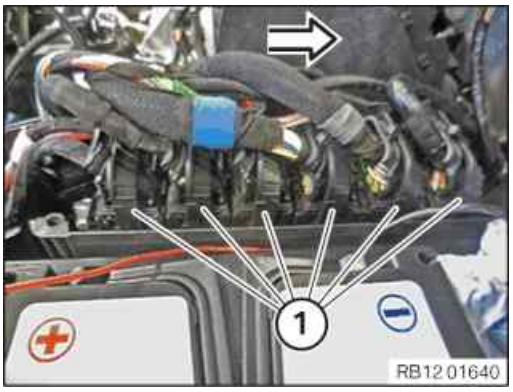
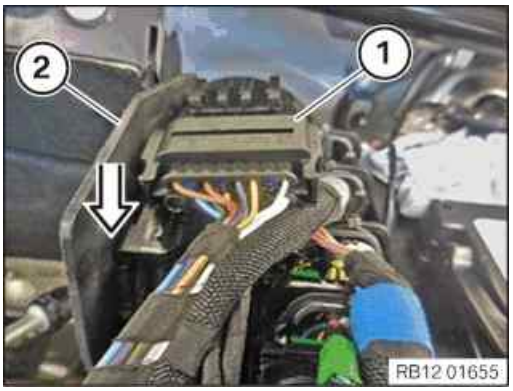
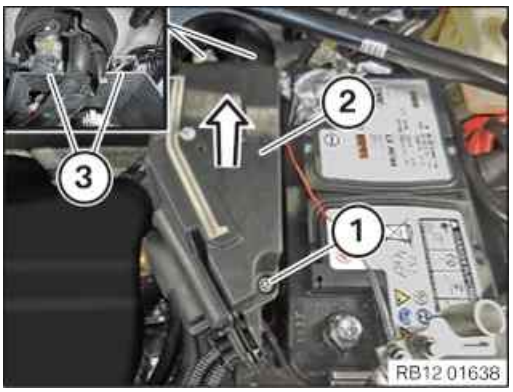


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



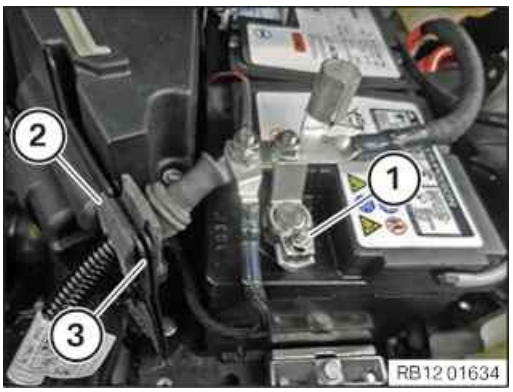
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

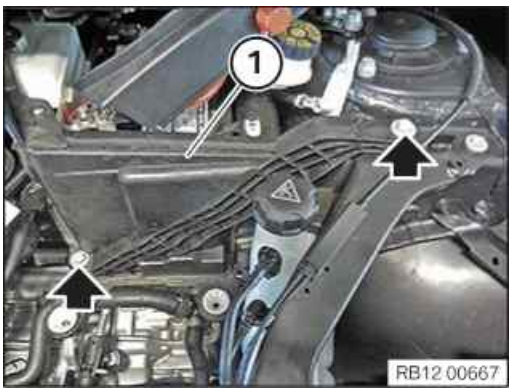
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

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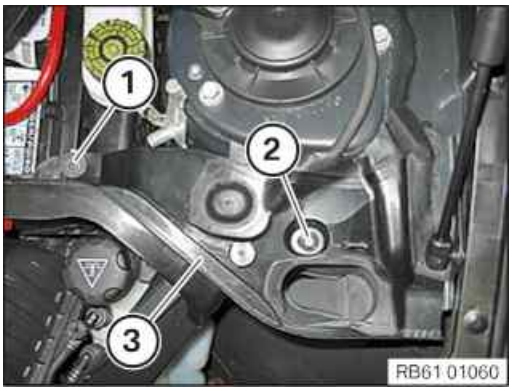
- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

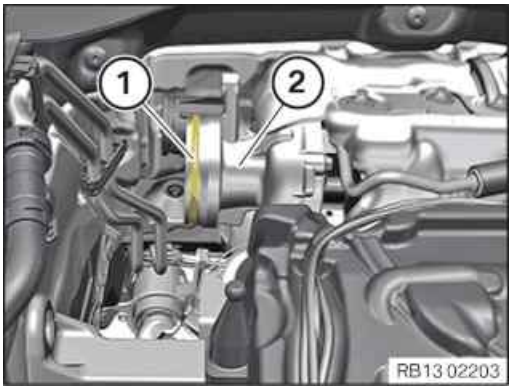


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

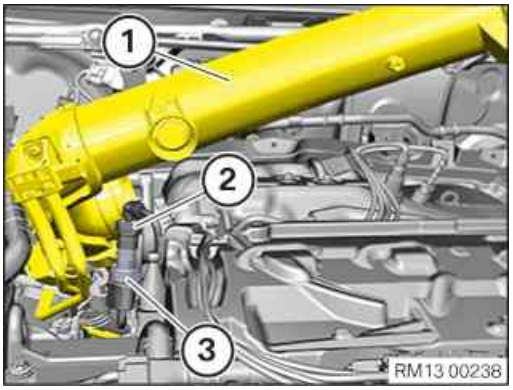
Battery cover

Screw		2,8 Nm

77 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



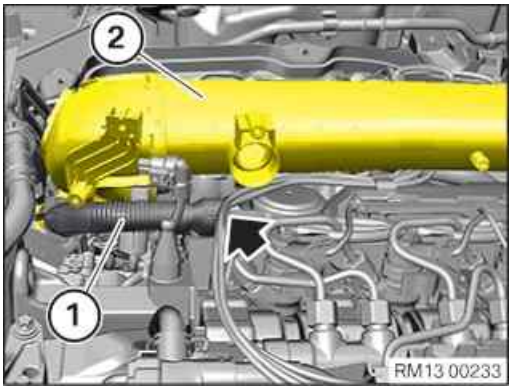
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.

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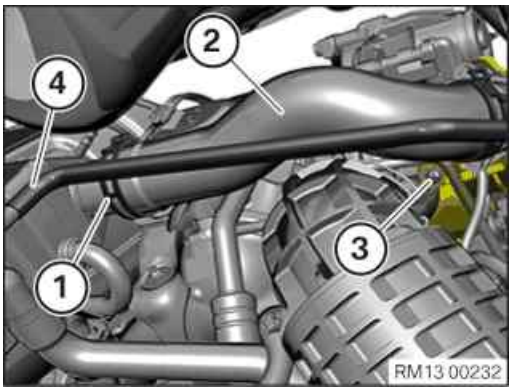


- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

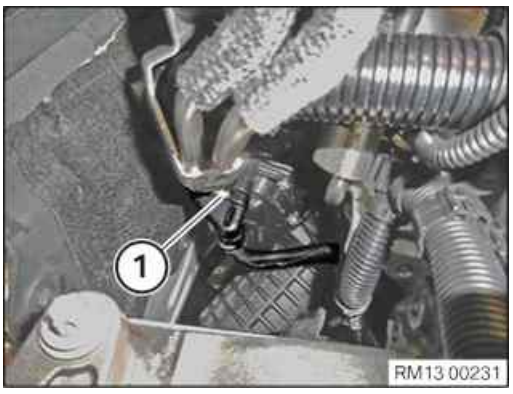
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

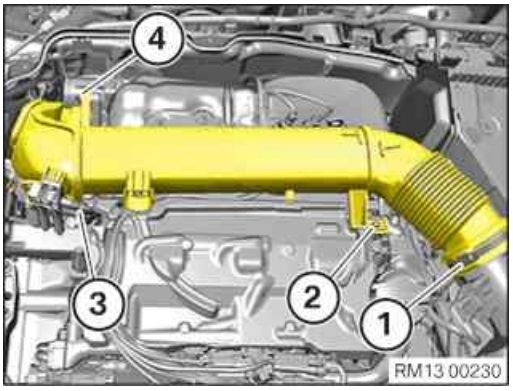
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

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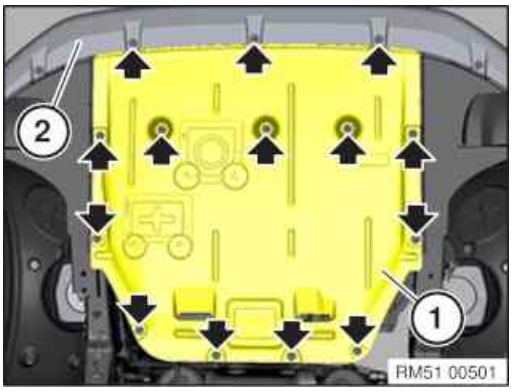
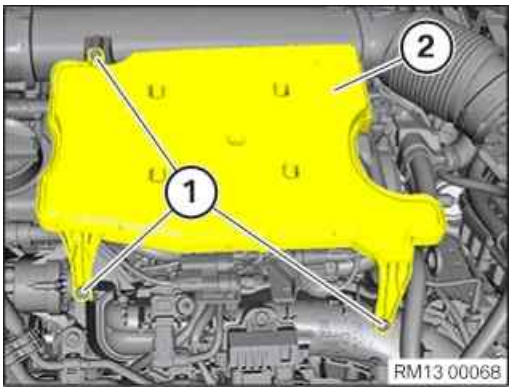


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

79 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

80 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

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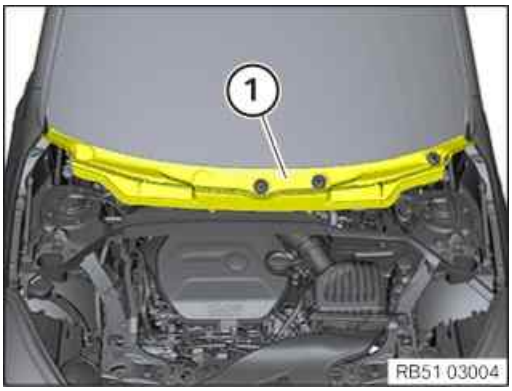
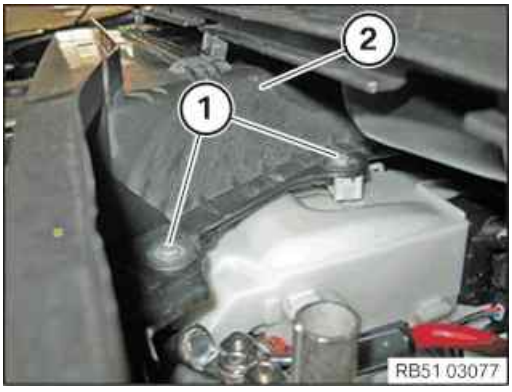
- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

81 – Install the rear cowl panel cover



- Feed in and engage the rear cowl panel cover (1).

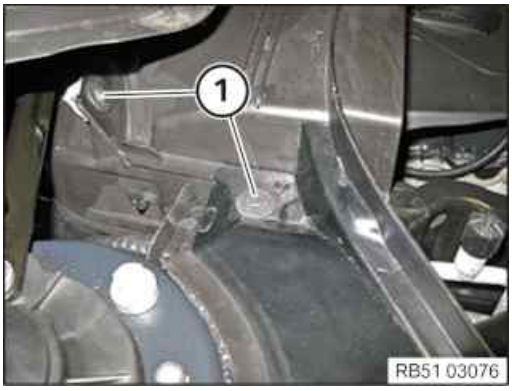
82 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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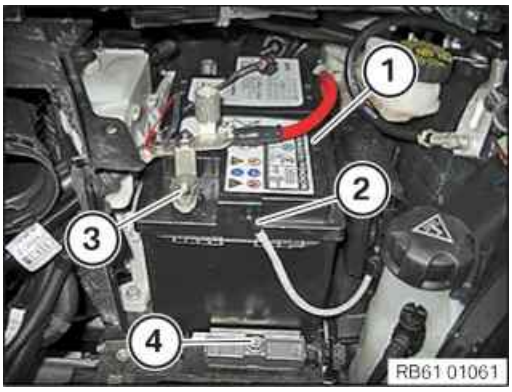
83 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

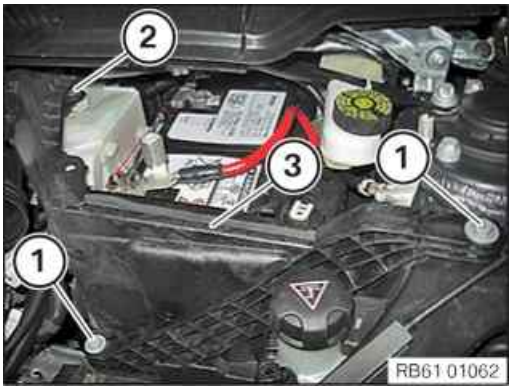
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

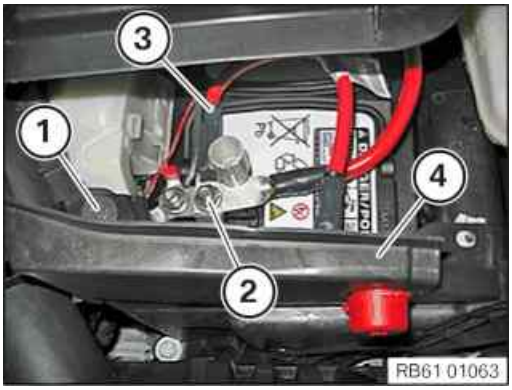
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

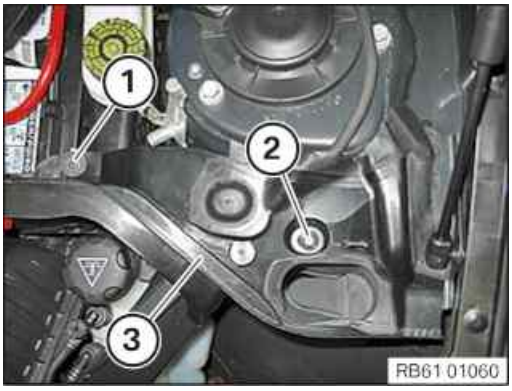
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

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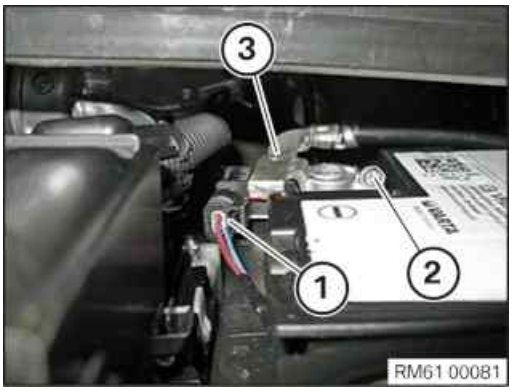
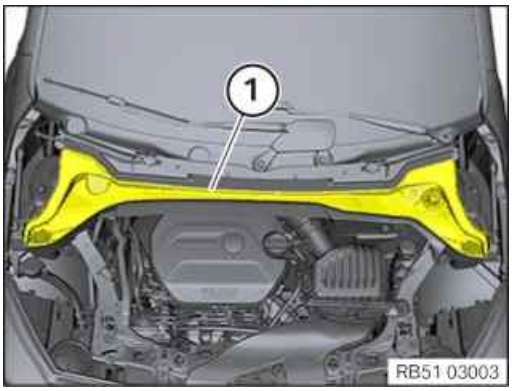


- Position the negative battery terminal (3).
- Tighten nut (2).

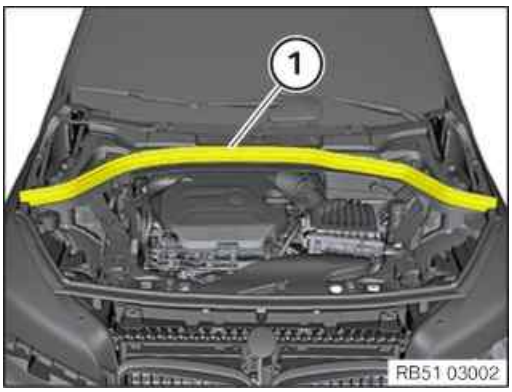
Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.



- Feed in the cowl panel cover (1).



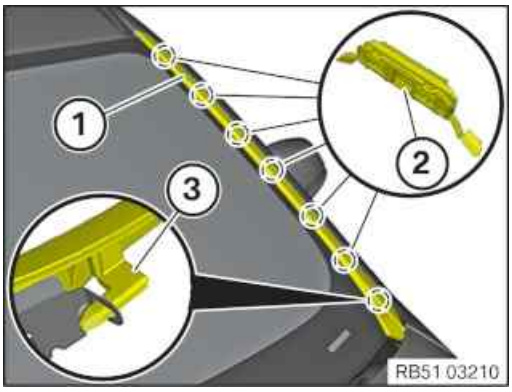
- Press the gasket (1) in a downwards direction.

84 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

85 – Install left and right wiper arm

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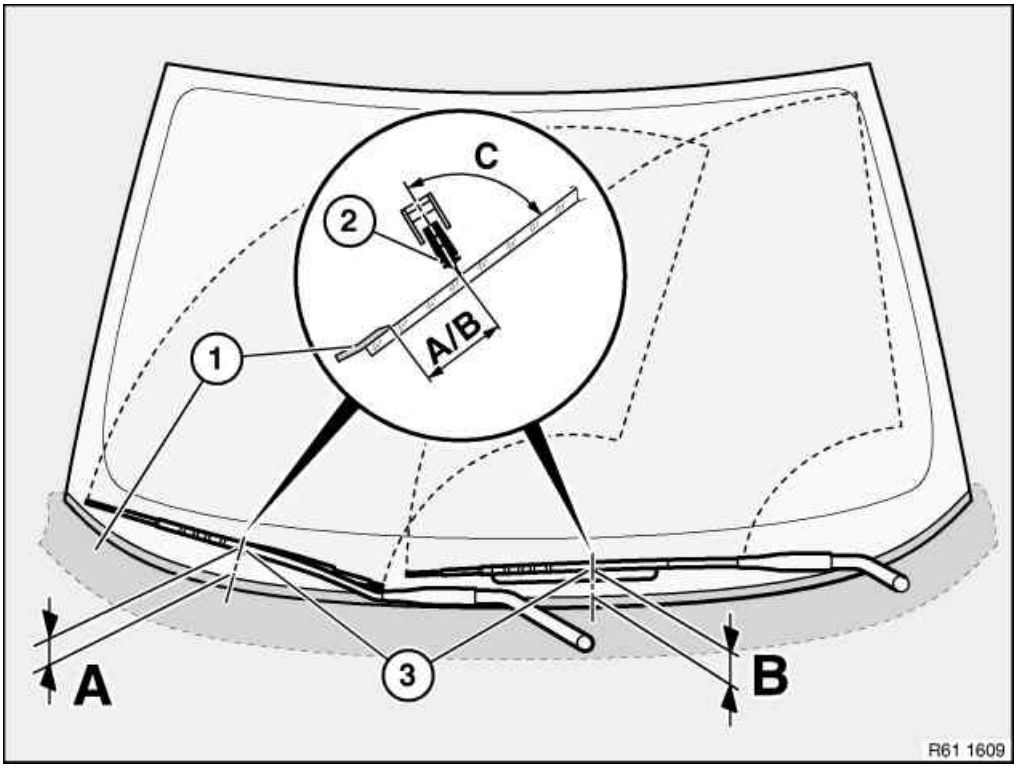
NOTICE

Description is for left component only. Procedure on the right side is identical.

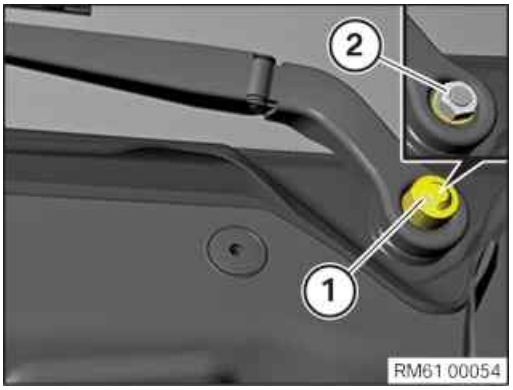
▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

86 – Installing intake silencer housing

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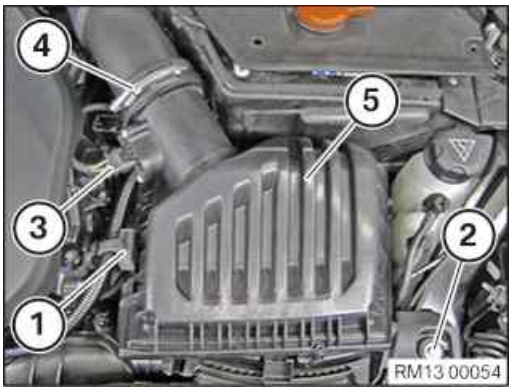


- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

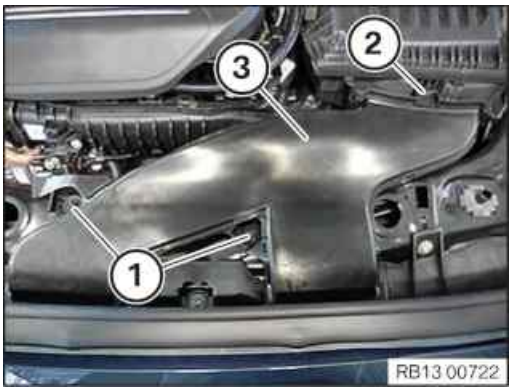
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

87 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

Oil feed line on cylinder head — Used in step 45

M6x12		Tightening torque	8 Nm

Oil feed line to exhaust turbocharger — Used in step 45

Hollow bolt	Renew sealing rings.	Jointing torque Angle of rotation	10 Nm 45 °

Heat shield for exhaust turbocharger — Used in step 46 47 73

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head — Used in step 46

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger — Used in step 48

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

Diesel particle filter to holder — Used in step 48

M8 hexagon nut		Tightening torque	19 Nm

SCR metering module V-clip to exhaust system — Used in step 48

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

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Holder for coolant lines to diesel particulate filter — Used in step 48

Torx bolt BM6x16		Tightening torque	8 Nm

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter — Used in step 48

Flange nutM8		Tightening torque	19 Nm

Differential pressure sensor to holder — Used in step 49

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 49 77

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor — Used in step 50

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter — Used in step 51 52

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 53

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft — Used in step 54

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter — Used in step 55

Sensor		Tightening torque	50 Nm

Monitoring sensor — Used in step 56

Sensor		Tightening torque	50 Nm

Starter motor to transmission — Used in step 57

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 57

M8		Tightening torque	13,5 Nm

Exhaust system to body — Used in step 58

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 58

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 58

V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system — Used in step 58

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter — Used in step 58

Sensor		Tightening torque	50 Nm

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Cross-member/torsion strut to axle support and mounting

Used in step 59

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body

Used in step 60

M10x18		Tightening torque	56 Nm

Rear connection carrier to body

Used in step 60

M8x18		Tightening torque	28 Nm

Rear end of front axle support to body

Used in step 61

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body

Used in step 61

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body

Used in step 61 69

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing

Used in step 61

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing

Used in step 61

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body

Used in step 62

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support

Used in step 62

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate

Used in step 62

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier

Used in step 62

		Tightening torque	11,8 Nm

Holder to front axle support

Used in step 63

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

Anti-roll bar link to anti-roll bar

Used in step 65

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body

Used in step 67

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Used in step 67

Plastic nut		Tightening torque	3 Nm

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Underbody panelling, side — Used in step 68

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side — Used in step 68

Plastic nut		Tightening torque	2,6 Nm

Brake disc to front wheel hub — Used in step 70

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub — Used in step 70

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 70

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear — Used in step 72

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead — Used in step 72

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead — Used in step 74

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support — Used in step 75

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray — Used in step 76

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 76

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 76

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 76

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 76

M8		Tightening torque	19 Nm

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Positive battery connection point cover to engine compartment partition wall — Used in step 76

		Tightening torque	3 Nm

Battery cover — Used in step 76 83

Screw			2,8 Nm

Exhaust gas pressure sensor — Used in step 77

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 77

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 77

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 77 86

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 78

			3 Nm

Resonator to manifold and clean air pipe — Used in step 79

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 82

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 83

M8 screw			19 Nm

Positive battery terminal — Used in step 83

NutM6			5 Nm

Trailing link — Used in step 83

M8 screw			19 Nm

Positive battery cable to battery terminal — Used in step 83

Nut M8			15,2 Nm

Negative battery terminal (with IBS) — Used in step 83

NutM6			5 Nm

Windscreen wiper arm — Used in step 85

Combination hexagon nut		Tightening torque	35 Nm

Intake silencer housing to lock bridge — Used in step 86

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 87

M6		Tightening torque	8 Nm

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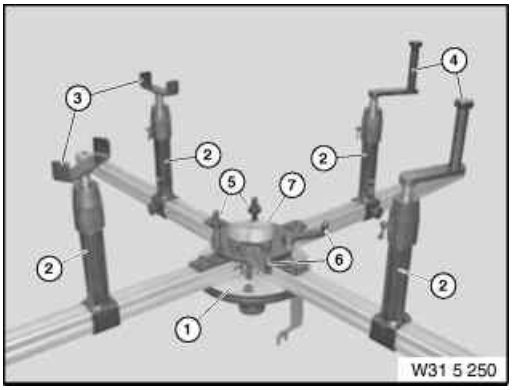
Overview of Special Tools

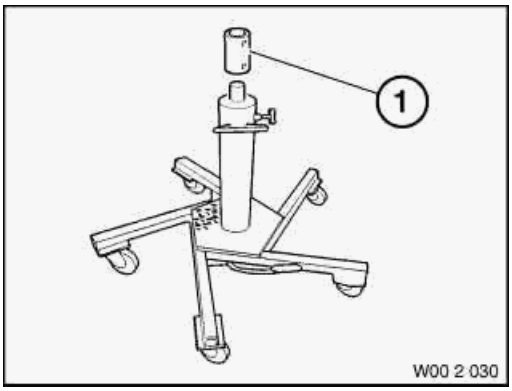
0 495 817 (31 5 251) Basic body



Common Used in step 27 61

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



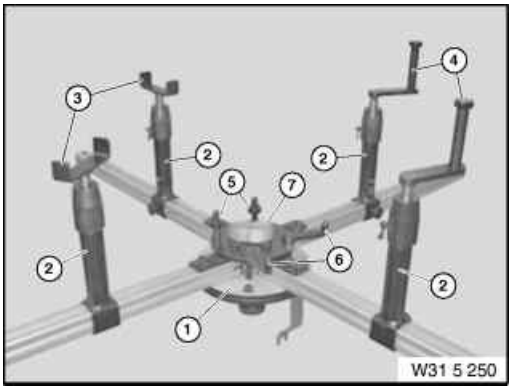
Common Used in step 27 61

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

0 495 821 (31 5 255) Adapter



Common Used in step 27

Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

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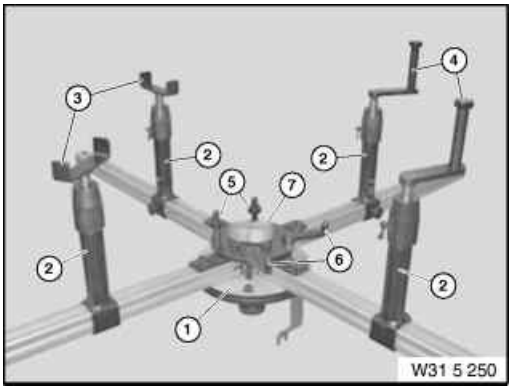
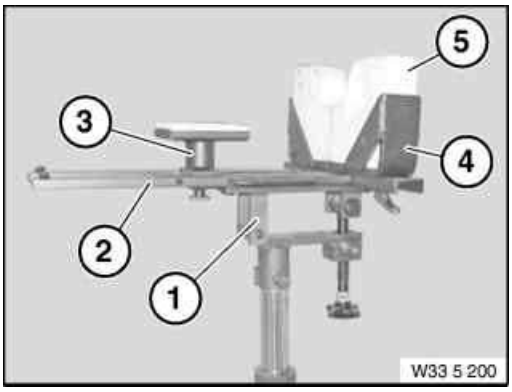
0 495 819 (31 5 253) Adapter



Common	Used in step 27
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt



Common	Used in step 27 61
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

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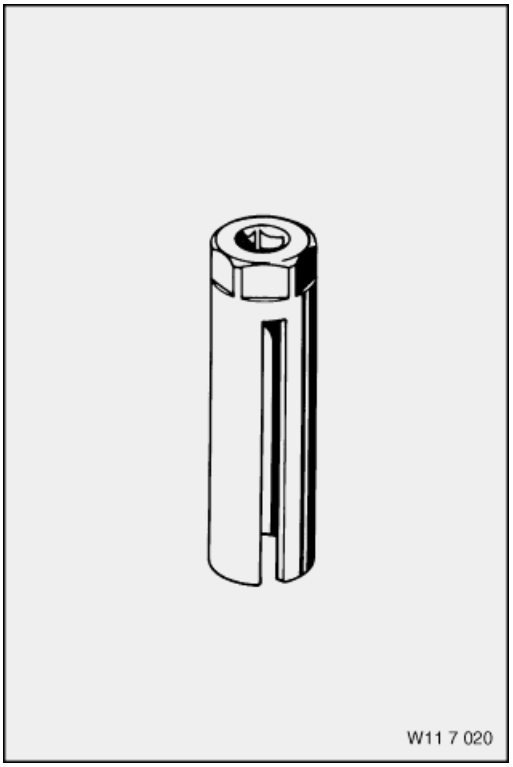
0 491 074 (11 7 020) Socket wrench insert



Common	Used in step 33 34 56
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

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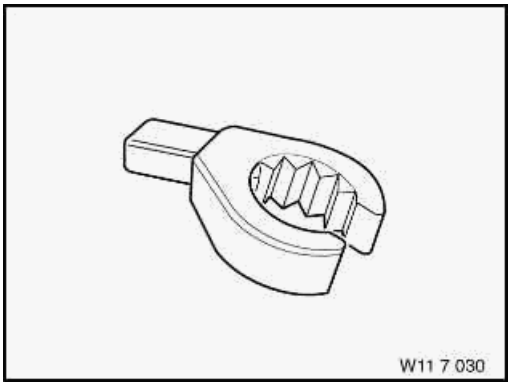
0 491 075 (11 7 030) Socket wrench insert



Common	Used in step 39 50
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

2 344 011 Tool

Common	Used in step 70
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 18
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 18
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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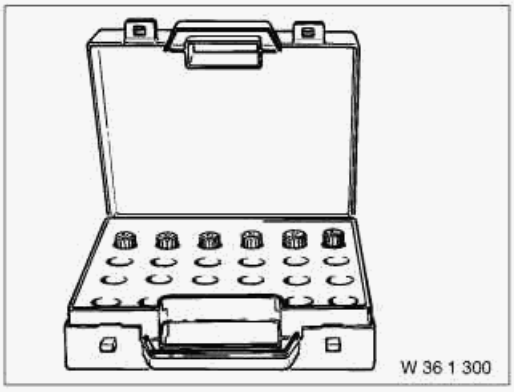
0 495 225 (36 1 327) Wheel stud



Common	Used in step 18
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 18
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 18
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 18
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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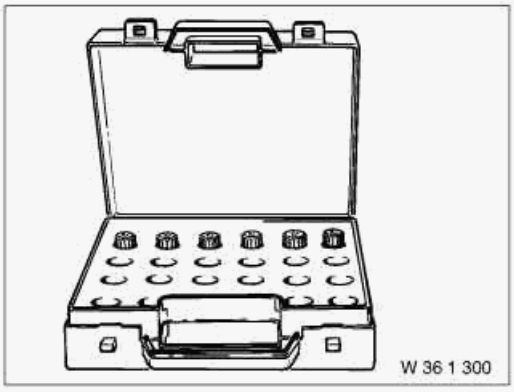
0 495 229 (36 1 332) Wheel stud



Common	Used in step 18
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 18
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Links

Functional descriptions	Used in step
Troubleshooting on the exhaust turbocharger	

General repair instructions	Used in step
61 20 ... Notes on AGM battery	3 83
61 12 ... Notes on intelligent battery sensor (IBS)	3 83
61 00 ... Notes for disconnecting and connecting battery	3 83

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 33 34 36 37 38 39 40
11 65 020 Turbocharger damage due to blocked oil supply lines	

Operating materials	Used in step
2.0 Grease for wheel centring	70

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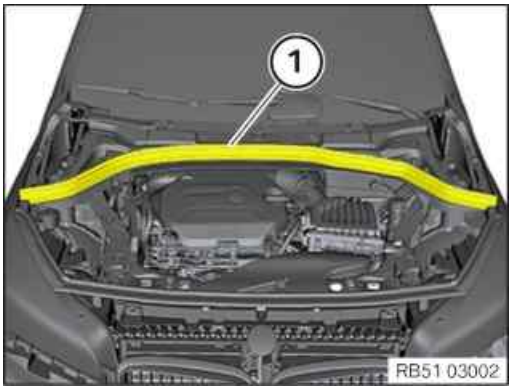
11 42 210 Removing and installing/sealing or replacing oil return line for exhaust turbocharger

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

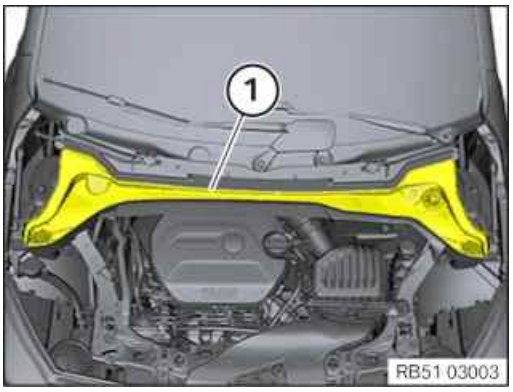
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

2 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

3 – Removing the upper bulkhead cover

- Loosen screws (1).

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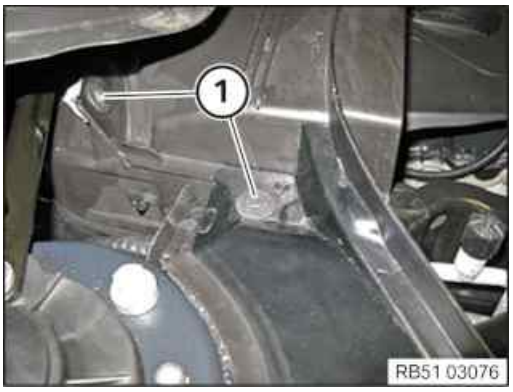
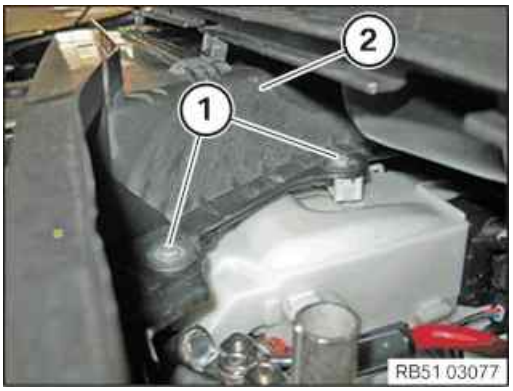


- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

4 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

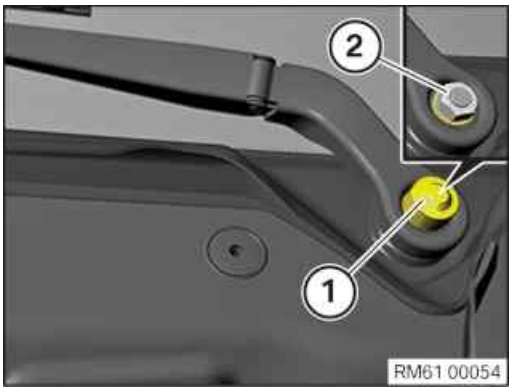
▶ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).

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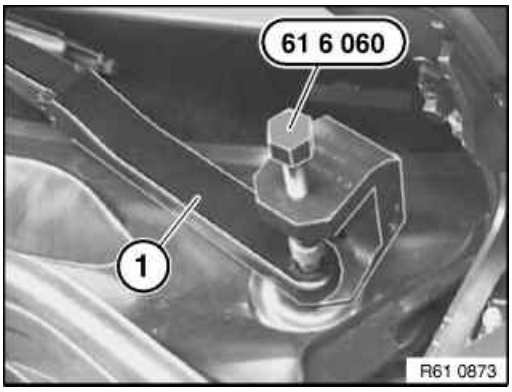


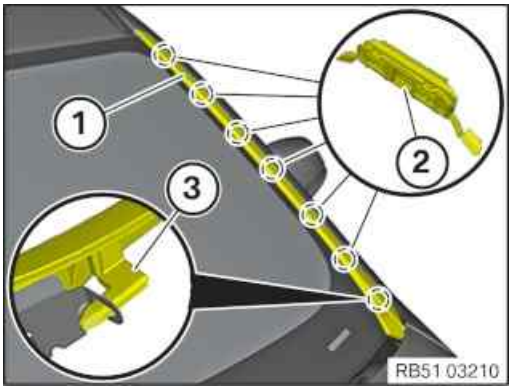
- Pull off the wiper arm (1) using special tool .

5 – Remove the gutter strip on the windscreen on the left and right

NOTICE

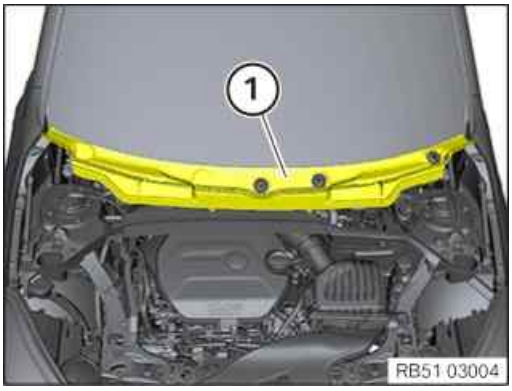
Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

6 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

7 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

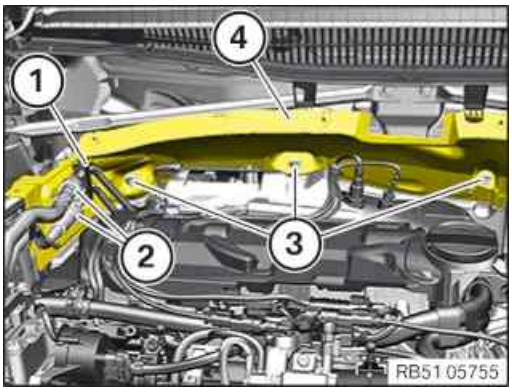
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

8 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

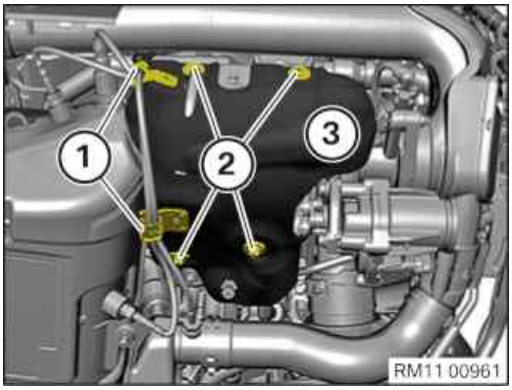
9 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).

10 – Removing the front underbody protection

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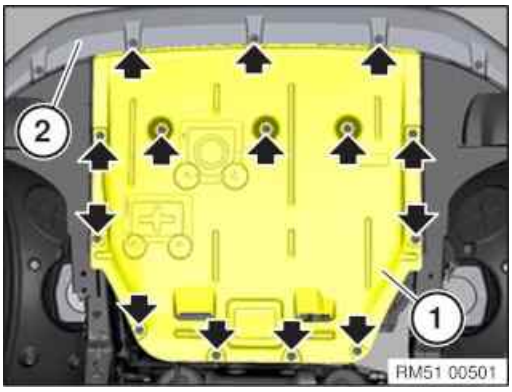


- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

MAIN WORK

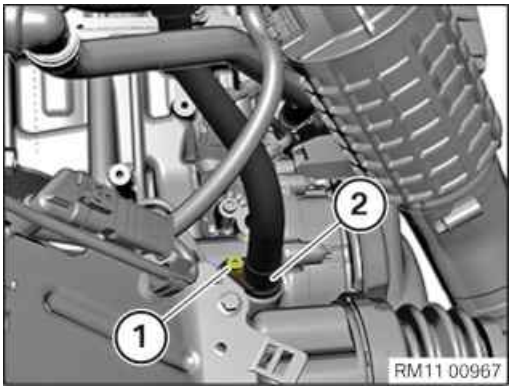
11 – Removing the oil return line for the exhaust turbocharger

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screw (1).
- Pull the oil return line (2) out of the crankcase.

- Loosen screws (1).
- Feed out and remove oil return line (2) downwards.

12 – Installing the oil return line for the exhaust turbocharger

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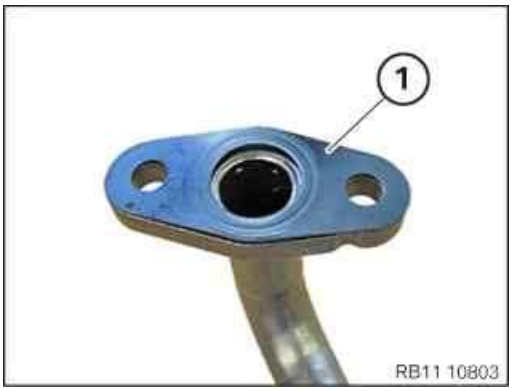
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

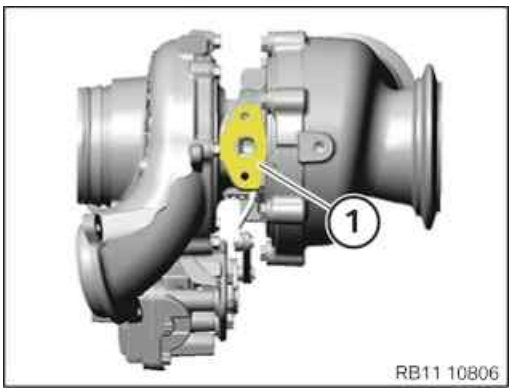
- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Renew gasket (1).

  Parts: Gasket

- Check the O-ring (1) for damage and renew as needed.



RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface (1).

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

- Do not use any metal-cutting tools.

- Clean sealing surface.

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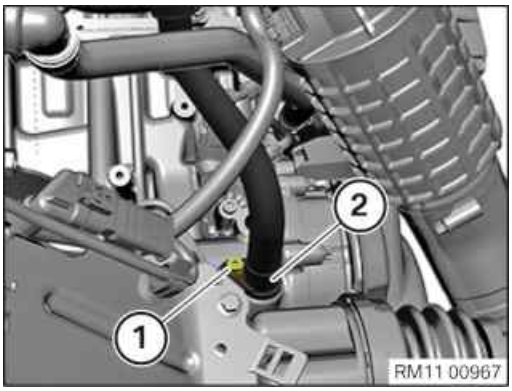
- Feed in and install the oil return line (2) for the exhaust turbocharger.
- Ensure that gasket is correctly seated.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm



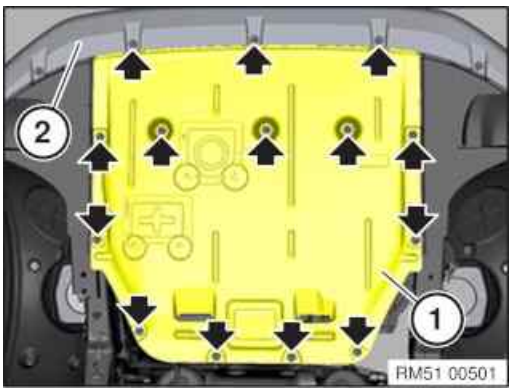
- Install oil return line (2) into crankcase.
- Make sure the O-ring is not damaged.
- Tighten down screw (1).

Oil return line to crankcase

M6x12		Tightening torque	8 Nm

POSTPROCESSES

13 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

14 – Install the heat shield on the exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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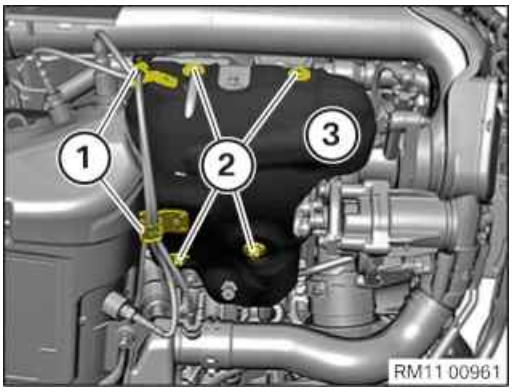

- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

15 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

16 – Installing rear bulkhead upper part

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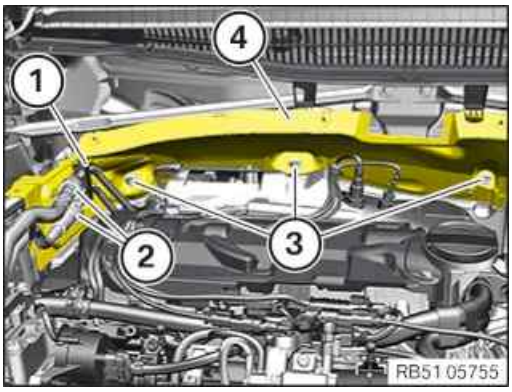


- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

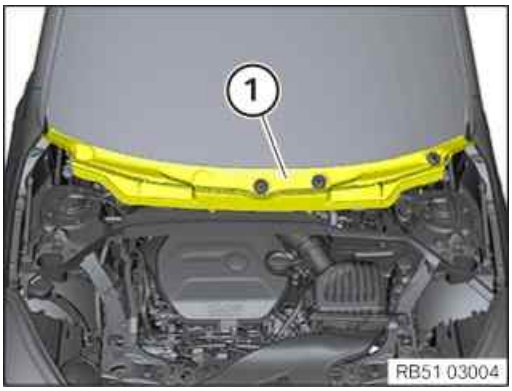
Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

17 – Install the rear cowl panel cover



- Feed in and engage the rear cowl panel cover (1).

18 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.

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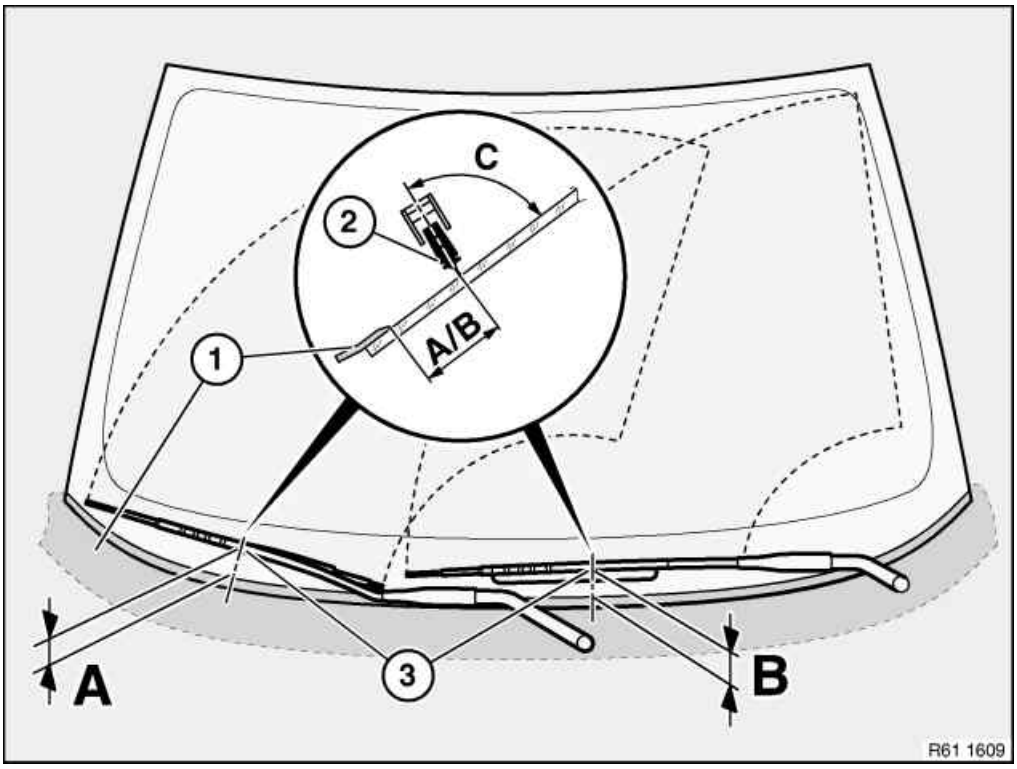
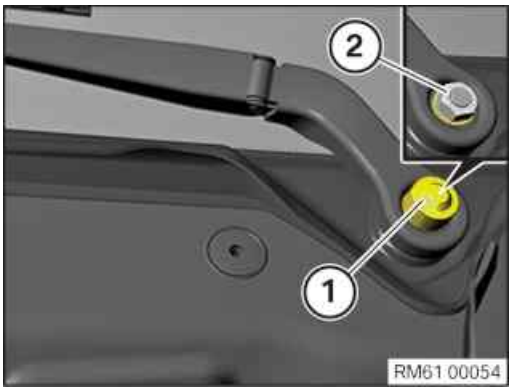


- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

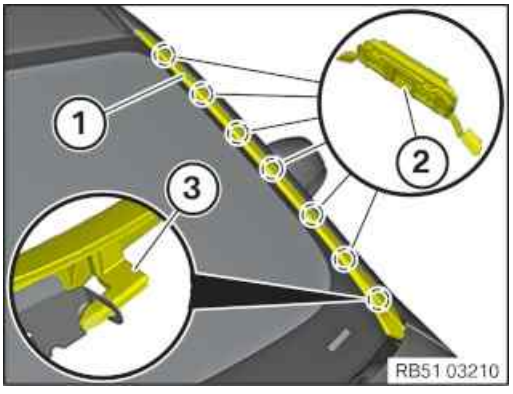
- Connect the protective cap (1).

19 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

20 – Installing the upper bulkhead cover

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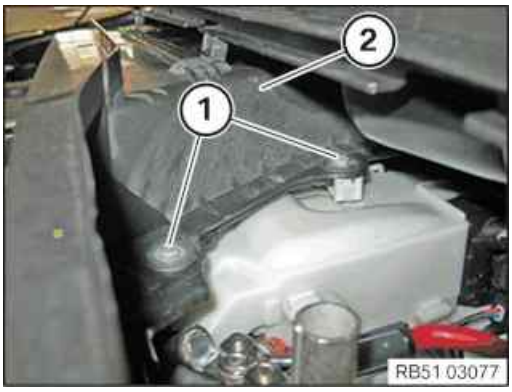
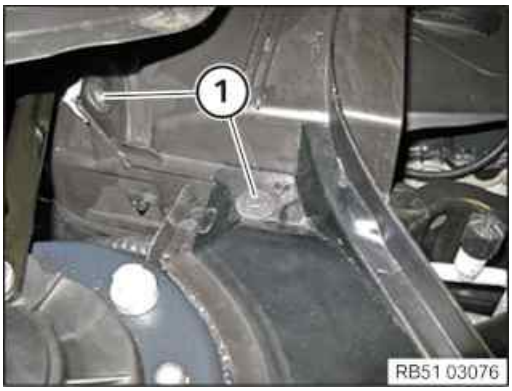


- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

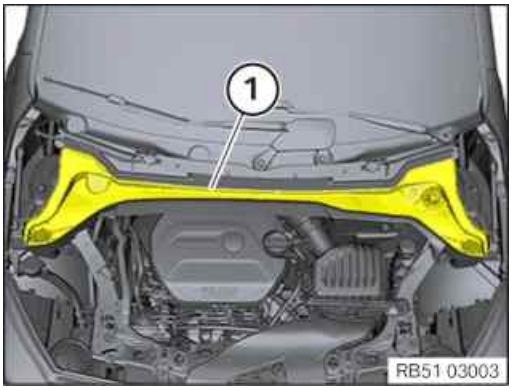
Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

21 – Installing front cowl panel cover



- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

22 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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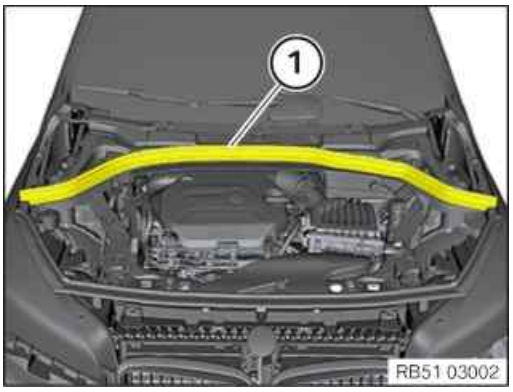

- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

Additional Information

Overview of Tightening Torques

Oil return line to turbocharger			Used in step 12
M6x12		Tightening torque	8 Nm

Oil return line to crankcase			Used in step 12
M6x12		Tightening torque	8 Nm

Underbody protection front			Used in step 13
			3 Nm

Heat shield for exhaust turbocharger			Used in step 14
Torx screw BM 6x12		Tightening torque	10 Nm

Rear bulkhead upper part to lower section of bulkhead			Used in step 16
Oval-head screw		Tightening torque	5 Nm

Windscreen wiper arm			Used in step 18
Combination hexagon nut		Tightening torque	35 Nm

Bulkhead cover, top			Used in step 20
Screw		Tightening torque	3 Nm

Overview of Special Tools

Overview Technical Data

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11 42 827 Replace control valve of central piston cooling

WARNING

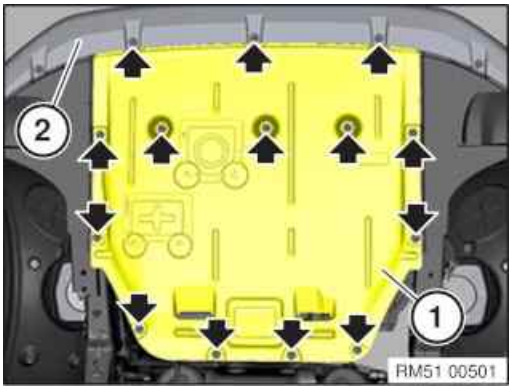
Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

PRELIMINARY WORK

1 – Removing the front underbody protection



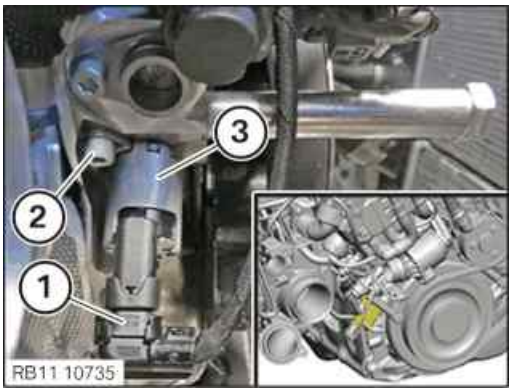
- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

MAIN WORK

2 – Removing the control valve for central piston cooling

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Unlock plug connection (1) and disconnect.
- Loosen screw (2).
- Remove the control valve (3) for central piston cooling.

3 – Installing the control valve for central piston cooling

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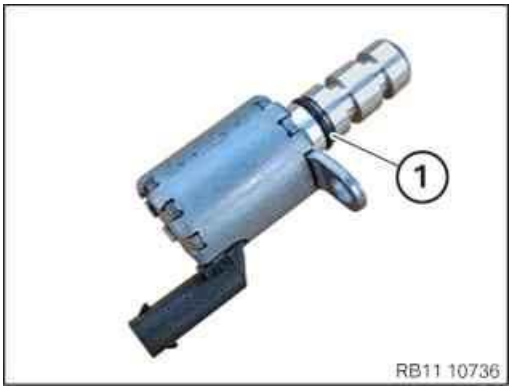
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Renew the gasket (1) using the special tool **0 496 714 (00 9 030)**.

  Parts: Gasket

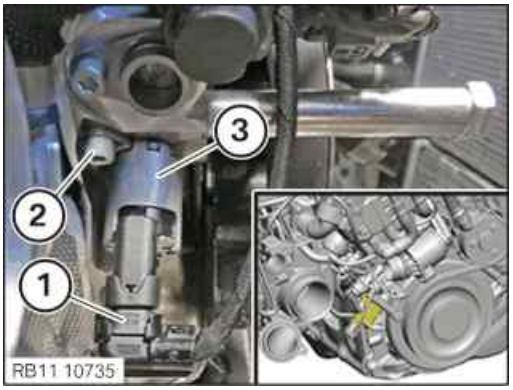
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Clean sealing surface.



- Install the control valve (3) for central piston cooling.
- Tighten down screw (2).

Central piston cooling valve to crankcase

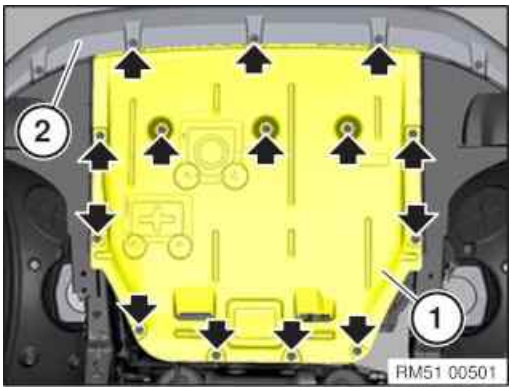
M6x16		Tightening torque	8 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

POSTPROCESSES

4 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

5 – Check engine oil level

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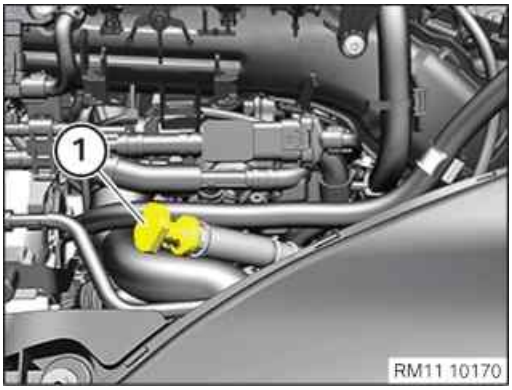
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

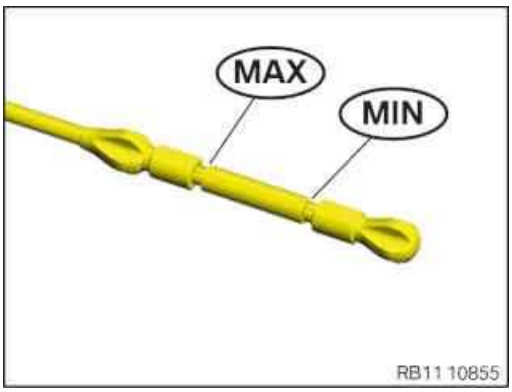


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

Additional Information

Overview of Tightening Torques

Central piston cooling valve to crankcase — Used in step 3

M6x16		Tightening torque	8 Nm

Underbody protection front — Used in step 4

			3 Nm

Overview of Special Tools

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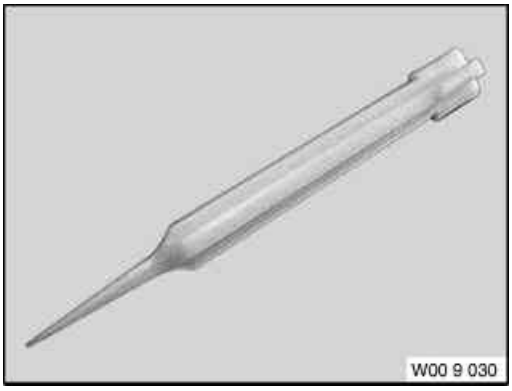
0 496 714 (00 9 030) Wedge



Common	Used in step 3
Usage	For dismantling O-rings, gaskets and trim panels. This special tool replaces special tool 00 9 316.
Included in the tool or work	
Storage location	A50
Replaced by	
In connection with	
SI-Number	01 20 09 (581)

Overview Technical Data

Parts

Parts required

Designation	Used in step
Seal of central piston cooling control valve to crankcase	3

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11 42 826 Replace switch valve of central piston cooling

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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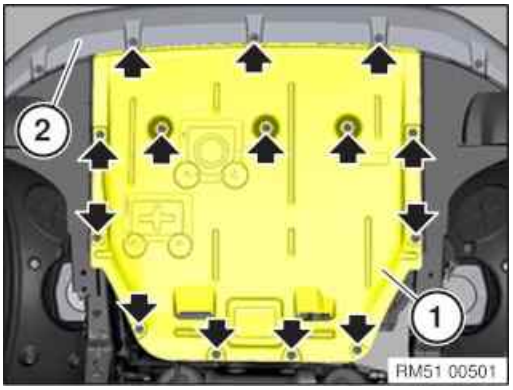
PRELIMINARY WORK

1 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

2 – Removing the oil pressure switch

WARNING

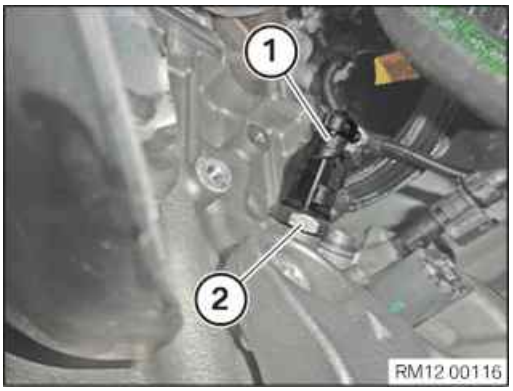
Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock and disconnect the plug connection (1).
- Loosen and remove the oil pressure switch (2).
- Catch and dispose of emerging engine oil.

MAIN WORK

3 – Removing the central piston cooling relay valve

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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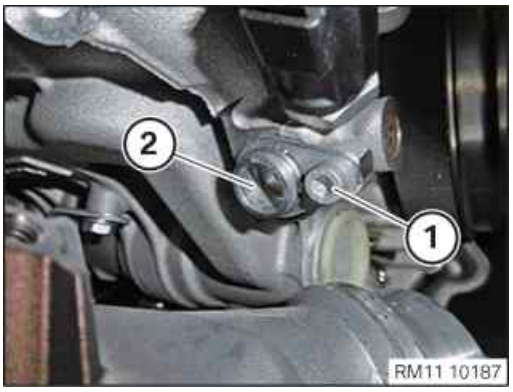


- Loosen screw (1).

RISK OF DAMAGE

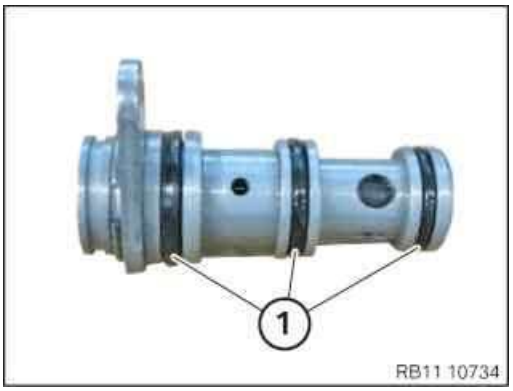
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Remove the relay valve (2) for the central piston cooling.

4 – Installing the relay valve for central piston cooling



- Renew the seals (1) with the special tool **0 496 714 (00 9 030)**.

  Parts: Seals

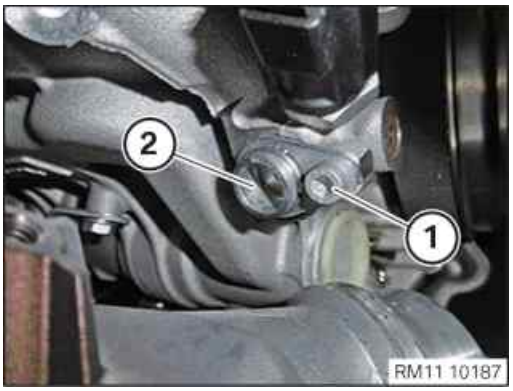
RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Clean sealing surface.



- Install the relay valve (2) for central piston cooling.
- Tighten down screw (1).

Central piston cooling valve to crankcase

M6x16		Tightening torque	8 Nm

POSTPROCESSES

5 – Installing the oil pressure switch

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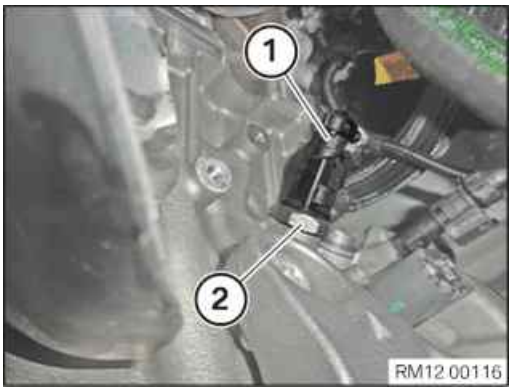


- Renew oil pressure switch (2).

  Parts: Oil pressure sensor
- Guide in and install oil pressure switch (2).
- Tighten oil pressure switch (2).

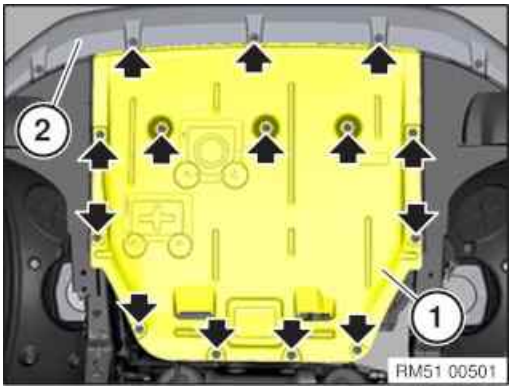
Oil pressure switch to crankcase

Sensor	Replace oil pressure switch.	Tightening torque	22 Nm

- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

6 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

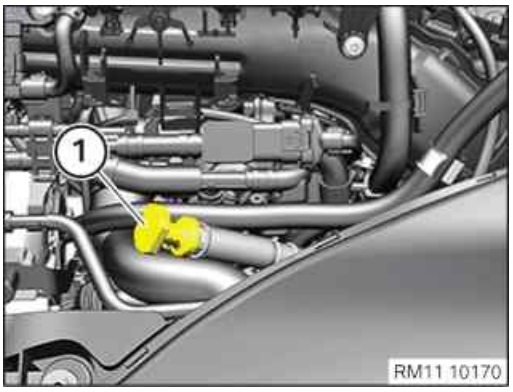
7 – Check engine oil level

- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▸ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).



- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.

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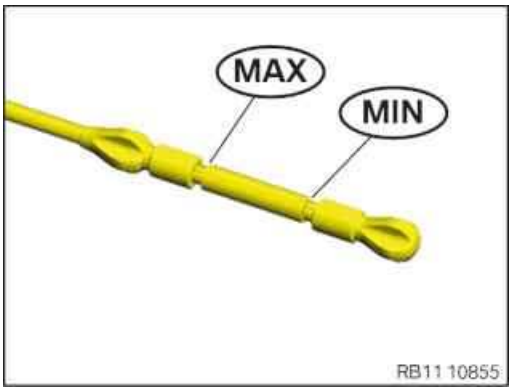


TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

Additional Information

Overview of Tightening Torques

Central piston cooling valve to crankcase — Used in step 4

M6x16		Tightening torque	8 Nm

Oil pressure switch to crankcase — Used in step 5

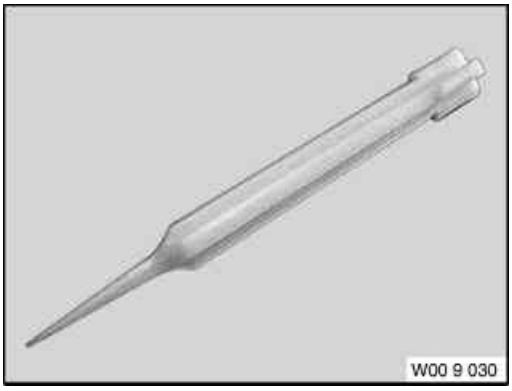
Sensor	Replace oil pressure switch.	Tightening torque	22 Nm

Underbody protection front — Used in step 6

			3 Nm

Overview of Special Tools

0 496 714 (00 9 030) Wedge



Common — Used in step 4

Usage	For dismantling O-rings, gaskets and trim panels. This special tool replaces special tool 00 9 316.
Included in the tool or work	
Storage location	A50
Replaced by	
In connection with	
SI-Number	01 20 09 (581)

Overview Technical Data

Parts

Parts required

Designation	Used in step
Seal, shift valve, central piston cooling to crankcase	4

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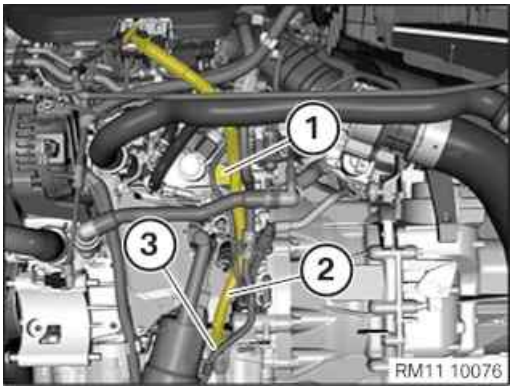
11 43 000 Removing and installing or replacing guide tube for dipstick (B37C)

Necessary preliminary tasks:

- Remove fan cowl.

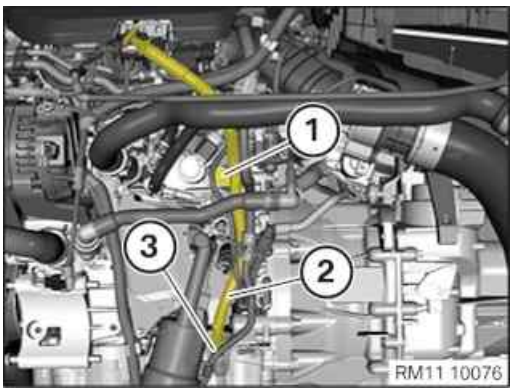
Removal:



Release screw (1).

Remove guide tube (2) in an upward direction.

Installation:



Mount new O-ring (3) on guide tube.

Part: Replace O-ring.

Install guide tube (2).

Tighten screw (1).

Required follow-up work:

- Install fan cowl.

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11 43 000 Removing and installing/sealing the oil dipstick guide tube

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

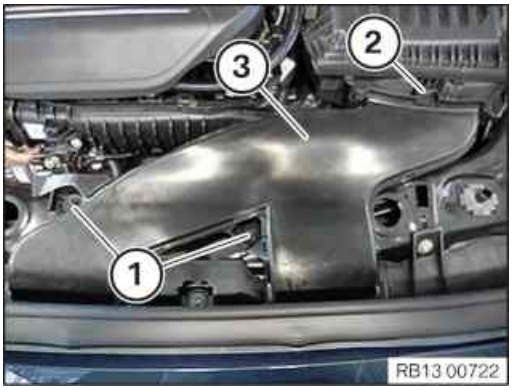
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

3 – Removing intake silencer housing

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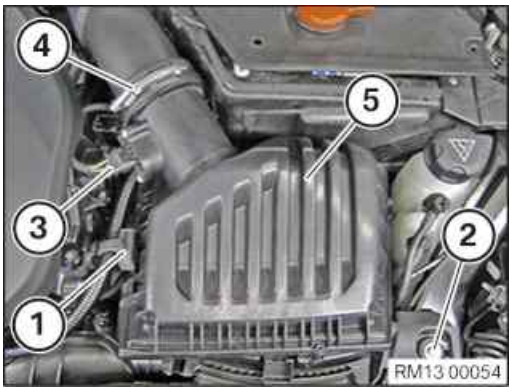
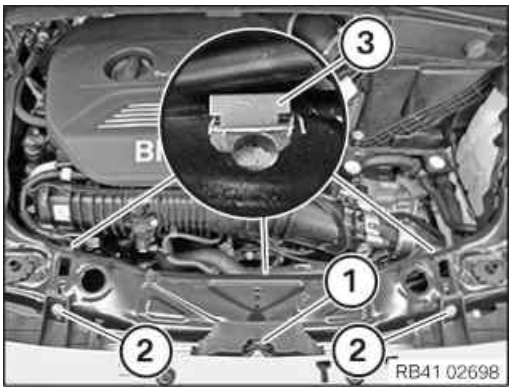
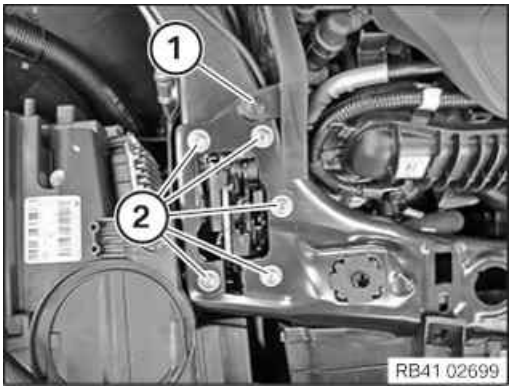


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

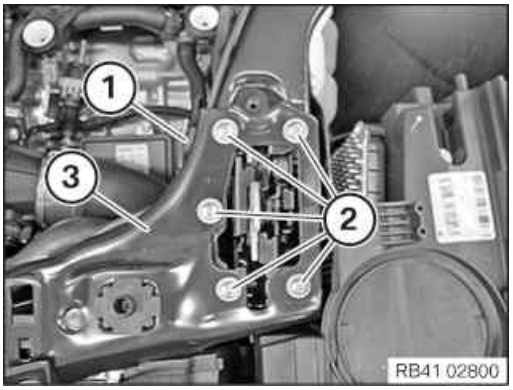
4 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

5 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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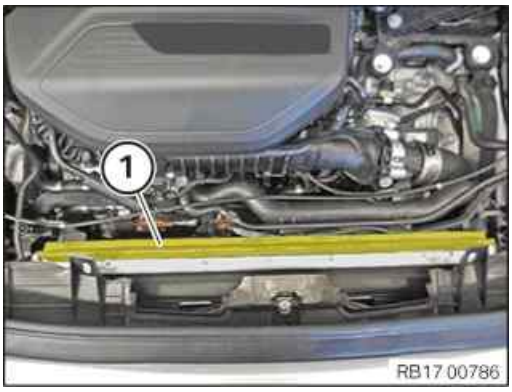
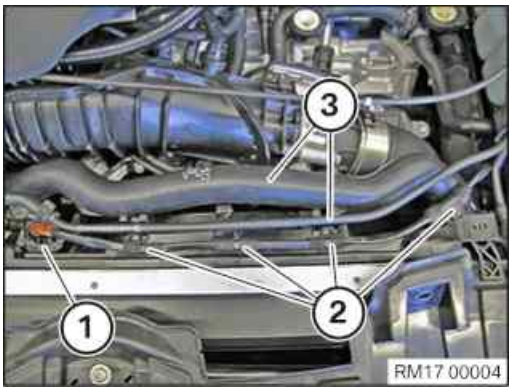
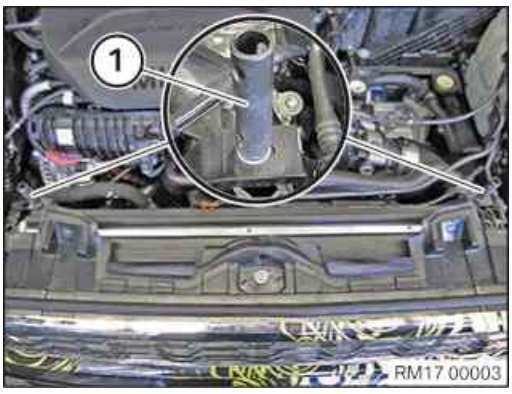


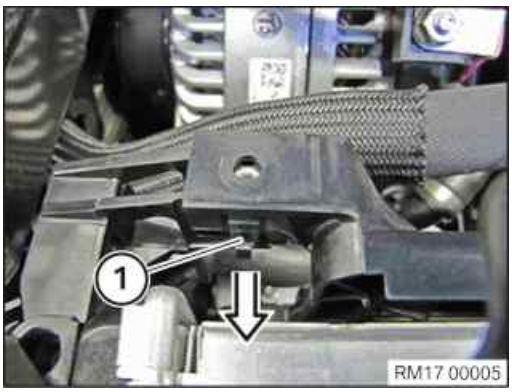
- Feed out and remove the sealing (1) from the radiator.



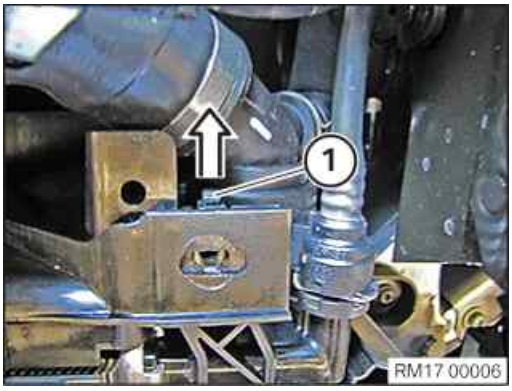
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

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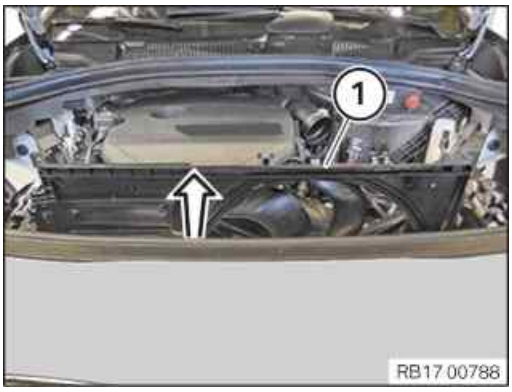
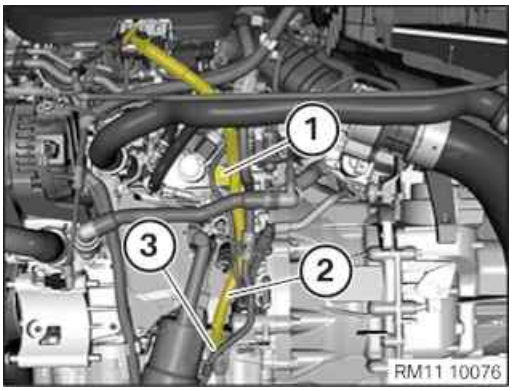


- Guide out fan cowl (1) in direction of arrow and remove.

MAIN WORK

6 – Removing the guide tube for the oil dipstick



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

7 – Installing guide tube for oil dipstick

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Renew O-ring (1).

  Parts: O-ring

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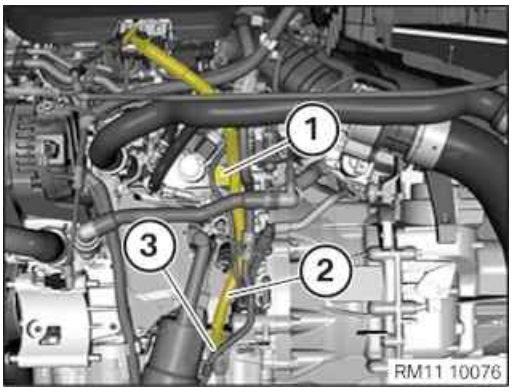


- Guide in guide tube (2) for oil dipstick and slide it into the oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

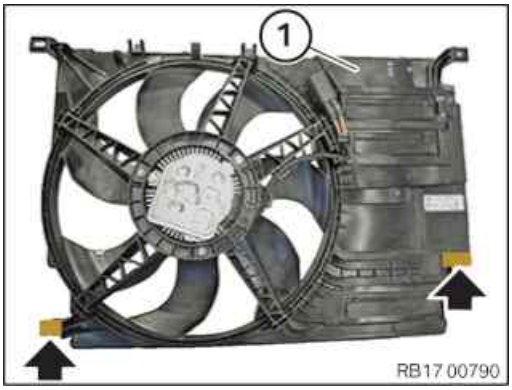
M8x16		Tightening torque	19 Nm

POSTPROCESSES

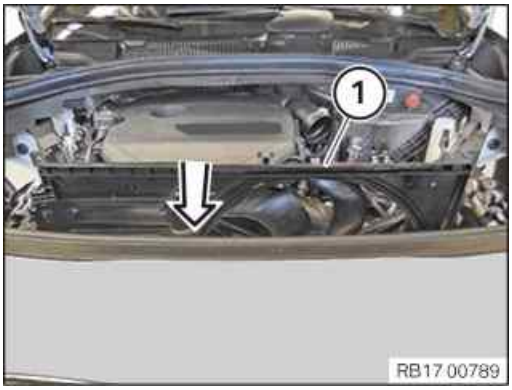
8 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.

- Lock the left and right locks (arrows).

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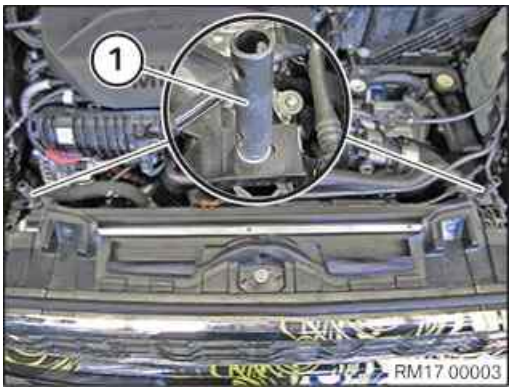
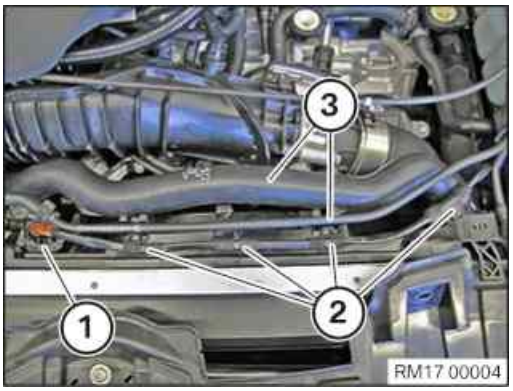


- Tighten the screws (1).

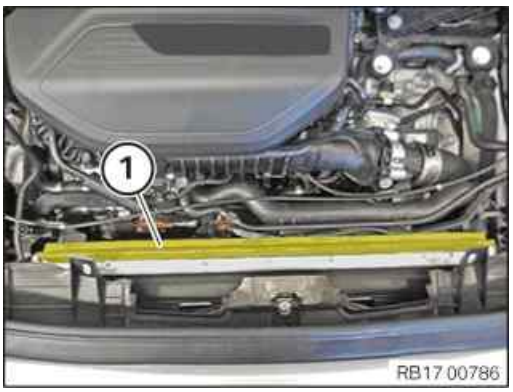
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



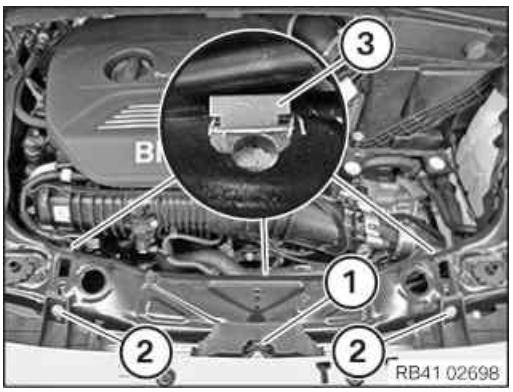
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



- Guide the sealing (1) on the radiator in and install it.

9 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

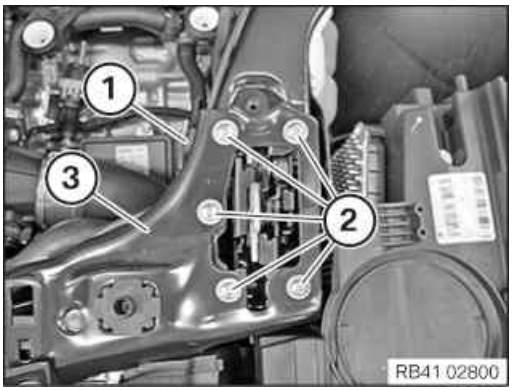
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.



- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

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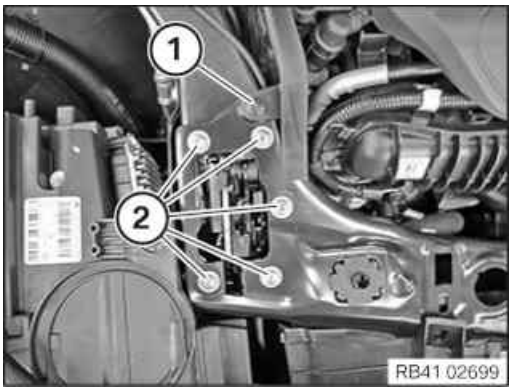


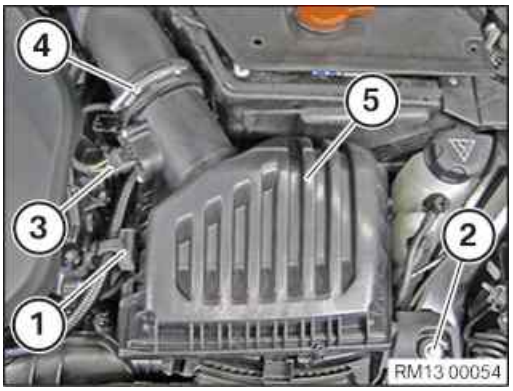
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

10 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

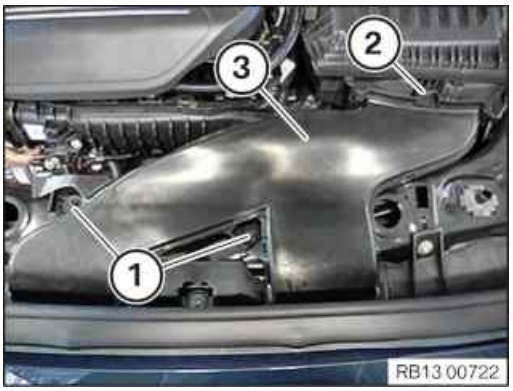
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

11 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

12 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Guide tube for oil dipstick on engine			Used in step 7
M8x16		Tightening torque	19 Nm

Fan cowl on radiator			Used in step 8
M6X12		Tightening torque	6 Nm

Bracing strut to top cross connection			Used in step 9
M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection			Used in step 9
M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection			Used in step 9
M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge			Used in step 10
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 10
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 11
M6		Tightening torque	8 Nm

Links

Functional descriptions	Used in step

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Oil supply	7

Parts

Parts required

Designation	Used in step
Seal, guide tube for oil dipstick on oil sump	7

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11 43 000 Removing and installing/sealing the oil dipstick guide tube

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

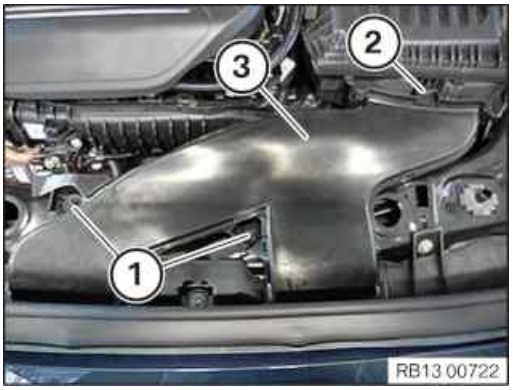
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

3 – Removing intake silencer housing

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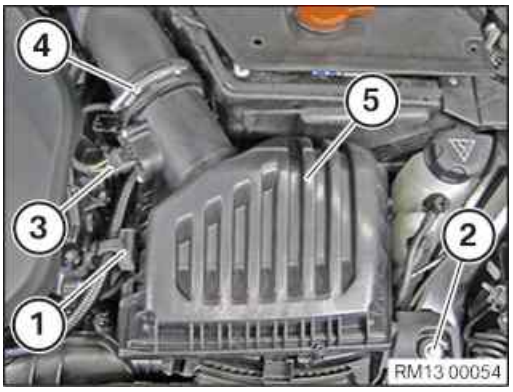
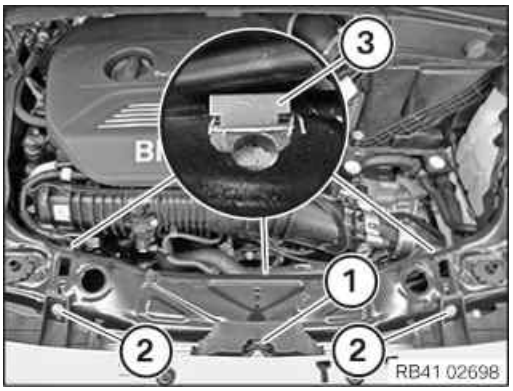
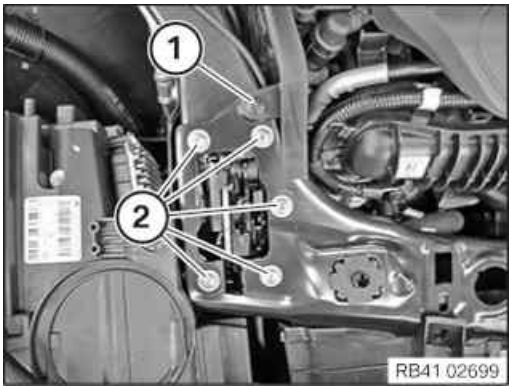


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

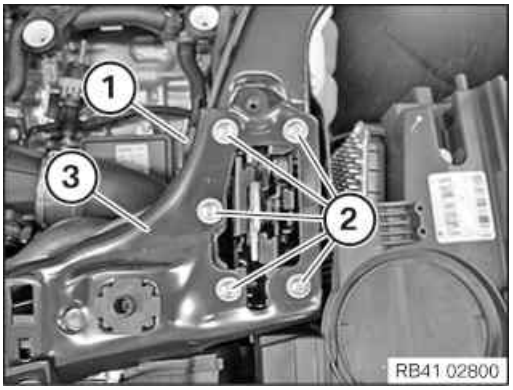
4 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

5 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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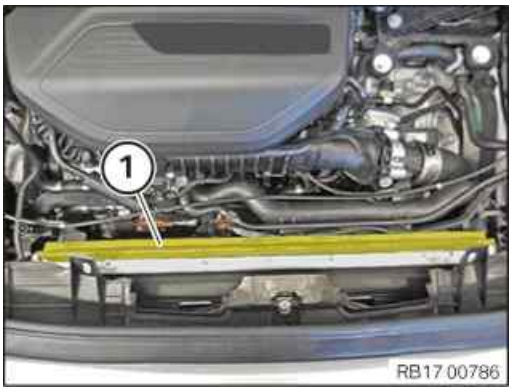
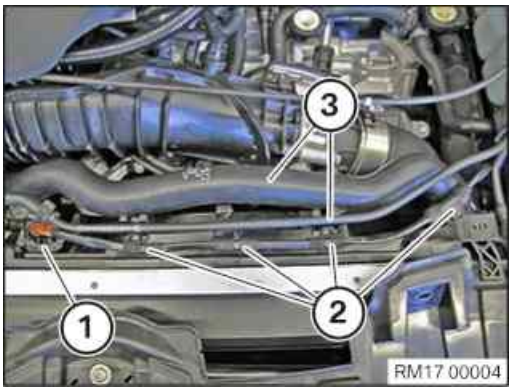
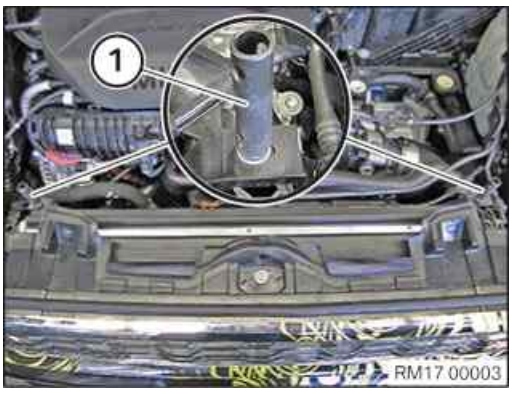


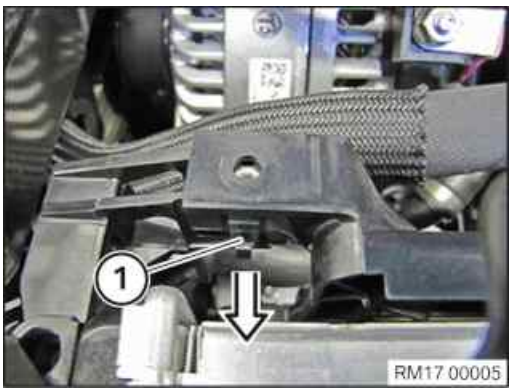
- Feed out and remove the sealing (1) from the radiator.



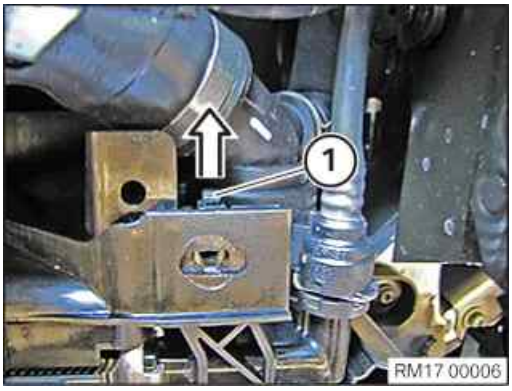
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

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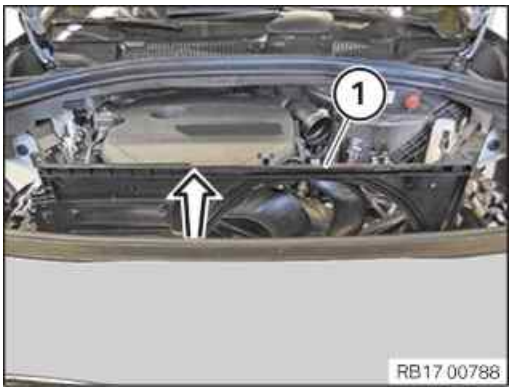
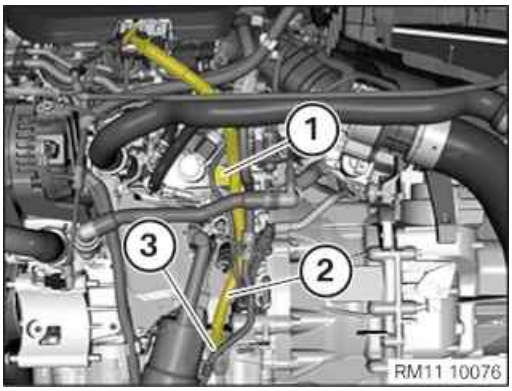


- Guide out fan cowl (1) in direction of arrow and remove.

MAIN WORK

6 – Removing the guide tube for the oil dipstick



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

7 – Installing guide tube for oil dipstick

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Renew O-ring (1).

  Parts: O-ring

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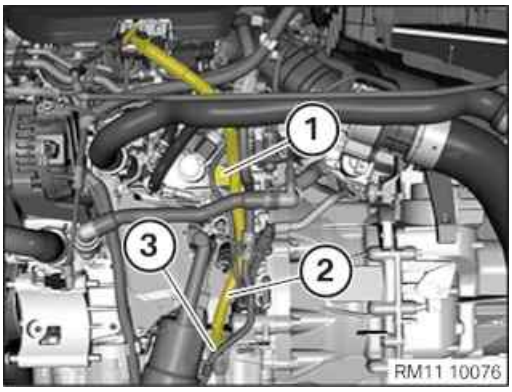


- Guide in guide tube (2) for oil dipstick and slide it into the oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

Guide tube for oil dipstick on engine

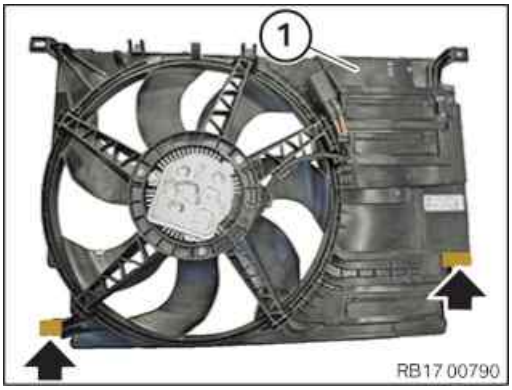
M8x16		Tightening torque	19 Nm

POSTPROCESSES

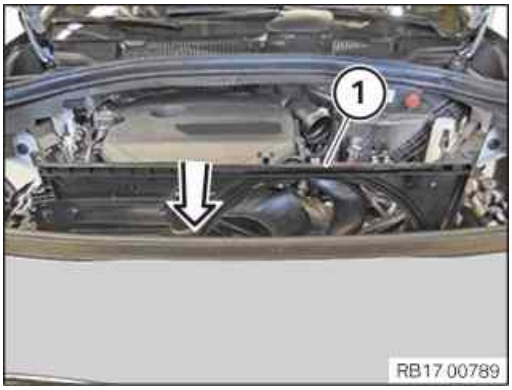
8 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.

- Lock the left and right locks (arrows).

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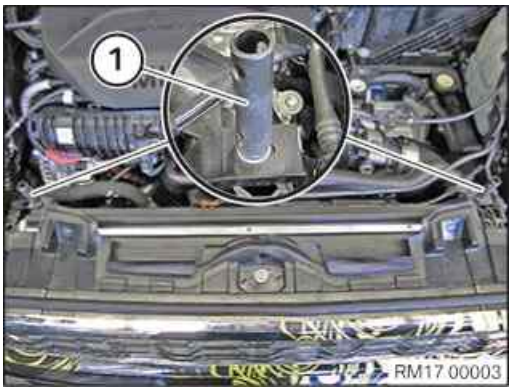
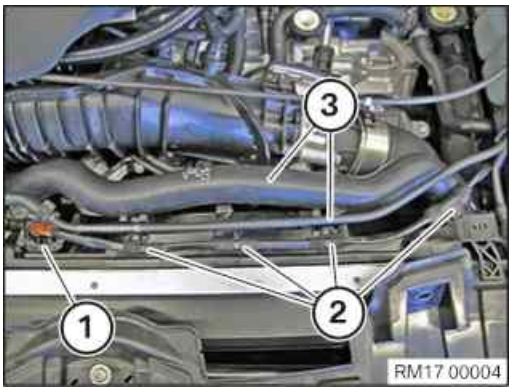


- Tighten the screws (1).

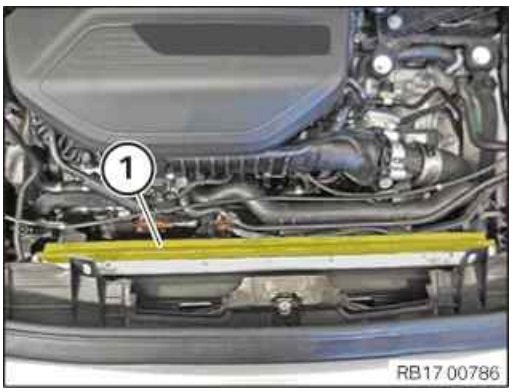
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



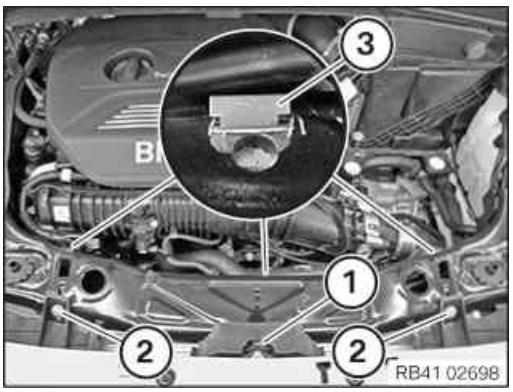
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



- Guide the sealing (1) on the radiator in and install it.

9 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

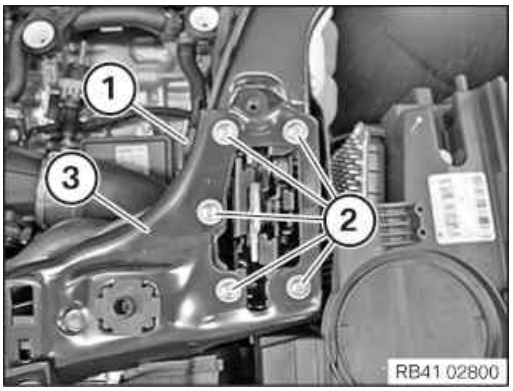
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.



- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

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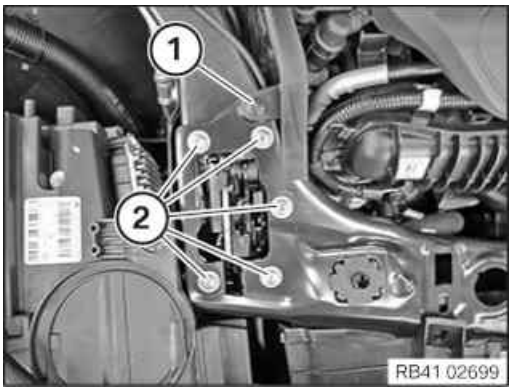


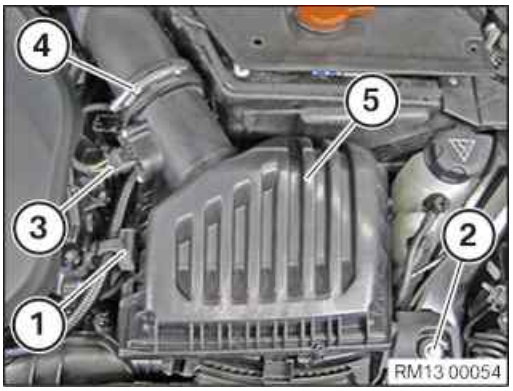
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

10 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

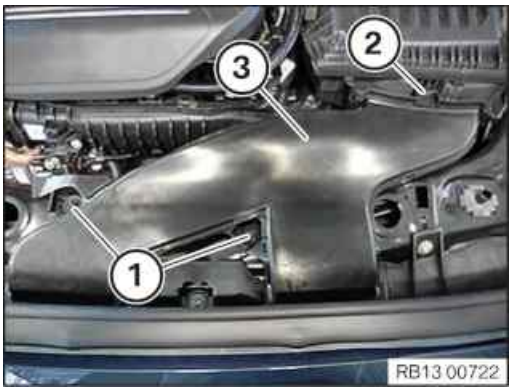
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

11 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

12 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Guide tube for oil dipstick on engine			Used in step 7
M8x16		Tightening torque	19 Nm

Fan cowl on radiator			Used in step 8
M6X12		Tightening torque	6 Nm

Bracing strut to top cross connection			Used in step 9
M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection			Used in step 9
M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection			Used in step 9
M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge			Used in step 10
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 10
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 11
M6		Tightening torque	8 Nm

Links

Functional descriptions	Used in step

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Oil supply	7

Parts

Parts required

Designation	Used in step
Seal, guide tube for oil dipstick on oil sump	7

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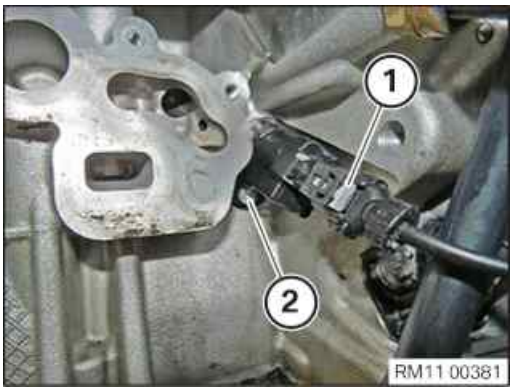
11 41 115 Removing and installing/replacing hydraulic valve (B37C)

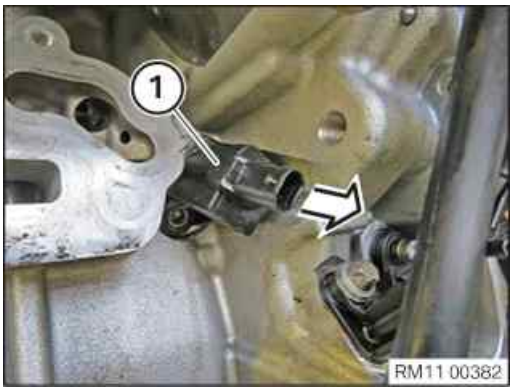
Necessary preliminary tasks:

- Remove full-flow oil filter.

Removal:

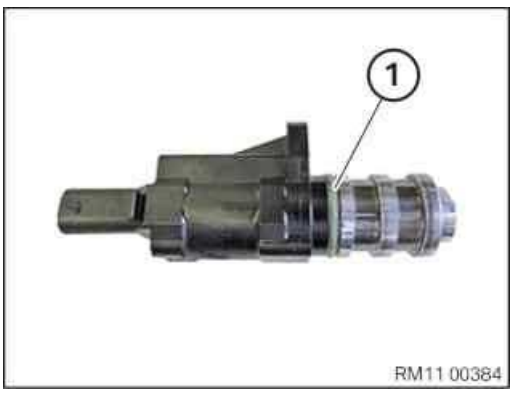


Unlock and disconnect the connector (1).
Release screw (2).



Remove hydraulic valve (1) in direction of arrow.

Installation:



Parts: Replace O-ring (1).
Oil O-ring (1).

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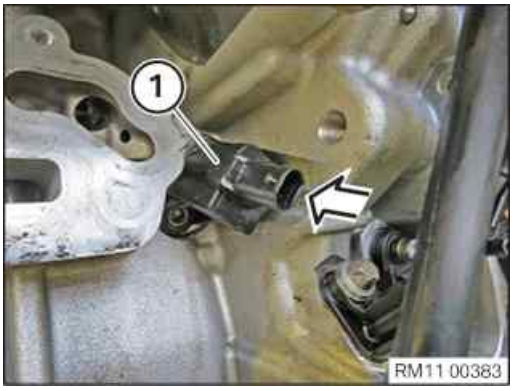
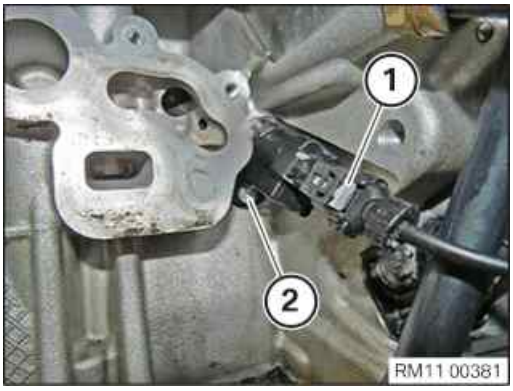


Install hydraulic valve (1) in direction of arrow.



Tighten screw (2).
Tightening torque: 11 00 2AZ.
Connect the plug (1).

Required follow-up work:

- Install full-flow oil filter.
- Assemble engine.

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11 44 000 Removing and installing/replacing oil-to-water heat exchanger (B37C)

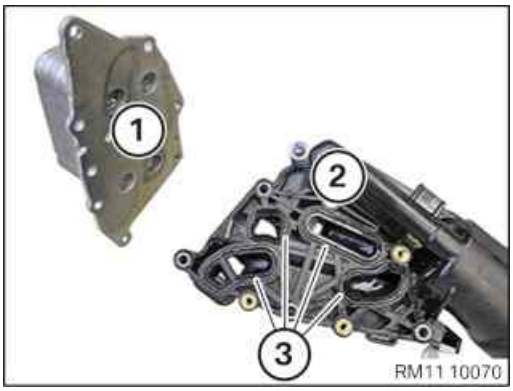
Necessary preliminary tasks:

- Remove full-flow oil filter.

Removal:

Release screws (1).

Remove heat exchanger.



Replace gaskets (3) on full-flow oil filter (2).

Installation:

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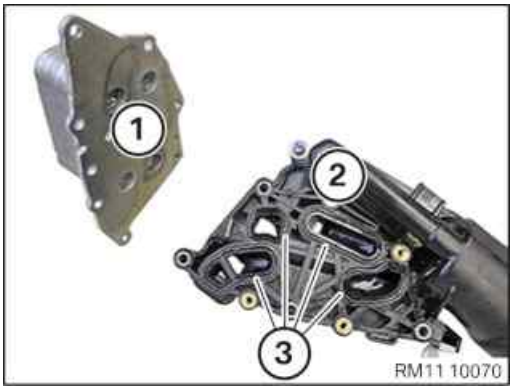

Installation note:
All sealing surfaces and gaskets must be cleaned and free of oil.

Replace gaskets (3).

Place oil-to-water heat exchanger (1) on full-flow oil filter (2).

Tighten down screws (1).

Tightening torque: 11 42 8AZ.

Required follow-up work:

- Install full-flow oil filter

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11 42 020 Removing and installing/replacing the full-flow oil filter (B37C)

Special tools required:

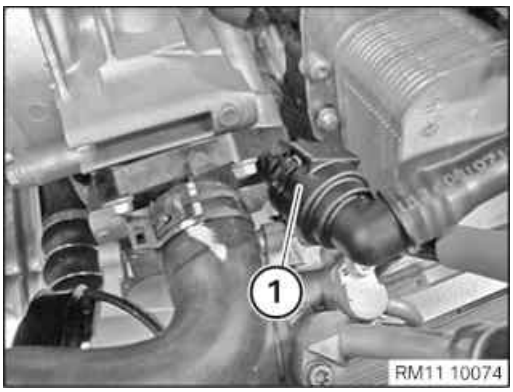
- 11 4 470
- 11 6 480

Necessary preliminary tasks:

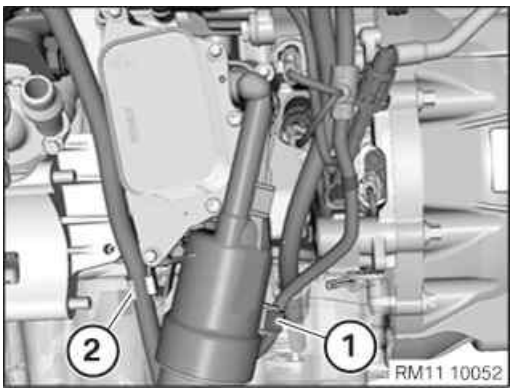
- Disconnect battery negative lead.
- Drain off oil.
- Remove fan cowl.
- Remove underbody protection
- Drain coolant.
- Release A/C compressor and place to one side.

Removal:

Unlock and detach coolant hose (1).



Unlock and detach coolant hose (1).



Unclip wiring harness (1).
Unclip positive wire (2).

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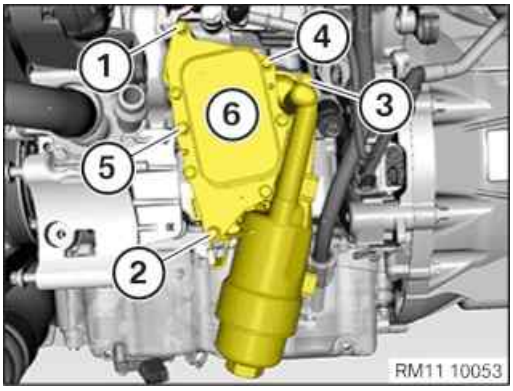


Release screws in the sequence **5 - 1**.

Remove full-flow oil filter (6).

Installation:

Important!

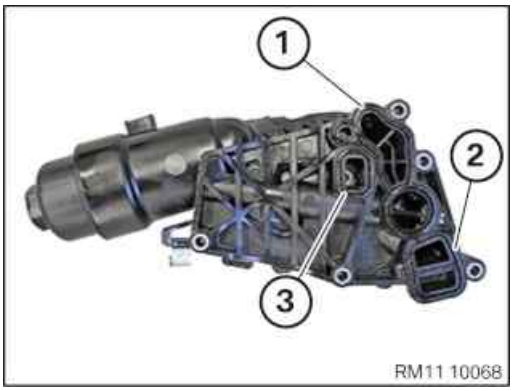
Clean away gasket residues from the crankcase and full-flow oil filter with the special tool 11 4 470 .

Do not use any metal-cutting tools (e.g. emery cloth).

No particles/foreign material may enter the media openings.

Foreign particles in the oil cause damage to the connecting rod bearing/engine.

Crank engine with special tool11 6 480 until engine oil exits from the oil channels in the area of the full-flow oil filter.



Note:
All sealing surfaces and gaskets must be cleaned and free of oil.

Replace gaskets (1, 2 and 3).

When replacing, remount oil-to-water heat exchanger.

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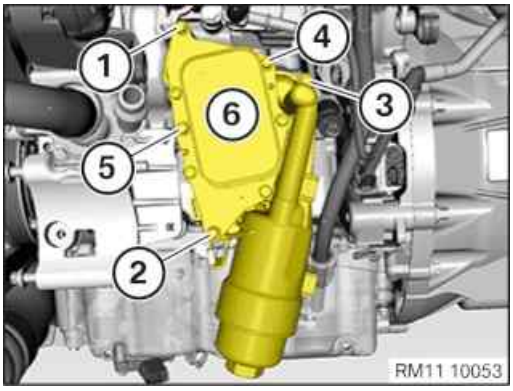
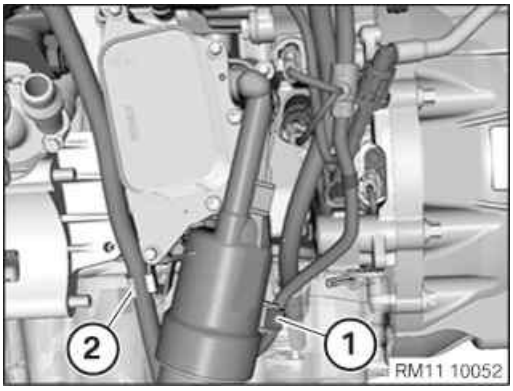


Position full-flow oil filter (6).

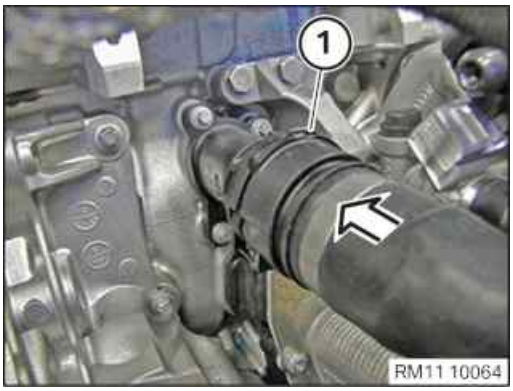
Tighten screws in the sequence **1 - 5**.

Tightening torque: 11 42 7AZ.



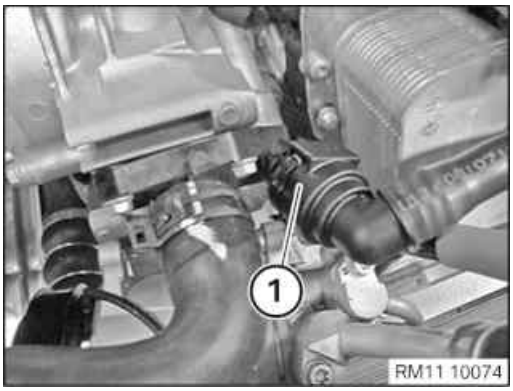
Clip in wiring harness (1).

Clip in positive wire (2).



Connect coolant hose (1).

Lock must snap audibly into place.



Connect coolant hose (1).

Lock must snap audibly into place.

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Required follow-up work:

- Secure air conditioning compressor.
- Install fan cowl.
- Install underbody protection.
- Top up coolant.
- Top up oil.
- Connect battery earth lead.

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11 16 550 Removing and installing/replacing alternator support (B37C)

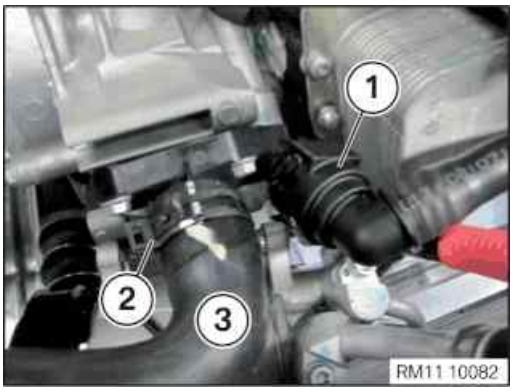
Special tools required:

- 11 4 470

Necessary preliminary tasks:

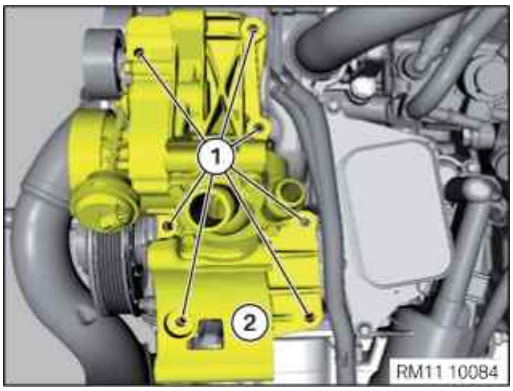
- Remove alternator.
- Remove fan cowl.
- Only release air conditioning compressor for air conditioning and secure to prevent falling down. (Air conditioning does not have to be drawn off.)
- Drain coolant.

Removal:



Unlock and detach coolant hose (1).

Release clamp (2) and pull off coolant hose (3).



Release screws (1).

Remove alternator support (2).

Installation:

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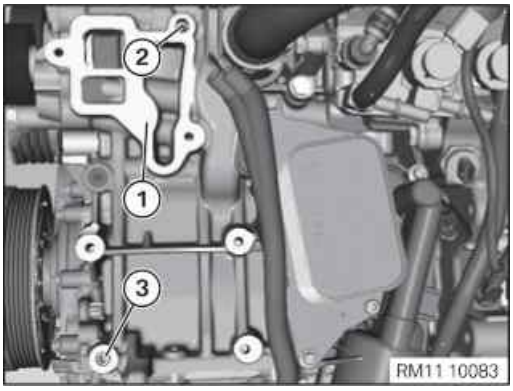


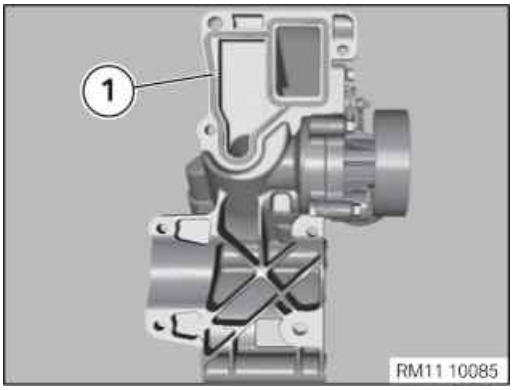
Clean sealing surface (1) with special tool 11 4 470 .

Check centring bushes (2 and 3) for damage, replace if necessary.

Replacement:

Remounting the coolant pump.

Remounting the coolant thermostat.



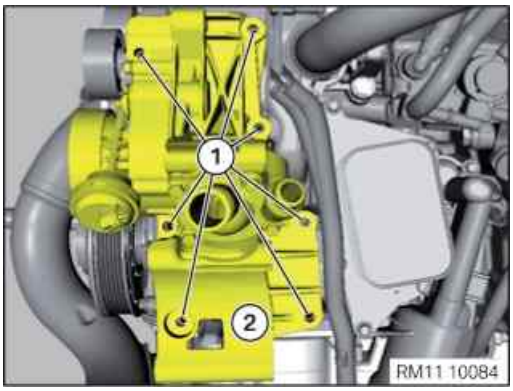
Note:
Sealing bead (1) is bonded to housing of the new alternator support.

Installation note:
If the sealing bead (1) protrudes slightly and if the sealing bead (1) is not damaged, the alternator support can be reinstalled.

If damaged: remove sealing bead (1) using suitable tool.

Replacing the sealing bead (1) sealant 2 2 (Loctite 5970).

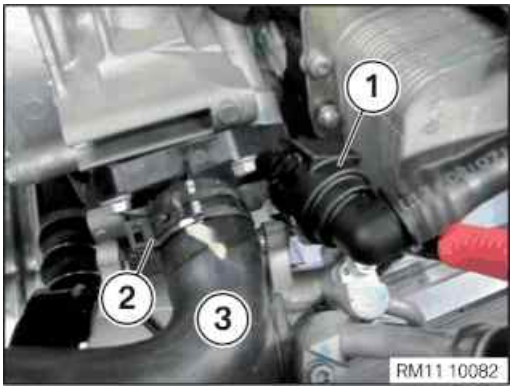
Sealant height approximately 2 to 2.5 mm.



Mount alternator support (2).

Tighten down screws (1).

Tightening torque 11 51 3AZ.



Mount coolant hose (1) (must audibly engage).

Mount coolant hose (3).

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Required follow-up work:

- Mount air conditioning compressor for air conditioning.
- Install fan cowl.
- Install alternator.
- Top up coolant.

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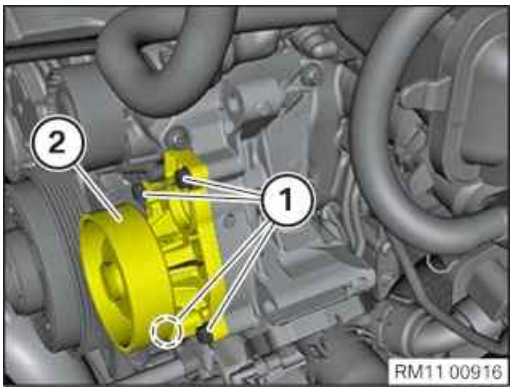
11 51 000 Removing and installing/replacing coolant pump (B37C)

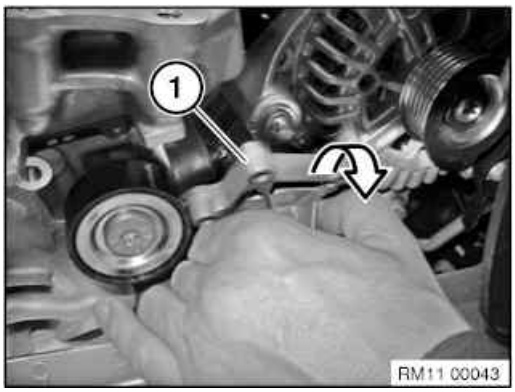
Necessary preliminary tasks:

- Remove front underbody protection.
- Remove alternator.
- Drain coolant.

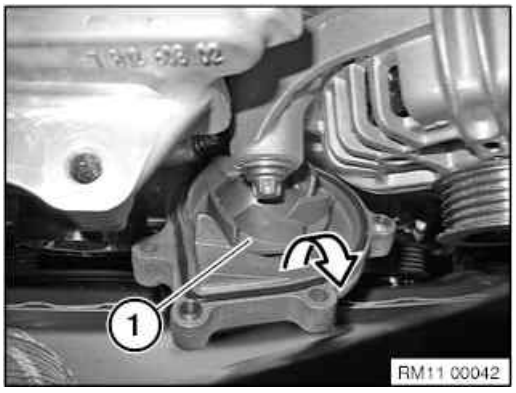
Removal:



Release screws (2 and 3) from coolant pump (1).*Note:* Graphic B38.



Lift out coolant pump (1) upwards.



Remove coolant pump (1).

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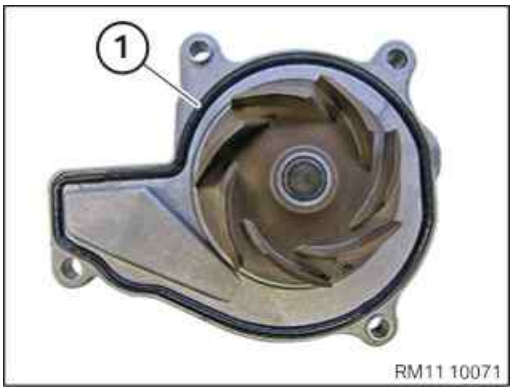
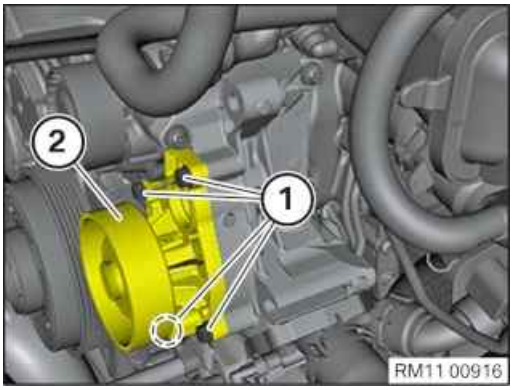
Installation:



Sealing bead (1) is applied to housing of coolant pump.*Installation note:*
If the sealing bead (1) protrudes slightly and if the sealing bead (1) is not damaged, the coolant pump can be reinstalled.

If the sealing bead (1) is damaged, remove sealing bead (1) with a suitable tool and replace with sealing compound 2.2 (Loctite 5970).

Sealant height approximately 2 to 2.5 mm.



Tighten screws (2 and 3) on coolant pump (1).

Tightening torque: 11 51 2AZ.

Note:
Graphic B38.

Required follow-up work:

- Install alternator.
- Install front underbody protection.
- Top up coolant.

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11 51 000 Removing and installing/replacing the coolant pump

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.
For additional information see:
Main group 17
17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.
Non-compliance will result in danger of component damage and/or engine damage.
Filling specification **absolutely must** be adhered to.
The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.
A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

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- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

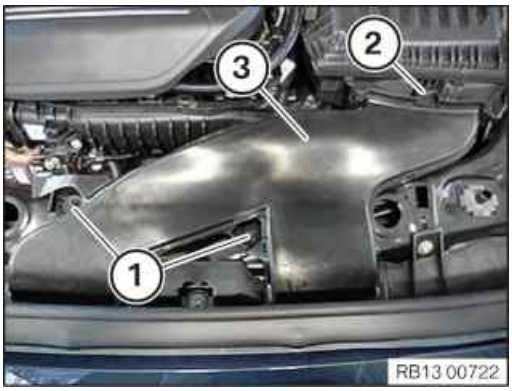
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

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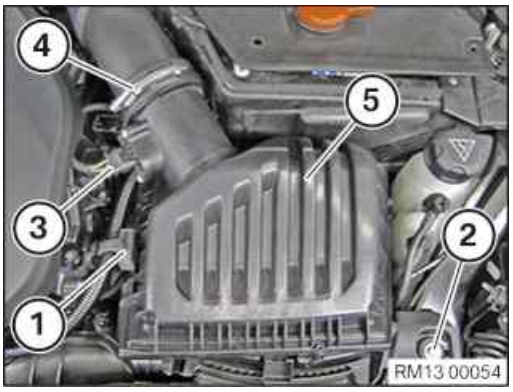
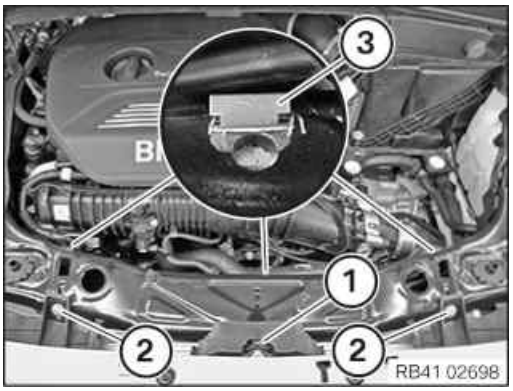
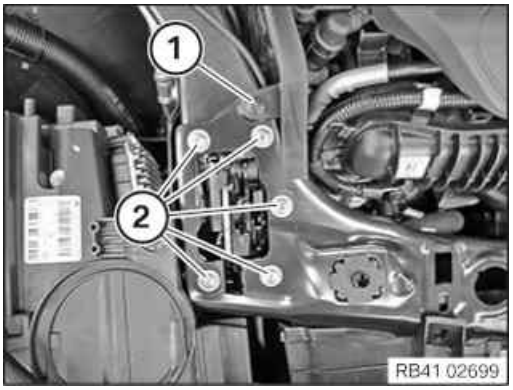


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

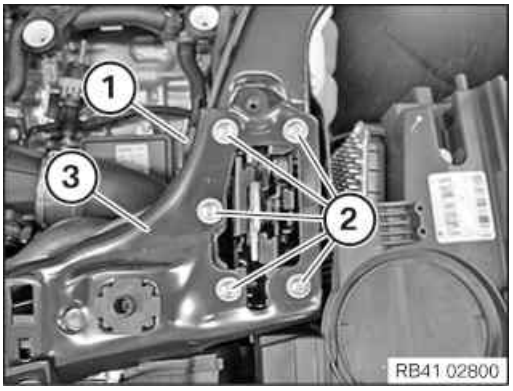
5 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.

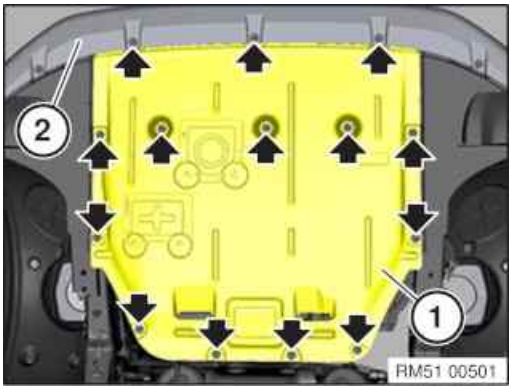


- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

6 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

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7 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

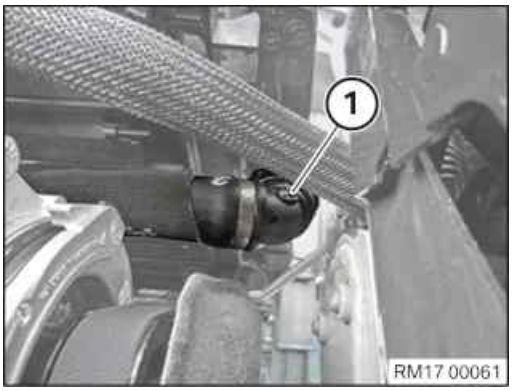
When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

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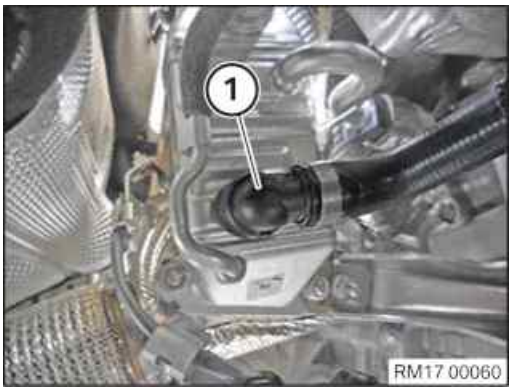


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

8 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

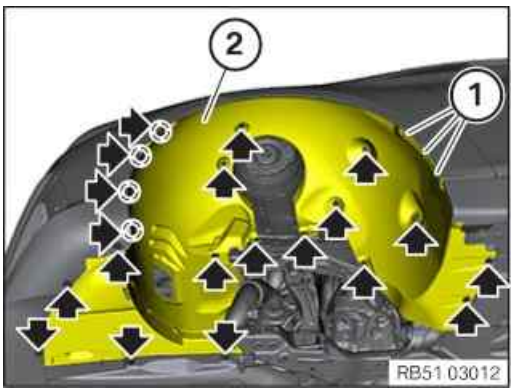
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

9 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

10 – Remove right charge-air line

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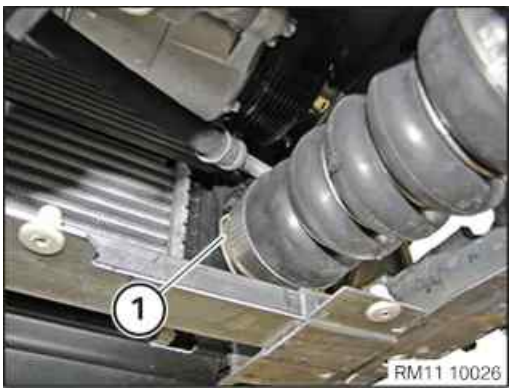
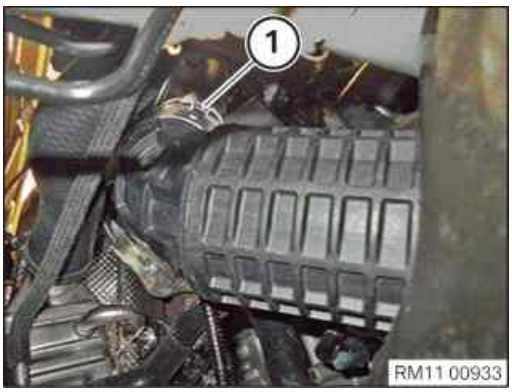
- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

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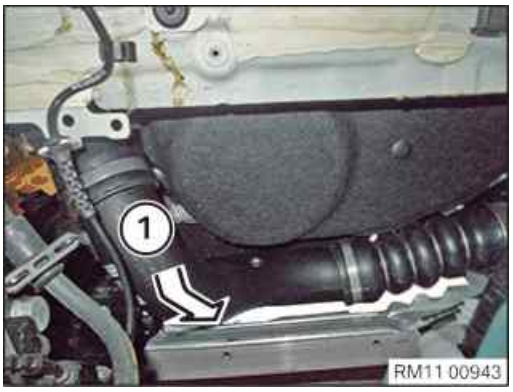
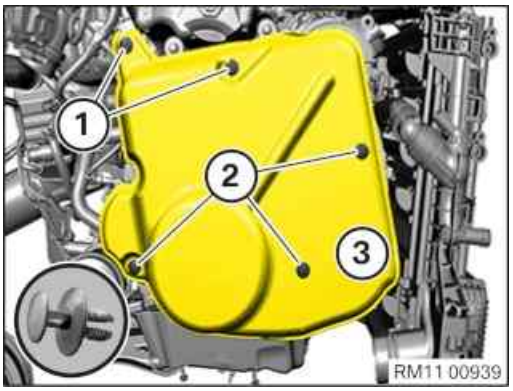


- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

11 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

12 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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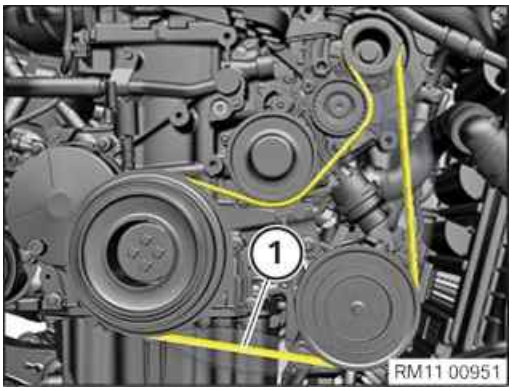
- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .

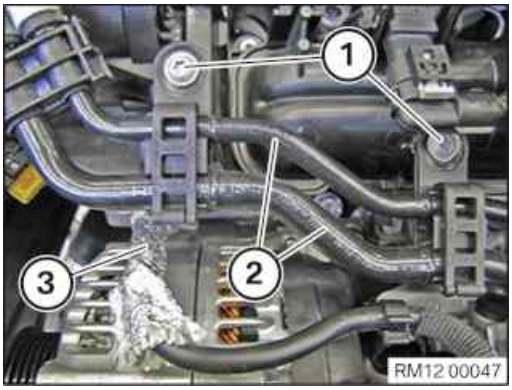


- Guide out the drive belt for the alternator (1) and remove it.

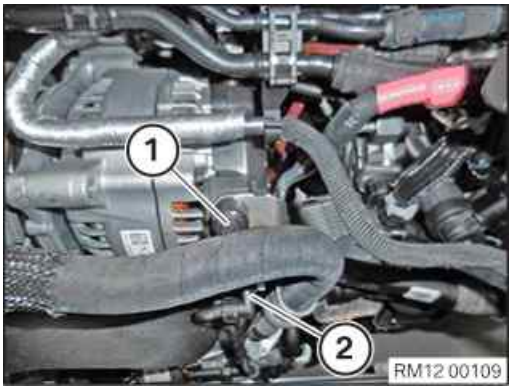
13 – Removing the alternator

Prerequisite

Battery earth lead is disconnected.



- Loosen screws (1).
- Place fuel feed and return line (2) to one side.
- Unlock the coolant ventilation line (3) and pull it off the cylinder head.
- Catch and dispose of escaping coolant.



- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock the plug connection (2) and pull off from the alternator.

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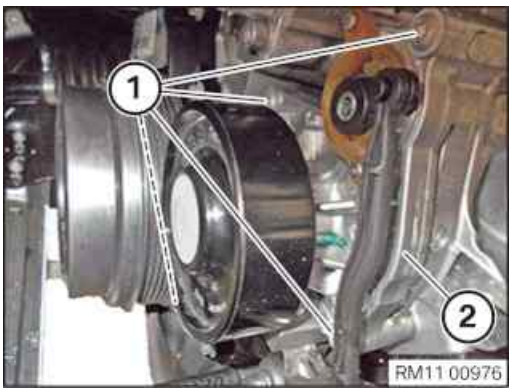
- Loosen screws (1).

- Feed the alternator (1) out toward the top and remove it.

MAIN WORK

14 – Removing the coolant pump



- Loosen screws (1).

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Feed out and remove the coolant pump (2).

15 – Installing coolant pumps

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Clean sealing surfaces.

Check

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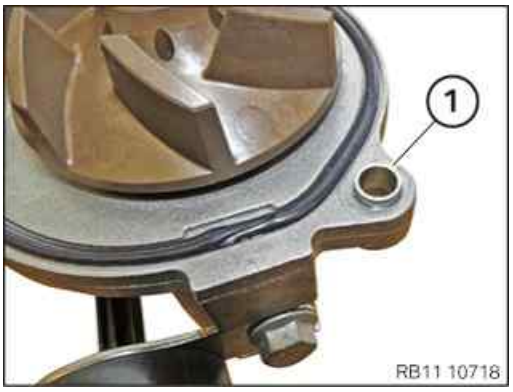


- Check the fitting sleeve (1) for damage.

desired state

- Fitting sleeve must not be scratched or deformed.

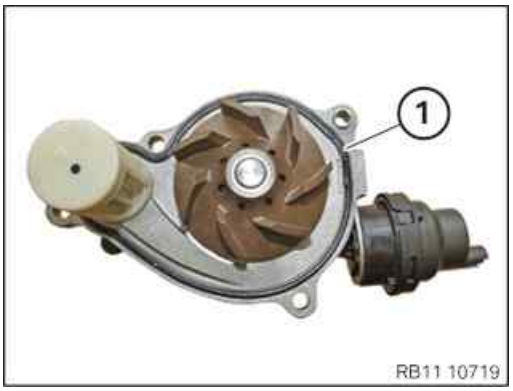
Result

» Fitting sleeve is damaged.

Measure

- Completely renew the coolant pump.

  Parts: Coolant pump



Check

- Check the sealing bead for damage.
- Measure the height of the sealing bead in reference to the surface.

Height of the sealing bead

	2,0 mm ... 2,5 mm

Result

» The sealing bead is damaged or the measured dimension deviates.

Measure

- Remove sealing bead.
- Reapply sealing bead.

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)

Processing time of liquid sealing compound

	< 12 min

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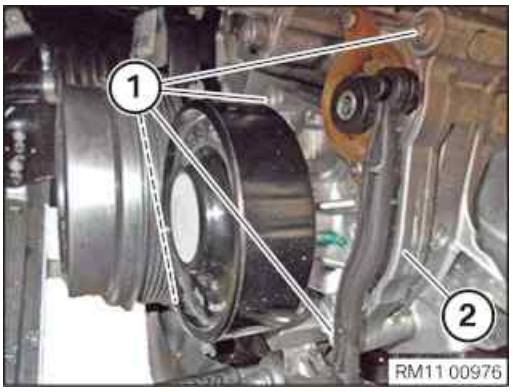


- Insert and install the coolant pump (2).
- Tighten the screws (1).

Coolant pump to crankcase

M6	If reusing the coolant pump: Apply Loctite 5970 For additional information see: 11 00 ... Overview of consumables in EPC (Electronic Parts Catalogue) sealing compound 2.2	Tightening torque	8 Nm

POSTPROCESSES

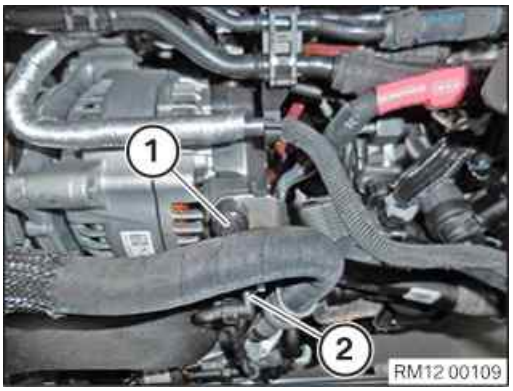
16 – Installing the alternator

- Insert and install the alternator (1).

- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm



- Mount the positive battery cable to the alternator and secure it with the nut.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1) on the nut.
- Connect the connector (2) to the alternator and lock audibly.

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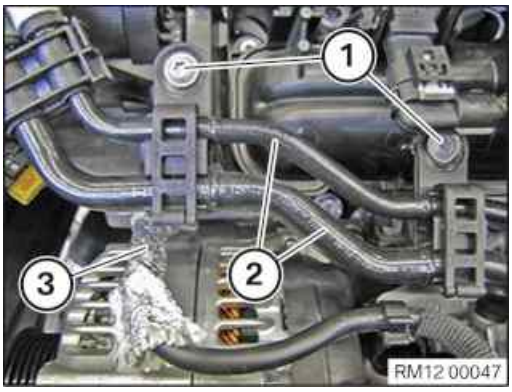


- Mount fuel supply and return line (2).
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect the coolant ventilation line (3) to the cylinder head and audibly lock.

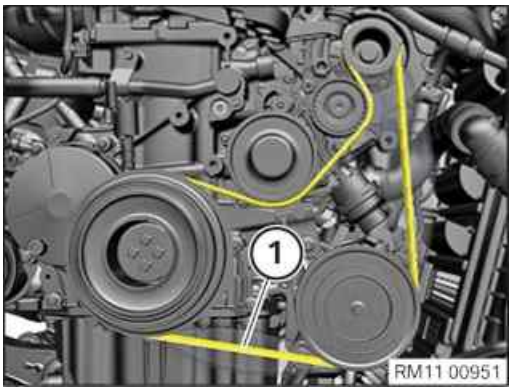
17 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

18 – Install the acoustic cover for the engine at the front

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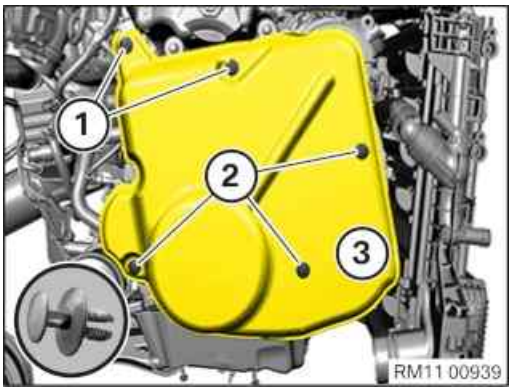


- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

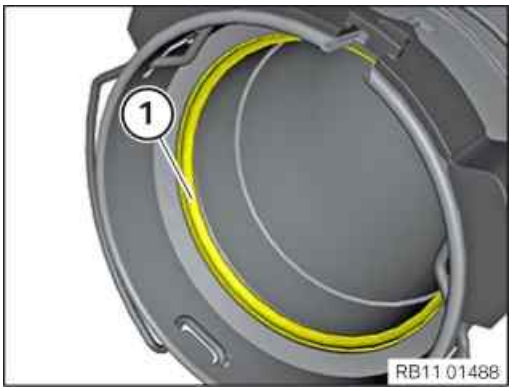
19 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

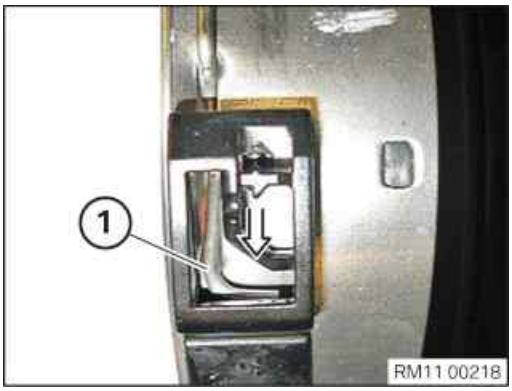
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

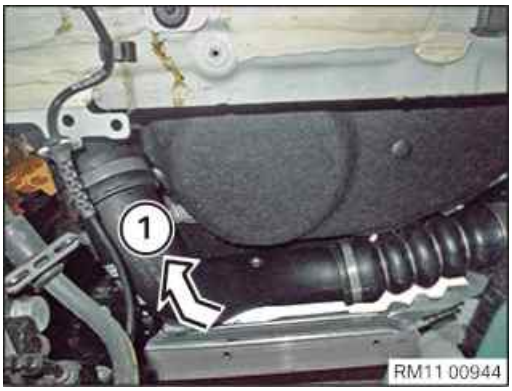


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.

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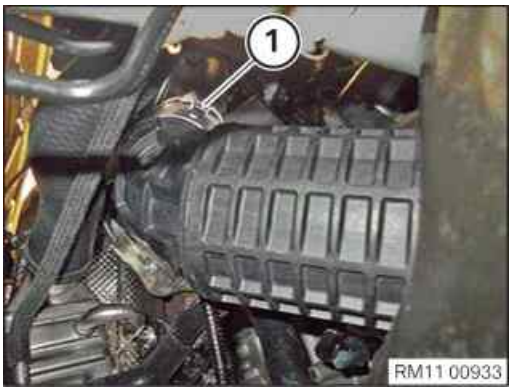
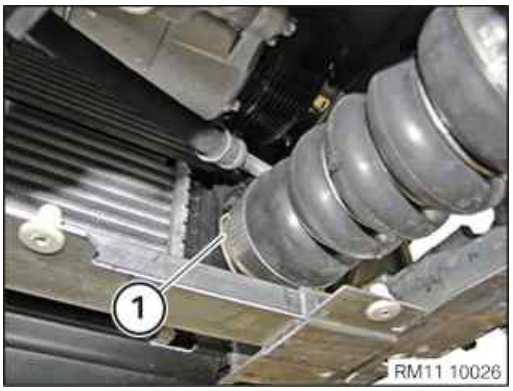


- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

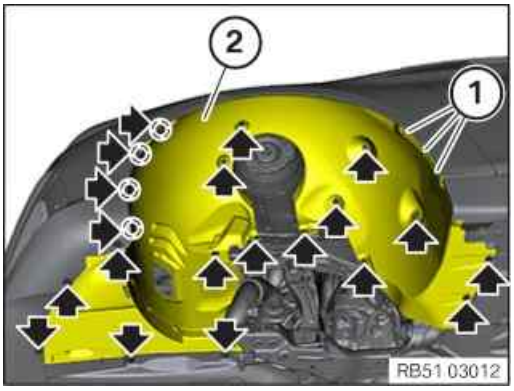
M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

20 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

21 – Installing the front right wheel

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▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

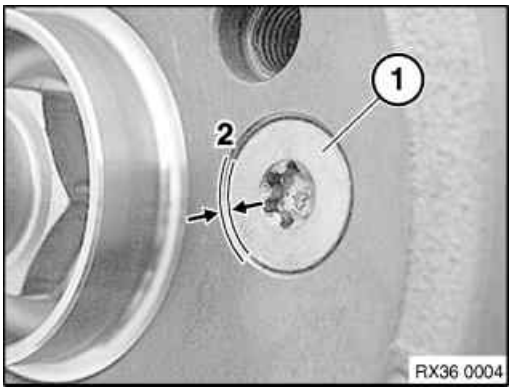
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

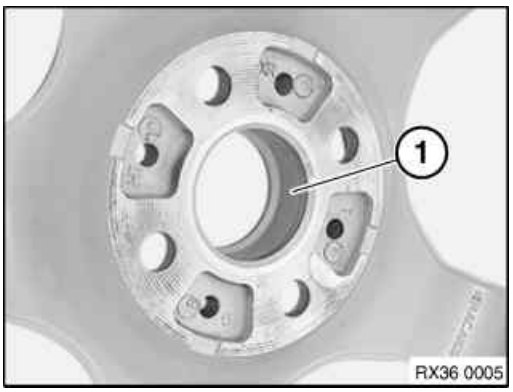


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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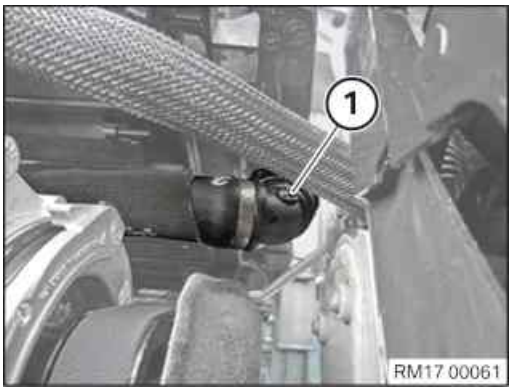
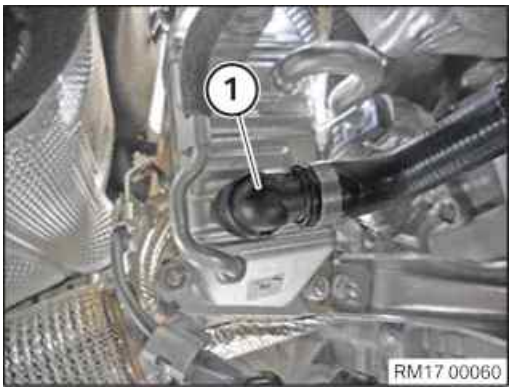
22 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

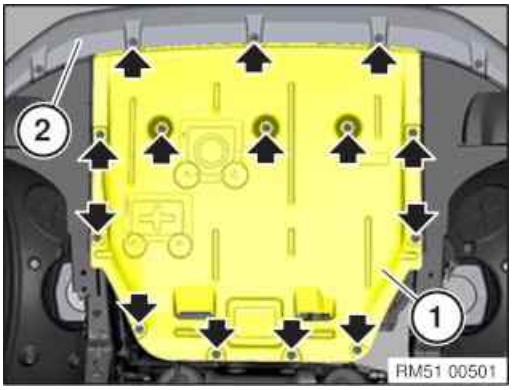


- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

23 – Installing the front underbody protection

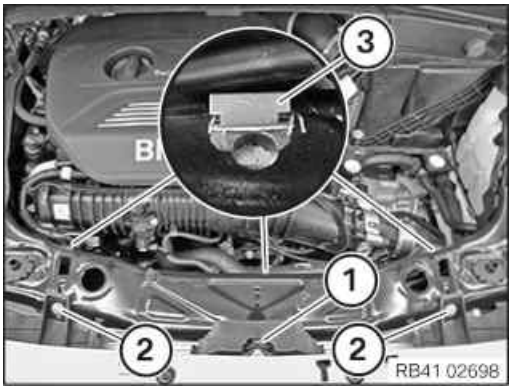


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

24 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

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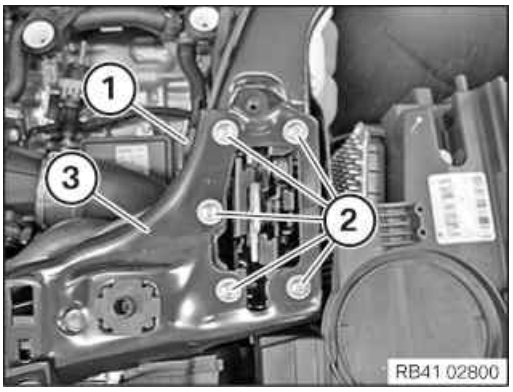
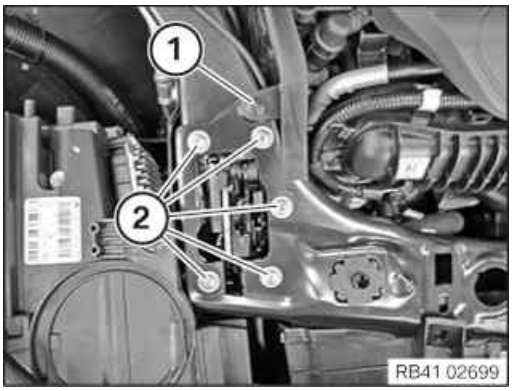


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



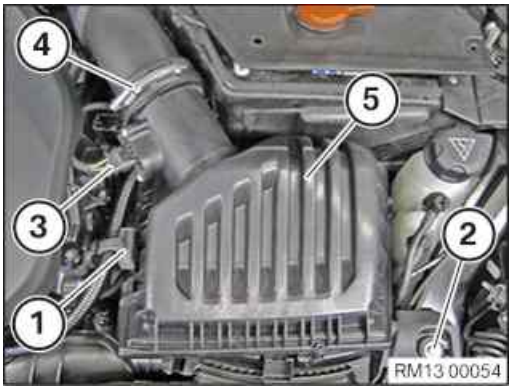
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

25 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

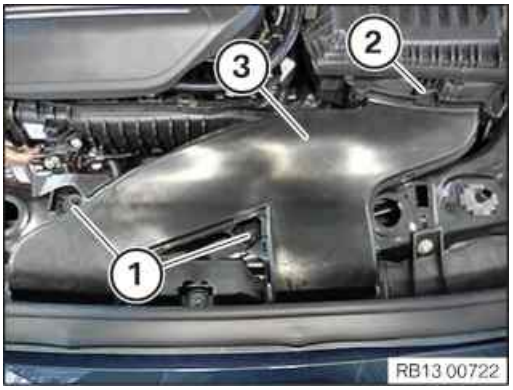
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

26 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

27 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

28 – Disconnecting all battery earth leads

- See additional information.

29 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Coolant pump to crankcase			Used in step 15
M6	If reusing the coolant pump: Apply Loctite 5970 For additional information see: 11 00 ... Overview of consumables in EPC (Electronic Parts Catalogue) sealing compound 2.2	Tightening torque	8 Nm

Alternator to component carrier			Used in step 16
M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator			Used in step 16
M8		Tightening torque	19 Nm

Fuel line to intake plenum			Used in step 16
TS6x20		Tightening torque	5 Nm

Charge air line to crankcase			Used in step 19
M6x25		Tightening torque	5 Nm

Charge air duct to oil sump			Used in step 19
M6		Tightening torque	8 Nm

Wheel arch cover			Used in step 20
Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub			Used in step 21
M8	Renew screw.		16 Nm

Wheel bolts			Used in step 21
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

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Underbody protection front			Used in step 23
			3 Nm

Bracing strut to top cross connection			Used in step 24
M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection			Used in step 24
M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection			Used in step 24
M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge			Used in step 25
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 25
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 26
M6		Tightening torque	8 Nm

Overview of Special Tools

2 344 011 Tool

Common	Used in step 21
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 8
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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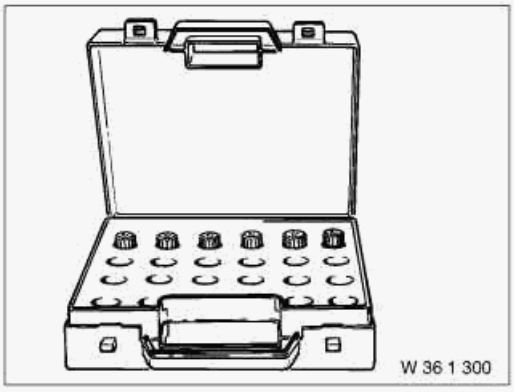
0 495 224 (36 1 326) Wheel stud



Common	Used in step 8
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 8
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 8
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 8
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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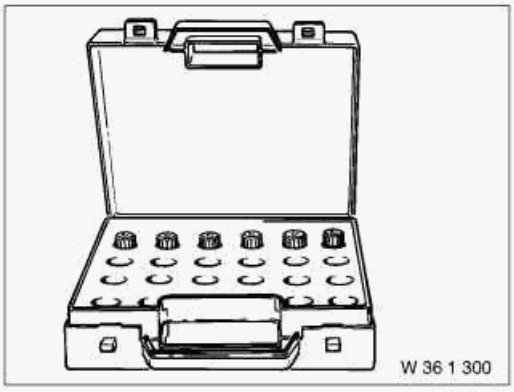
0 495 228 (36 1 331) Wheel stud



Common	Used in step 8
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 8
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 8
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Height of the sealing bead	Used in step 15
	2,0 mm ... 2,5 mm

Processing time of liquid sealing compound	Used in step 15
	< 12 min

Links

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	15

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 28

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17 00 008 Draining and topping up coolant for high-temperature circuit 29
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17 00 008 Draining and topping up coolant for high-temperature circuit 29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 29
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17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
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17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	29
17 00 039 Bleeding cooling system (B37, B47)	29
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17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	29
17 00 008 Draining and topping up the high-temperature coolant circuit	29
17 00 008 Draining and topping up the high-temperature coolant circuit	29
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	29
17 00 008 Draining and topping up the high-temperature coolant circuit	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
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17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29

Operating materials	Used in step
2.0 Grease for wheel centring	21

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11 53 942 Removing and installing (replacing) the connecting branch on the engine block (Draining and topping up coolant, see 17 00 ...)

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WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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1 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

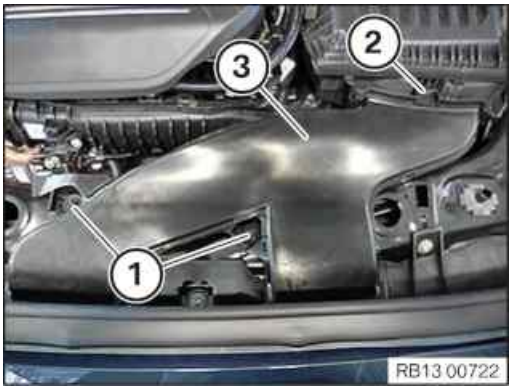
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

3 – Removing intake silencer housing

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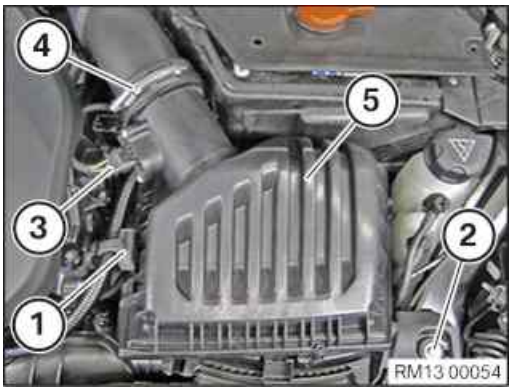
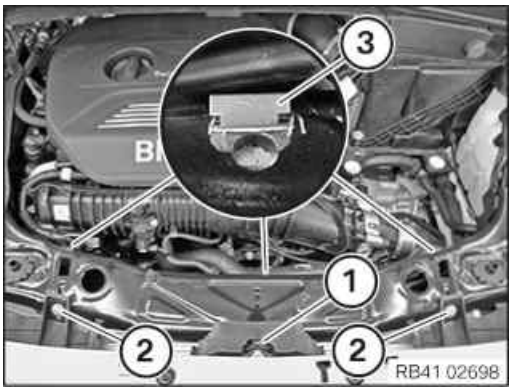
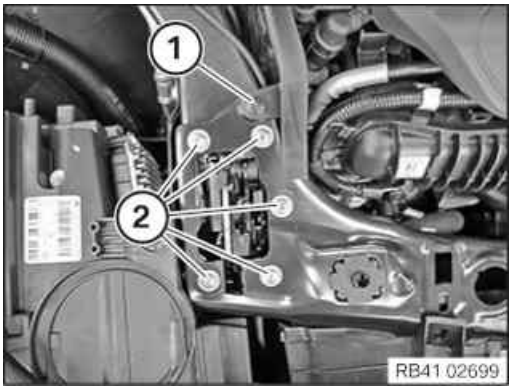


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

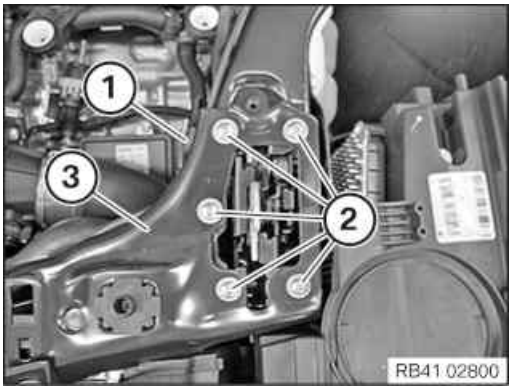
4 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.

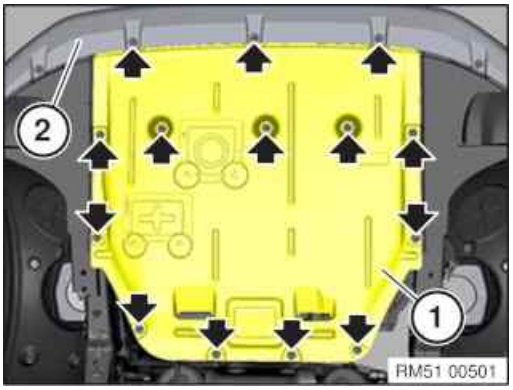


- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

5 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

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6 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

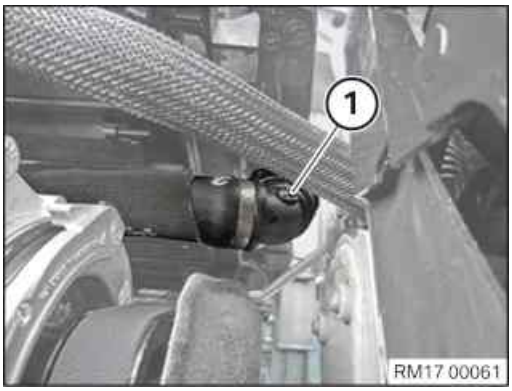
When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

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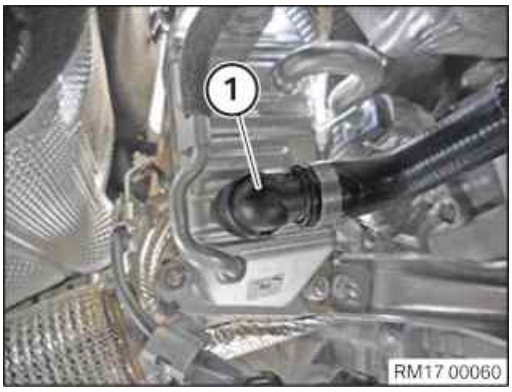
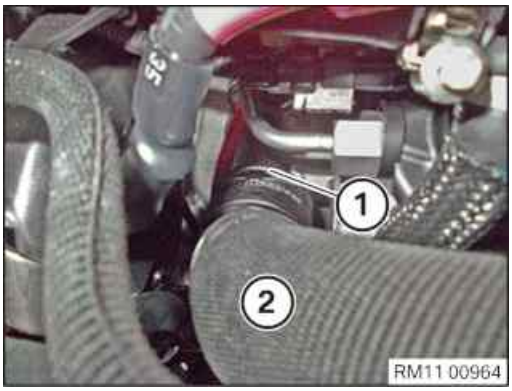


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

MAIN WORK

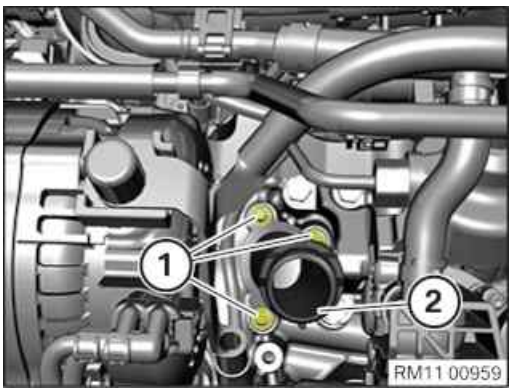
7 – Remove connecting branch on the engine block



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1) upward.
- Pull off the coolant hose (2).
- Catch and dispose of escaping coolant.

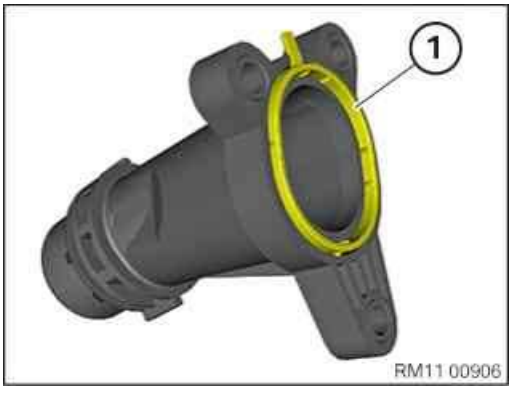


- Loosen screws (1).
- Guide out and remove the connecting branch (2).

8 – Install connecting branch on the engine block

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.



- Renew gasket (1).

  Parts: Gasket

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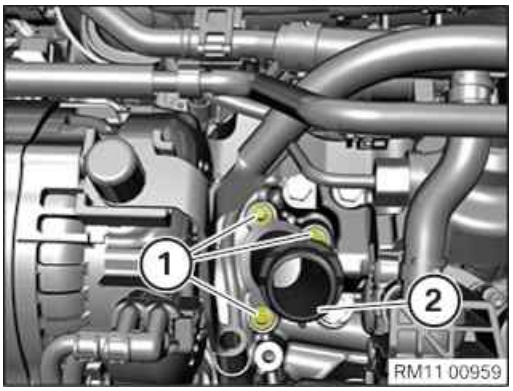
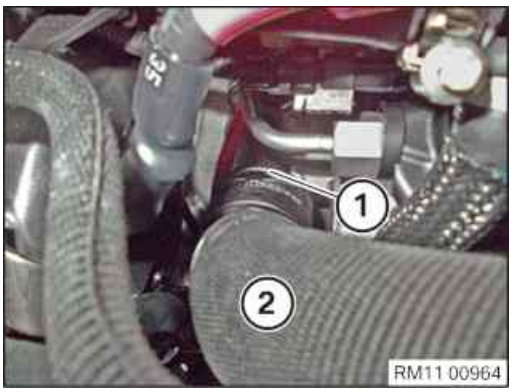
- Clean the sealing surface (1) on the engine block with the special tool **0 495 102 (11 4 470)**.



- Insert and position the connecting branch (2).
- Tighten the screws (1).

Connecting branch to engine block

M6x25		Tightening torque	8 Nm



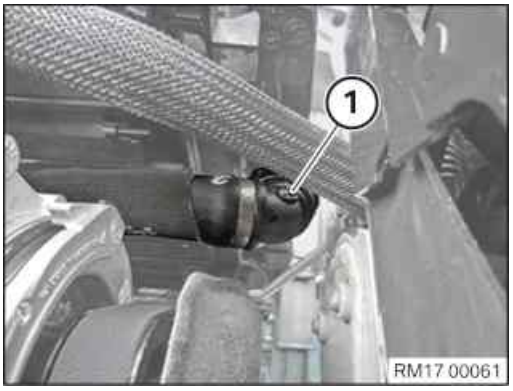
- Connect and lock coolant hose (2).
- Ensure that the lock (1)engages audibly.

POSTPROCESSES

9 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Connect the right coolant line (1) to the radiator and lock audibly.

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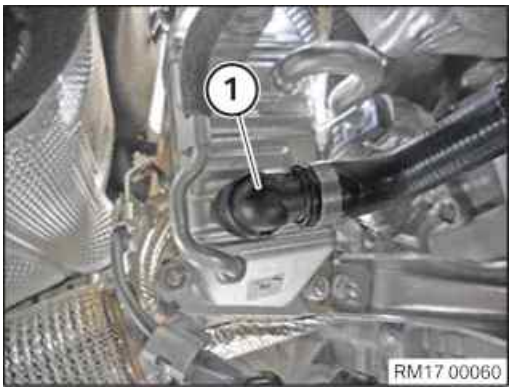
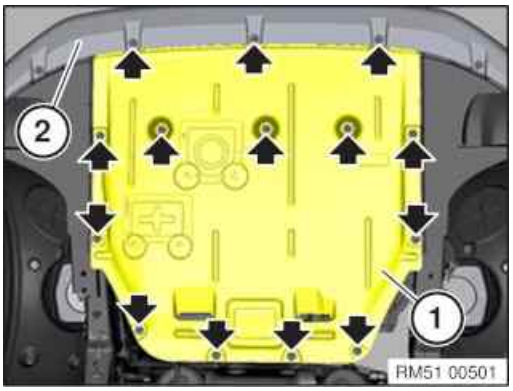


- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

10 – Installing the front underbody protection

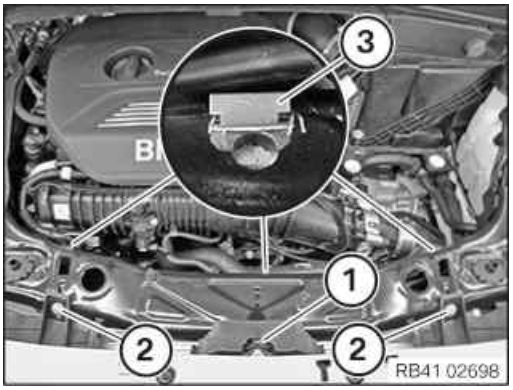


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

11 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

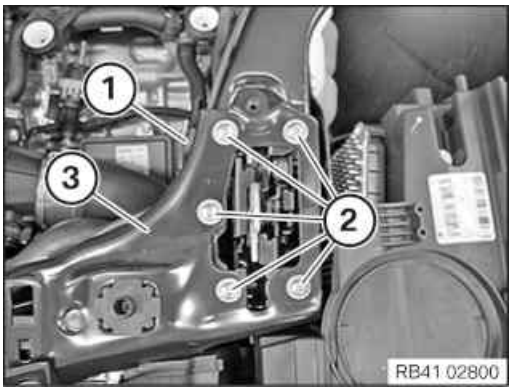
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.



- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

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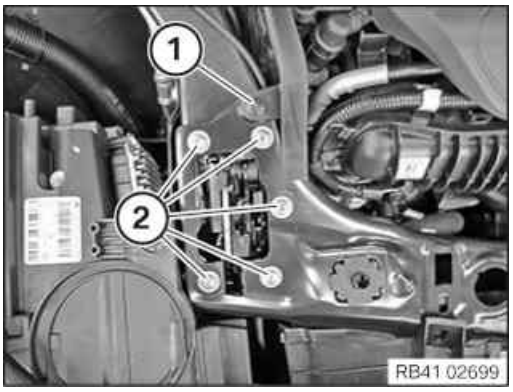


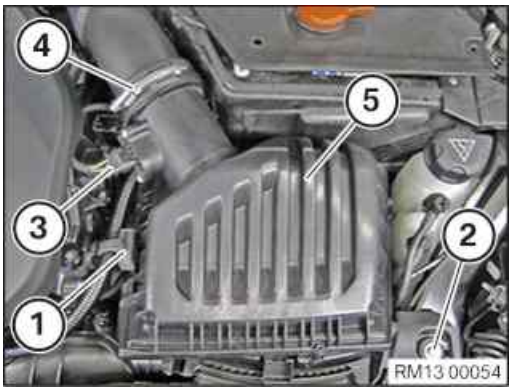
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

12 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

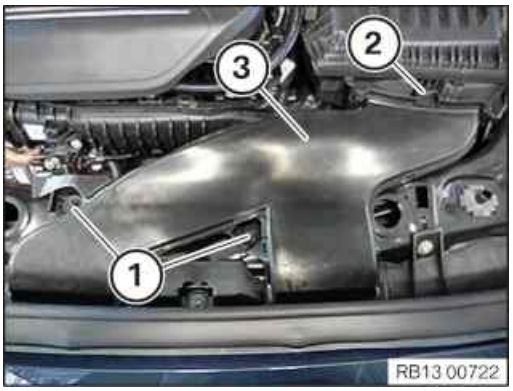
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

13 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

14 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

15 – Filling and bleed the high-temperature coolant circuit

- See additional information.

Additional Information

Overview of Tightening Torques

Connecting branch to engine block			Used in step 8
M6x25		Tightening torque	8 Nm

Underbody protection front			Used in step 10
			3 Nm

Bracing strut to top cross connection			Used in step 11
M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection			Used in step 11
M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection			Used in step 11
M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge			Used in step 12
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 12
Clamp		Tightening torque	3 Nm

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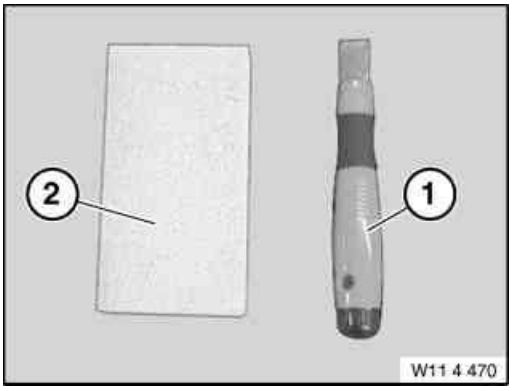
Intake neck to cross connection			Used in step 13
M6		Tightening torque	8 Nm

Overview of Special Tools

0 495 102 (11 4 470) Tool



Common Used in step 8

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

Links

Repair instructions	Used in step
17 00 008 Draining and topping up coolant for high-temperature circuit	15
17 00 008 Draining and topping up coolant for high-temperature circuit	15
17 00 008 Draining and topping up coolant for high-temperature circuit	15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	15
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool 15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 15
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature) 15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 15
17 00 039 Bleeding the cooling system (B36, B38, B46, B48) 15
17 00 039 Bleeding cooling system (B37, B47) 15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 15
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48) 15
17 00 008 Draining and topping up the high-temperature coolant circuit 15
17 00 008 Draining and topping up the high-temperature coolant circuit 15
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM 15
17 00 008 Draining and topping up the high-temperature coolant circuit 15
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures) 15
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 15
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures) 15
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures) 15
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures) 15

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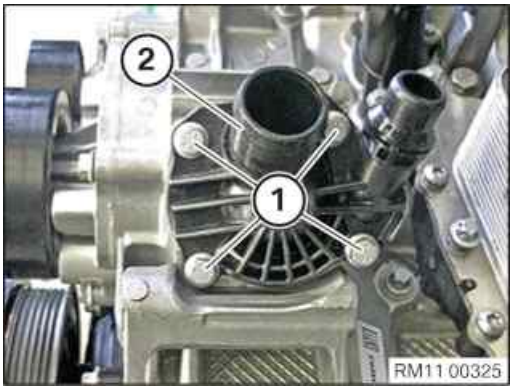
11 53 000 Removing and installing or replacing coolant thermostat (B37C)

Necessary preliminary work:

- Remove fan cowl.
- Drain coolant.
- Only loosen compressor for air conditioning and secure to prevent falling (air conditioning does not have to be bled).

Note: Until production date 10/2015, the coolant thermostat can only be replaced after a technical change in conjunction with the coolant pump.

Removal:



Release screws (1).

Remove thermostat housing (2).

Remove thermostat (1) from housing in direction of arrow.

Installation:

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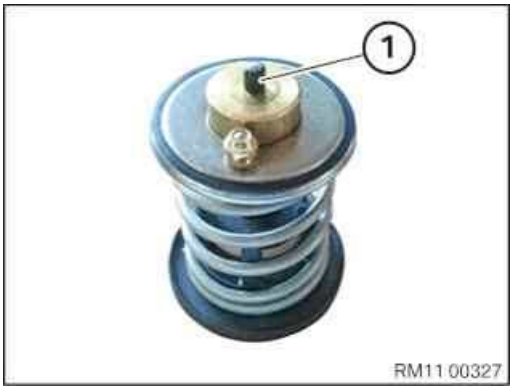
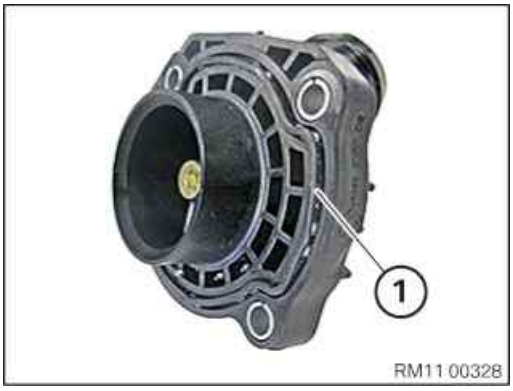
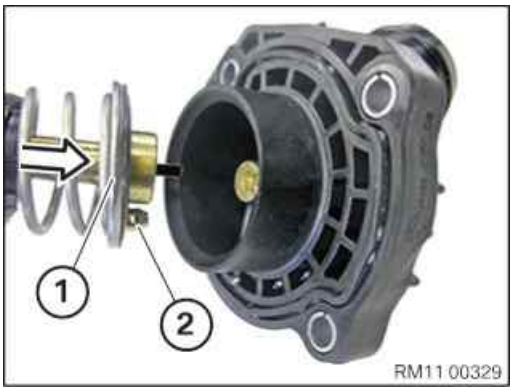


Installation note:
Guide sleeve (1) must not be damaged or missing.

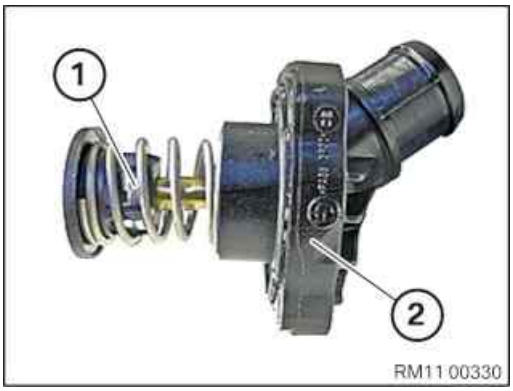


Parts: Replace profile seal (1).



Installation note:
Valve (2) must be positioned at bottom.

Insert thermostat (1) in housing.



Caution!
Thermostat (1) must not tilt out of housing (2) during installation.

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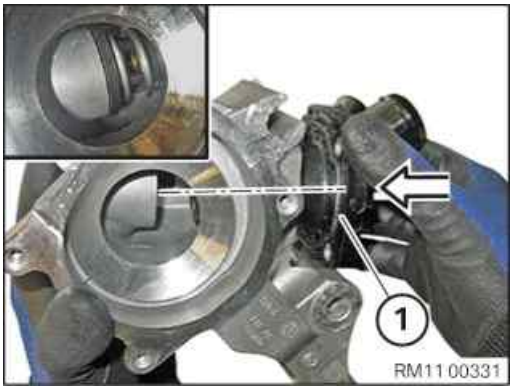
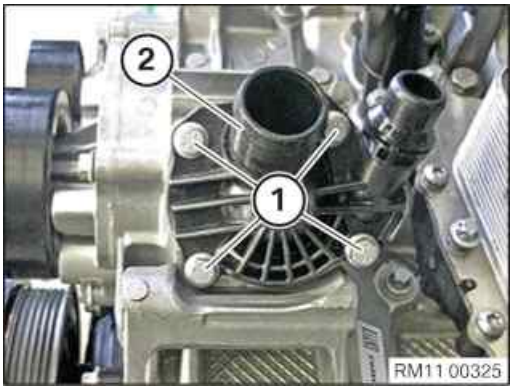


Note:
Alternator bracket dismantled for improved clarity.

Install thermostat housing (1) with thermostat in a straight line and free from stress.



Tighten screws (1).

Tightening torque: 11 00 2AZ.

Required follow-up work:

- Install compressor for air conditioning.
- Top up coolant.
- Install fan cowl.

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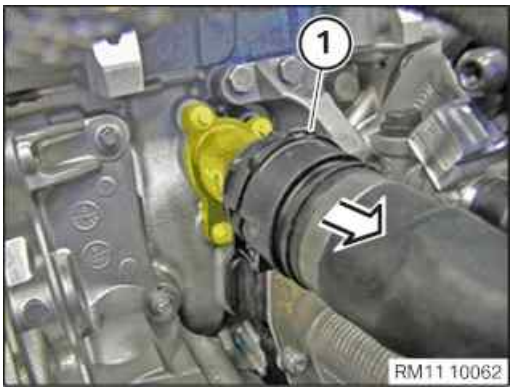
11 53 942 Removing and installing/replacing connecting branch (B37C)

Necessary preliminary tasks:

- Drain coolant

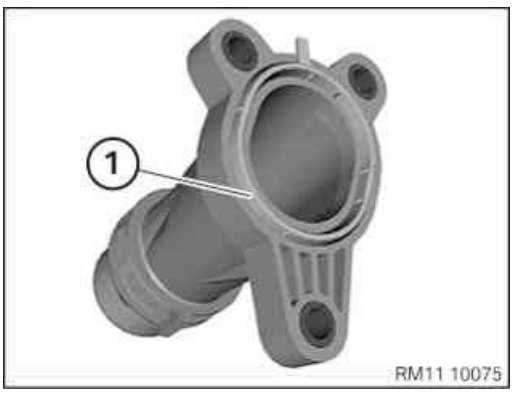
Removal:



Unlock coolant hose (1) and disconnect from connecting branch.

Release screws (1) on connecting branch.
Remove connecting branch.

Installation:



Install gasket (1).
Part: Replace sealing ring.

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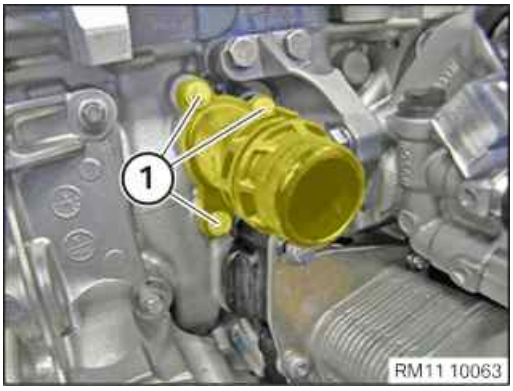
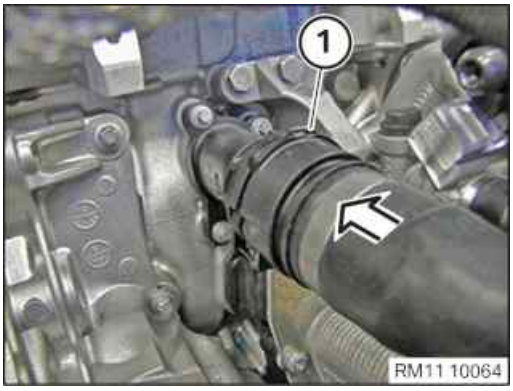


Position connecting branch.

Tighten screws (1) on connecting branch.

Tightening torque 11 51 1AZ.



Mount coolant hose on connecting branch (1).

Lock must snap audibly into place.

Required follow-up work:

- Add coolant

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11 53 000 Removing and installing/replacing coolant thermostat

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Up to production date 10/2015 the coolant thermostat can after a technical alteration only be replaced in conjunction with the coolant pump.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

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- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

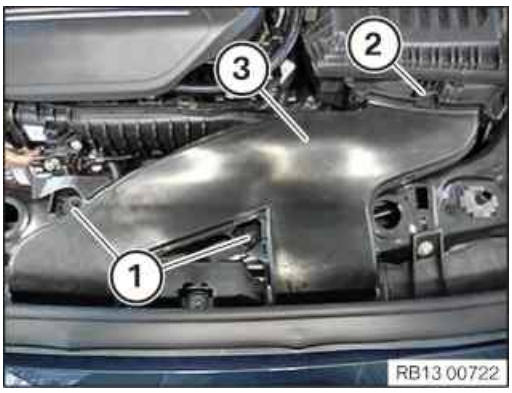
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing

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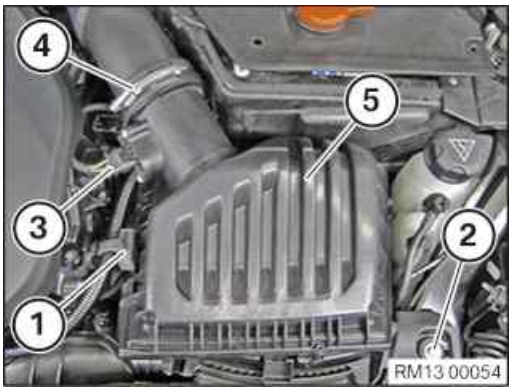
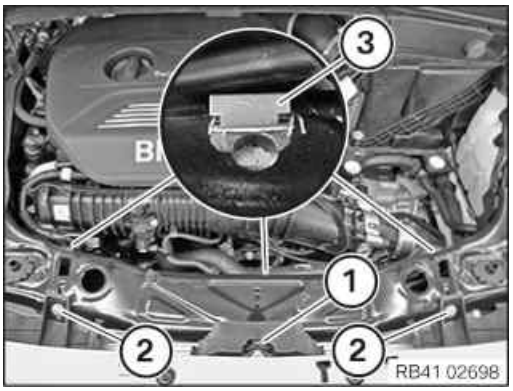
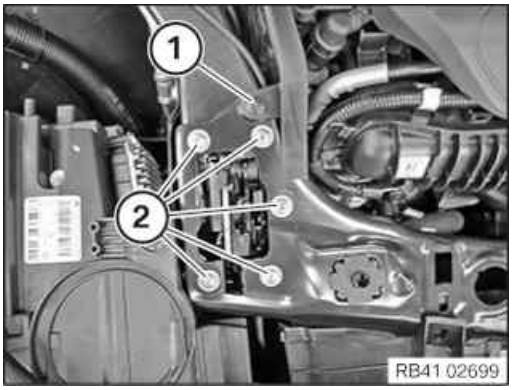


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

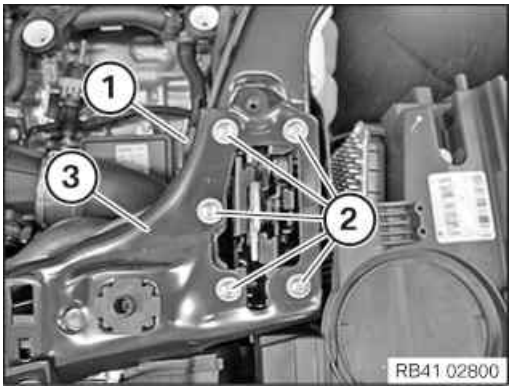
5 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.

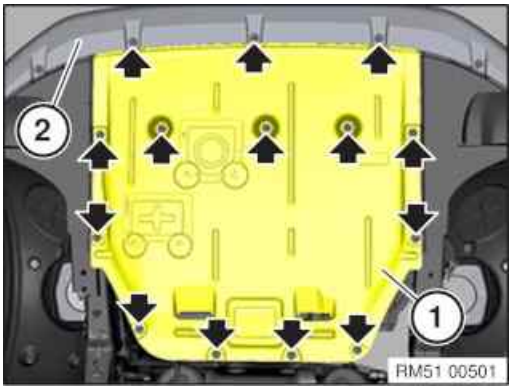


- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

6 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

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7 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

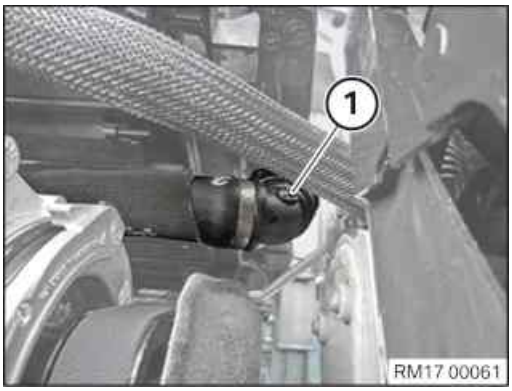
When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.

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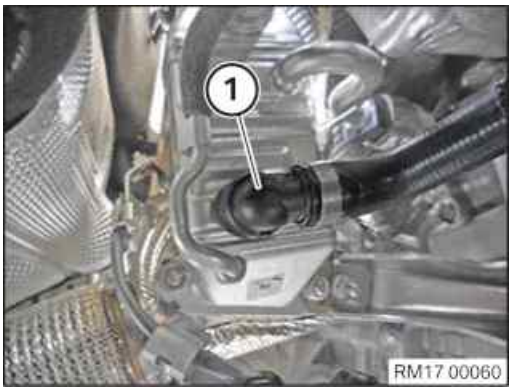


- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

8 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

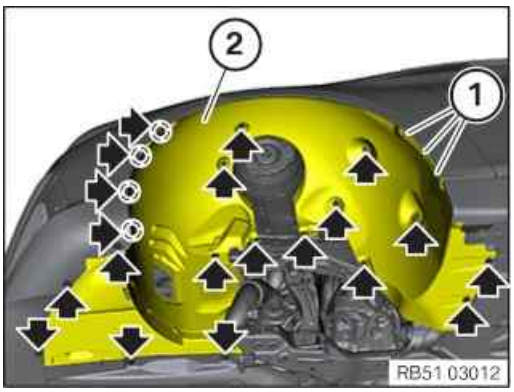
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

9 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

10 – Remove right charge-air line

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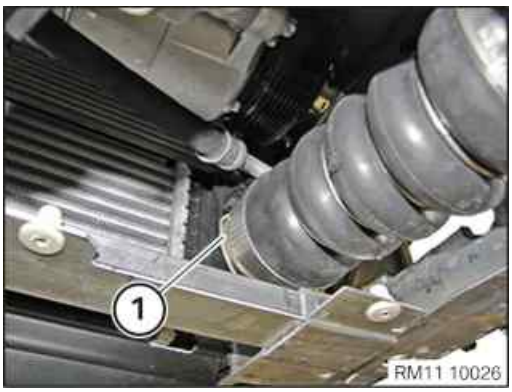
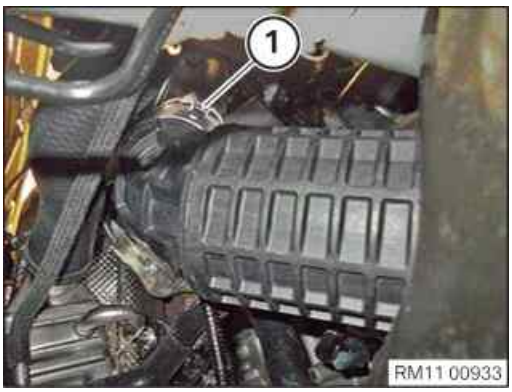
- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

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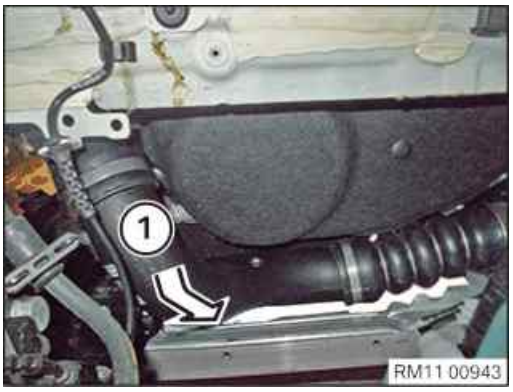
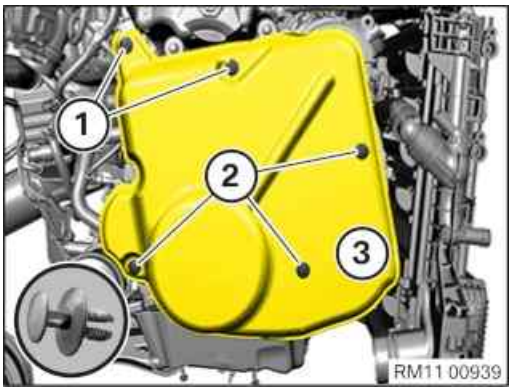


- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

11 – Removing the acoustic cover for the engine at the front



- Release the expanding rivets (1) from the top.
- Release the expanding rivets (2) from the bottom.
- Feed out and remove acoustic cover (3) downwards.

12 – Removing the drive belt for alternator

CAUTION

Spring preload.

Danger of injury!

- The use of the specified special tool (tool) is mandatory.
- The described operation must be carried out properly.

CAUTION

Component with preload.

Danger of injury!

- Reduce preload as far as possible before disassembly. Relieve component.

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.

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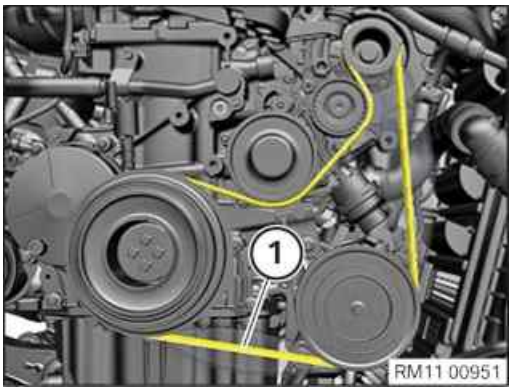
- Increase the preload on the belt tensioner in the direction of arrow.
- Secure the belt tensioner with the special tool .

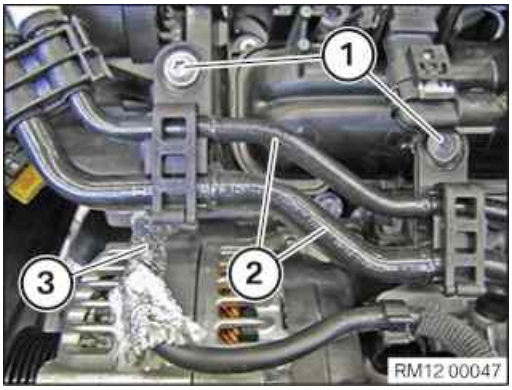


- Guide out the drive belt for the alternator (1) and remove it.

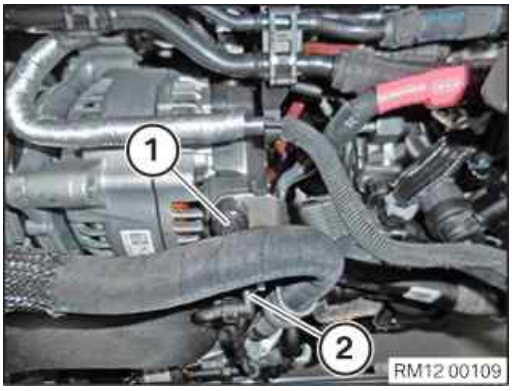
13 – Removing the alternator

Prerequisite

Battery earth lead is disconnected.



- Loosen screws (1).
- Place fuel feed and return line (2) to one side.
- Unlock the coolant ventilation line (3) and pull it off the cylinder head.
- Catch and dispose of escaping coolant.



- Remove the cover (1) and loosen the nut below.
- Disconnect positive battery cable from alternator.
- Unlock the plug connection (2) and pull off from the alternator.

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- Loosen screws (1).

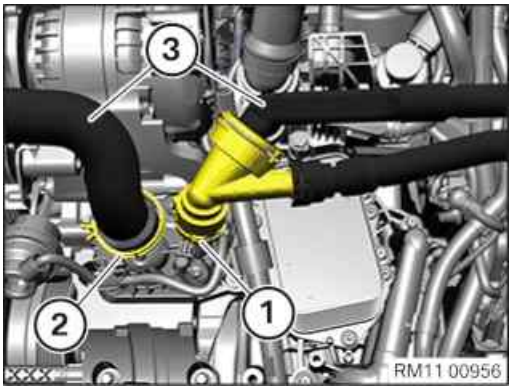
- Feed the alternator (1) out toward the top and remove it.

MAIN WORK

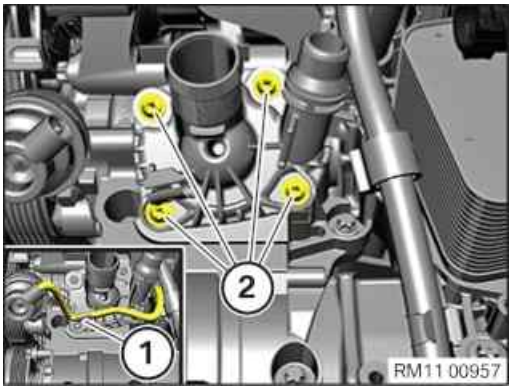
14 – Removing the coolant thermostat

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.



- Unlock the lock of the coolant pipe on the thermostat housing (1).
- Loosen hose clamp (2).
- Disconnect the coolant pipe and coolant hose (3) from the thermostat housing and set aside.
- Catch and dispose of escaping coolant.



- Take the vacuum hose (1) out of the holder.
- Unscrew the bolts (2) on the thermostat housing.
- Thread out and remove the thermostat housing.
- Catch and dispose of escaping coolant.

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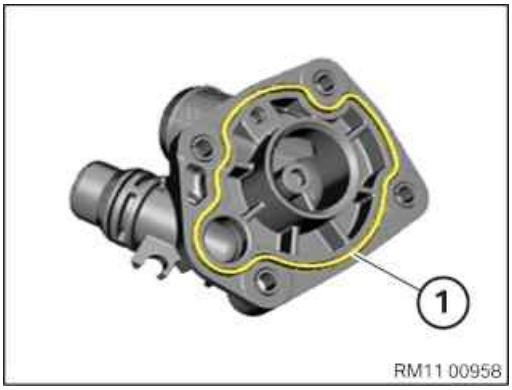
- Remove the coolant thermostat (1) from the thermostat housing in the direction of the arrow.

15 – Installing the coolant thermostat

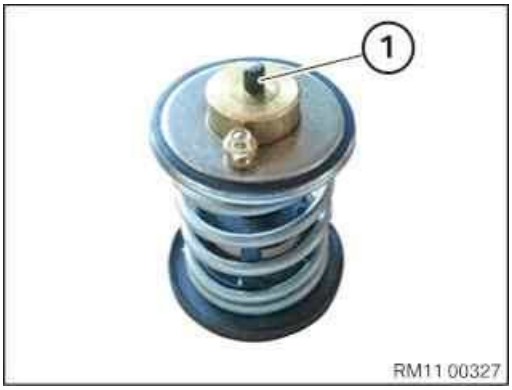
TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



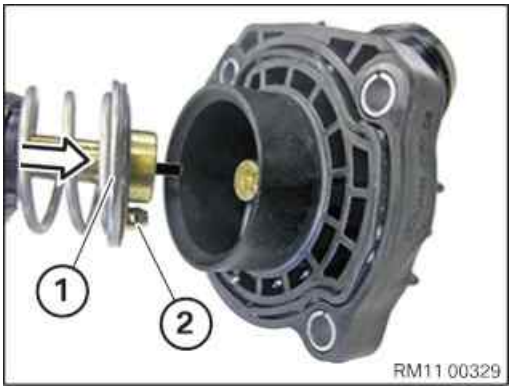
- Renew seal (1) from thermostat housing.

  Parts: Gasket



- Check the guide sleeve (1) for damage and renew if necessary.

  The guide sleeve (1) must not be damaged or missing.



- Insert the coolant thermostat (1) into the thermostat housing so that the valve (2) is on the bottom.

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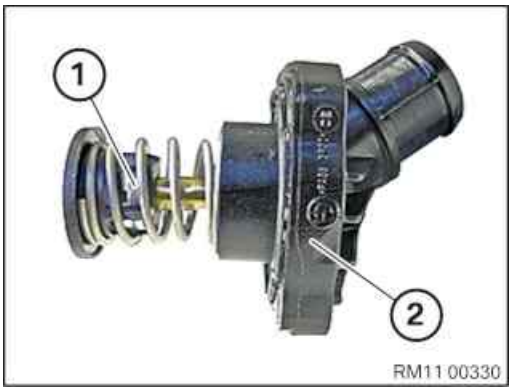
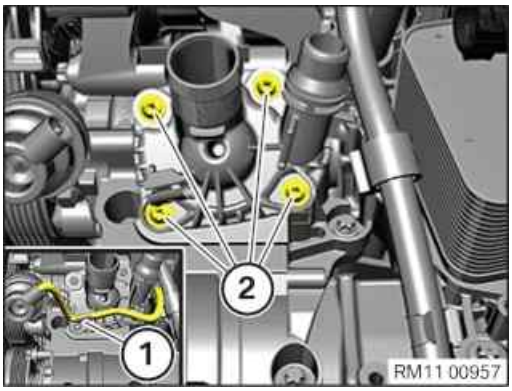


- Make sure that the coolant thermostat (1) does not fall out of the thermostat housing (2) during the installation.

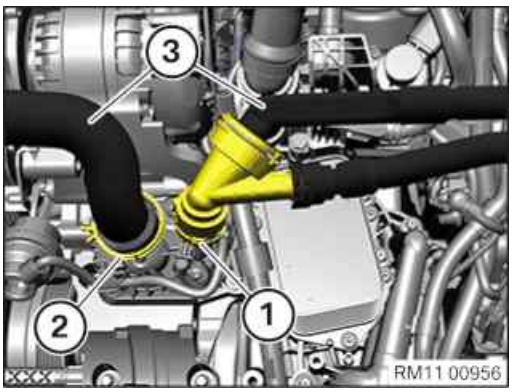


- Install the thermostat housing with the coolant thermostat.
- Tighten down screws (2).

Thermostat housing to component carrier

M6		Tightening torque	8 Nm

- Secure vacuum hose (1) in holder on thermostat housing.



- Connect coolant line and coolant hose (3).
- Make sure that the coolant line (3) engages audibly on the thermostat housing.
- Secure coolant hose with hose clamp (2).

POSTPROCESSES

16 – Installing the alternator

- Insert and install the alternator (1).

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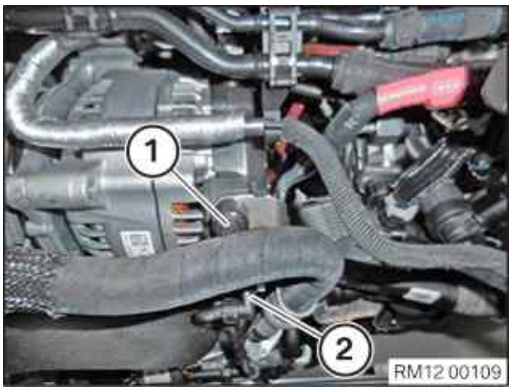
- Tighten the screws (1).

Alternator to component carrier

M10x75 / M10x125		Tightening torque	38 Nm

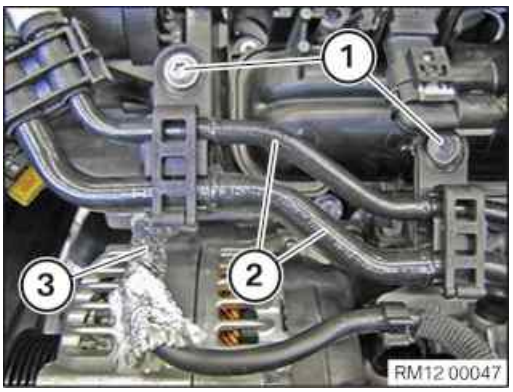


- Mount the positive battery cable to the alternator and secure it with the nut.
- Tighten nut.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

- Mount the cover (1) on the nut.
- Connect the connector (2) to the alternator and lock audibly.



- Mount fuel supply and return line (2).
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

- Connect the coolant ventilation line (3) to the cylinder head and audibly lock.

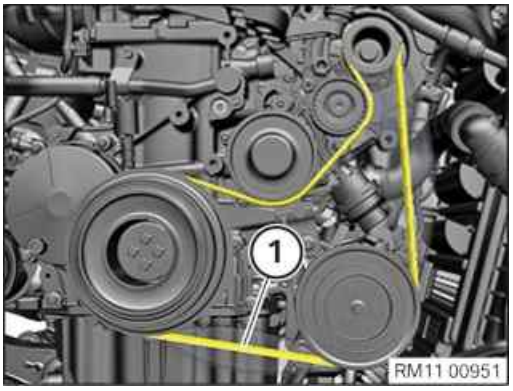
17 – Installing the drive belt for alternator

TECHNICAL INFORMATION

If the drive belt is reused: Mark direction of travel and reinstall drive belt in same direction of travel.

TECHNICAL INFORMATION

The drive belt must be replaced if contaminated with coolant- and oil residues.



- Feed in the drive belt for the alternator (1) and install it.

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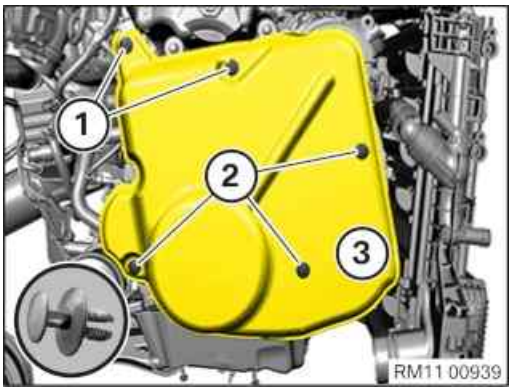
- Increase the preload on the belt tensioner in the direction of arrow.
- Feed the special tool out of the belt tensioner and remove it.

18 – Install the acoustic cover for the engine at the front



- Thread in and position the acoustic cover (3).
- Secure the acoustic cover (3) with the expanding rivets (2) from the bottom.
- Secure the acoustic cover (3) with the expanding rivets (1) from the top.

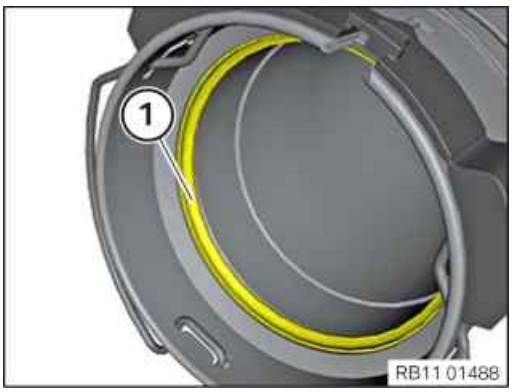
19 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

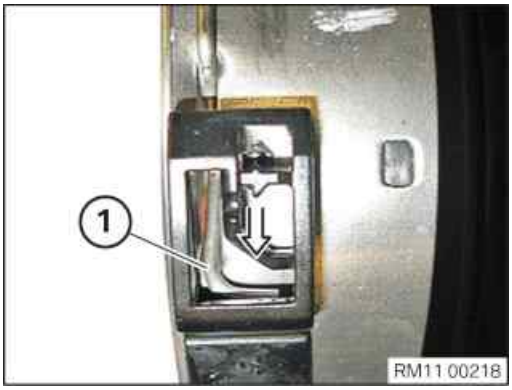
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.



- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).

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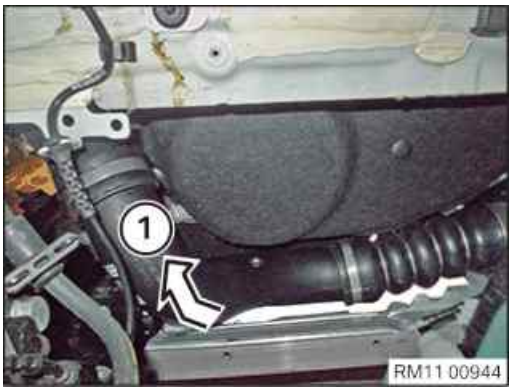
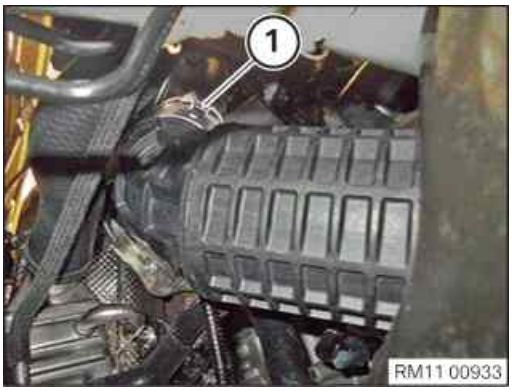
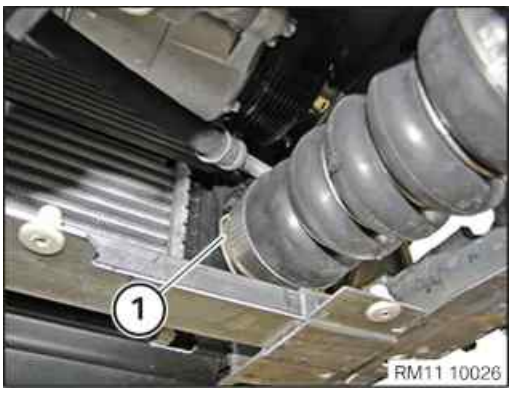


- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.



- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

20 – Installing the front right wheel arch cover

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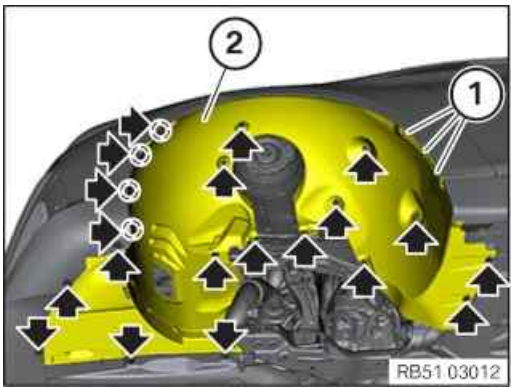


- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

21 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

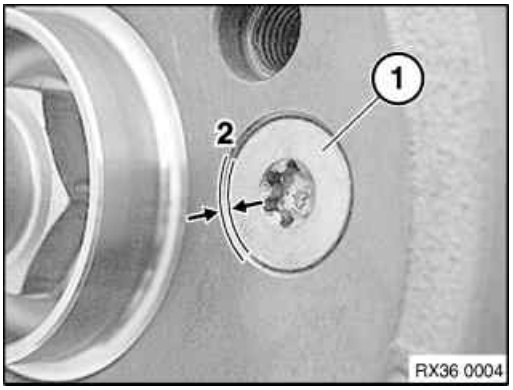
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

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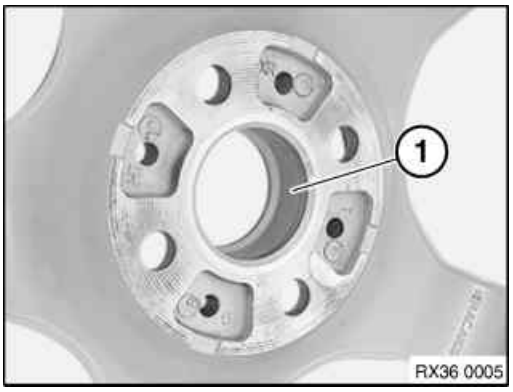

- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

22 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

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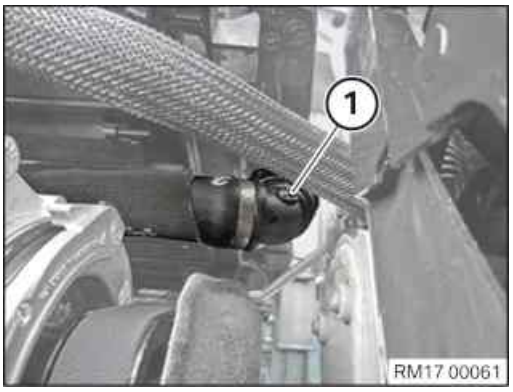
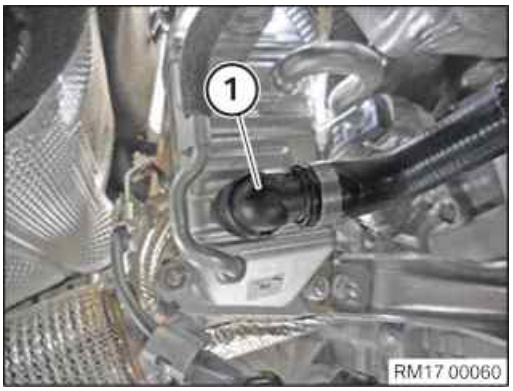
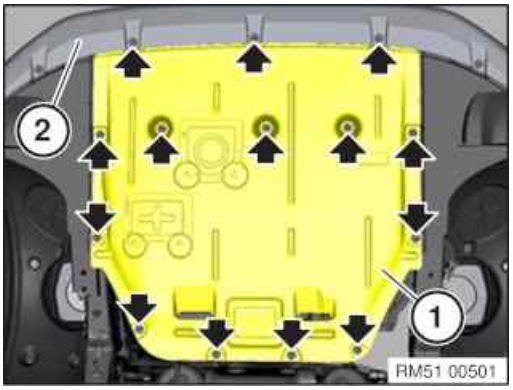


- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

23 – Installing the front underbody protection

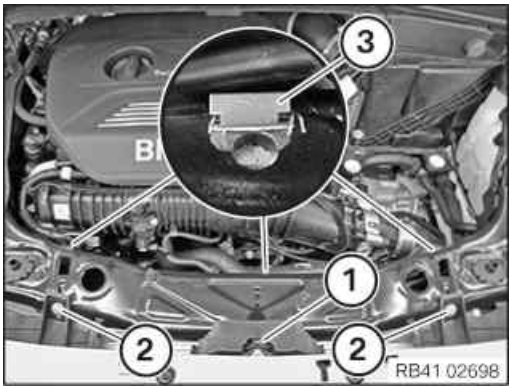


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

24 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

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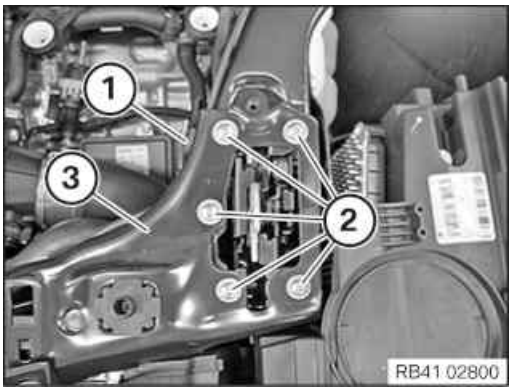
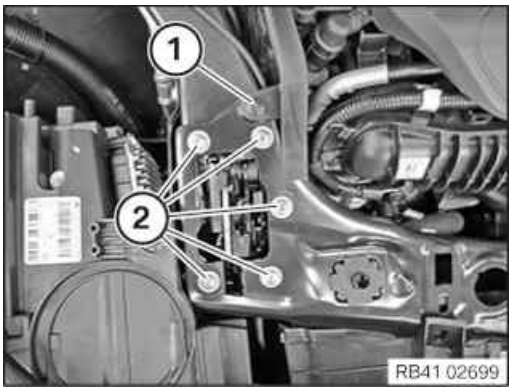


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



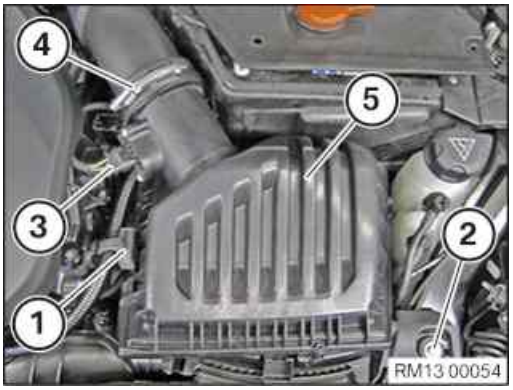
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

25 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

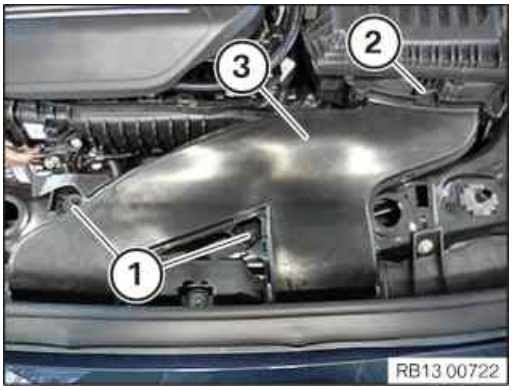
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

26 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

27 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

28 – Disconnecting all battery earth leads

- See additional information.

29 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

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- See additional information.

Additional Information

Overview of Tightening Torques

Thermostat housing to component carrier			Used in step 15
M6		Tightening torque	8 Nm

Alternator to component carrier			Used in step 16
M10x75 / M10x125		Tightening torque	38 Nm

Positive battery cable to alternator			Used in step 16
M8		Tightening torque	19 Nm

Fuel line to intake plenum			Used in step 16
TS6x20		Tightening torque	5 Nm

Charge air line to crankcase			Used in step 19
M6x25		Tightening torque	5 Nm

Charge air duct to oil sump			Used in step 19
M6		Tightening torque	8 Nm

Wheel arch cover			Used in step 20
Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub			Used in step 21
M8	Renew screw.		16 Nm

Wheel bolts			Used in step 21
M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front			Used in step 23
			3 Nm

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Bracing strut to top cross connection			Used in step 24
M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection			Used in step 24
M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection			Used in step 24
M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge			Used in step 25
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 25
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 26
M6		Tightening torque	8 Nm

Overview of Special Tools

2 344 011 Tool

Common	Used in step 21
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud

Common	Used in step 8
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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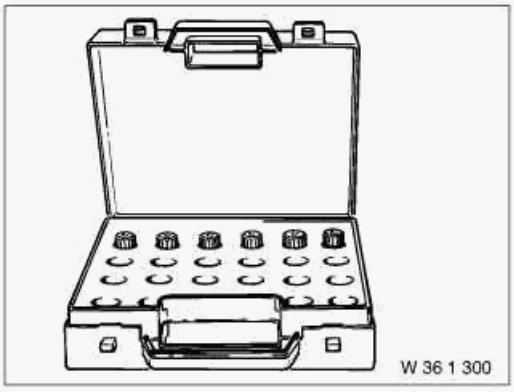
0 495 224 (36 1 326) Wheel stud



Common	Used in step 8
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 8
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 8
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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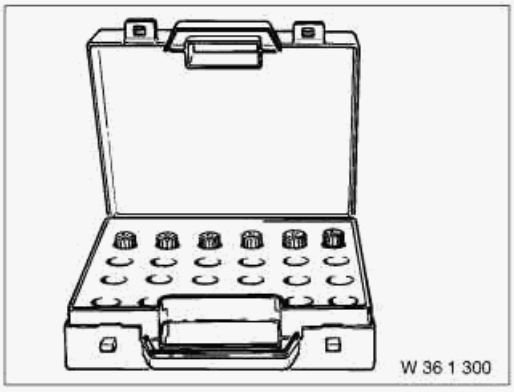
0 495 227 (36 1 329) Wheel stud



Common	Used in step 8
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 8
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 8
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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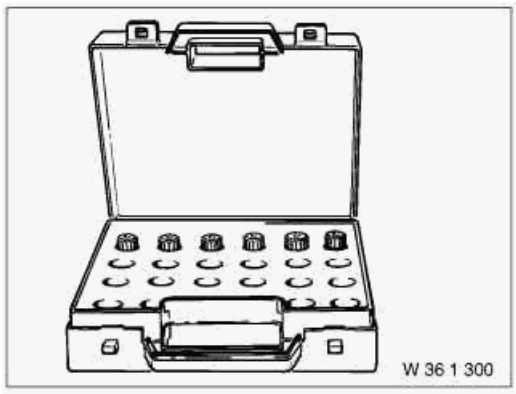
0 495 230 (36 1 333) Wheel stud



Common	Used in step 8
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 28
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 28
61 20 900 Disconnecting and connecting battery earth lead	1 28
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61 20 900 Disconnecting and connecting battery earth lead 1 28
17 00 008 Draining and topping up coolant for high-temperature circuit 29
17 00 008 Draining and topping up coolant for high-temperature circuit 29
17 00 008 Draining and topping up coolant for high-temperature circuit 29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 29
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool 29
17 00 039 Bleeding the cooling system (B36, B38, B46, B48) 29
17 00 039 Bleeding cooling system (B37, B47) 29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool 29
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48) 29
17 00 008 Draining and topping up the high-temperature coolant circuit 29
17 00 008 Draining and topping up the high-temperature coolant circuit 29
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM 29

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17 00 008 Draining and topping up the high-temperature coolant circuit	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29

Operating materials	Used in step
2.0 Grease for wheel centring	21

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11 61 730 BMW leakage test for differentiated intake system

Special tools required:

- 81 29 0 426 464
- 81 31 2 353 954
- 2 409 665
- 2 358 459
- 0 426 464
- 81 31 2 357 800
- 2 353 954

Caution!

Excess pressure and vacuum lines can be recognised by the size of their fasteners and are colour-coded blue and red respectively.

Identification:

- Pressure line blue
- Vacuum line red

Excess pressure and vacuum lines must not be mixed up.

Mixing up the lines will result in engine damage.

Necessary preliminary work:

- Release the intake filter housing.
- Prepare BMW diagnosis system
- Start diagnosis program
  1. Power train
  2. Engine electronics
  3. Air supply
  4. Charging pressure control system or perception of lack of power

Ordering information:

- Workshop Equipment - Start BMW
- Workshop equipment catalogue
- Measuring and test equipment
- Service and diagnosis
- Order number 81 29 0 426 464
- Order number 81 31 2 353 954

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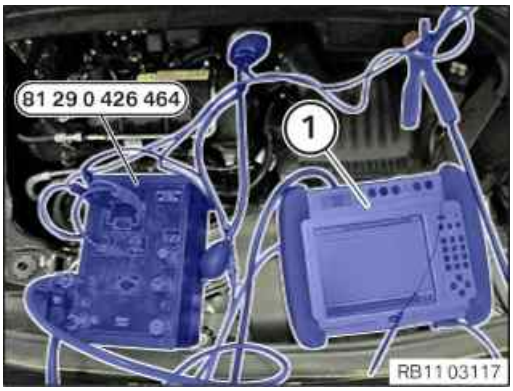
Check intake system for leaks:

For a precise leakage test, both clean air pipes must be closed with the special tool 2 409 665 .

Connect the pressure hose (1) with special tool 2 358 459 .

Insert the blue excess pressure line (2) into the pneumatic coupling (1) up to the limit position.

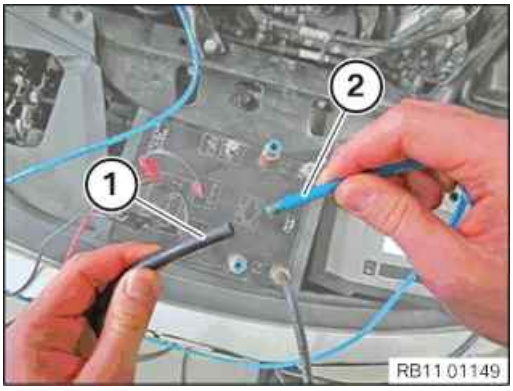
Connect the pressure lines with the diagnosis system and the IMIB.



Insert the blue overpressure lines on the diagnosis auxiliary device 0 426 464 on the connector (1).

Connect Integrated Measurement Interface Box (1 via the hose 81 31 2 357 800 (previously: 81 38 2 201 924) with the connection piece of the diagnostics aid.

Installation note:
Follow diagnosis instruction.



Leak detection with BMW smoke tester:

Disconnect the overpressure line (2) on the diagnosis auxiliary device.

Connect pressure line (1) from the BMW smoke tester 2 353 954 with the overpressure line (2).

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Put the BMW smoke tester 2 353 954 into operation according to the operating instructions.

Observe BMW diagnosis instructions.

Leaks on the air intake duct are detected by escaping smoke.

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11 12 800 Clean cylinder head intake channels and intake plenums

Special tools required:

- 11 8 880
- 11 0 235
- 2 302 630
- 11 6 480
- 11 6 050
- 2 356 969
- 2 356 966
- 2 356 967

Necessary preliminary work:

- Disconnect negative battery lead
- Removing intake plenum
- Remove front right wheel arch panel

Dismantle intake plenum:

- Remove throttle body
- Remove adjuster
- Remove charging pressure sensor
- Remove the temperature sensor for the exhaust-gas recirculation
- If applicable, remove preheating control unit

Wear protective goggles and gloves.

Caution!
Never place electrical components in cleaning agent!

Cleaning intake plenum:

- Wear personal protective clothing/equipment
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (see Section 3.2)
- Place intake plenum in cleaning agent
- Observe application time of at least 1 hour

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Cleaning intake ports: Caution!

Risk of engine damage!

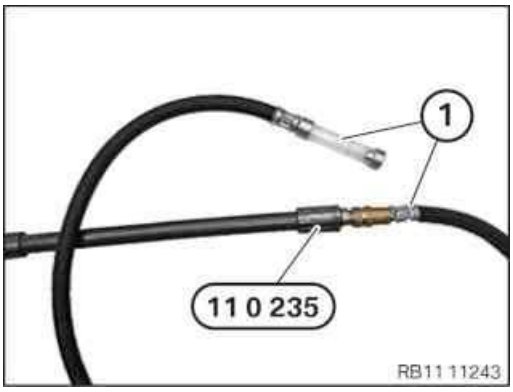
When cleaning the intake ports, it must be ensured that the intake valves of the corresponding cylinder are closed.

Determine the TDC (intake valves closed) using a TDC determination unit via the glow-plug hole.

Start with the 1st cylinder when cleaning the intake ports.

Remove glow-plug cylinder 1.

Screw in special tools 11 8 880 and 11 0 235 .



Connect TDC determination unit (1) from special tool 2 302 630 with special tool 11 0 235 .

Turn the engine with special tool 11 6 480 on the central bolt till cylinder 1 is in TDC position.**Caution!**

Do not crank engine in reverse direction.

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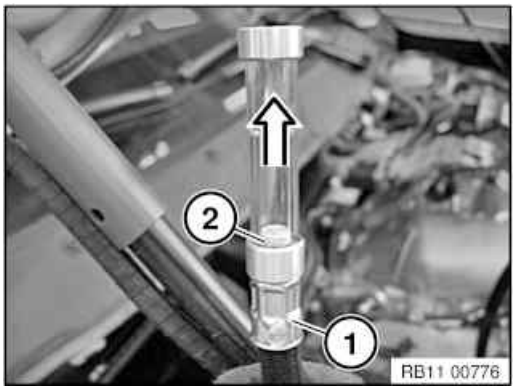
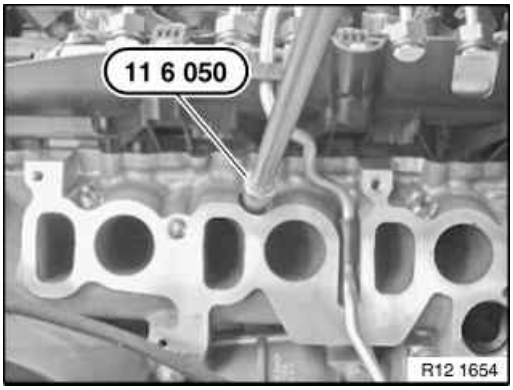


Caution!

Determine the TDC (intake valves closed) using a TDC determination unit (1) via the glow-plug hole.

Turn the engine on the central bolt until cylinder 1 is in TDC position.

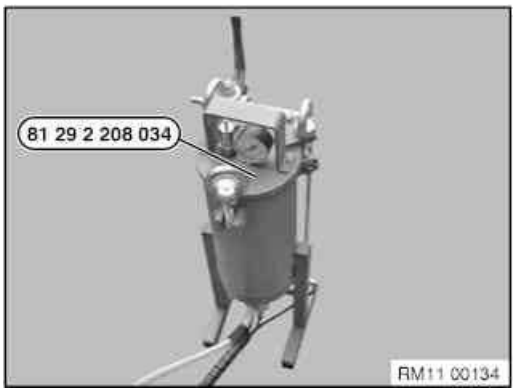


Remove special tools.

Reinstall glow-plug using special tool 11 6 050 .

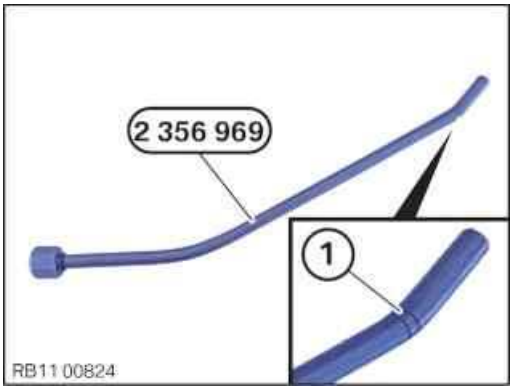
Installation note:

Tightening torque 12 23 1AZ.



The following are required:

- Blasting tool 81 29 2 208 034
- Walnut shell granulate
- Vacuum cleaner



Caution!

Front area of sensors is marked with two notches. These can additionally be highlighted in colour.

During the blasting process, only pull the wands out of the vacuum adapter until the mark becomes visible.

Blasting wand for swirl ports:

- 2 356 969

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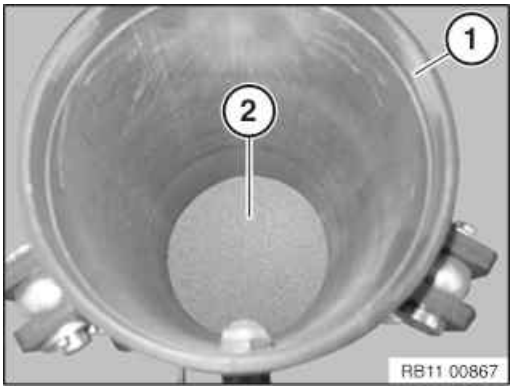
Vacuum adapter for tangential swirl port:

- 2 356 966

Vacuum adapter for swirl port:

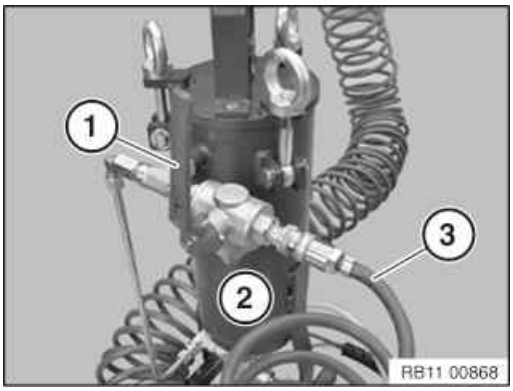
- 2 356 967



Note:
Use 2 litres of granulate per cleaning operation; this corresponds to a blasting duration of approx. 20 seconds.

Open blasting tool (1) and pour in 2 litres of granulate (2).

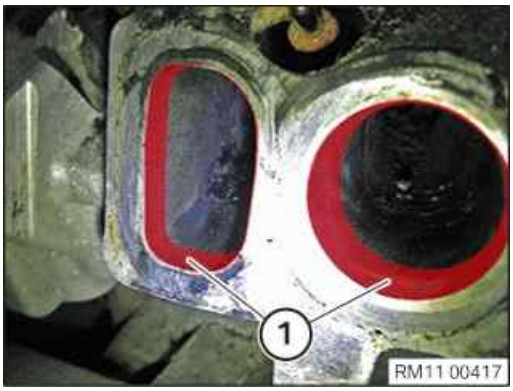
Close the device again.



Note:
Operating pressure 6 - 8 bar.

Close main valve (1) on blasting tool (2).

Connect compressed air (3).



Cleaning the swirl port of 1st cylinder:

Prior to the blasting process, clean the front area of both intake ports (1) of first cylinder with a suitable tool (e.g. plastic scraper, brushes 83 19 2 298 237).

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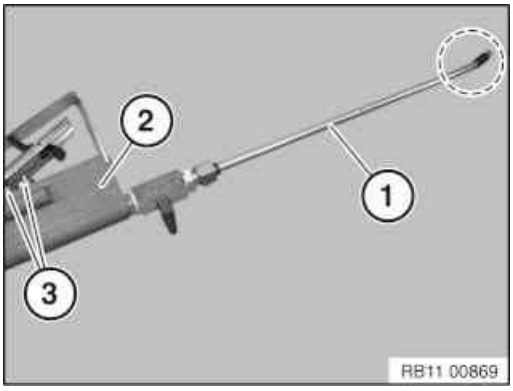


Screw together blasting wand 2 356 969 (1) and actuator (2).

Open blasting tool and pour in 2 l granulate.

Close the device again.

Note:
Actuator (3) has two stages!

In stage one, only compressed air flows through the blasting wand.

In stage two (operation is fully pressed), granulate is added (blasting process).

Connect vacuum adapter 2 356 967 to vacuum cleaner. Hold vacuum adapter 2 356 967 against swirl port at no. 1 cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.

Caution!

Danger of injury!

Risk of damage!

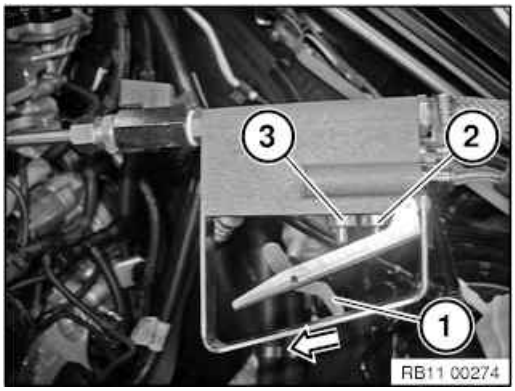
Second person required to assist.

Blasting wand may only be pulled out until the mark becomes visible.

Wear safety goggles.

Insert blasting wand 2 356 969 in the adapter 2 356 967 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.

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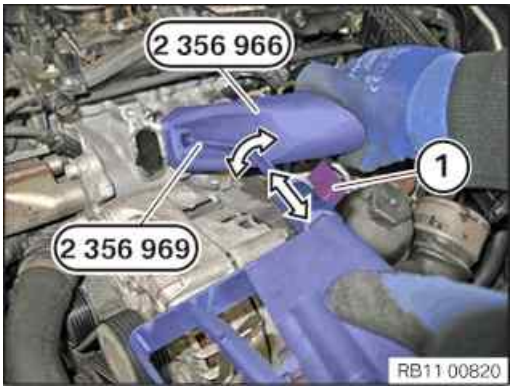
Cleaning the tangential swirl port of 1st cylinder:

Open blasting tool and pour in 2 l granulate.

Close the device again.

Connect vacuum adapter 2 356 966 to vacuum cleaner. Hold vacuum adapter 2 356 966 on swirl port of first cylinder.

Open the main valve on the blasting tool and switch the vacuum cleaner on.



Caution!

Danger of injury!

Risk of damage!

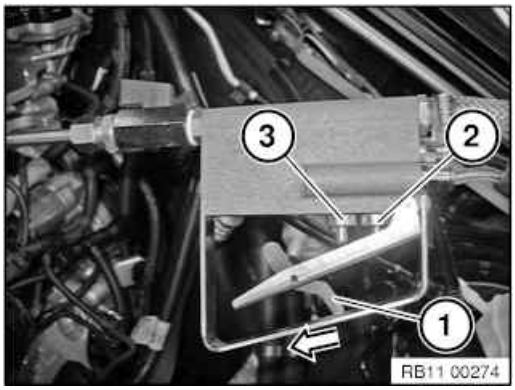
Second person required to assist.

Blasting wand may only be pulled out until the mark becomes visible.

Wear safety goggles.

Insert blasting wand 2 356 969 in the adapter 2 356 966 .

Open the actuator valve (1).



Slide locking lever (1) to the front in direction of arrow.

Operate compressed-air valve (2) at stage one; compressed air can now flow in.

Fully operate valve (3) at stage two; walnut shell granulate is now injected.

Clean intake port, rotating the blasting wand and moving it vertically up and down.

Blasting wand may only be pulled out until the mark becomes visible.

When you notice that the collection container is becoming empty, continue operation for at least 10 seconds at stage one in order to swirl up and draw off the remaining granulate.

Close operation valve. Close main valve, check pressure drop at the pressure gauge.

Evaluate result if necessary.

If necessary, repeat procedure.

Cleaning the other cylinders:

Clean the tangential ports and swirl ports of the next cylinder using the same procedure.

Caution!

When cleaning the intake ports, it must be ensured that the intake valves of the corresponding cylinder are closed.

Determine the TDC (intake valves closed) using a TDC determination unit via the glow-plug hole.

Do not crank engine in reverse direction.

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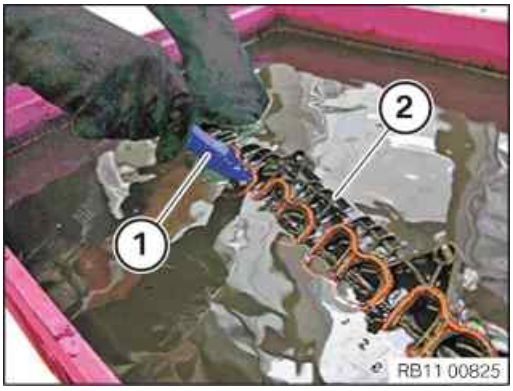

Wear protective goggles and gloves.

Caution!

Do not clean electrical components with a parts cleaning unit or high pressure cleaner!

Cleaning intake plenum:

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings on intake plenum (2) and swirl flap using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with the brush (1) if necessary
- Then clean intake plenum (2) with a parts cleaning unit or a high-pressure cleaner
- Check all seals for damage and renew, if applicable

Observe country-specific waste disposal regulations.

Required follow-up work:

Assemble intake plenum:

- Installing the throttle body
- Install adjuster
- Install the charging pressure sensor
- Install the temperature sensor for the exhaust-gas recirculation
- If applicable, install preheating control unit

- Crank the engine at the central bolt at minimum twice
- Install front right wheel arch panel trim
- Install intake plenum
- Connect battery earth lead

- Reset the quantity correction under:
  - Service functions
  - 01 Drive
  - Digital Diesel Electronics
  - Reset correction values of injectors

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11 12 ... Clean intake plenum (B37, B47)

Necessary preliminary work:

- Remove intake plenum

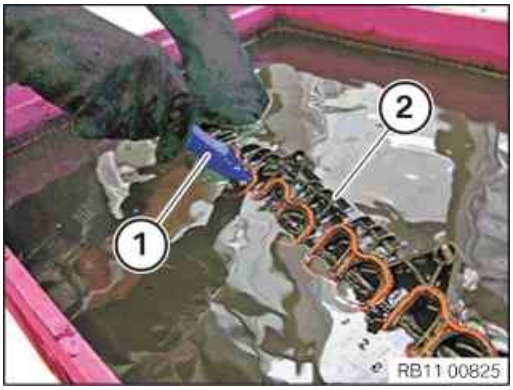
Dismantle intake plenum:

- Remove throttle body
- Remove adjuster
- Remove charging pressure sensor
- Remove the temperature sensor for the exhaust-gas recirculation .
- If applicable, remove preheating control unit

Wear protective goggles and gloves.

Caution!
Never place electrical components in cleaning agent!

- Put on personal protective clothing/equipment!
- Prepare cleaning agent: Mix 2 parts water with 1 part BMW universal cleaner (part number: 83 19 2 360 981) mixed
- Place intake plenum in cleaning agent
- Adhere to an application time of at least 1 h



Wear protective goggles and gloves.

Caution!
Do not clean electrical components with a parts cleaning unit or high pressure cleaner.

- Remove the intake plenum (2) from the cleaning agent
- Clean the openings of the intake plenum (2) and swirl flaps using the brush (1)

  (Part number: 83 19 2 298 237)
- Clean throttle valve, exhaust-gas recirculation valve, mixing tube and mounted parts with brush (1) if necessary
- Clean the intake plenum (2) with a parts cleaning unit or a high-pressure cleaner.
- Check all seals for damage and renew, if applicable.

Pay attention to country specific instructions for disposal.

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Required follow-up work:

Assemble intake plenum:

- Installing the throttle body
- Install adjuster
- Install the charging pressure sensor
- Install the temperature sensor for the exhaust-gas recirculation.
- If applicable, install preheating control unit

- Install intake plenum

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11 61 050 Removing and installing the intake plenum.

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

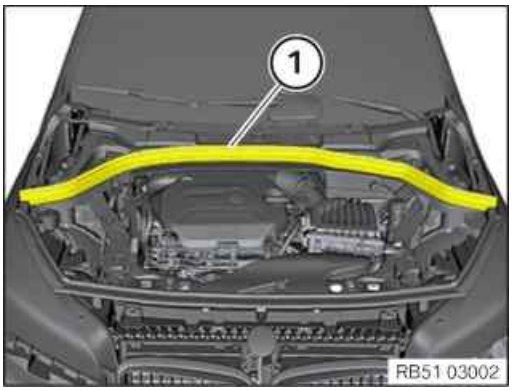
1 – Disconnecting all battery earth leads

- See additional information.

2 – Remove the seal for the rear bonnet

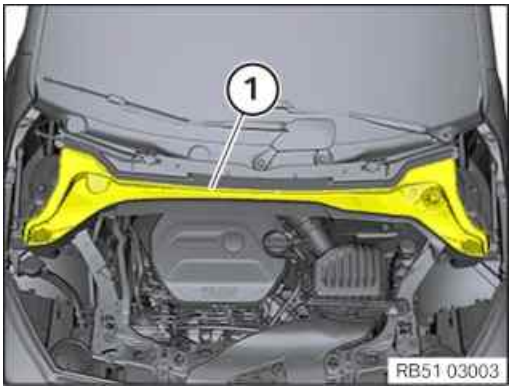
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

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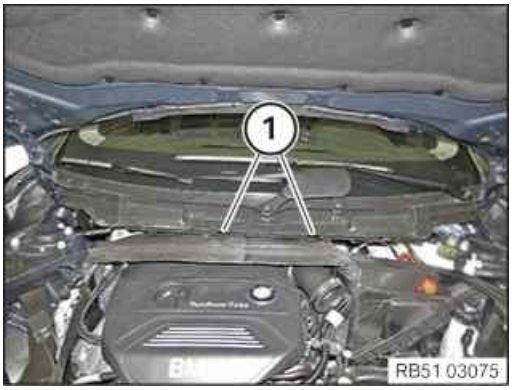
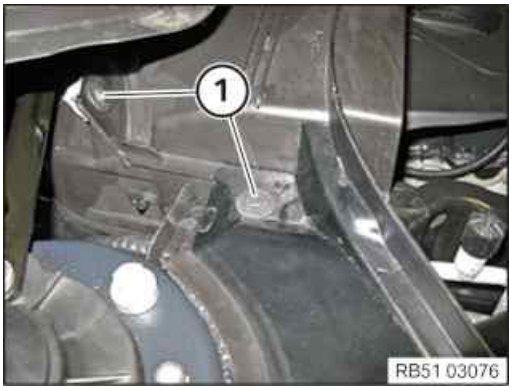
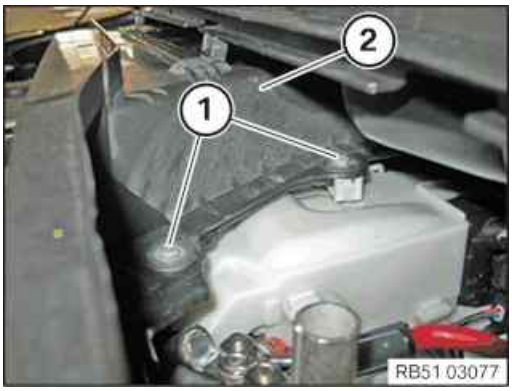
4 – Removing the upper bulkhead cover



- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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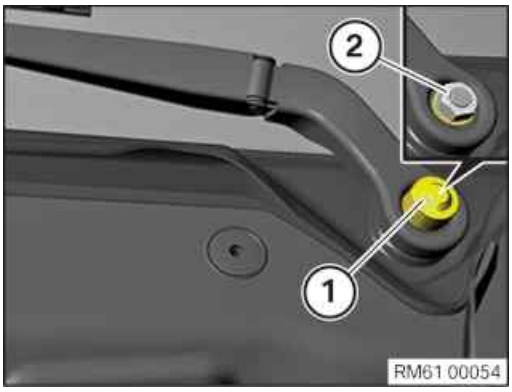
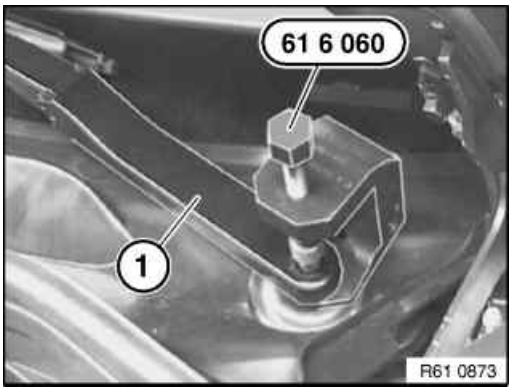


- Remove the protective cap (1).
- Loosen nut (2).



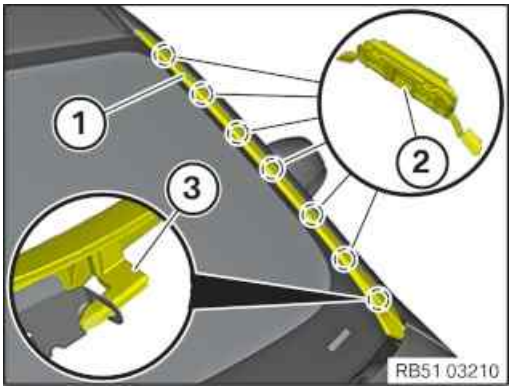
- Pull off the wiper arm (1) using special tool .

6 – Remove the gutter strip on the windscreen on the left and right

NOTICE

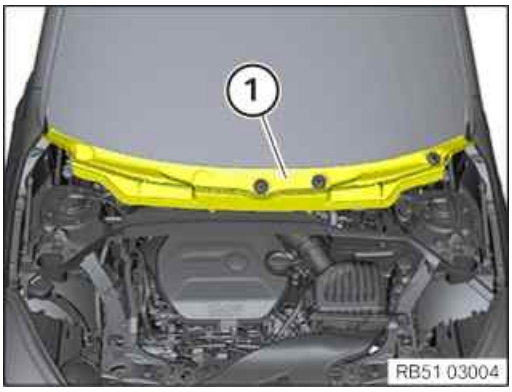
Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

7 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

8 – Removing the acoustic cover

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

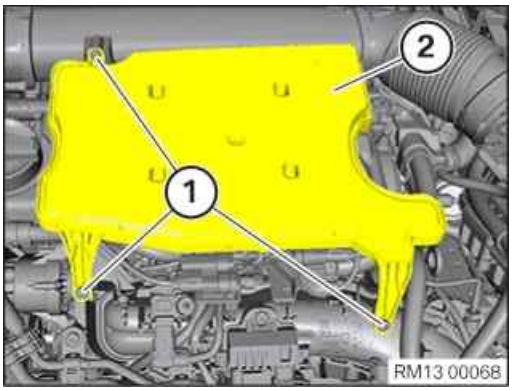
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

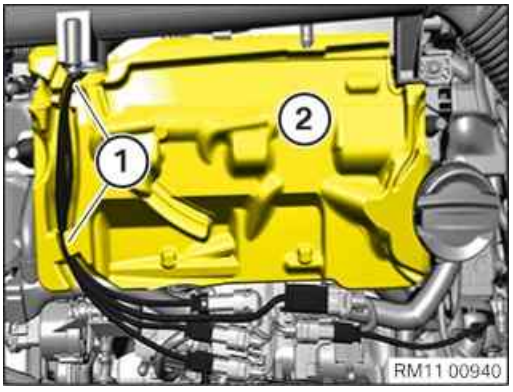
- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

10 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

11 – Remove the intake neck for intake silencer housing

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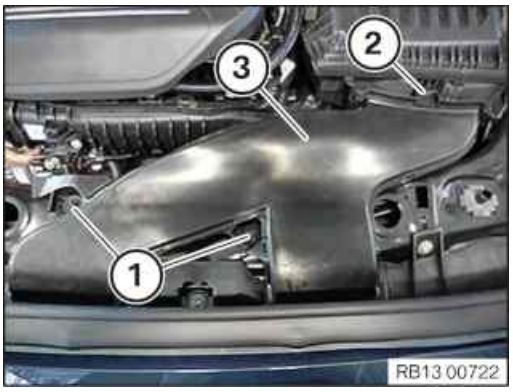
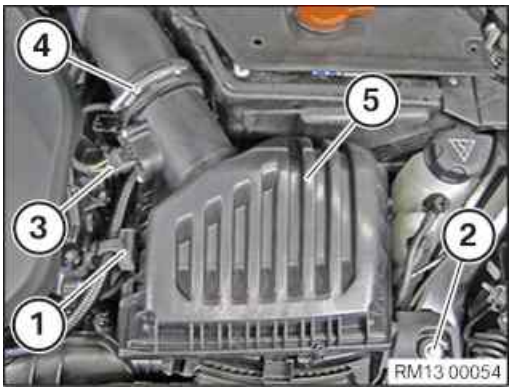


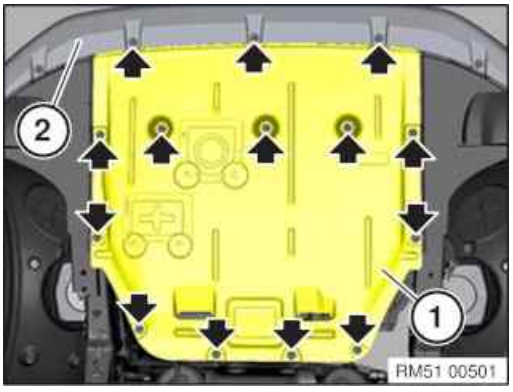
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

12 – Removing intake silencer housing



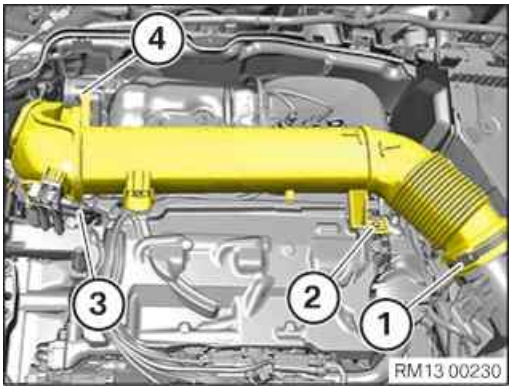
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

13 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

14 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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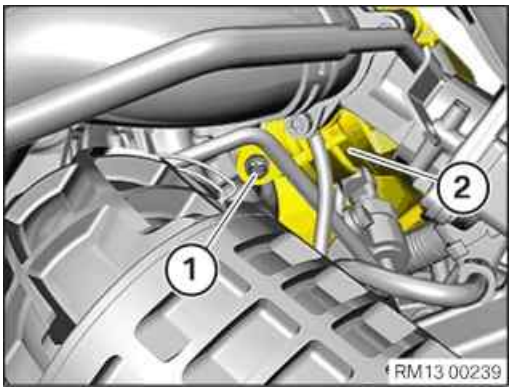
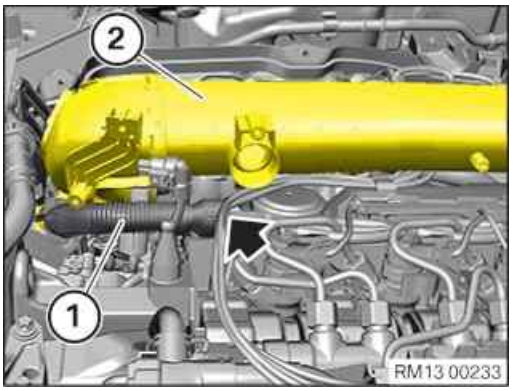


- Unscrew the screw (1) from the clean air pipe (2).

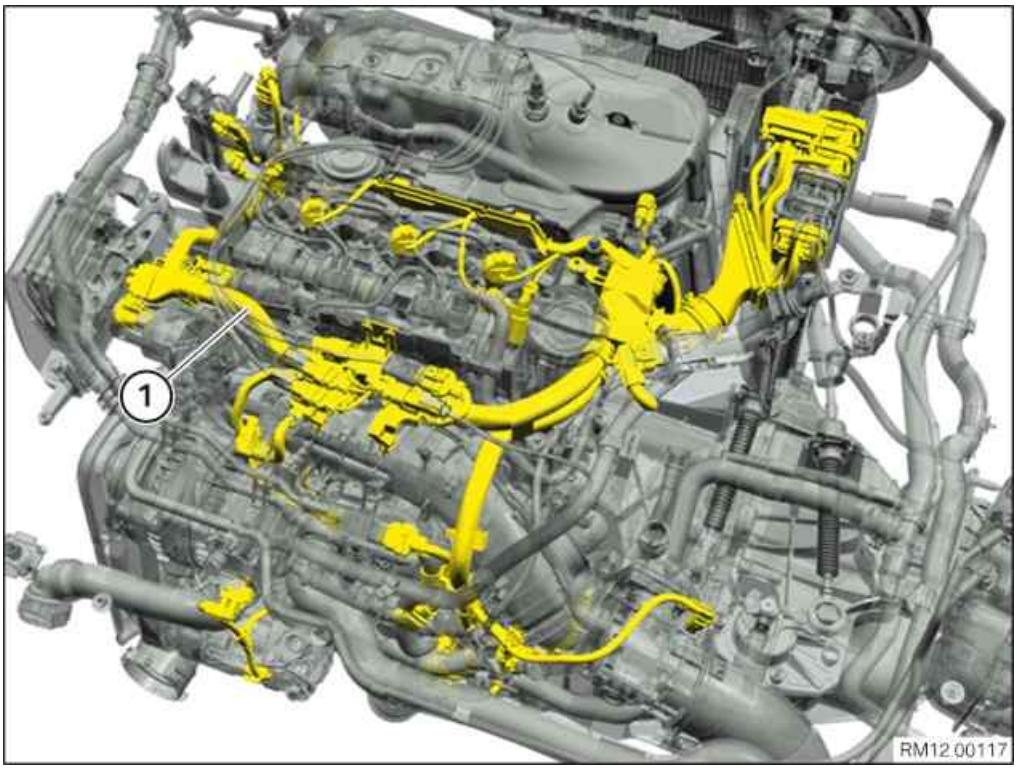


- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

15 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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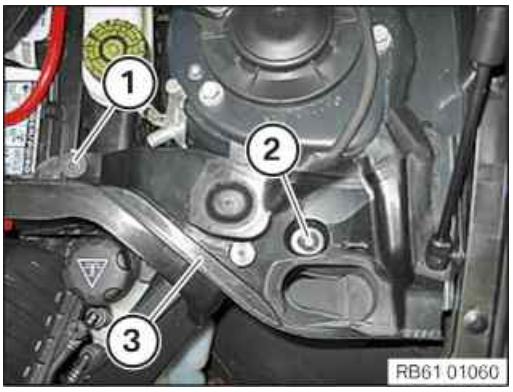
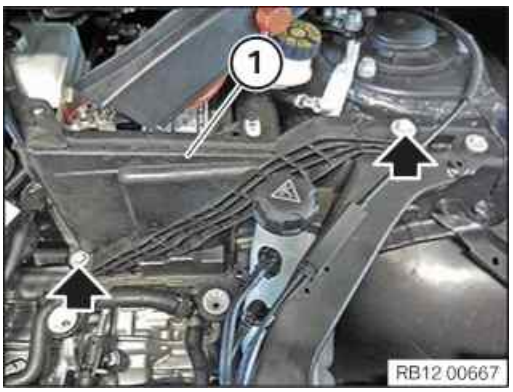
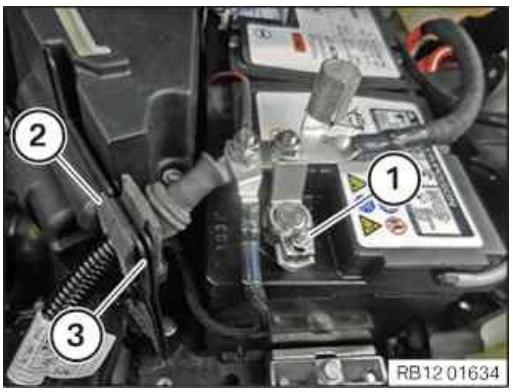


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

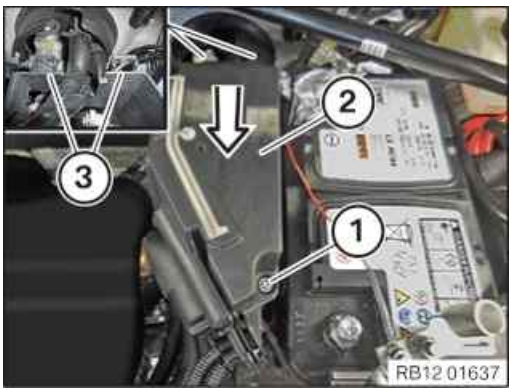
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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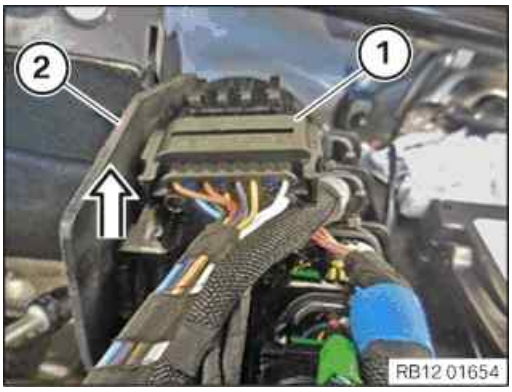
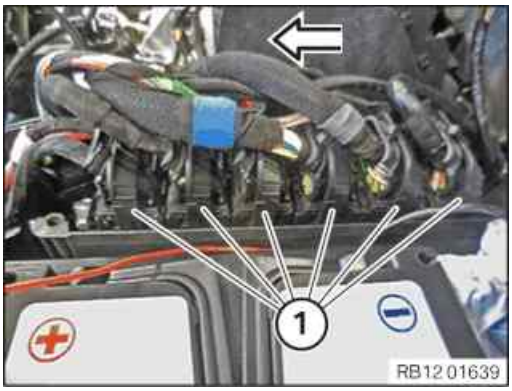
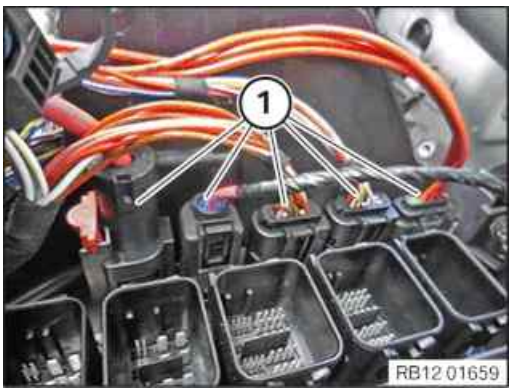


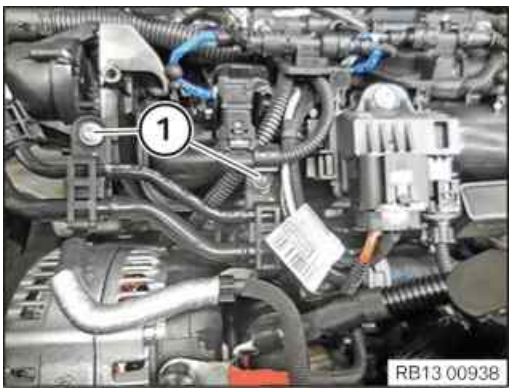
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



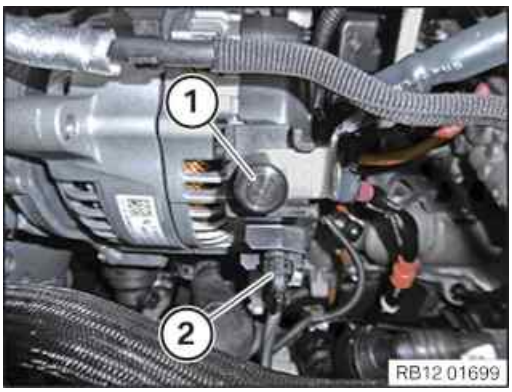
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).



- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

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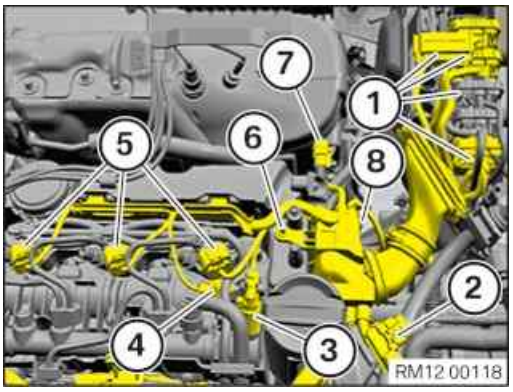
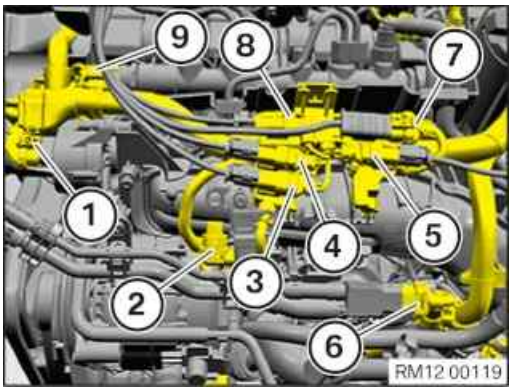
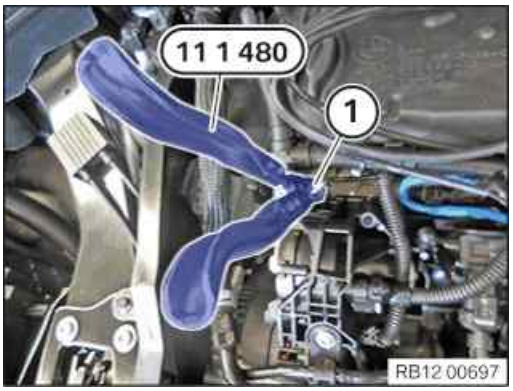


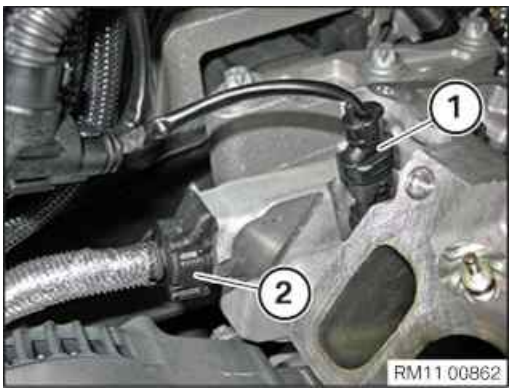
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.



- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

16 – Removing the cable clips from the intake plenum

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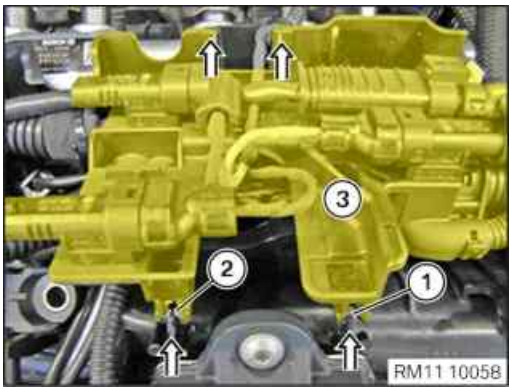


- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

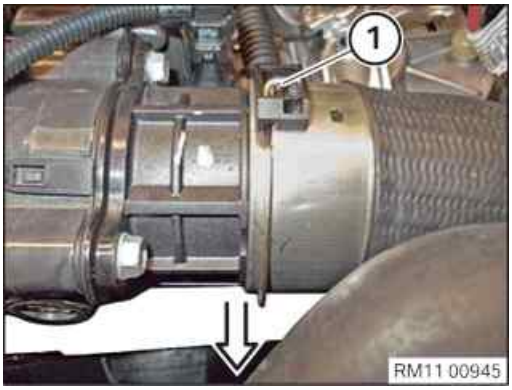
MAIN WORK

17 – Removing the intake plenum

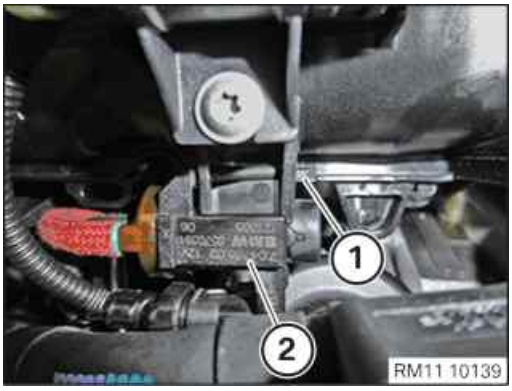
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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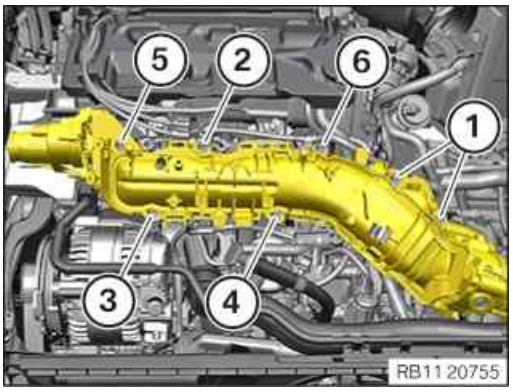
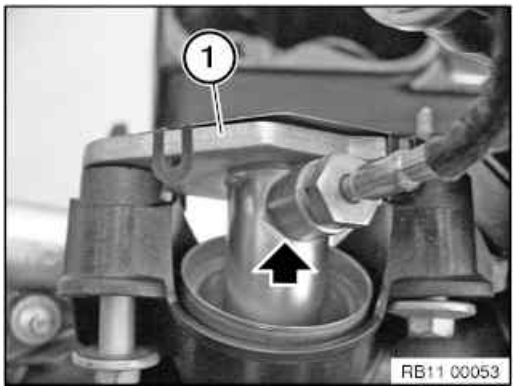
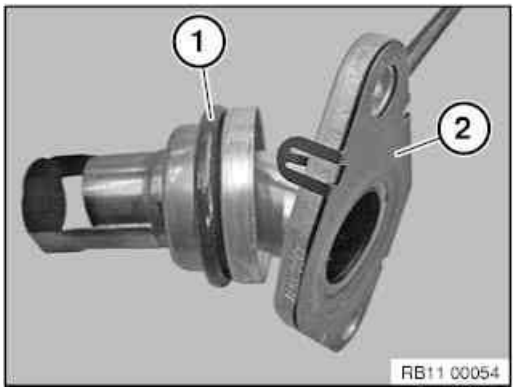


- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

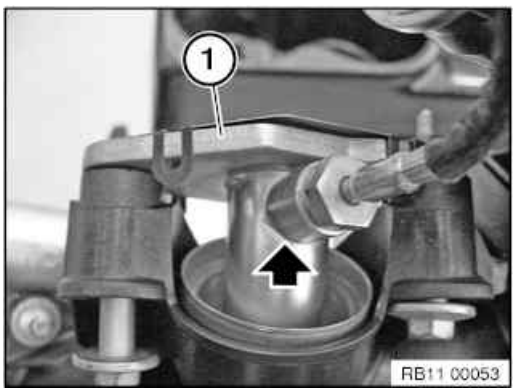
18 – Installing the intake plenum



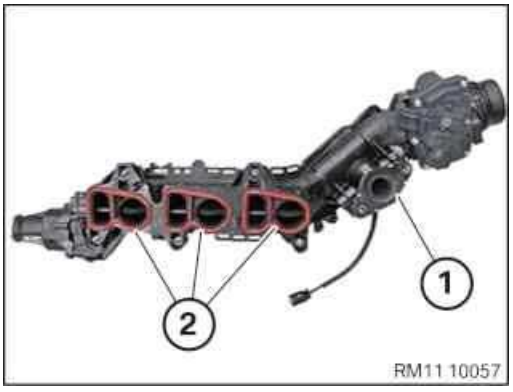
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.



- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.

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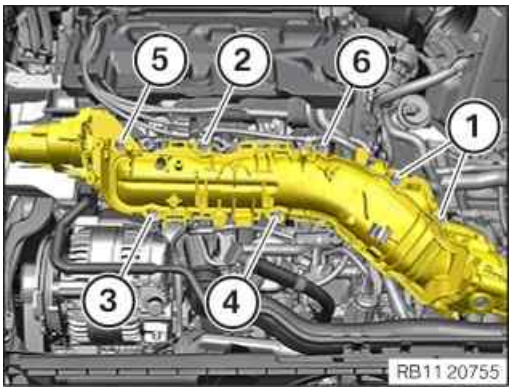
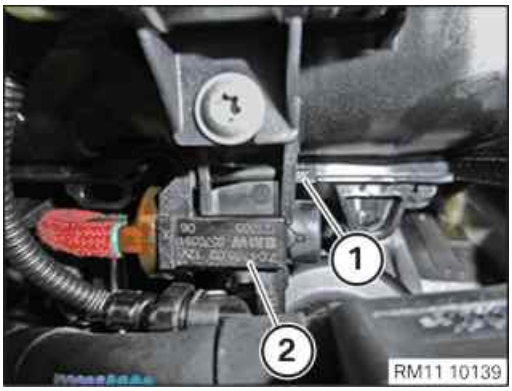


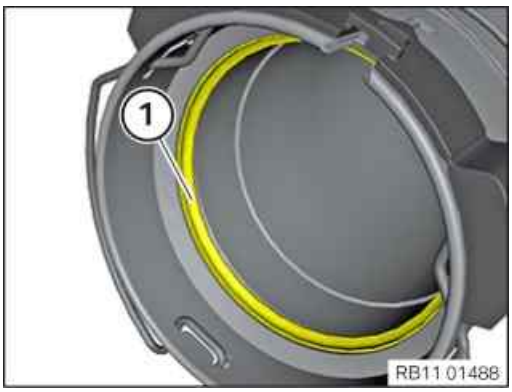
- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm

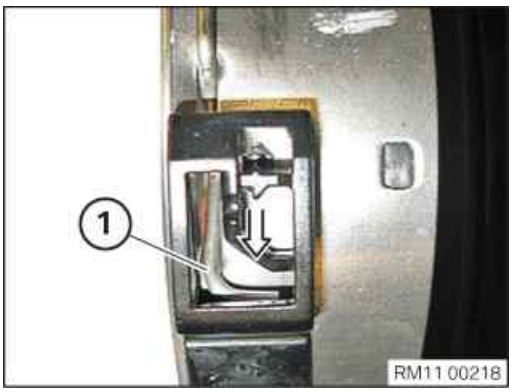


- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.

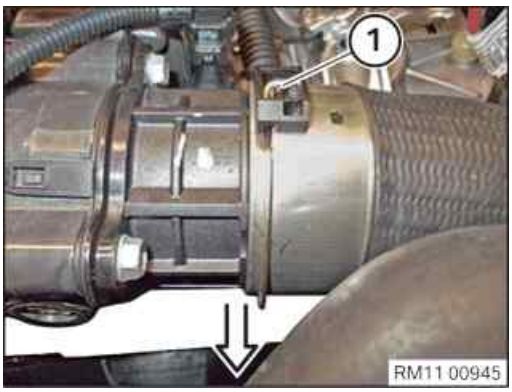


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

POSTPROCESSES

19 – Installing the cable clip for the intake plenum

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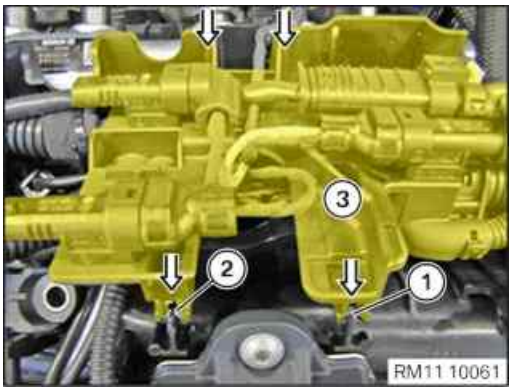
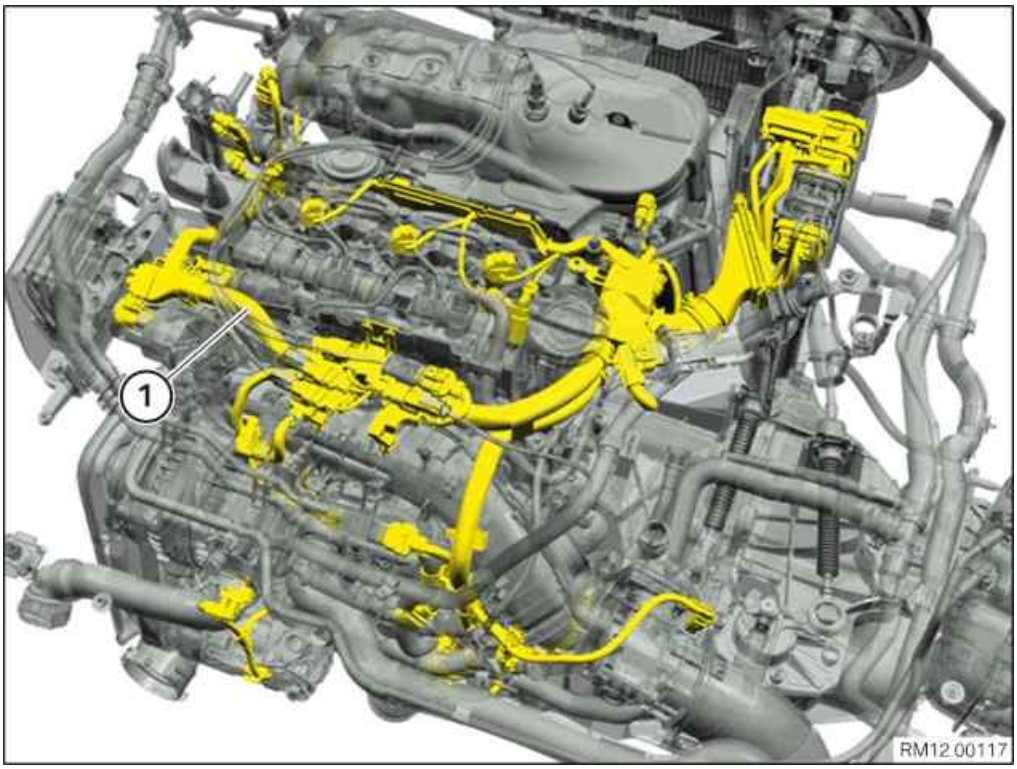


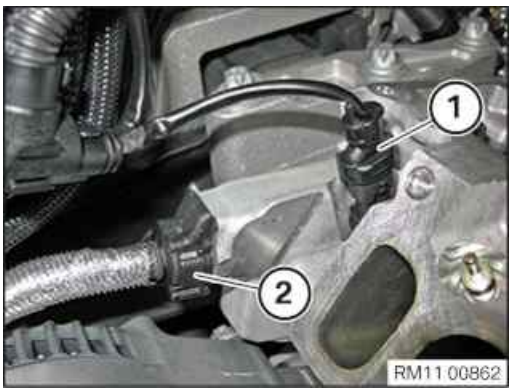
- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

20 – Fastening the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.

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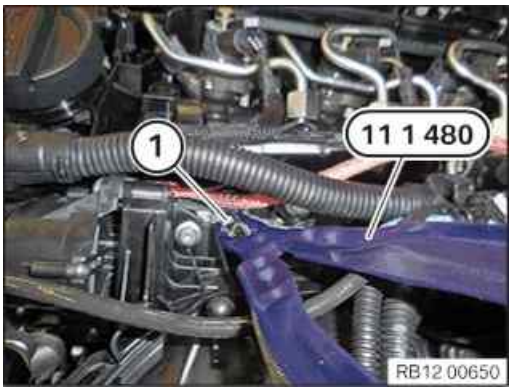
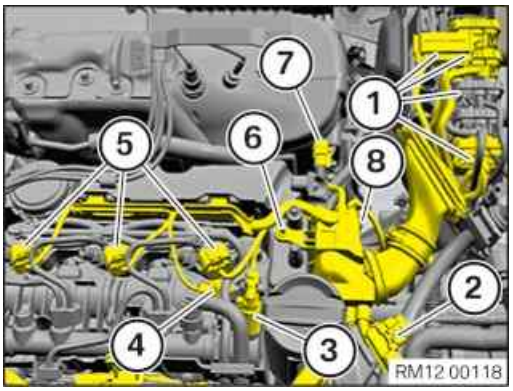


- Connect and lock the connector (1) on the glow elements.

  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

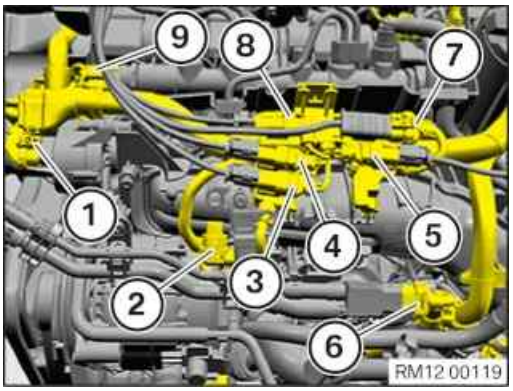


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

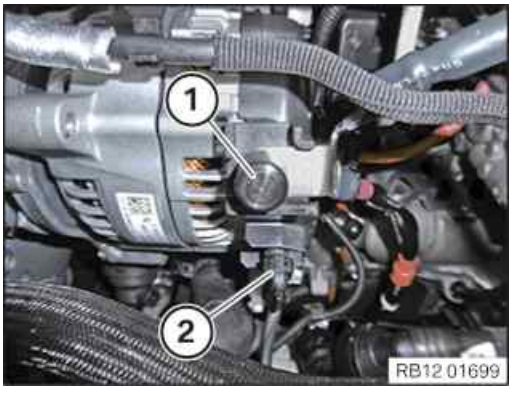
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.



- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm

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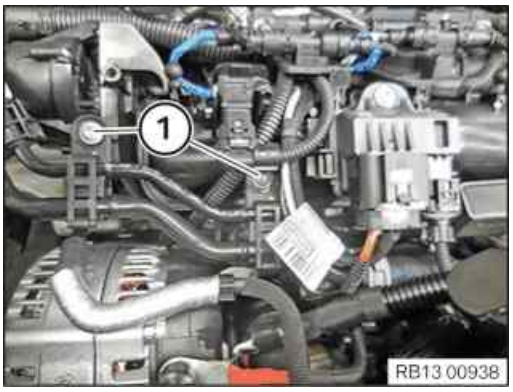
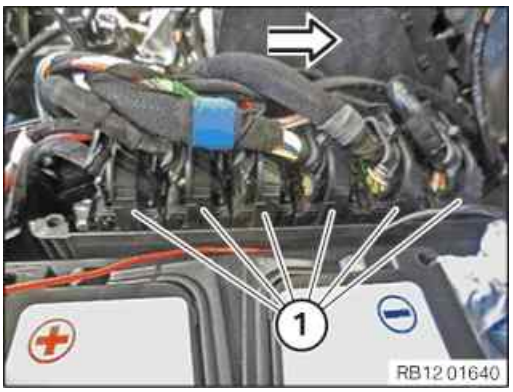


- Position fuel lines.
- Tighten the screws (1).

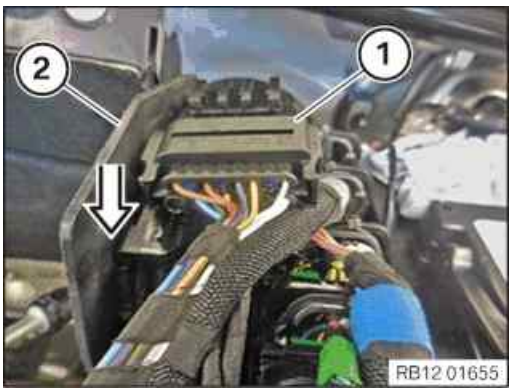
Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

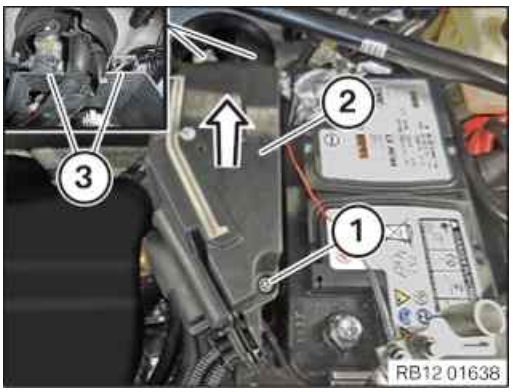
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm

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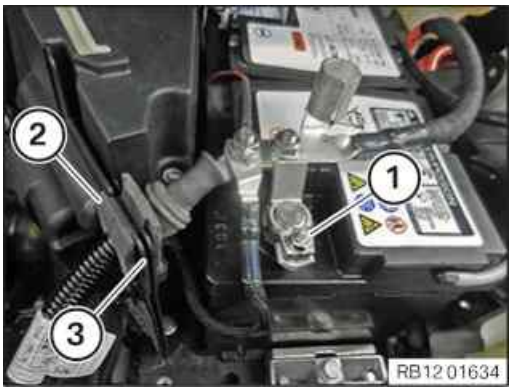
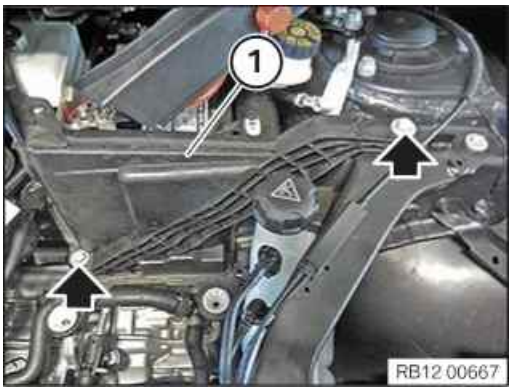


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

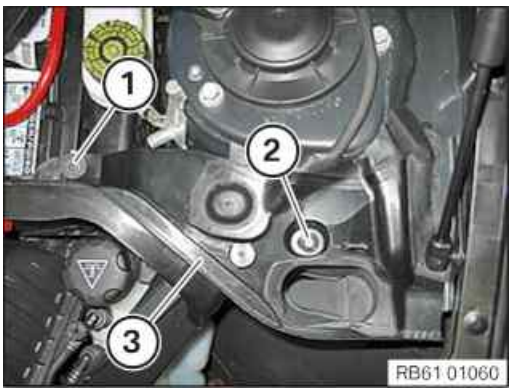
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

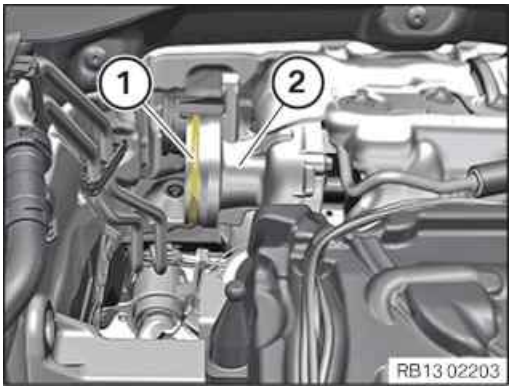


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

21 – Partially securing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

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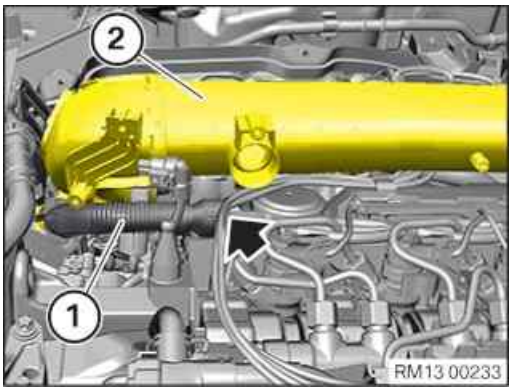
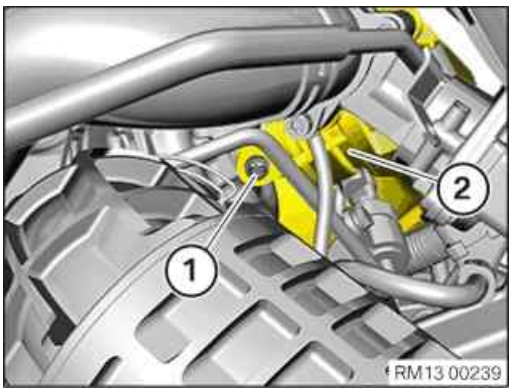
- Feed in clean air pipe (1) and install.



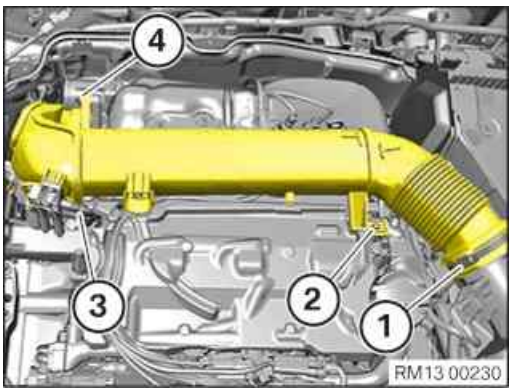
- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

22 – Installing intake silencer housing

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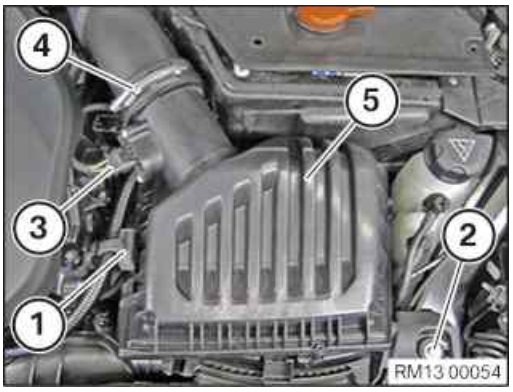


- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

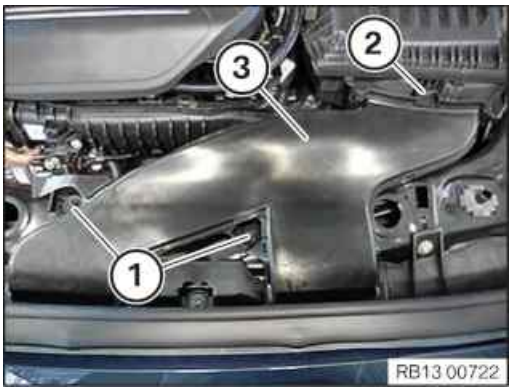
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

23 – Install the intake neck for the intake filter housing



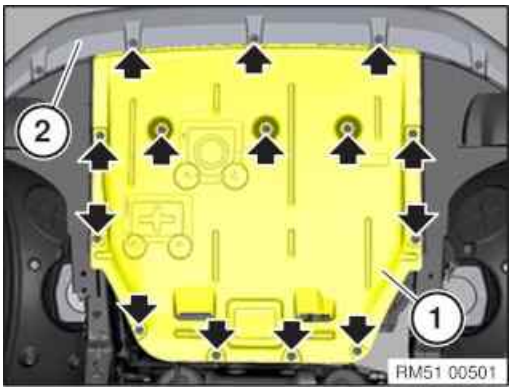
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

24 – Installing the front underbody protection

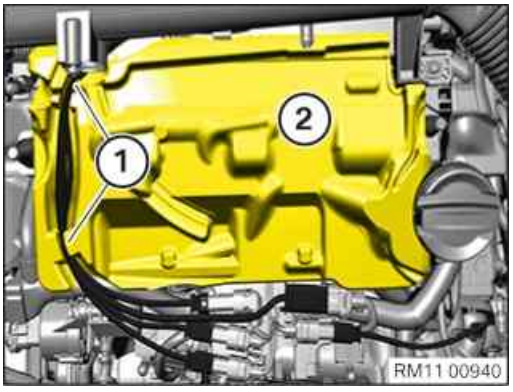


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

25 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

26 – Install resonator

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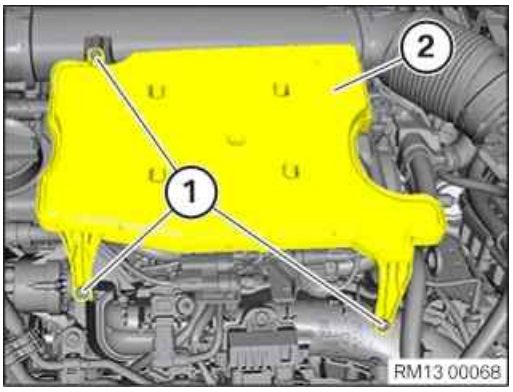

- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

27 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

28 – Installing the upper bulkhead cover

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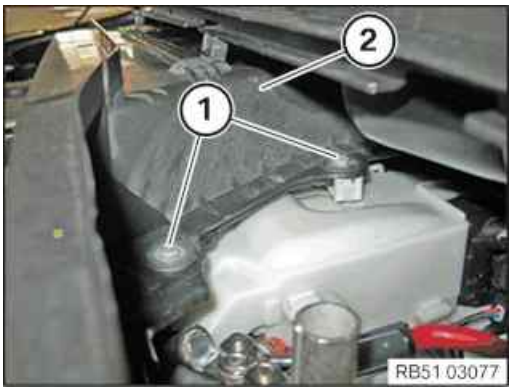
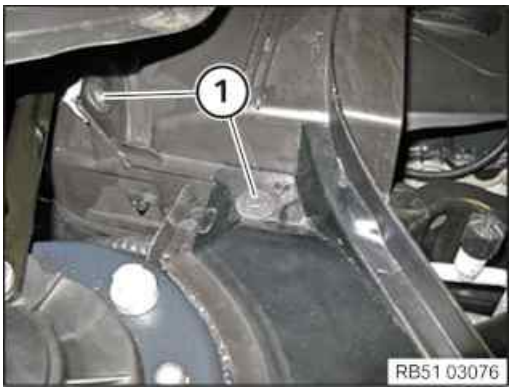


- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

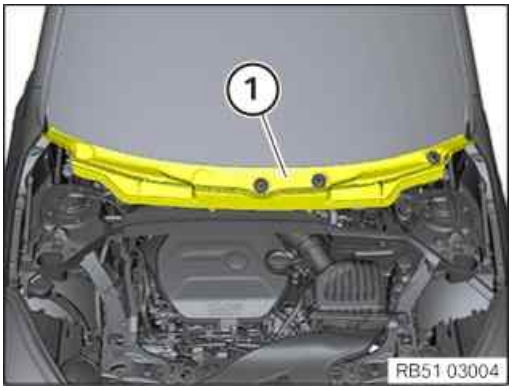
Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

29 – Install the rear cowl panel cover



- Feed in and engage the rear cowl panel cover (1).

30 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**

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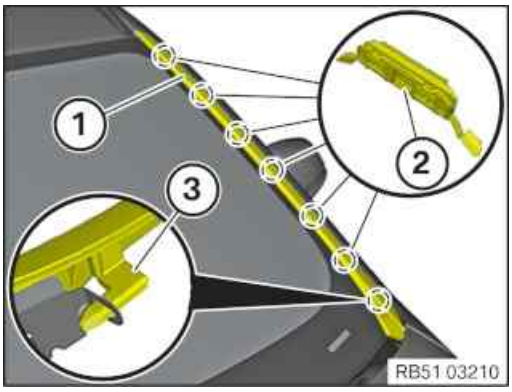


- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

31 – Install left and right wiper arm

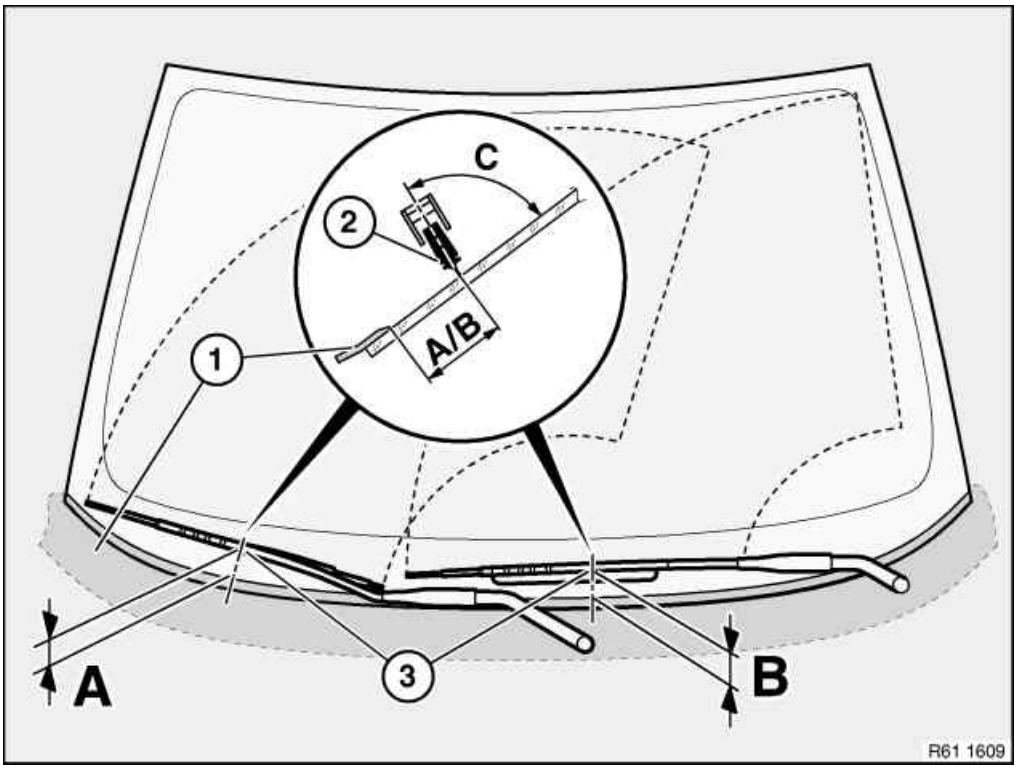
NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

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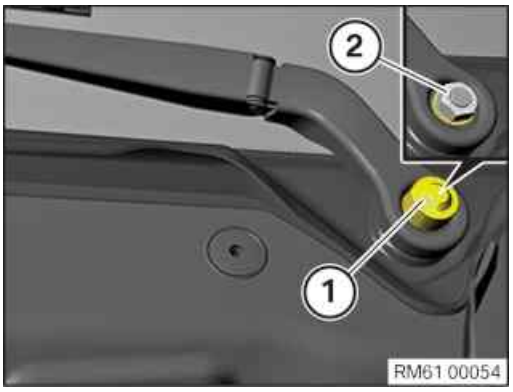


NOTICE

Description is for left component only. Procedure on the right side is identical.

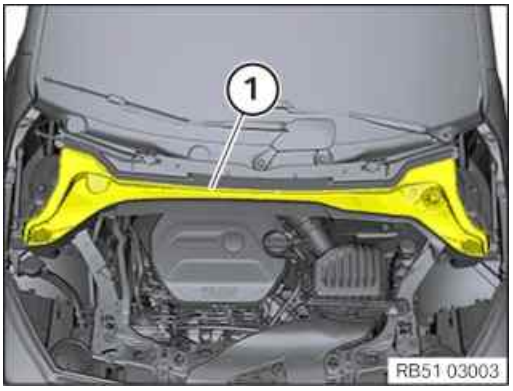
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

32 – Installing front cowl panel cover

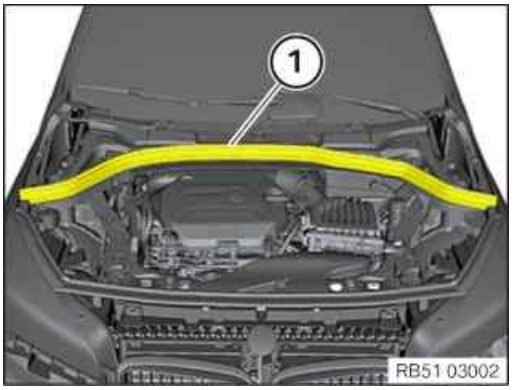


- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

33 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

34 – Disconnecting all battery earth leads

- See additional information.

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Additional Information

Overview of Tightening Torques

Intake plenum to cylinder head

Used in step 18

M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover

Used in step 20

TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator

Used in step 20

M8		Tightening torque	19 Nm

Fuel line to intake plenum

Used in step 20

TS6x20		Tightening torque	5 Nm

Cover to electronics box

Used in step 20

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 20

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 20

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 20

		Tightening torque	3 Nm

Battery cover

Used in step 20

Screw			2,8 Nm

Clean air pipe to exhaust turbocharger

Used in step 21

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover

Used in step 21

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing

Used in step 21 22

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge

Used in step 22

M6X30		Tightening torque	8 Nm

Intake neck to cross connection

Used in step 23

M6		Tightening torque	8 Nm

Underbody protection front

Used in step 24

			3 Nm

Resonator to manifold and clean air pipe

Used in step 26

Screw TS6	Renew screw.	Tightening torque	5 Nm

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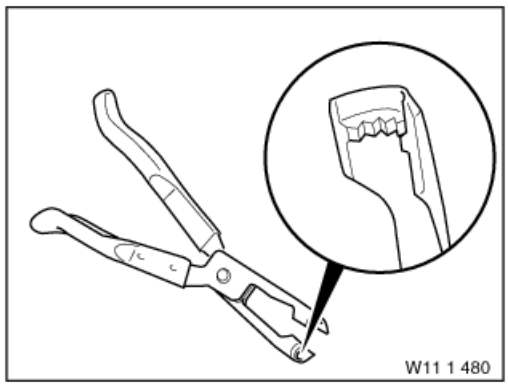
Bulkhead cover, top			Used in step 28
Screw		Tightening torque	3 Nm

Windscreen wiper arm			Used in step 31
Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common	Used in step 15
Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

Overview Technical Data

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 34
61 20 900 Disconnecting and connecting battery earth lead	1 34
61 20 900 Disconnecting and connecting battery earth lead	1 34
61 20 900 Disconnecting and connecting battery earth lead	1 34
61 20 900 Disconnecting and connecting battery earth lead	1 34
61 20 900 Disconnecting and connecting battery earth lead	1 34
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 34
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 34
61 20 900 Disconnecting and connecting battery earth lead	1 34
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 34
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 34
61 20 900 Disconnecting and connecting battery earth lead	1 34
61 20 900 Disconnecting and connecting battery earth lead	1 34
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61 20 900 Disconnecting and connecting battery earth lead	1	34
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61 20 900 Disconnecting and connecting battery earth lead	1	34
61 20 900 Disconnecting and connecting battery earth lead	1	34

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11 61 085 Removing and installing/replacing adjuster (B37C)

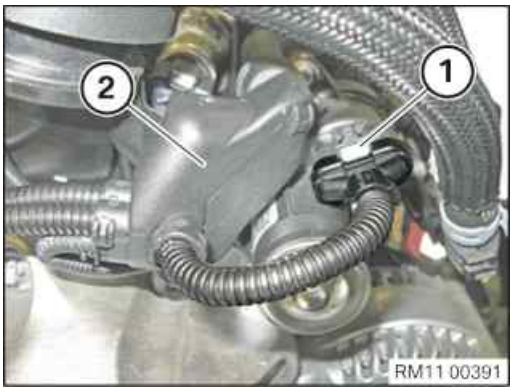
Important!

The adaptation values must be reset before the adjuster is replaced.

Necessary preliminary tasks:

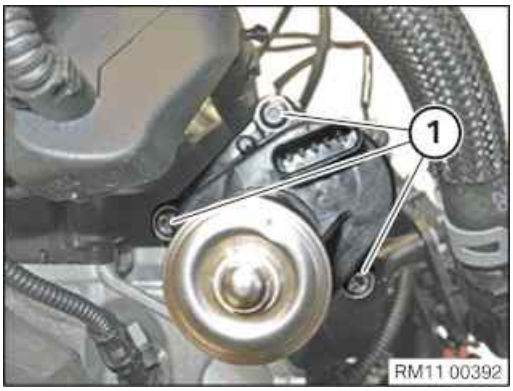
- Reset adaptation values with diagnosis system
- Remove acoustic cover

Removal:



Unlock and disconnect the connector (1).

Unclip wiring harness (2) and raise.



Release screws (1).

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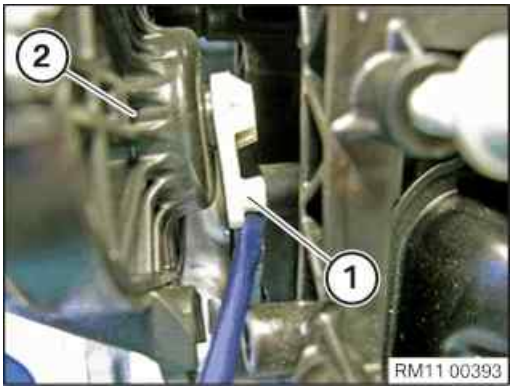
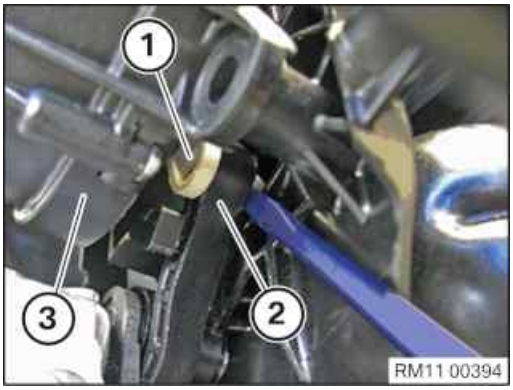
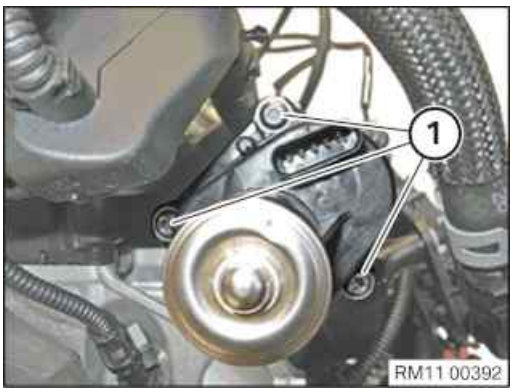


Unclip drive arm (1).
Remove adjuster.

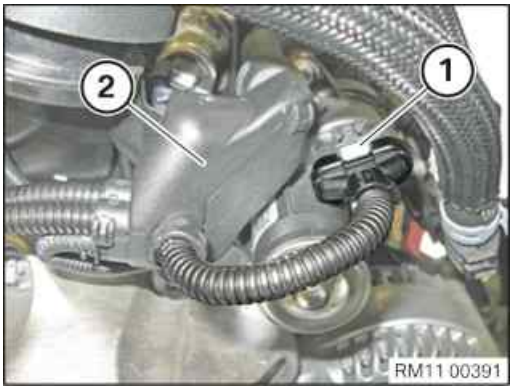
Installation:



Clip drive arm (1) into connecting rod (2).
Install adjuster (3).



Secure screws (1).
Tightening torque 11 61 5AZ.



Connect the plug (1).
Clip in wiring harness (2).

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Required follow-up work:

- Install acoustic cover.

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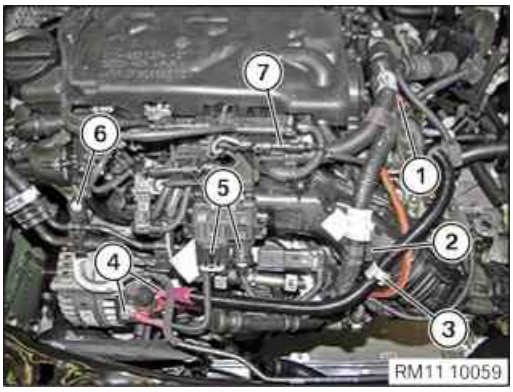
11 61 550 Removing and installing/replacing air intake manifold (B37C)

Installation note:
Follow diagnosis instruction.

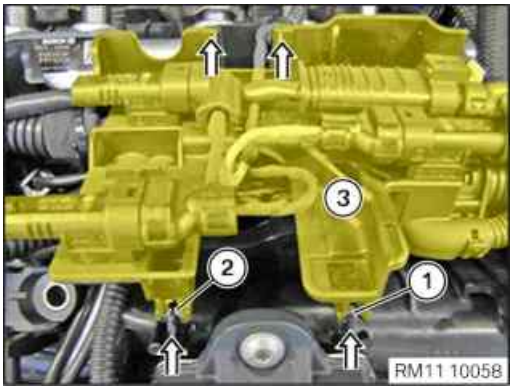
Necessary preliminary tasks:

- Disconnect negative battery lead.
- Remove acoustic cover
- Remove fan cowl.
- Remove underbody protection
- Partially release cable channel.
- Partially release pressure pipe.

Removal:



Pull off vacuum hose (1) from exhaust-gas recirculation valve.
Release wiring harness on holder (2) of intake plenum.
Release positive battery cable (3) from holder.
Unscrew positive battery cables (4) from alternator.
Release screw (6) on holder of diesel lines.
Detach connector (5) from preheating control unit.
Unlock plug connection (7) of temperature sensor and disconnect.



Release clip (1 and 2).
Remove cable clip (3) upwards in direction of arrow and place to one side.

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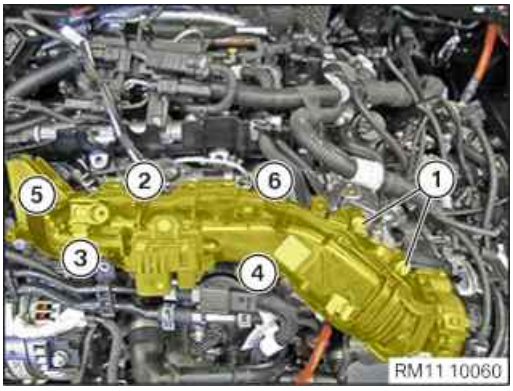
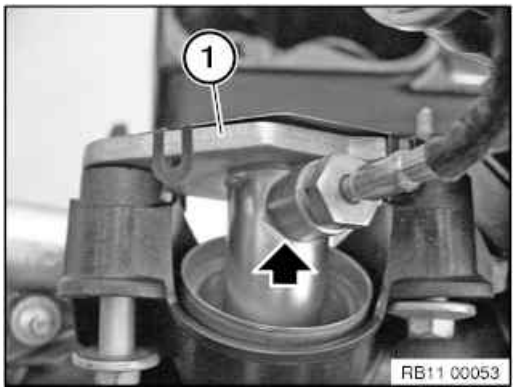


Release screws (1) on exhaust-gas recirculation cooler.

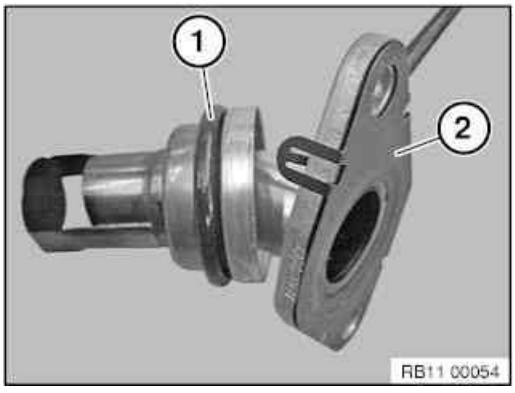
Release bolts (2-6).

Remove intake plenum towards front.



Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

Installation:

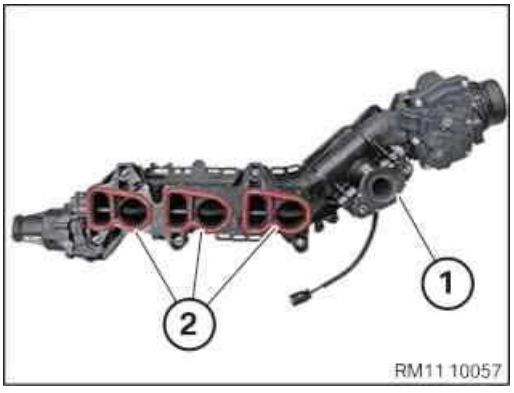


Installation note:
Install O-ring (1).

Part: Replace O-ring.

Clip in beaded metal gasket (2).

Part: Replace beaded metal gasket.



Install all sealing rings (2).

Parts: Replace gaskets.

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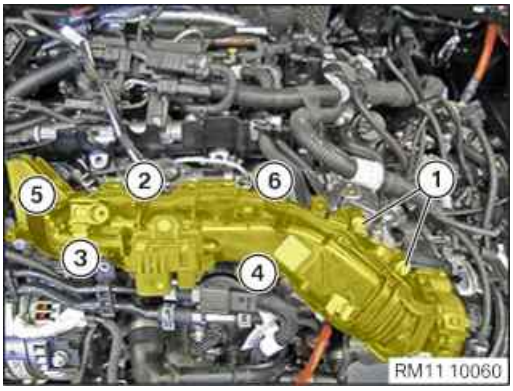
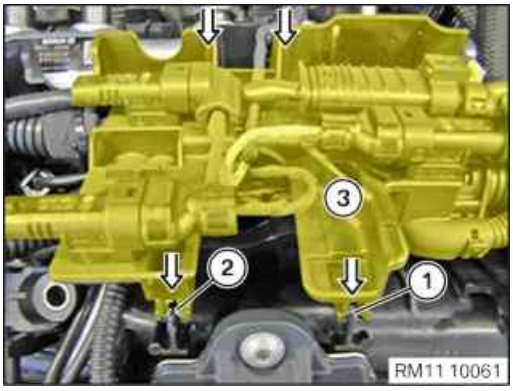
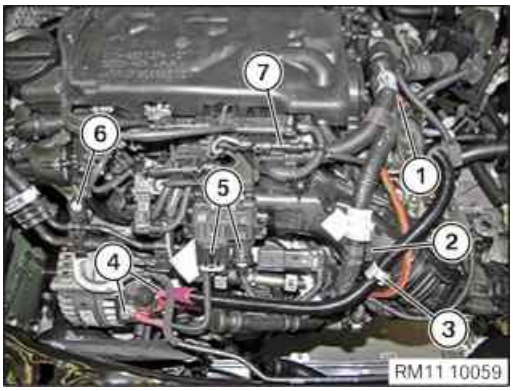


Tighten screws in order (2-6).
Tightening torque 11 61 1AZ.
Tighten screws (1) on exhaust-gas recirculation cooler.
Tightening torque 11 61 2AZ.



Connect cable clip (3) in direction of arrow.
Clip in clip (1 and 2).



Connect vacuum hose (1) of exhaust-gas recirculation valve.
Clip in wiring harness on holder (2) of intake plenum.
Clip in positive battery cable into holder (3).
Screw tight positive battery cables (4) to alternator.
Screw tight screw (6) on holder of diesel lines.
Connect connector (5) of preheating control unit.
Connect plug connection (7) of temperature sensor.

Required follow-up work:

- Install cable channel.
- Connect battery ground cable.
- Install acoustic cover.
- Remove fan cowl.
- Remove underbody protection

Assemble engine.
Check air intake system for leaks.
Check function of DDE Digital Diesel Electronics.

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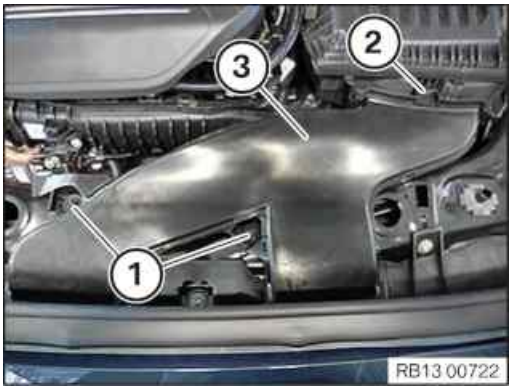
11 61 365 Removing and installing/replacing left charge air duct

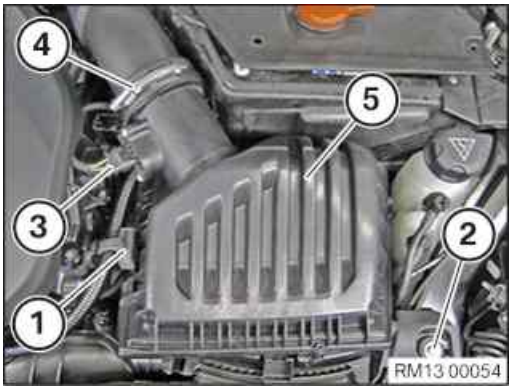
PRELIMINARY WORK

1 – Remove the intake neck for intake silencer housing



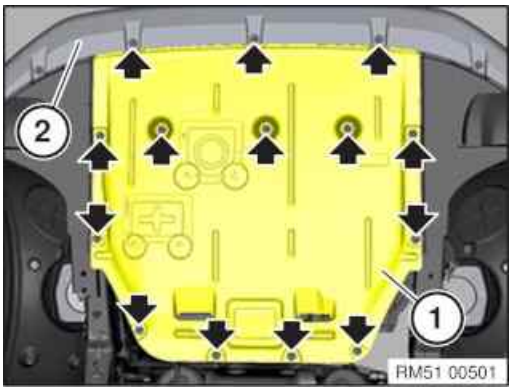
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

2 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

3 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

MAIN WORK

4 – Remove the pressure pipe between the throttle body and the charge air cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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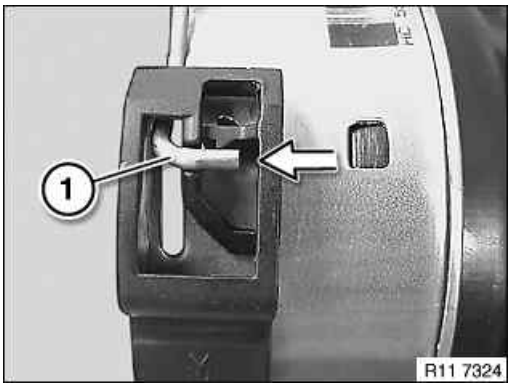
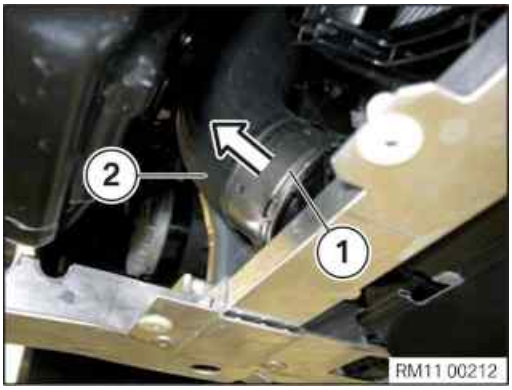
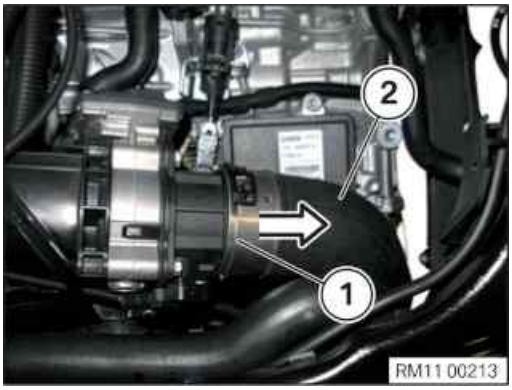


- Unlock the lock (1).

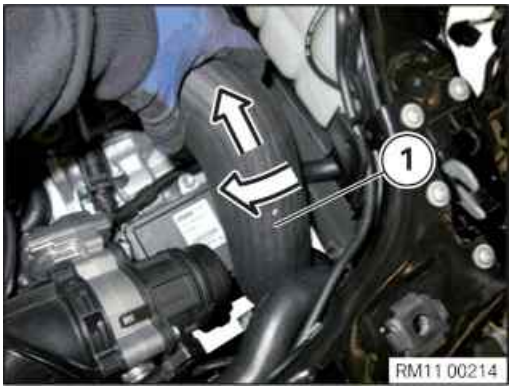
  The lock (1) must engage in the bracket (arrow).



- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.



- Unlock and detach the locks (1) on both sides.
- Guide out the pressure pipe (2) in the direction of the arrow and set it aside.



- Remove the pressure pipe (1) in the direction of the arrow.

5 – Installing pressure pipe between throttle body and charge air cooler

RISK OF DAMAGE

Damage to the exhaust turbocharger.

A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

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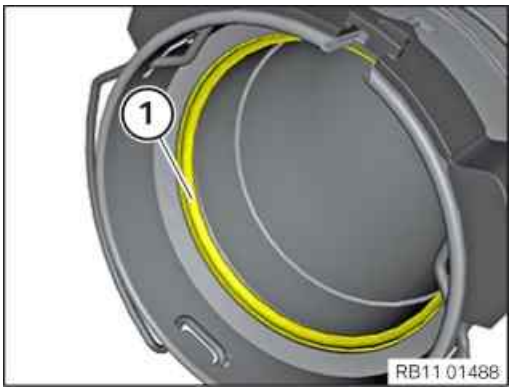


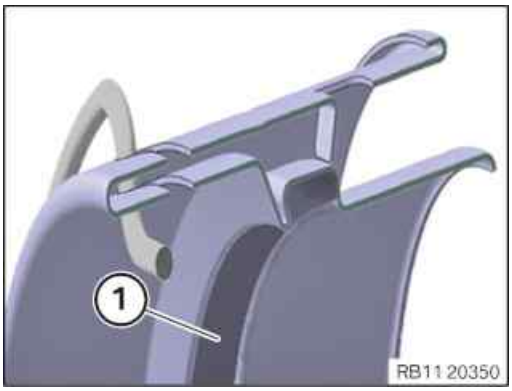
- Check seal (1) for damage and renew seal (1) as needed.

  Parts: Gasket

▶ **Replace damaged gasket**

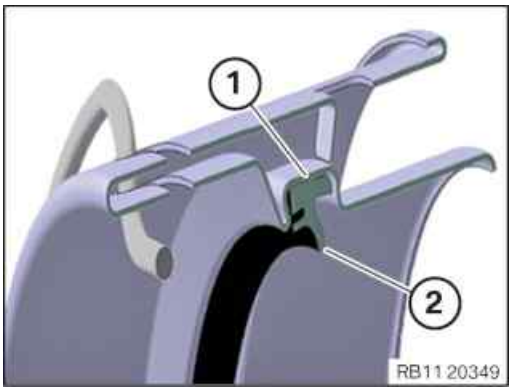
TECHNICAL INFORMATION

Do not use pointed or sharp-edged tools for the installation and/or removal.



- Remove damaged seal.
- Clean gasket groove (1) with a dry towel.

  The gasket groove (1) must be clean.



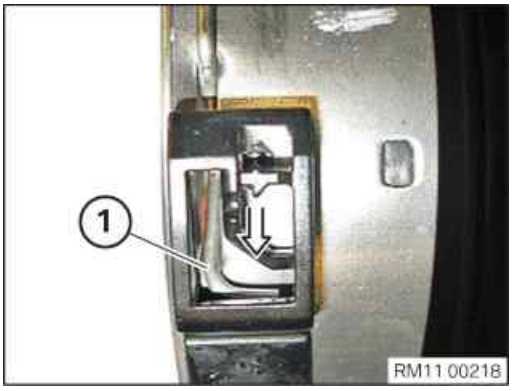
- Renew gasket.

  Parts: Gasket
- Install seal dry without lubricant or mounting agent.

TECHNICAL INFORMATION

Incorrect assembly is possible. Ensure correct installation position.

- Feed in and install the seal.
- Make sure the seal is correctly installed in the gasket groove (1).
- Make sure that the sealing lip (2) is pointing downwards (see figure).



- Detach the locks (1) in the direction of the arrow from the brackets.

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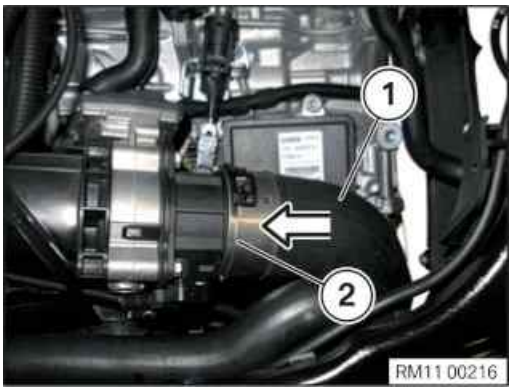
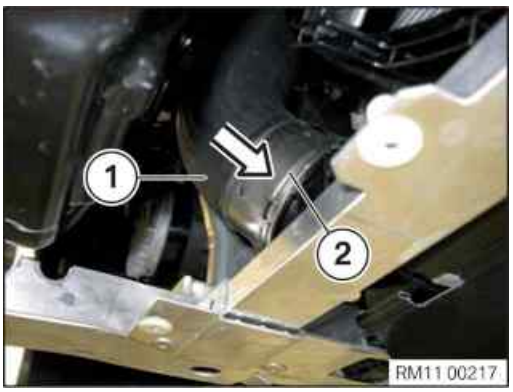
- Insert and install the pressure pipe (1) in the direction of the arrow.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (1) engage audibly.



- Insert and install the pressure pipe (1) in the direction of the arrow.
- Ensure that the locks (2)engage audibly.

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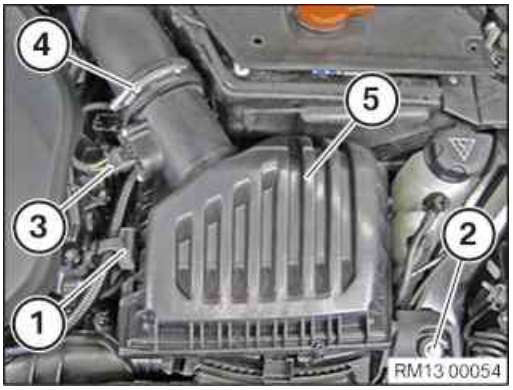
6 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

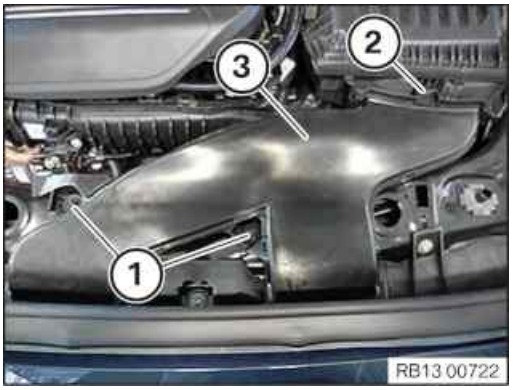
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

7 – Install the intake neck for the intake filter housing



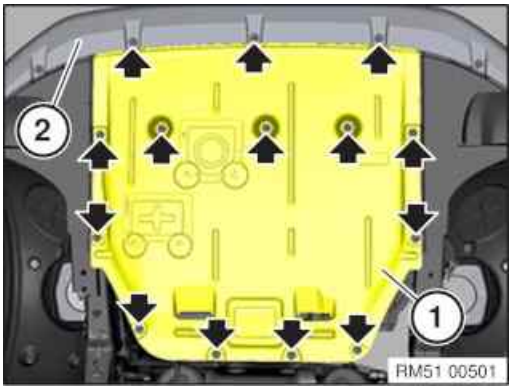
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

8 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

Additional Information

Overview of Tightening Torques

Intake silencer housing to lock bridge Used in step 6

M6X30		Tightening torque	8 Nm

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Clean air pipe to intake silencer housing

Used in step 6

Clamp		Tightening torque	3 Nm

Intake neck to cross connection

Used in step 7

M6		Tightening torque	8 Nm

Underbody protection front

Used in step 8

			3 Nm

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11 61 365 Removing and installing/replacing left charge air line (B37C)

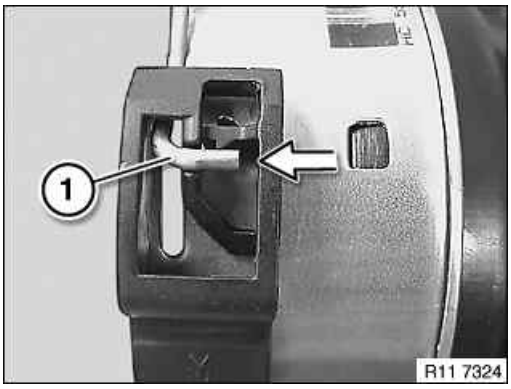
Safety information:

- In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.

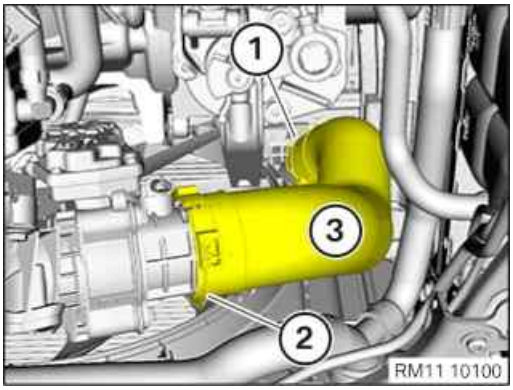
Necessary preliminary tasks:

- Remove front underbody protection
- Remove intake silencer housing

Removal:



Unlock lock of charge air line.*Note:*
Lock (1) must engage during unlocking (see arrow).



Unlock lock (1) on charge air cooler.

Unlock lock (2) on throttle body.

Pull off charge air line (3) from charge air cooler and exhaust turbocharger.

Preparation:

Release lock (1) of charge air line on both sides out of retaining lug.

Installation:

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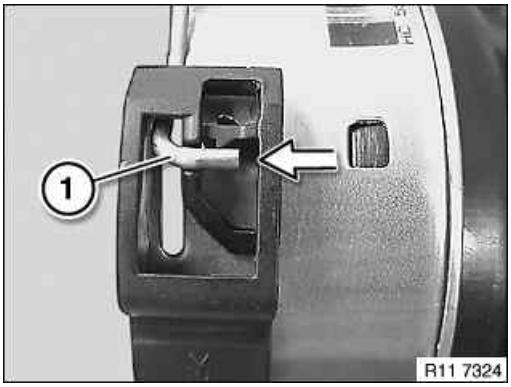
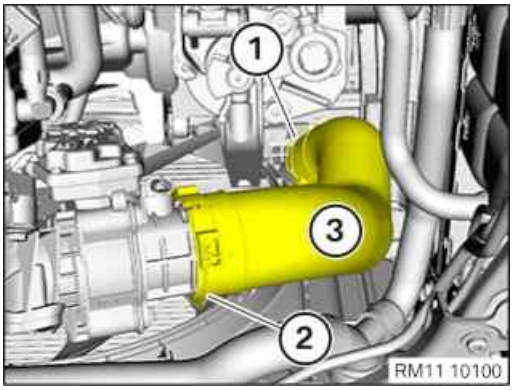


Note:
Release lock (1) of charge air line on both sides out of retaining lug (see arrow).

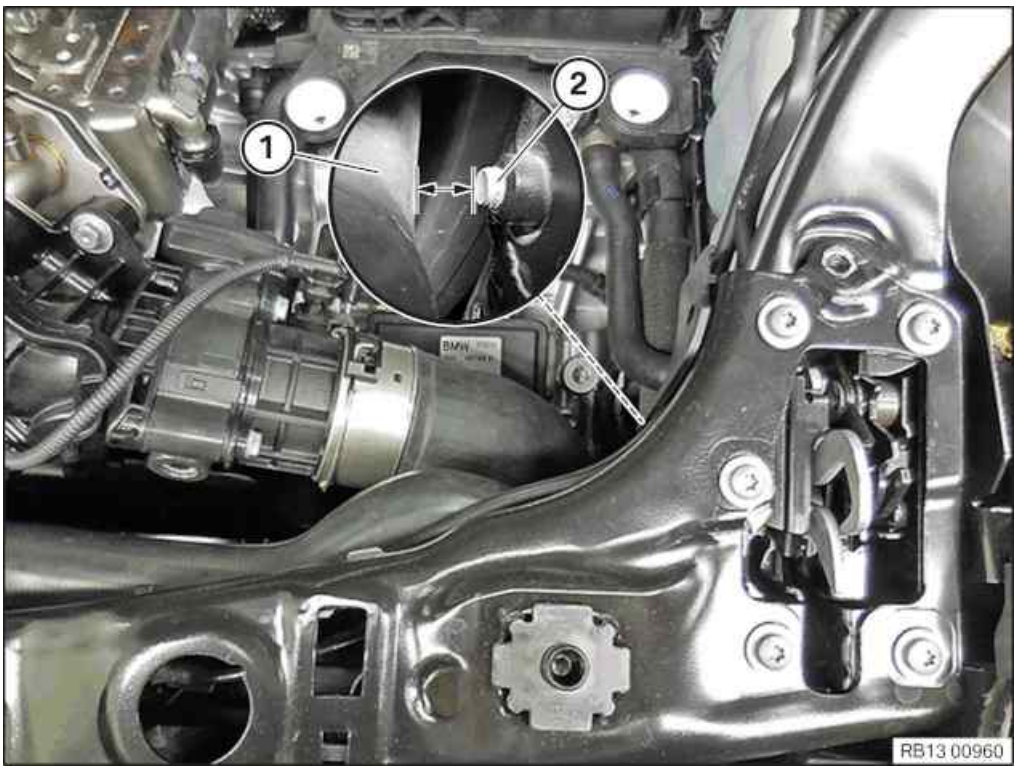
Lock must snap audibly into place.



Connect charge air line to charge air cooler and throttle body.

Lock (1) on charge air cooler must audibly engage.

Lock (2) on throttle body must audibly engage.



After installing charge air line (1), check, whether distance from screw connection (2) on side member is available.

If necessary, install chafe protection.

Required follow-up work:

- Install front underbody protection
- Install intake silencer housing

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11 61 362 Removing and installing/replacing right charge air line (B37C)

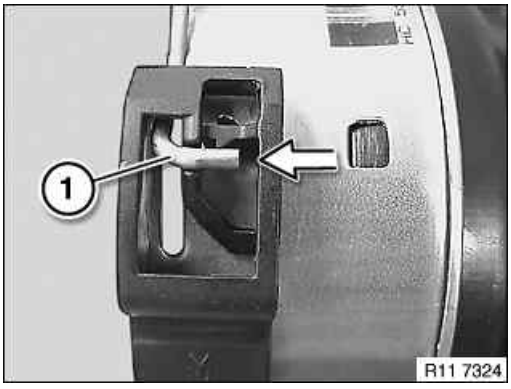
Safety information:

- In the event of a leak at the pressure pipe, there is a **risk of damage** to the exhaust turbocharger.

Necessary preliminary tasks:

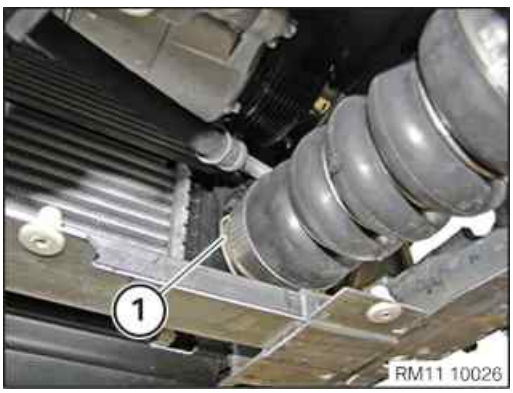
- Remove front underbody protection.

Removal:



Unlock lock of charge air line at exhaust turbocharger.*Note:*
Lock (1) between charge air line and exhaust turbocharger must engage during unlocking (see arrow).

Release screws (1).



Unlock lock (1) on charge air cooler.

Pull off charge air line from charge air cooler and exhaust turbocharger.

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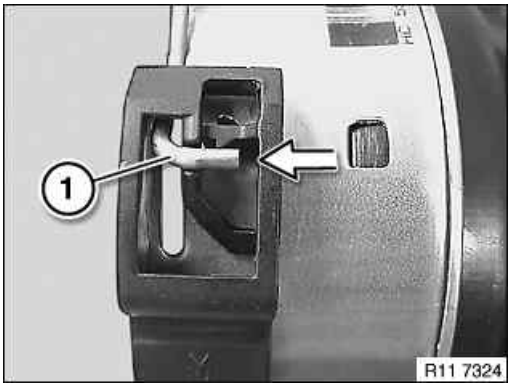
Preparation:

Release lock (1) of charge air line on both sides out of retaining lug.

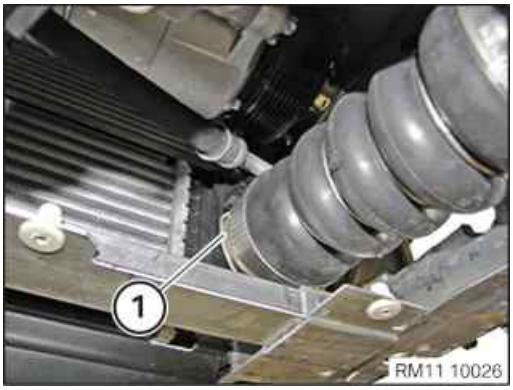
Installation:



Note:
Release lock (1) of charge air line on both sides out of retaining lug (see arrow).

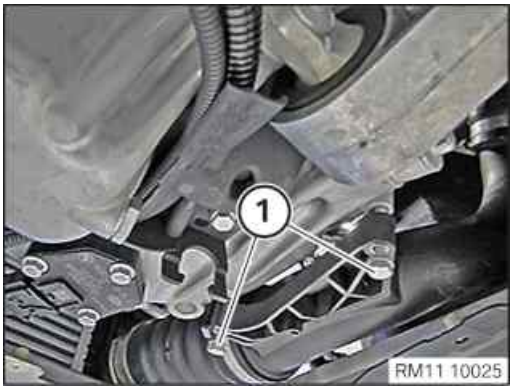
Connect charge air line to exhaust turbocharger.

Lock must snap audibly into place.



Connect charge air line to charge air cooler.

Lock (1) must snap audibly into place.



Tighten down screws (1).

Required follow-up work:

- Install front underbody protection.

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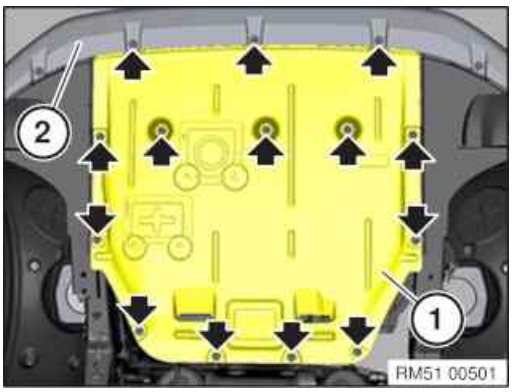
11 61 362 Removing and installing/replacing the right charge-air duct

PRELIMINARY WORK

1 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

2 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

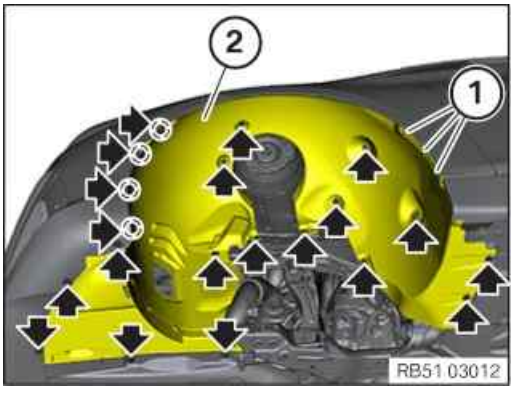
TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

3 – Removing the front right wheel arch cover



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

MAIN WORK

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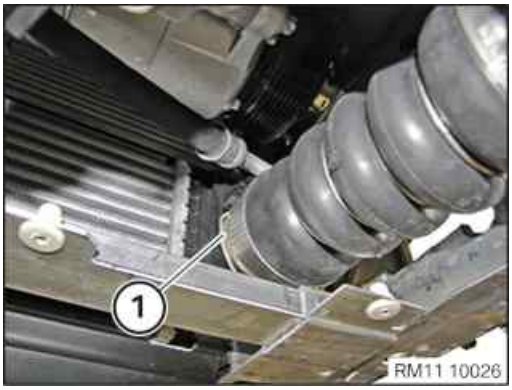
4 – Remove right charge-air line

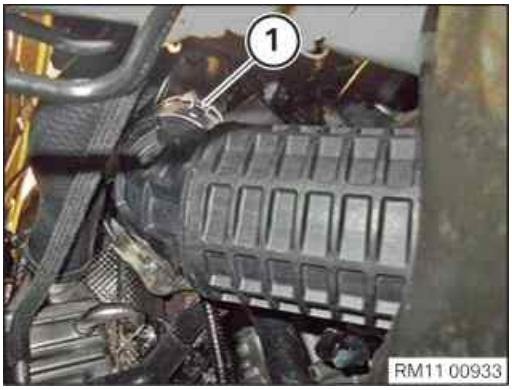
- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.

- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

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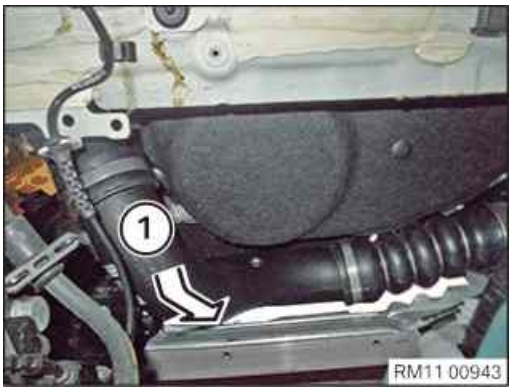


- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

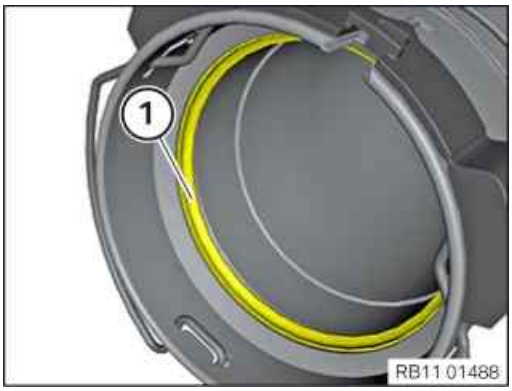
5 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

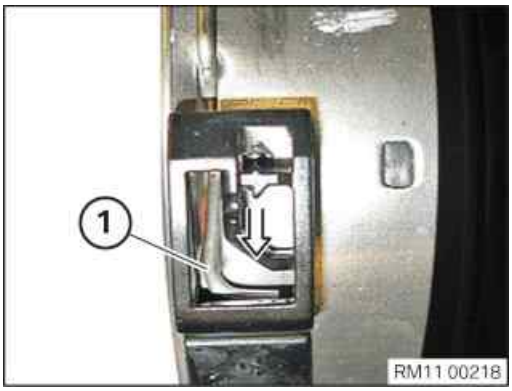
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

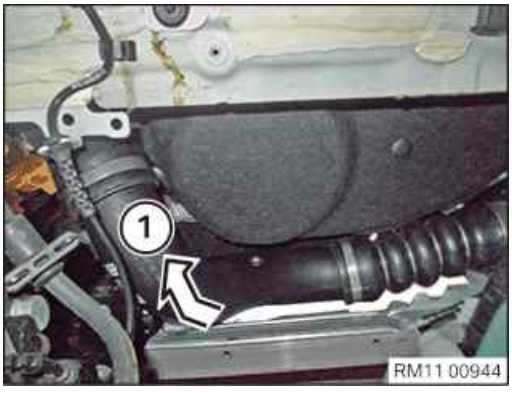


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.

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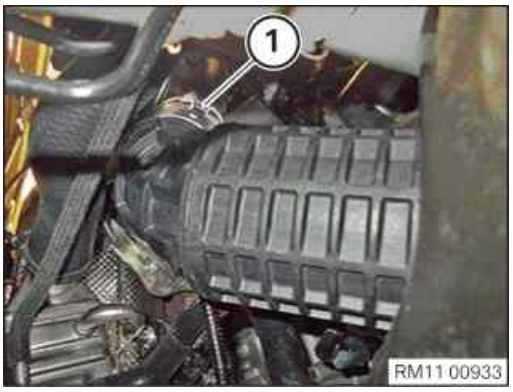
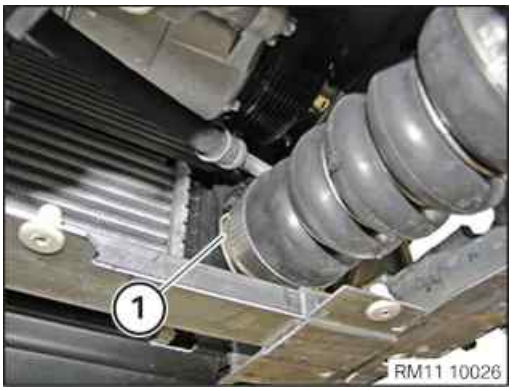


- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

  The lock (1) must audibly engage.

- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

POSTPROCESSES

6 – Installing the front right wheel arch cover

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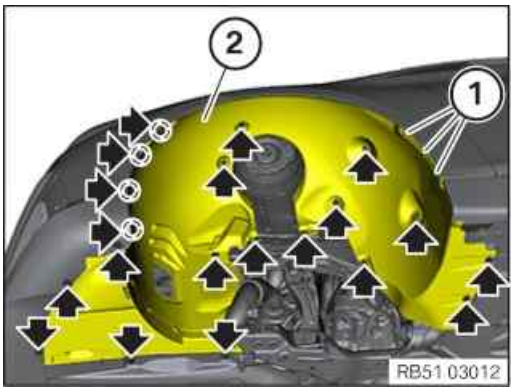


- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

7 – Installing the front right wheel

▸ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

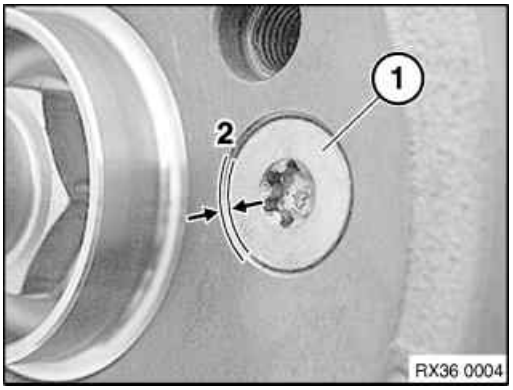
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

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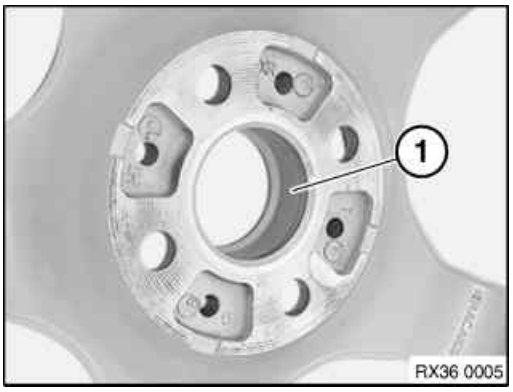


- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

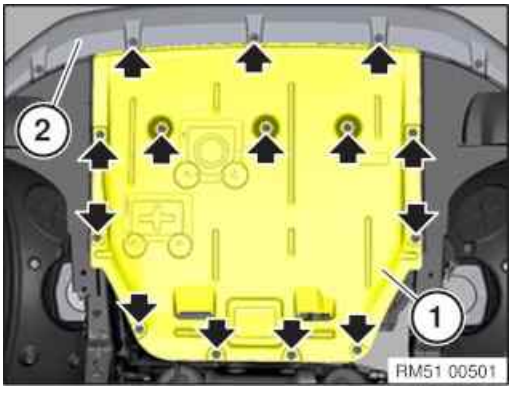
  Parts: Wheel bolts

- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

8 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

Additional Information

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Overview of Tightening Torques

Charge air line to crankcase

Used in step 5

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 5

M6		Tightening torque	8 Nm

Wheel arch cover

Used in step 6

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub

Used in step 7

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 7

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front

Used in step 8

			3 Nm

Overview of Special Tools

2 344 011 Tool

Common Used in step 7

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

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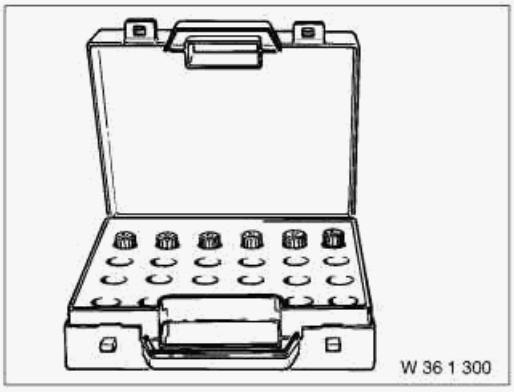
0 495 221 (36 1 323) Wheel stud



Common	Used in step 2
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 2
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 2
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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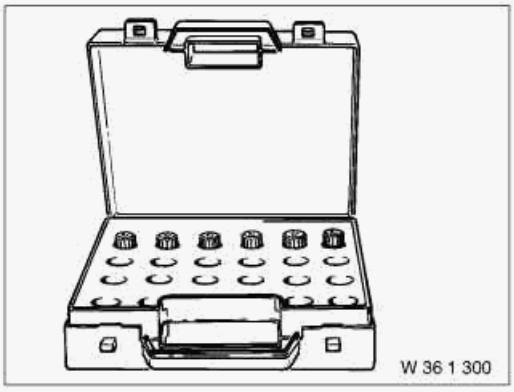
0 495 226 (36 1 328) Wheel stud



Common	Used in step 2
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 2
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 2
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 229 (36 1 332) Wheel stud

Common	Used in step 2
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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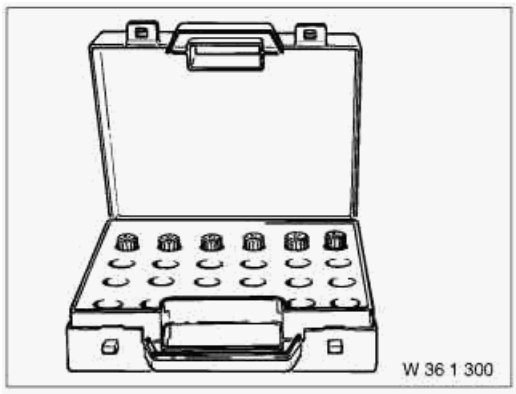
0 495 230 (36 1 333) Wheel stud



Common	Used in step 2
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Links

Operating materials	Used in step
2.0 Grease for wheel centring	7

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11 61 085 Removing and installing/replacing the swirl-flap controller

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Damage to the acoustic cover.

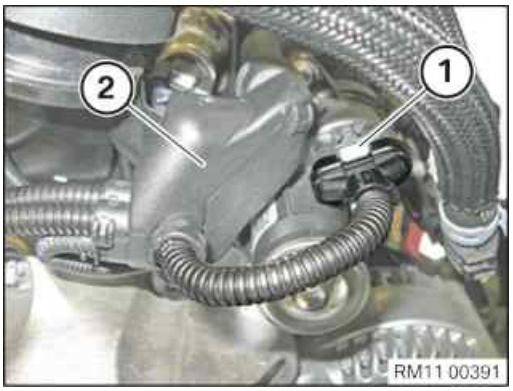
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

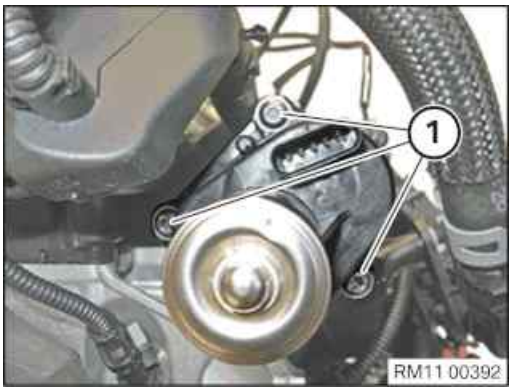
- Unclip the acoustic cover from the marked areas towards the top.

MAIN WORK

2 – Remove swirl-flap controller



- Unlock and disconnect connector (1).
- Release the wiring harness (2) from the holder and lift until the screws are accessible.



- Release the screws (1) with a suitable tool.

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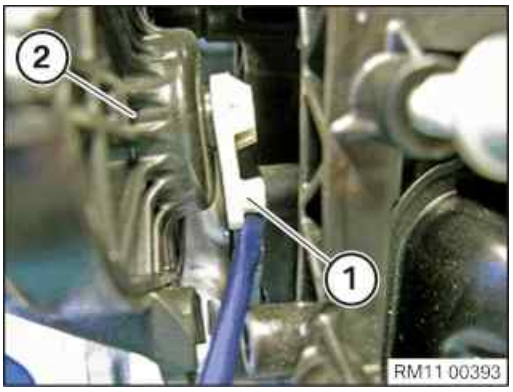
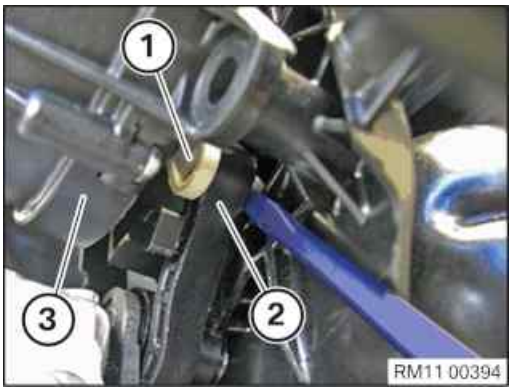
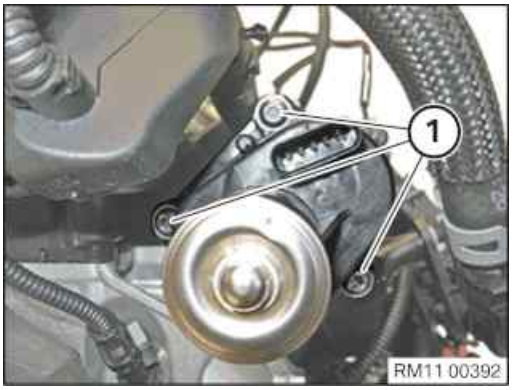


- Carefully release the drive arm (1) from the adjustment lever.
- Remove the swirl-flap controller (2).

3 – Install swirl-flap controller



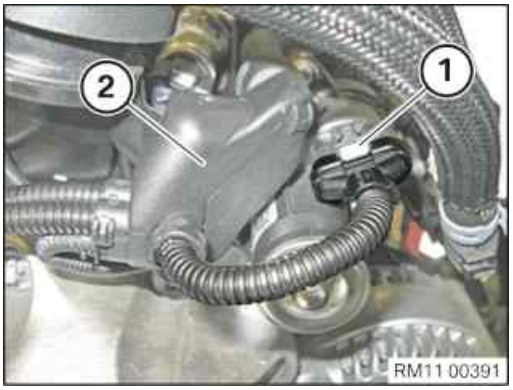
- Position the swirl-flap controller.
- Carefully engage the drive arm (1) in the adjustment lever (2).
- Install the swirl-flap controller (3).



- Tighten the screws (1).

Swirl-flap controller to intake plenum

M6 x 16	Tighten the bolts in alternating order until flush.	4 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure the vehicle wiring harness (2) in the holder.

POSTPROCESSES

4 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

5 – When replacing the swirl-flap controller: Delete adaptations

- Replace swirl-flap actuator.

  Parts: Swirl-flap controller

▶ **Delete adaptations**

- Connect diagnosis system.
  - Power train
  - Digital Diesel Electronics
  - Reset adaptations
  - Delete adaptations

Additional Information

Overview of Tightening Torques

Swirl-flap controller to intake plenum Used in step 3

M6 x 16	Tighten the bolts in alternating order until flush.	4 Nm

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Links

Functional descriptions	Used in step
Delete adaptations	2 5

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11 61 051 Replace intake plenum

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

PRELIMINARY WORK

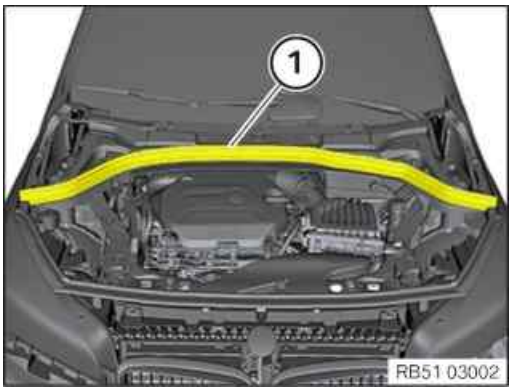
1 – Disconnecting all battery earth leads

- See additional information.

2 – Remove the seal for the rear bonnet

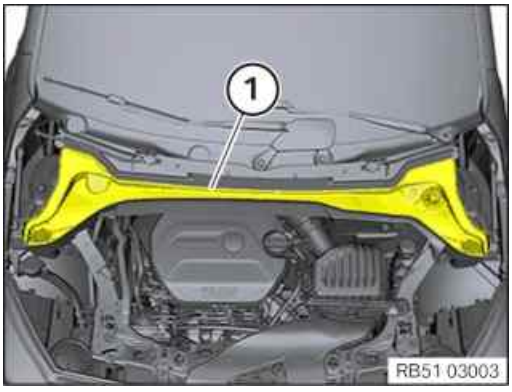
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

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4 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

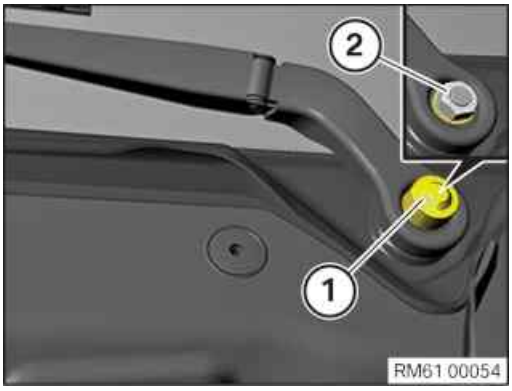
▸ **Remove the wiper arm**

RISK OF DAMAGE

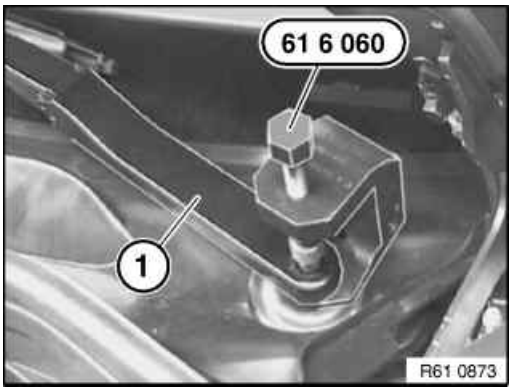
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

5 – Remove the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Remove the gutter strip on the windscreen**

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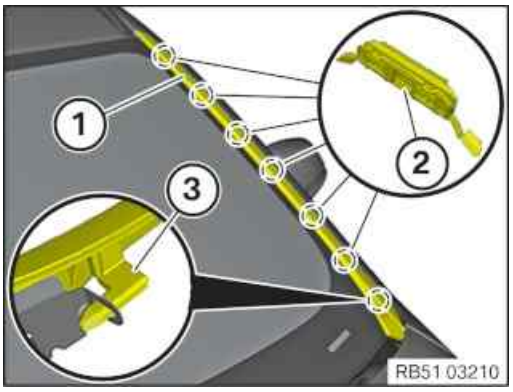
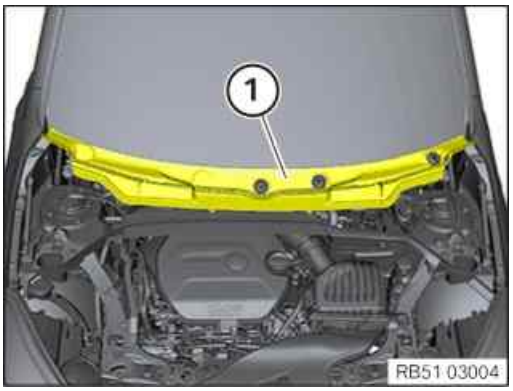


- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

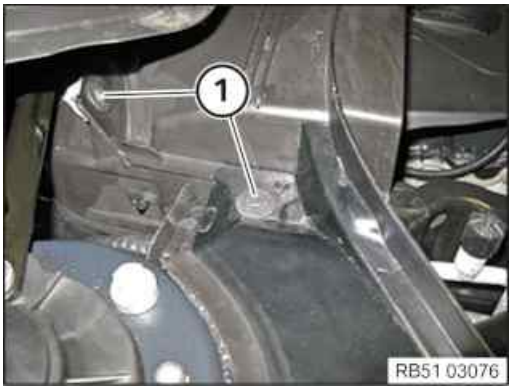
6 – Remove the rear cowl panel cover



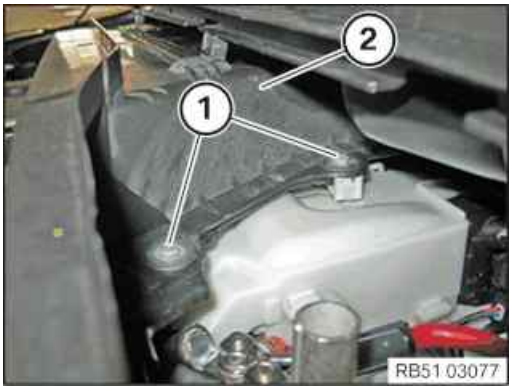
- Disengage and guide out the rear cowl panel cover (1) towards the top.

7 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

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8 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

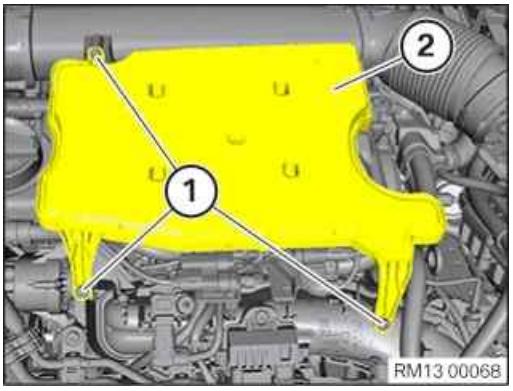
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

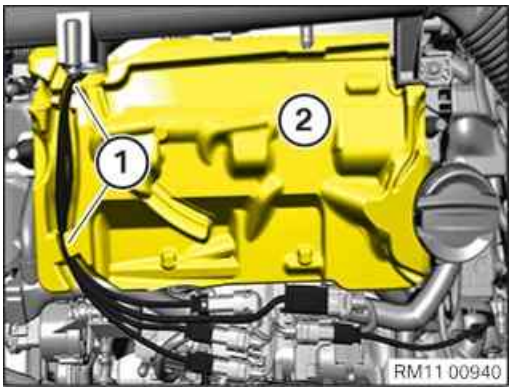
- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

10 – Remove the acoustic cover for the injectors



- Release the wiring harness (1) from the brackets.
- Guide the acoustic cover (2) out and remove.

11 – Remove the intake neck for intake silencer housing

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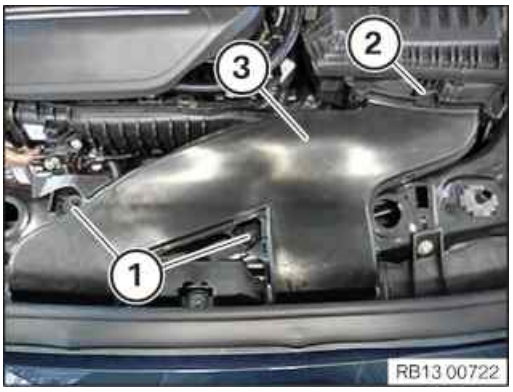
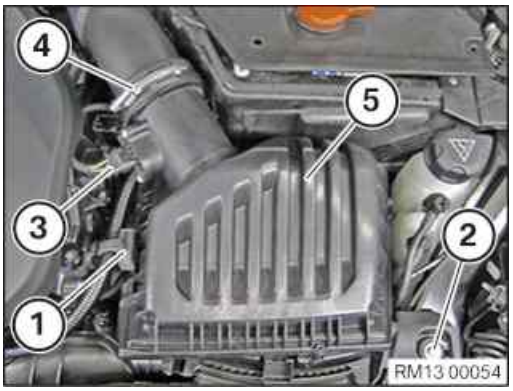


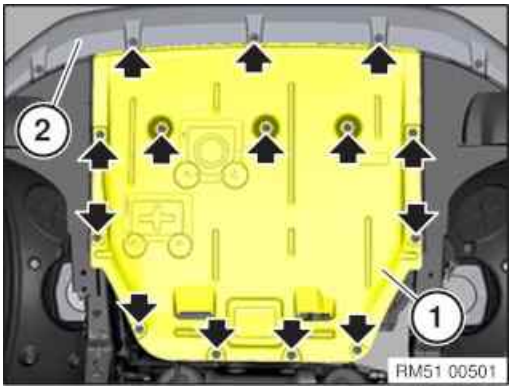
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

12 – Removing intake silencer housing



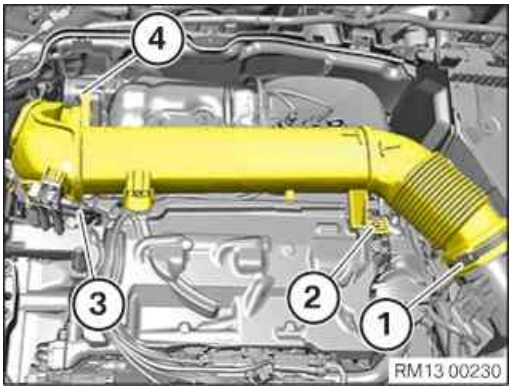
- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

13 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

14 – Partially detach the clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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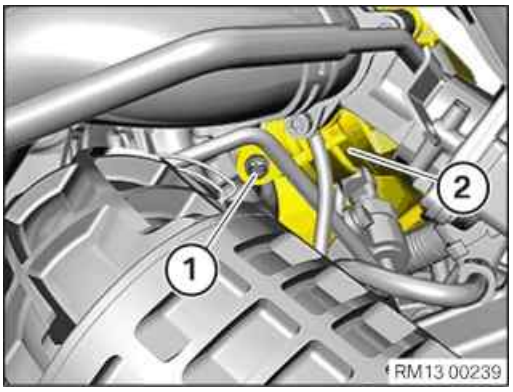
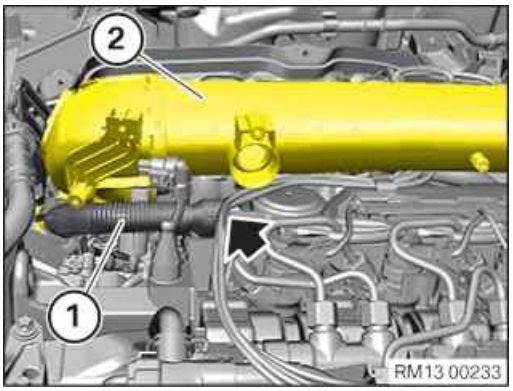


- Unscrew the screw (1) from the clean air pipe (2).

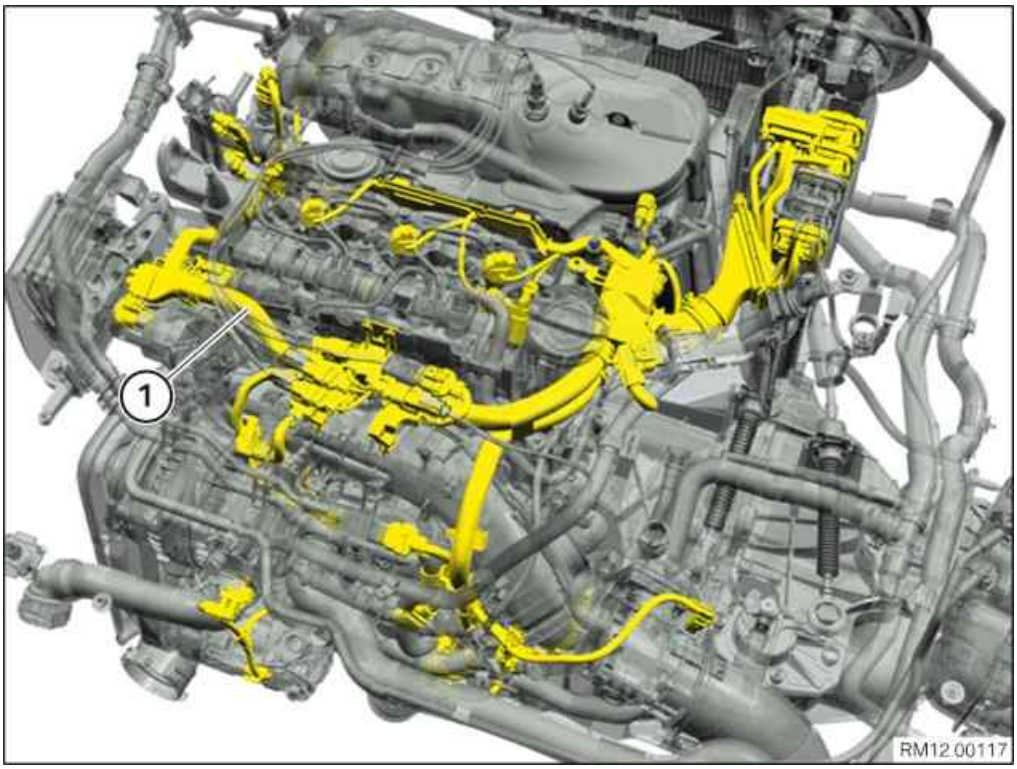


- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

15 – Releasing the wiring harness section for the intake plenum

Overview: Wiring harness section for the engine



1 Wiring harness section for the engine

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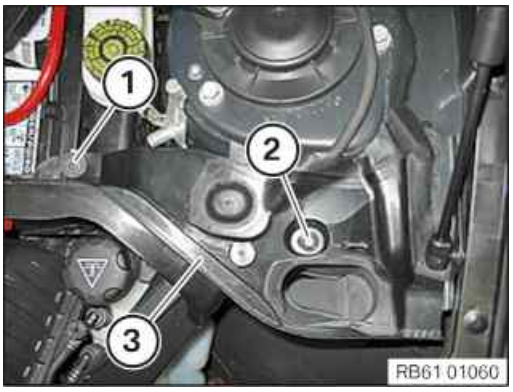
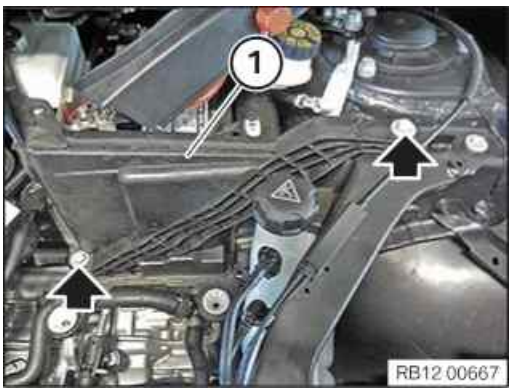
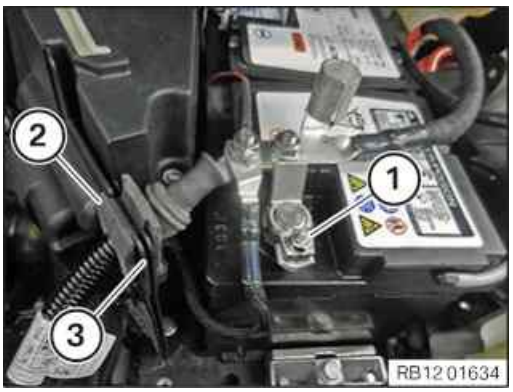


- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

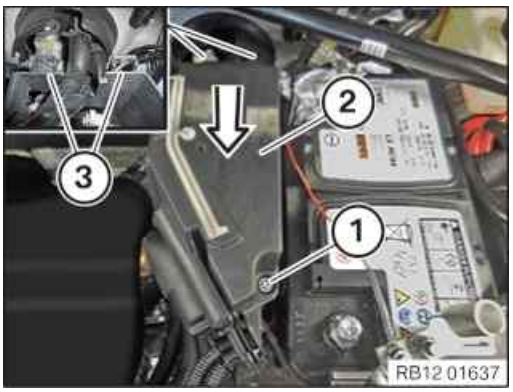
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.

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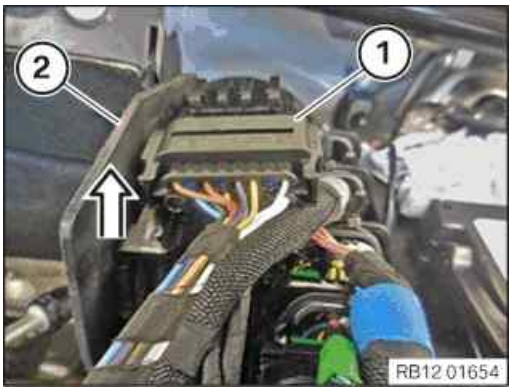
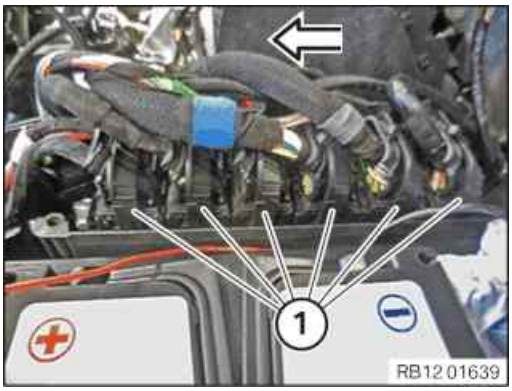
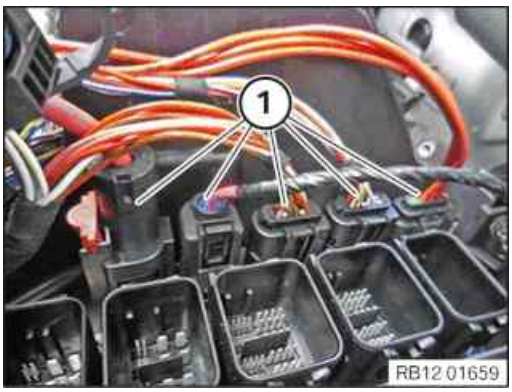


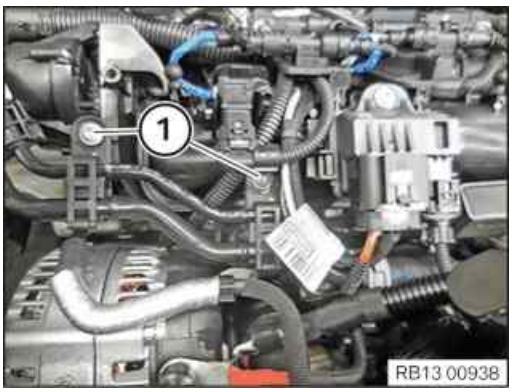
- Guide the connector (1)out of the electronics box (2) in the direction of arrow and remove it.
- Unlock and loosen connector (1).



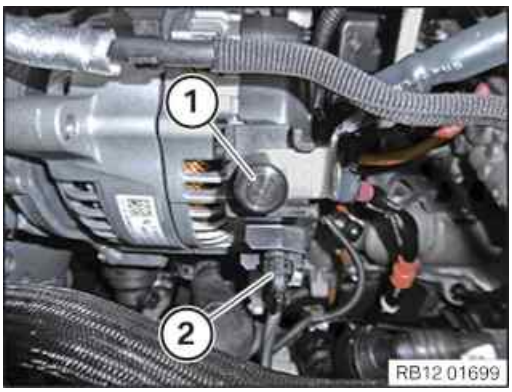
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).



- Loosen screws (1).



- Release the positive battery cable (1) on the alternator and place to one side.
- Unlock connector (2) and pull off.

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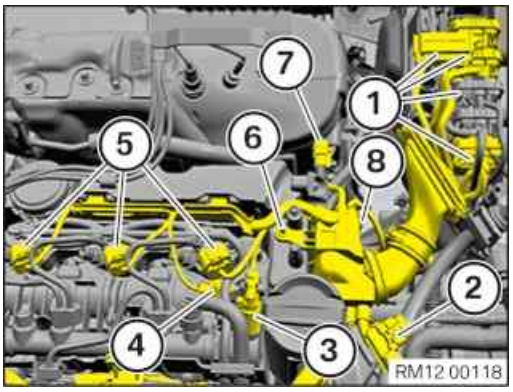
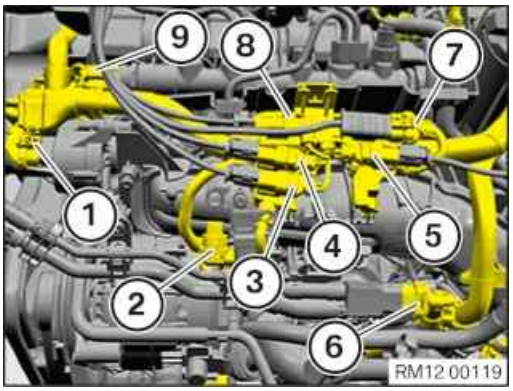
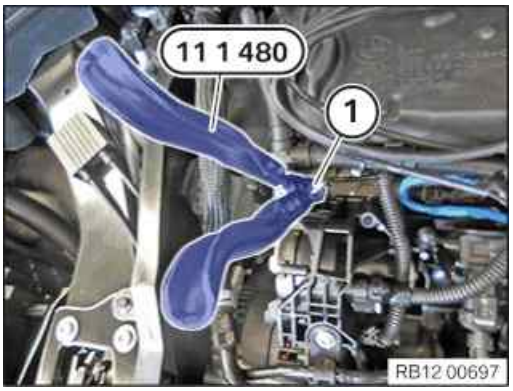


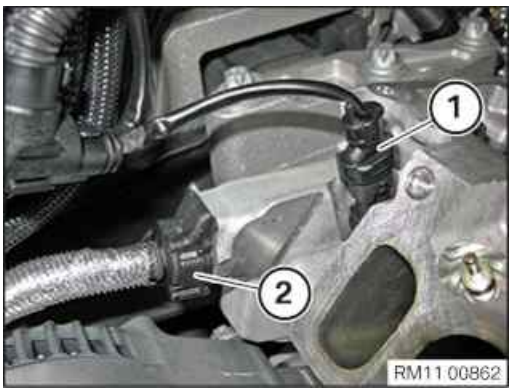
- Disconnect all connectors (1) from the DME control unit and remove the integrated supply module (PDM).
- Unlock connector (2) and pull off from hot film air mass meter.
- Unlock connector (3) and pull off from fuel pressure regulator.
- Unlock connector (4) and disconnect from camshaft sensor.
- Unlock the connector (5) and pull off from the injectors.
- Loosen screw (6).
- Unlock connector (7) and disconnect from differential pressure sensor.



- Unlock connector (1) and pull it off the servomotor for the swirl flap.
- Unlock the connector (2) and pull it off the charging pressure sensor.
- Unlock connector (3) and pull off from exhaust temperature sensor downstream from the diesel particulate filter.
- Unlock connector (4) and pull off from exhaust gas pressure sensor for the low pressure exhaust-gas recirculation cooler.
- Unlock connector (5) and pull off from exhaust gas pressure sensor for the exhaust-gas recirculation cooler.
- Unlock connector (6) and pull off from the fuel pressure and temperature sensor.
- Unlock and disconnect the connector (7) from the front oxygen sensor.
- Unlock connector (8) and pull off from exhaust gas pressure sensor upstream from the diesel particulate filter.



- Unlock connector (1) at all glow elements using special tool **0 490 796 (11 1 480)** and release.
- Guide the wiring harness out of the guide on the cylinder head cover and place to one side.



- Unlock and loosen connector (1).
- Unlock the clamp of the coolant line (2) and release the coolant line.

16 – Removing the cable clips from the intake plenum

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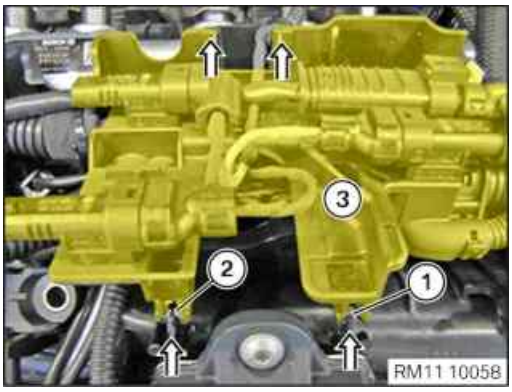


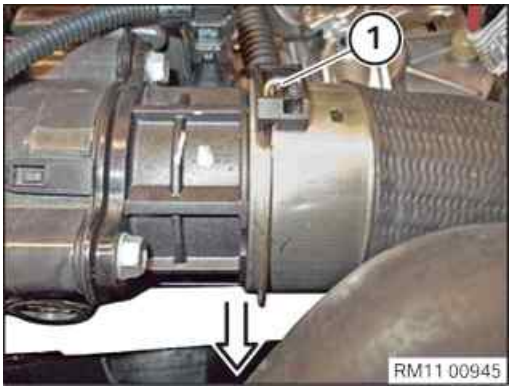
- Release the clips (1) and (2).
- Feed out the cable clip (3) in the direction of the arrow and set it aside.

17 – Removing the intake plenum

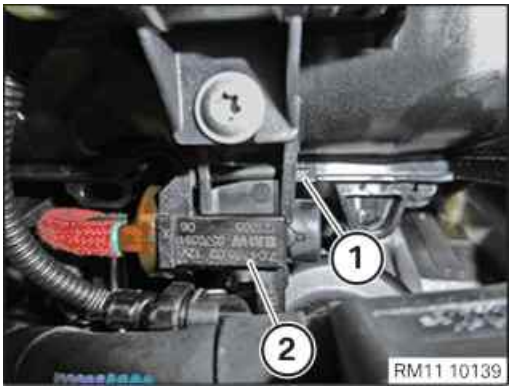
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the lock (1).



- Ensure that the lock (1) is unlocked.
- Pull the charge air line off the throttle valve.



- Unlock the lock (1) upward.
- Guide out the electric changeover valve (2) to the left and set it aside.

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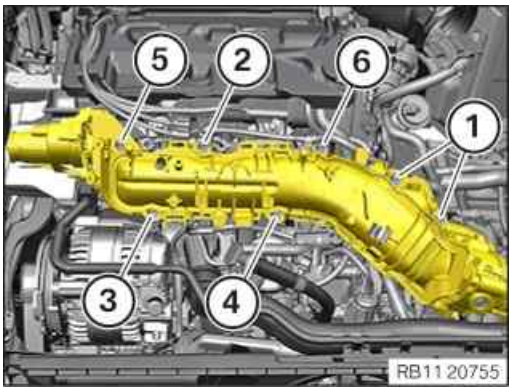
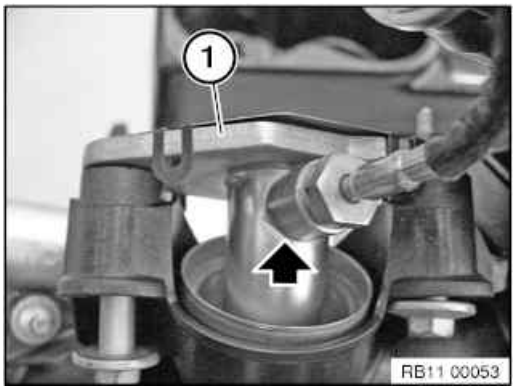


- Loosen the screws (1) on the exhaust-gas recirculation cooler.
- Release the screws (2) to (6).
- Guide the intake plenum out forwards and remove it.



- Remove the exhaust-gas recirculation pipe (1) in direction of arrow.

MAIN WORK

18 – Replacement: Checking part number of the intake plenum

NOTICE

For vehicles with Real Driving Emissions (RDE) with a production date from 03/2019:

The intake plenum and the exhaust-gas recirculation cooler vary.

When replacing the intake plenum or the exhaust-gas recirculation cooler: Make sure the part number is correct. Note the part number of the removed component and assign the corresponding, suitable part number.

In the electronic Parts Catalogue (EPC), components with the auxiliary "RDE" and components without the auxiliary "RDE" will be provided. Only the following combinations are permitted:

Intake plenum **with** the auxiliary **"RDE"** and exhaust-gas recirculation cooler **with** the auxiliary **"RDE"**.

Intake plenum **without** the auxiliary **"RDE"** and exhaust-gas recirculation cooler **without** the auxiliary **"RDE"**.

Components without the auxiliary "RDE" must not be installed with components with auxiliary "RDE".

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Note down part number (1).
- Select new part using the part number from the Electronic Parts Catalogue (EPC).

19 – When replacing the intake plenum: Remount components

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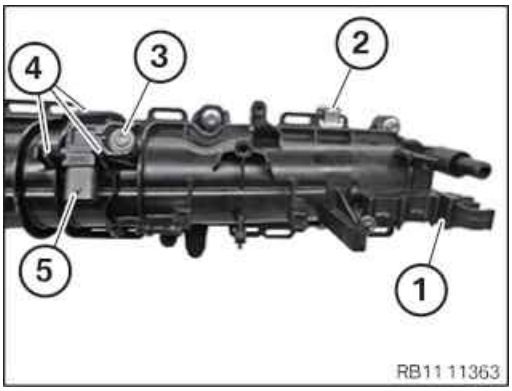
RISK OF DAMAGE

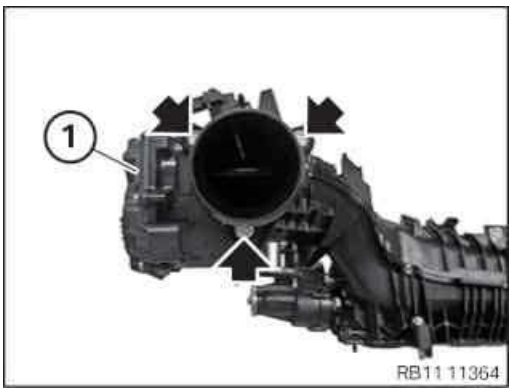
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Guide out and remove holder (1).
- Feed out and remove the clamp (2).
- Loosen screw (3).
- Unlock the locks (4).
- Remove the charging pressure sensor (5).



- Remove screws (arrows).
- Remove the throttle bodies (1).

- Release exhaust temperature sensor (1) using special tool .
- Feed out and remove exhaust temperature sensor (1).
- Replace intake plenum.

  Parts: Plenum

- Check the sealing ring (1) for damage and renew where required.
- Lightly coat the sealing ring (1) on the charging pressure sensor with lubricant for the installation.

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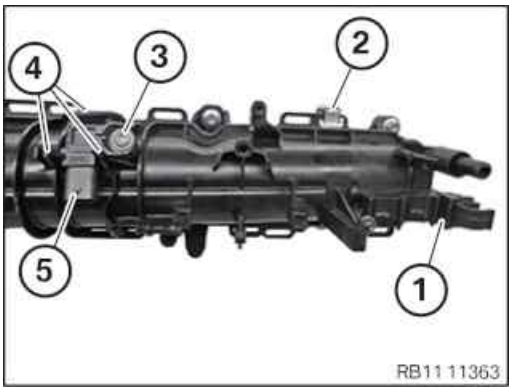


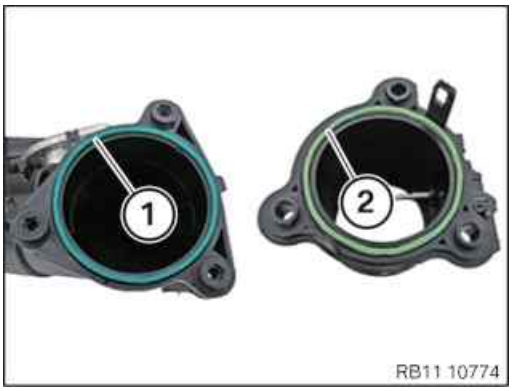
- Insert and install the charging pressure sensor (5).
- Lock the locks (4).

  The locks (4) must engage audibly.
- Tighten down screw (3).

Charging pressure sensor to intake plenum

6x20		Tightening torque	5 Nm

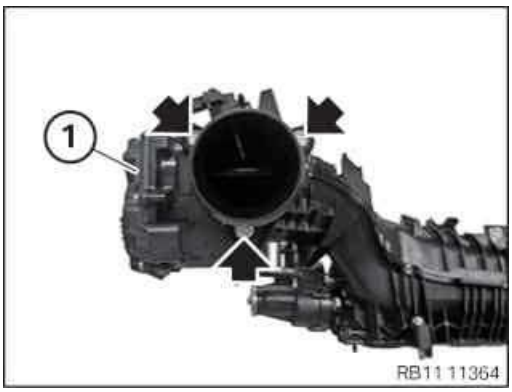
- Feed in and install the clamp (2).
- Insert and install the holder (1).



- Renew the gasket (1) between the intake system and the throttle body.

  Parts: Gasket.
- Renew gasket (2) between throttle body and charge air pipe.

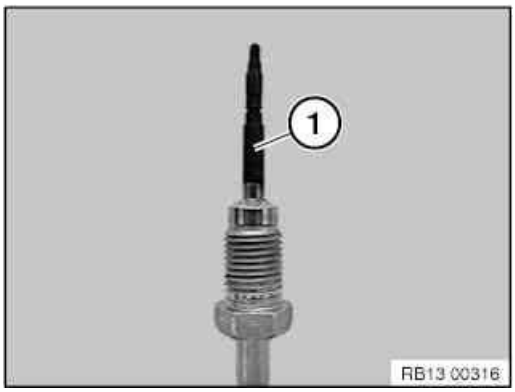
  Parts: Gasket.



- Feed in and install the throttle body (1).
- Tighten screws (arrows).

Throttle body to intake plenum

6x50		Tightening torque	7 Nm



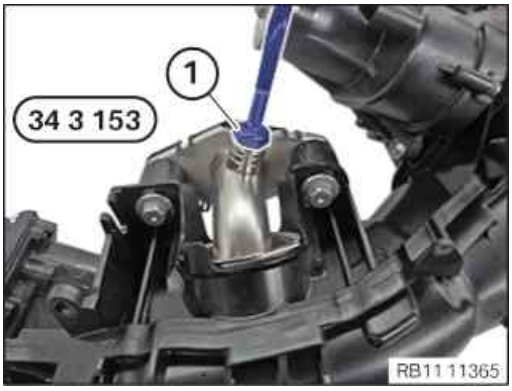
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1) with the special tool .

Exhaust temperature sensor for EGR

Sensor		Tightening torque	21,7 Nm

POSTPROCESSES

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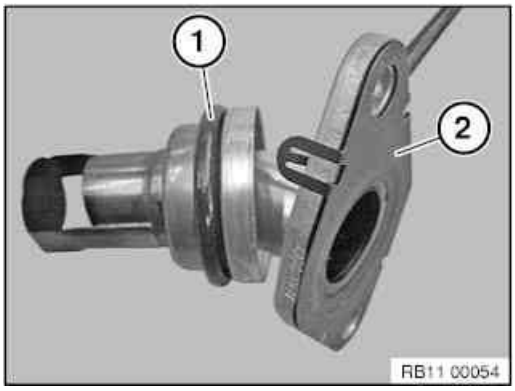
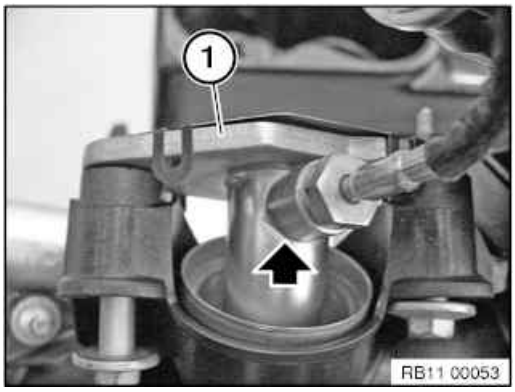
20 – Installing the intake plenum



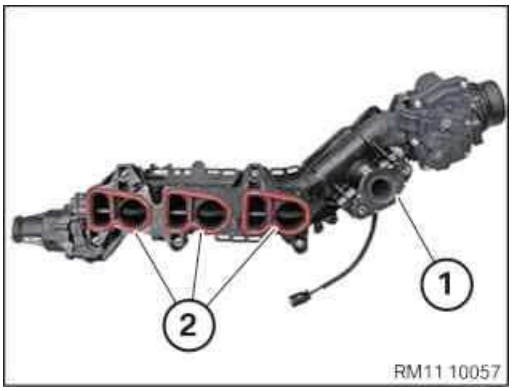
- Renew O-ring (1).

  Parts: O-ring
- Unclip the seal (2).
- Renew gasket.

  Parts: Gasket
- Position seal and clip in.

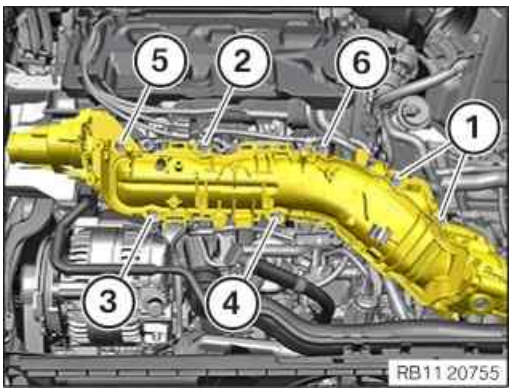


- Install the exhaust-gas recirculation pipe (1) in the intake plenum.



- Renew gaskets (2).

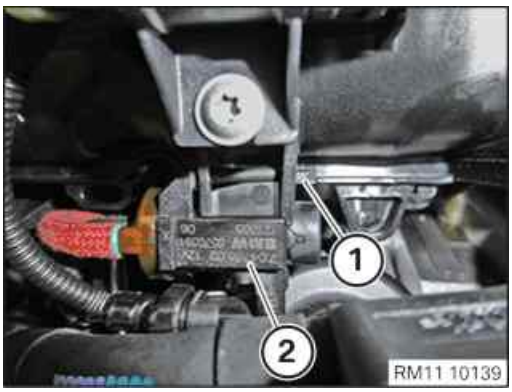
  Parts: Gasket
- Ensure that the seal (1) is firmly mounted on the intake plenum.



- Guide in and install intake plenum .
- Tighten the screws (1) to (6).

Intake plenum to cylinder head

M6		Tightening torque	11 Nm



- Feed the electric changeover valve (2) from left to right into the holder on the intake plenum.
- Lock (1) must engage audibly.

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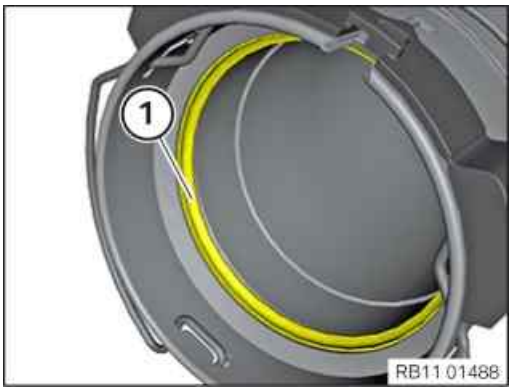
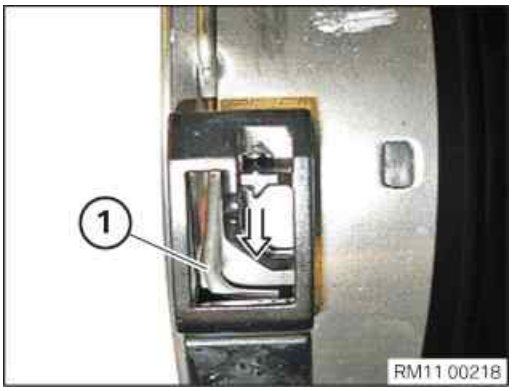
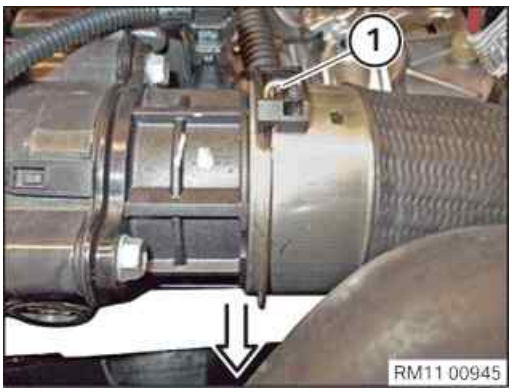


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Sealing ring



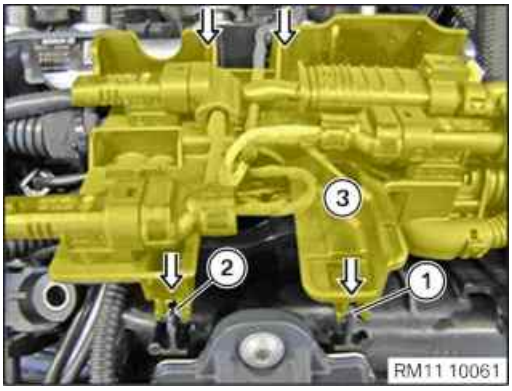
- Engage the lock (1) on the bracket (arrow).



- Connect the charge air line to the throttle valve.

  The lock (1) must audibly engage.
- Check the charge air line for tight fit and freedom of movement.

21 – Installing the cable clip for the intake plenum



- Feed in and install the cable clip (3) in the direction of arrow.
- Engage clips (1) and (2).

22 – Fastening the wiring harness section for the intake plenum

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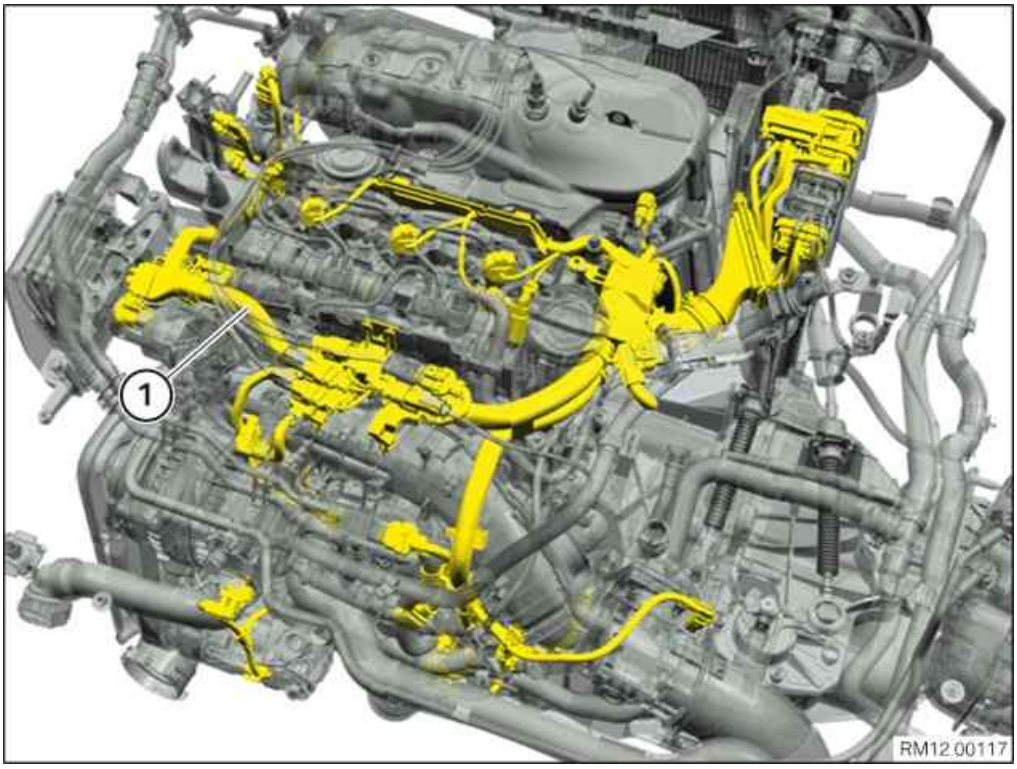
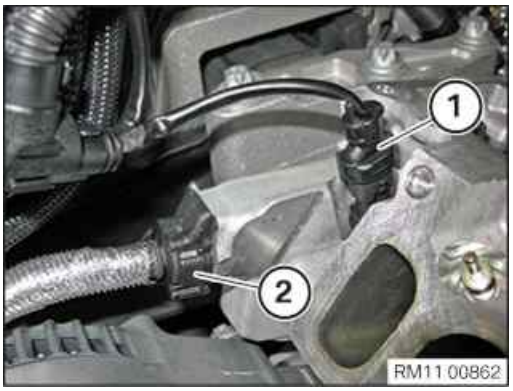
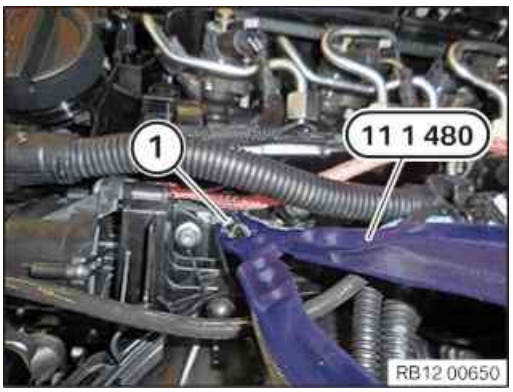
Overview: Wiring harness section for the engine



1 Wiring harness section for the engine



- Connect the coolant line (2) and lock the clamp.
- Connect and lock the connector (1).
- The locks must engage audibly.



- Connect and lock the connector (1) on the glow elements.
  The connector (1) must lock audibly.
- Guide the wiring harness into the guide on the cylinder head cover.

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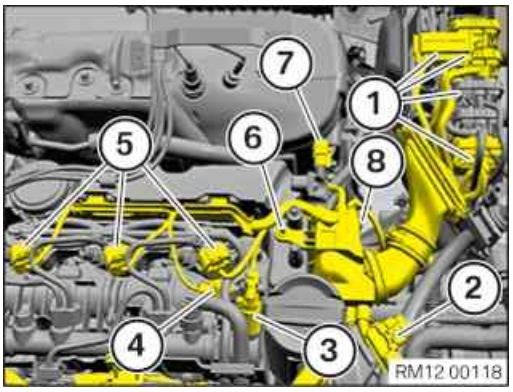
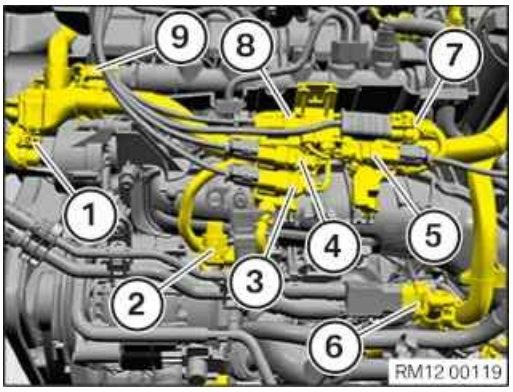


- Route the wiring harness section for the engine and fasten it with the clamps.
- Route all connectors (1) to the DME control unit and remove the integrated supply module (PDM).
- Connect and audibly lock the connector (2) to the hot film air mass meter.
- Attach connector (3) to the fuel pressure regulator and lock it audibly.
- Attach connector (4) to the camshaft sensor and lock it audibly.
- Attach connector (5) to the injectors and lock it audibly.
- Tighten down screw (6).

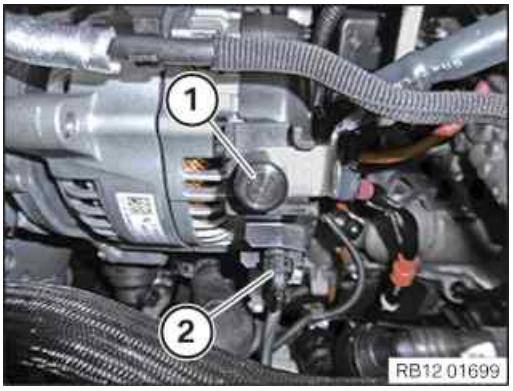
Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (7) to the differential pressure sensor and lock it audibly.



- Attach connector (1) to the servomotor for the swirl flaps and lock it audibly.
- Connect the connector (2) to the charging pressure sensor and lock it audibly.
- Attach connector (3) to the exhaust temperature sensor downstream from the diesel particulate filter and lock it audibly.
- Attach connector (4) to the exhaust temperature sensor for the low pressure exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (5) to the exhaust temperature sensor for the exhaust-gas recirculation cooler and lock it audibly.
- Attach connector (6) to the fuel pressure and temperature sensor and lock it audibly.
- Connect the connector (7) to the front oxygen sensor and lock audibly.
- Attach connector (8) to the exhaust temperature sensor upstream from the diesel particulate filter and lock it audibly.

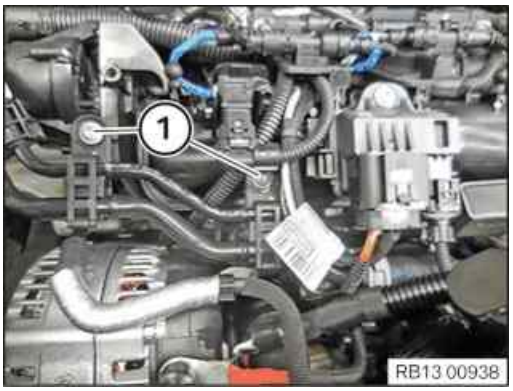


- Connect and lock the connector (2).

  Lock must audibly engage.
- Connect positive battery cable (1) on alternator and tighten.

Positive battery cable to alternator

M8		Tightening torque	19 Nm



- Position fuel lines.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

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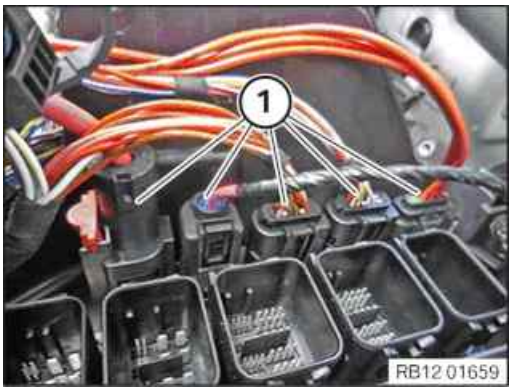
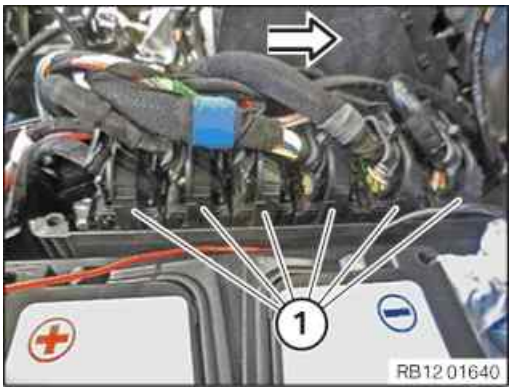
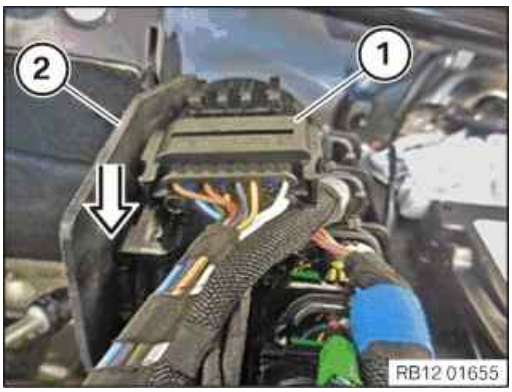


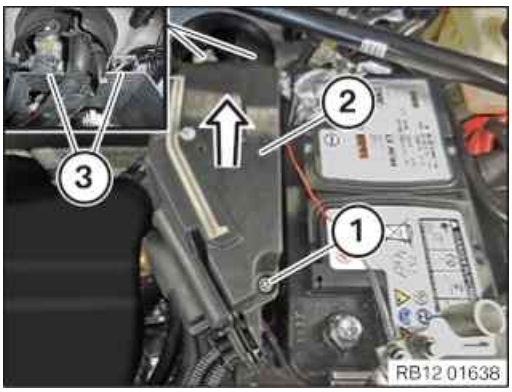
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



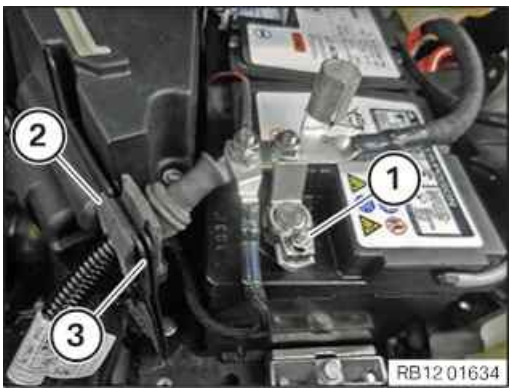
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert and install the cover (2) into the guides (3) in the direction of the arrow.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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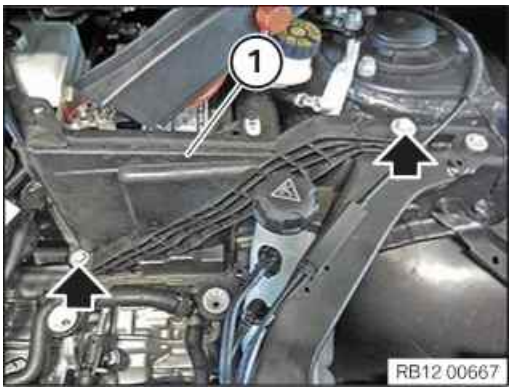


- Feed in and install tension strut (1).
- Tighten screws (arrows).

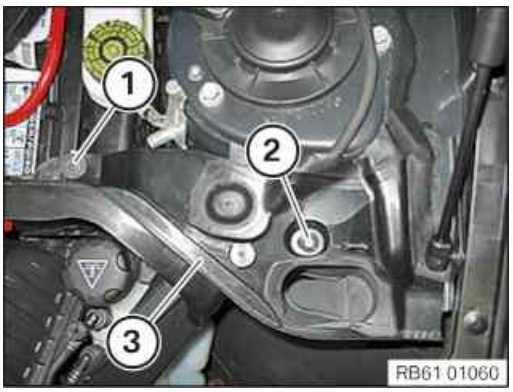
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

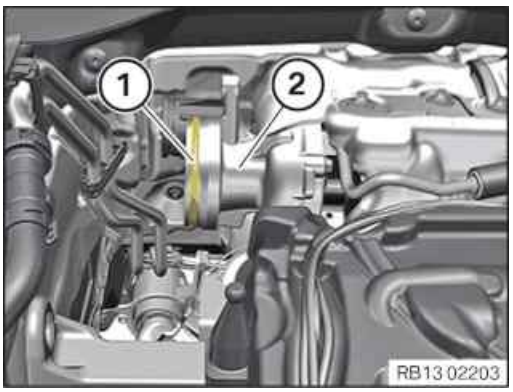


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

23 – Partially securing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.

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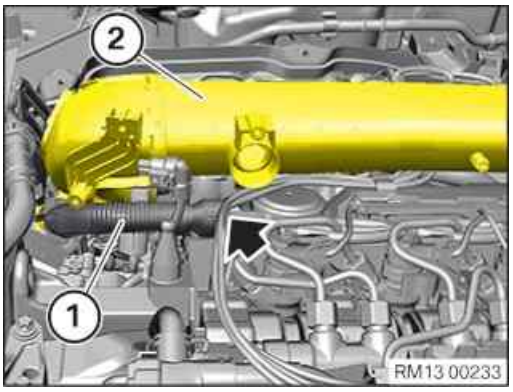
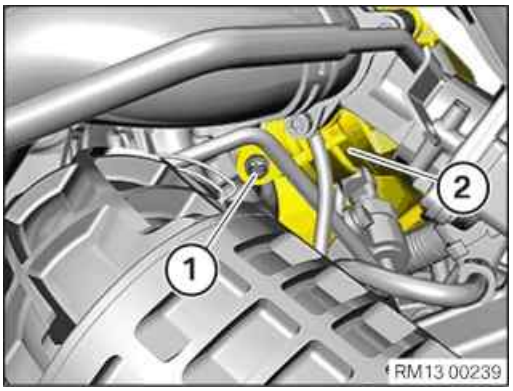


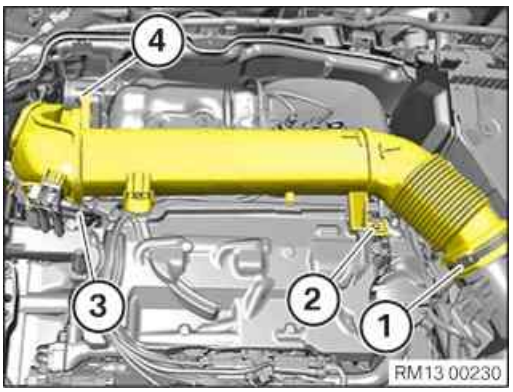
- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

24 – Installing intake silencer housing

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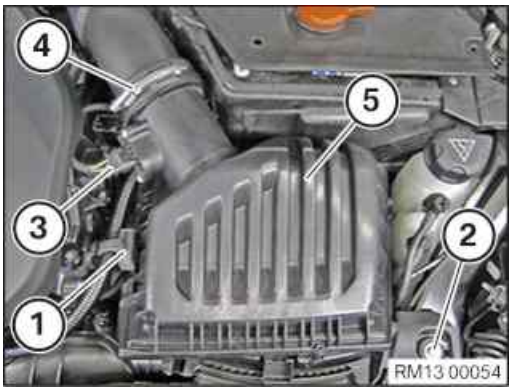


- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

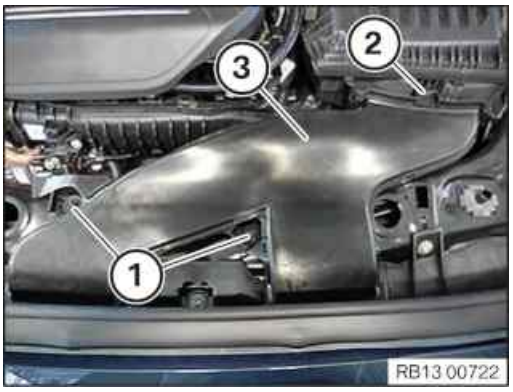
Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

25 – Install the intake neck for the intake filter housing



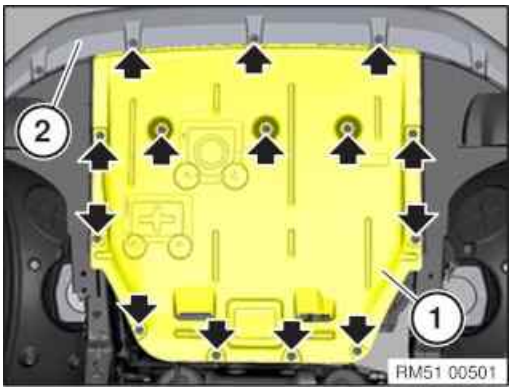
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

26 – Installing the front underbody protection

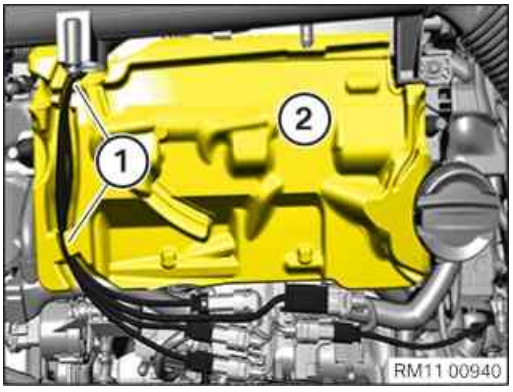


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

27 – Install the acoustic cover for the injectors



- Feed the acoustic cover (2) in and install.
- Fasten the wiring harness (1) to the brackets.

28 – Install resonator

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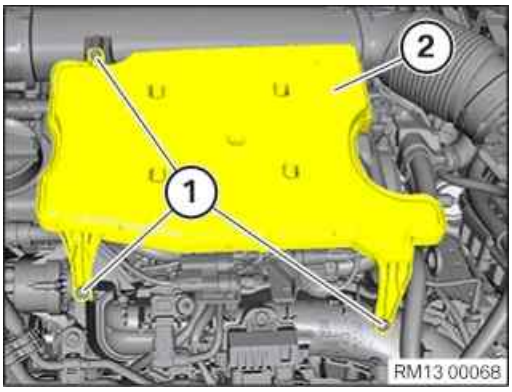

- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

29 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

30 – Installing the upper bulkhead cover

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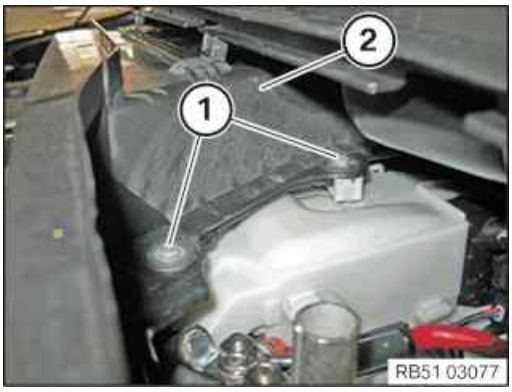
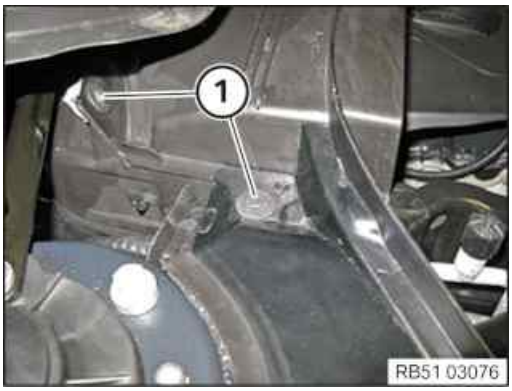


- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

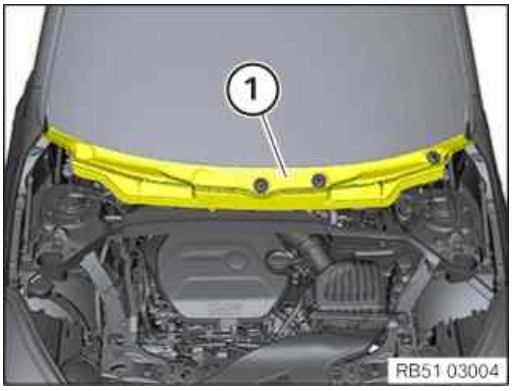
Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

31 – Install the rear cowl panel cover



- Feed in and engage the rear cowl panel cover (1).

32 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**

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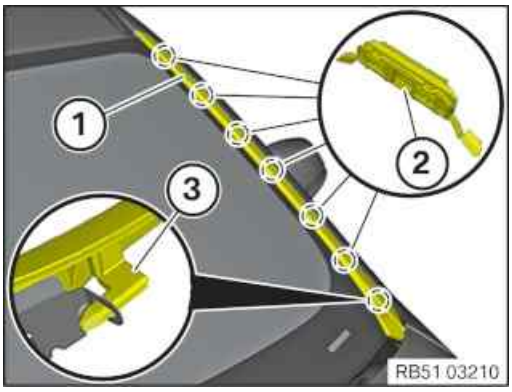


- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

33 – Install left and right wiper arm

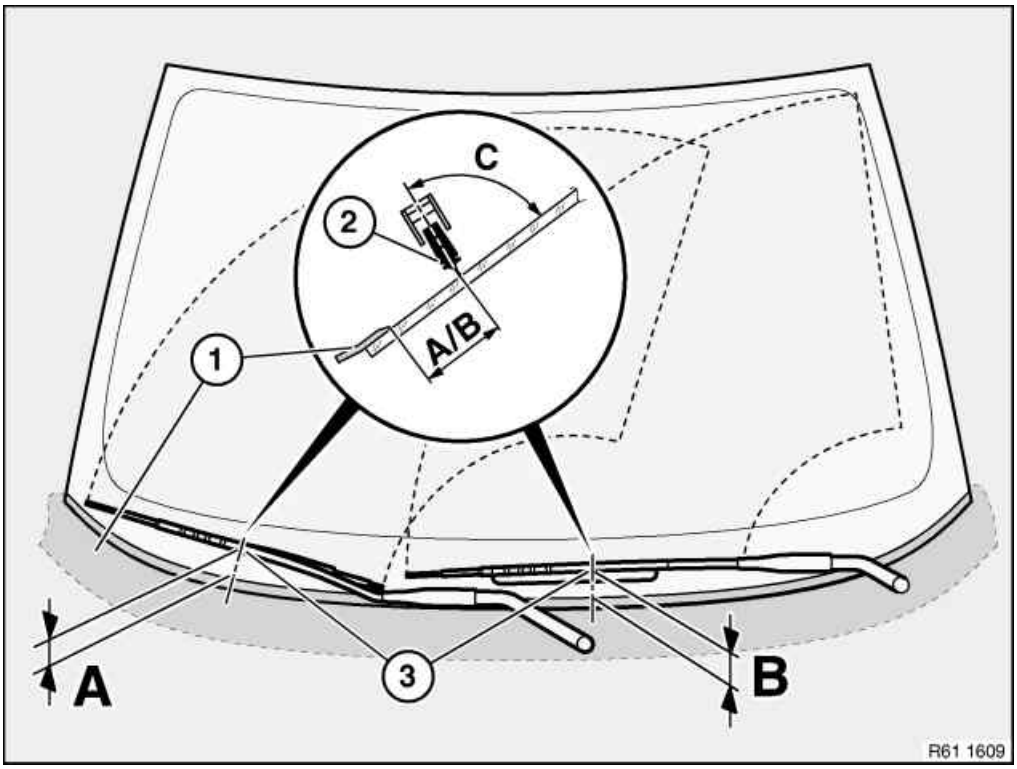
NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).

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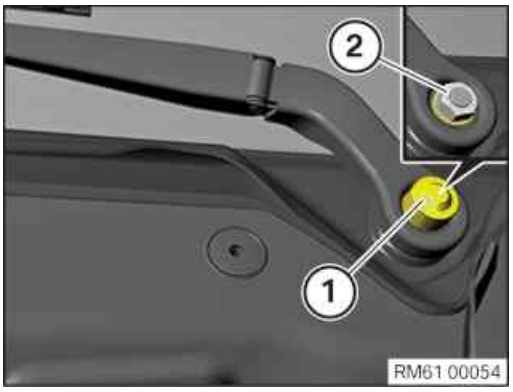


NOTICE

Description is for left component only. Procedure on the right side is identical.

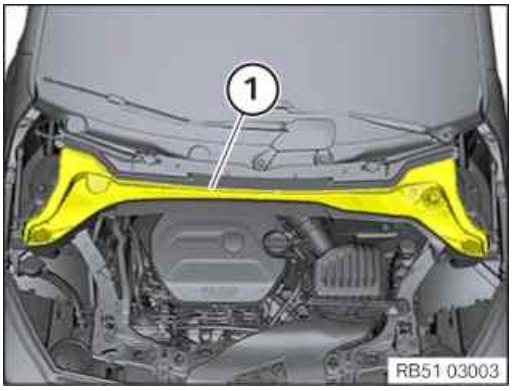
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

34 – Installing front cowl panel cover

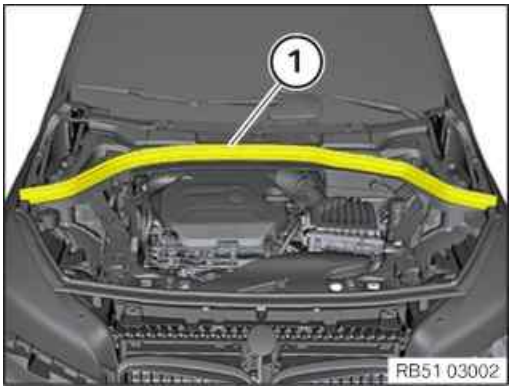


- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

35 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

36 – Disconnecting all battery earth leads

- See additional information.

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37 – Reset the adaptations for the swirl-flap controller

- Connect the diagnosis system and reset the adaptations:
  - Power train
  - Digital Diesel Electronics
  - Reset adaptations
  - Delete adaptations

Additional Information

Overview of Tightening Torques

Charging pressure sensor to intake plenum			Used in step 19
6x20		Tightening torque	5 Nm

Throttle body to intake plenum			Used in step 19
6x50		Tightening torque	7 Nm

Exhaust temperature sensor for EGR			Used in step 19
Sensor		Tightening torque	21,7 Nm

Intake plenum to cylinder head			Used in step 20
M6		Tightening torque	11 Nm

Wiring harness to cylinder head cover			Used in step 22
TS5x20		Tightening torque	3,5 Nm

Positive battery cable to alternator			Used in step 22
M8		Tightening torque	19 Nm

Fuel line to intake plenum			Used in step 22
TS6x20		Tightening torque	5 Nm

Cover to electronics box			Used in step 22
RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery			Used in step 22
NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray			Used in step 22
M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall			Used in step 22
		Tightening torque	3 Nm

Battery cover			Used in step 22
Screw			2,8 Nm

Clean air pipe to exhaust turbocharger			Used in step 23
Torx bolt BM8x25		Tightening torque	8 Nm

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Clean air pipe to cylinder head cover — Used in step 23

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 23 24

Clamp		Tightening torque	3 Nm

Intake silencer housing to lock bridge — Used in step 24

M6X30		Tightening torque	8 Nm

Intake neck to cross connection — Used in step 25

M6		Tightening torque	8 Nm

Underbody protection front — Used in step 26

			3 Nm

Resonator to manifold and clean air pipe — Used in step 28

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 30

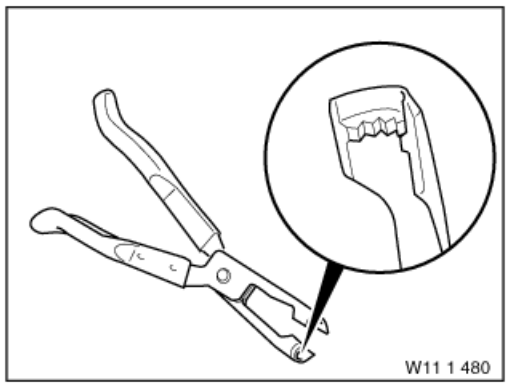
Screw		Tightening torque	3 Nm

Windscreen wiper arm — Used in step 33

Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

0 490 796 (11 1 480) Pliers



Common — Used in step 15

Usage	For removing valve stem seal
Included in the tool or work	
Storage location	A10
Replaced by	
In connection with	
SI-Number	01 01 93 (621)

Overview Technical Data

Links

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 36
61 20 900 Disconnecting and connecting battery earth lead	1 36
61 20 900 Disconnecting and connecting battery earth lead	1 36
61 20 900 Disconnecting and connecting battery earth lead	1 36
61 20 900 Disconnecting and connecting battery earth lead	1 36
61 20 900 Disconnecting and connecting battery earth lead	1 36
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 36

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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	36
61 20 900 Disconnecting and connecting battery earth lead	1	36
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	36
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1	36
61 20 900 Disconnecting and connecting battery earth lead	1	36
61 20 900 Disconnecting and connecting battery earth lead	1	36
61 20 900 Disconnecting and connecting battery earth lead	1	36
61 20 900 Disconnecting and connecting battery earth lead	1	36
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1	36
61 20 900 Disconnecting and connecting battery earth lead	1	36
61 20 900 Disconnecting and connecting battery earth lead	1	36
61 20 900 Disconnecting and connecting battery earth lead	1	36
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61 20 900 Disconnecting and connecting battery earth lead	1	36
61 20 900 Disconnecting and connecting battery earth lead	1	36
61 20 900 Disconnecting and connecting battery earth lead	1	36

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18 40 040 Removing and installing, sealing/replacing exhaust manifold (B37)

Warning!

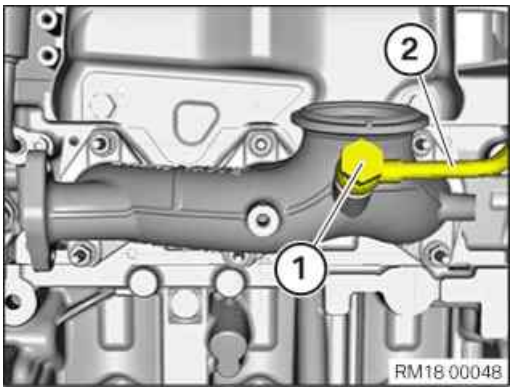
Risk of burning!

Only perform this repair work on an engine that has cooled down.

Necessary preliminary tasks:

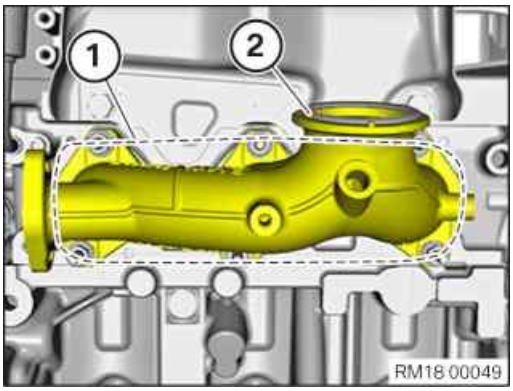
- Remove exhaust turbocharger.
- Remove diesel particulate filter.

Removal:



Release banjo bolt (1).

Place exhaust pressure pipe (2) on one side.



Release nuts along dashed line (1).

Release exhaust manifold (2) from cylinder head and remove.

Preparation for installation:

Clean connection points.

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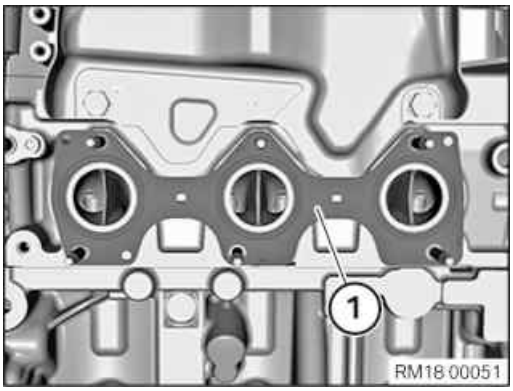
Installation:



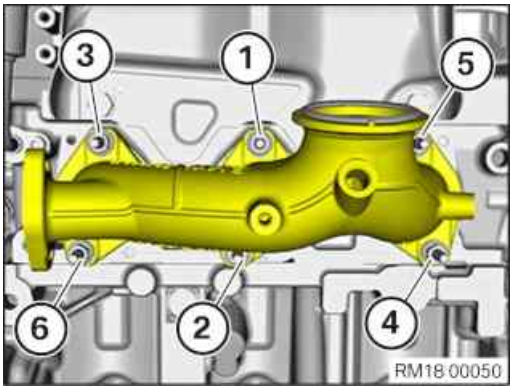
Replace gasket (1).

Part: Gasket

Important!

Gasket (1) is coated with graphite on one side.

The graphite coating must be fitted on the exhaust manifold side.

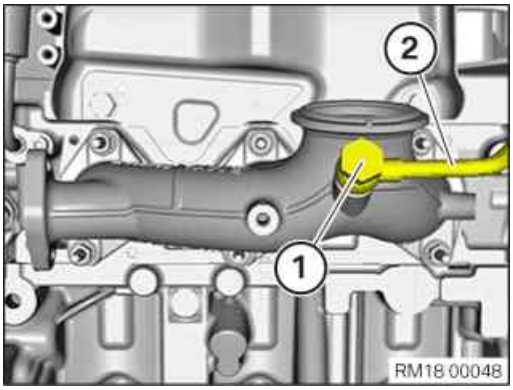


Mount exhaust manifold.

Position nuts and tighten in sequence.

Observe tightening specification!

Tightening torque 18 30 9AZ.



Renew sealing rings.

Parts: Sealing rings

Important!

To ensure operational reliability, use stainless steel sealing washers.

Mount exhaust pressure pipe (2).

Tighten banjo bolt (1).

Tightening torque 18 30 8AZ.

Required follow-up work:

- Install exhaust turbocharger.
- Install diesel particulate filter.

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11 65 020 Damage on the exhaust turbocharger due to obstructed oil supply lines

Caution!

If there is damage on the exhaust turbocharger:

- **Complaint:**

  Power loss, malfunction indicator lamp on

  Damage to the exhaust turbocharger.

  After damage to the exhaust turbochargers, the oil supply lines are often not replaced and the oil is not changed, this can lead to damage to the exhaust turbocharger again.

  Further, fault code entries in the preheating system or to the charging pressure controller (variable turbine geometry) are not considered.

  For N57X, additionally the following faults can be stored: 292200 Charging pressure controller (variable turbine geometry): Position sensor in charging pressure controller faulty or undervoltage 48F6 in charging pressure controller (variable turbine geometry)

  Attention: Subsequent damage is not covered by the warranty!

- **Cause**

  The oil supply lines for the exhaust turbocharger are clogged or blocked by oil sludge/coking. Due to that, oil supply to the exhaust turbocharger may be inadequate and can cause damage to the exhaust turbocharger again.

  Malfunctions in the preheating system can lead to clogging of the diesel particulate filter and thus to problems with the charging pressure control or the charging pressure build-up. Consequence: Problems at cold start or the engine does not start due to a faulty preheating system. Power loss or overheating of the exhaust branch.

  If the new exhaust turbocharger is not filled with enough oil prior to installation, the shaft bearings can be damaged at the first starting operation itself.

- **Solution**

  Proceed as follows in response to a customer complaint:

  If fault code entries are available for the preheating system, the preheating system must be repaired. Then delete the fault memory.

  Caution!

  If the engine does not heat up or only heats up very slowly because of a defective thermostat, this can result in premature or repeated damage to the exhaust turbocharger. **Always** check the coolant thermostat and thermostat for the EGR cooling if there is a complaint, and repair if applicable.

  Engine oil and filter exchange must be carried out on the engine absolutely, so as to guarantee operation of the changed exhaust turbocharger with fresh oil!

  Since the oil feed line as well as the oil return line may coke with increased mileage especially in the cable connection area of the exhaust turbocharger, the followings rules are applicable:

  Engines with one exhaust turbocharger:

  - Exhaust turbocharger exchange due to electrical fault on the exhaust turbocharger (vehicle mileage/km up to 100,000

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km):

- Check the oil feed line, oil return line and the associated banjo bolts for coking, **replace if applicable**.
- If the oil return line is replaced, the connecting pipe on the crankcase must **always** be cleaned, as it is also subject to coking!
- If a replacement is not necessary: If the exhaust turbocharger is offered only along with the oil return line and oil feed line in the Electronic Parts Catalogue (EPC), it can be removed from the order list again.

- Exhaust turbocharger exchange due to electrical fault on the exhaust turbocharger (vehicle mileage/km starting at 100,000 km):
  - Replace the oil feed line, oil return line and the associated banjo bolts.
  - If the oil return line is replaced, the connecting pipe on the crankcase must **always** be cleaned, as it is also subject to coking!
- Exchanging the exhaust turbocharger if there is mechanical damage on the exhaust turbocharger:
  - Always replace the oil feed line, oil return line and the associated banjo bolts.
  - If the oil return line is replaced, the connecting pipe on the crankcase must **always** be cleaned, as it is also subject to coking!

Engines with several exhaust turbochargers:

- Exchanging one or several exhaust turbochargers due to electrical faults on the exhaust turbocharger (vehicle mileage/km up to 100,000 km):
  - Check the oil feed lines, oil return lines and the associated banjo bolts of **all** exhaust turbochargers (including the intact exhaust turbocharger) for coking, **replace if applicable**.
  - If all the oil return lines are replaced, all the connecting pipes on the crankcase must **always** be cleaned, as they are also subject to coking!
  - If a replacement is not necessary: If the exhaust turbocharger is offered only along with the oil return line and oil feed line in the Electronic Parts Catalogue (EPC), it can be removed from the order list again.
- Exchanging one or several exhaust turbochargers due to electrical faults on the exhaust turbocharger (vehicle mileage/km starting at 100,000 km):
  - Replace the oil feed lines, oil return lines and the associated banjo bolts of **all** exhaust turbochargers (including the intact exhaust turbocharger).
  - If all the oil return lines are replaced, all the connecting pipes on the crankcase must **always** be cleaned, as they are also subject to coking!
- Exchanging one or several exhaust turbochargers if there is mechanical damage on the exhaust turbocharger:
  - Always replace the oil feed lines, oil return lines and the associated banjo bolts of **all** exhaust turbochargers (including the intact exhaust turbocharger).
  - If all the oil return lines are replaced, all the connecting pipes on the crankcase must **always** be cleaned, as they are also subject to coking!

In case the diesel particulate filter is foul with oil, clean or replace it, if necessary.

In order to exclude that the oil supply to the exhaust turbocharger is

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not impaired due to faulty crankcase ventilation, carry out a function check of the crankcase ventilation in this regard. The corresponding test module can be found in ISTA at:

- Power train
- Digital Diesel Electronics
- Engine ventilation
- Internal engine pressure

When installing the exhaust turbocharger, the exhaust turbocharger itself needs to be filled to capacity with fresh engine oil through the oil intake hole before the oil feed line is mounted. Important: Never use liquid sealing compounds when connecting the engine oil pipe as they can block the oil ducts.

After installing the exhaust turbocharger, start the engine and let it run at idle for 2 to 3 minutes before increasing the speed.

If required, initiate a regeneration of the diesel particulate filter

Important: For vehicles with N57x engines that have fault memory entries that are at the top, a successful diesel particulate filter regeneration must be carried out.

Then delete the fault memory.

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11 65 020 Removing and installing or replacing exhaust turbocharger (B37)

Warning!

Risk of burning!

Carry out this repair only when the engine has cooled down.

Note:

Troubleshooting on exhaust turbocharger.

Attention!

For exhaust turbocharger damage:

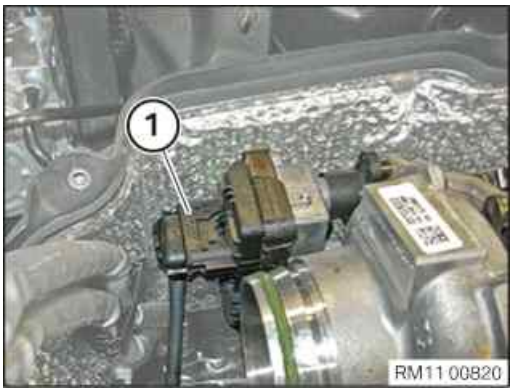
In order to avoid subsequent damage, the following notes and test steps must be followed absolutely.

Necessary preliminary tasks:

- Remove top bulkhead cover.
- Remove right charge-air duct.
- Remove clean air pipe.
- Loosen the diesel particulate filter. (Do not remove)

Removal:

Disconnect plug connection (1).



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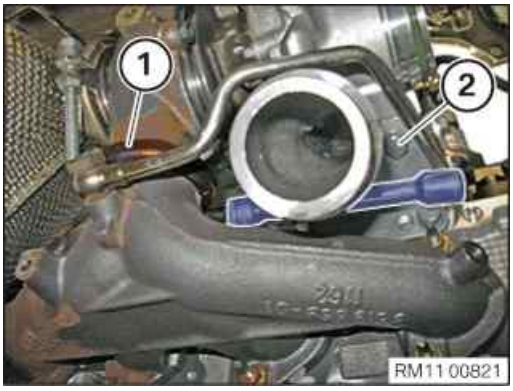
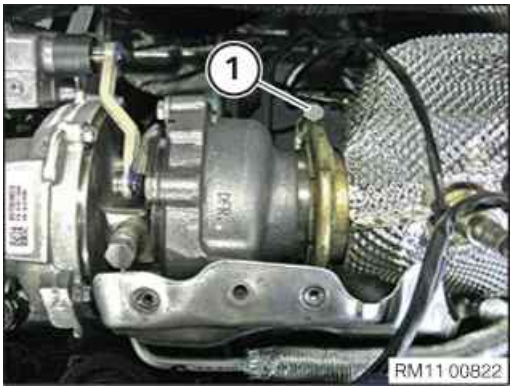


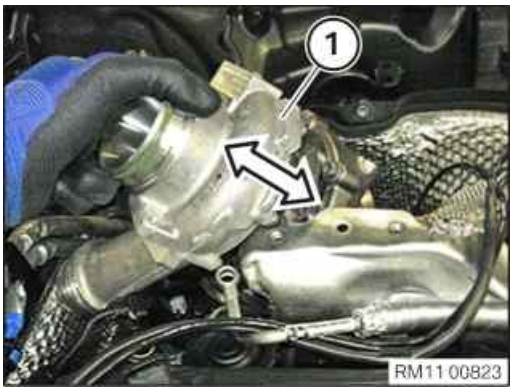
Release V-band clamp (1) between exhaust turbocharger and exhaust manifold.

Loosen screw (2) from the holder of the exhaust turbocharger.



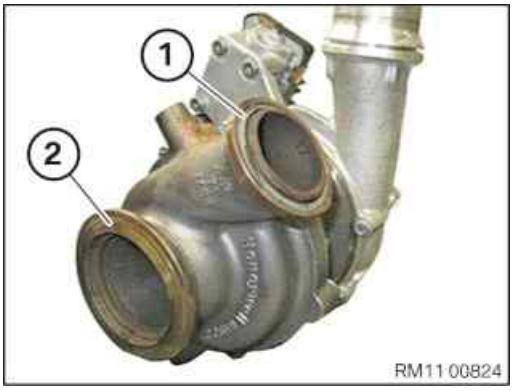
Loosen oil feed line on exhaust turbocharger.

Release V-band clamp (1) between exhaust turbocharger and diesel particulate filter.



Remove exhaust turbocharger (1) towards the top.

Installation:



Parts: Replace seals (1 and 2).

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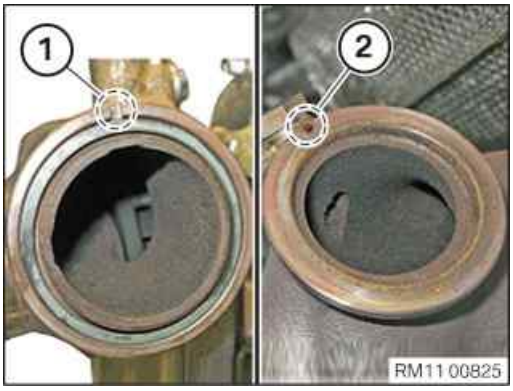
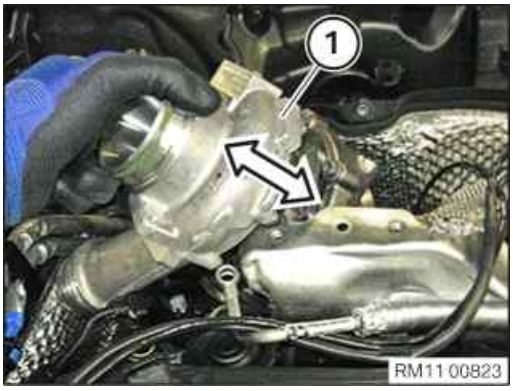
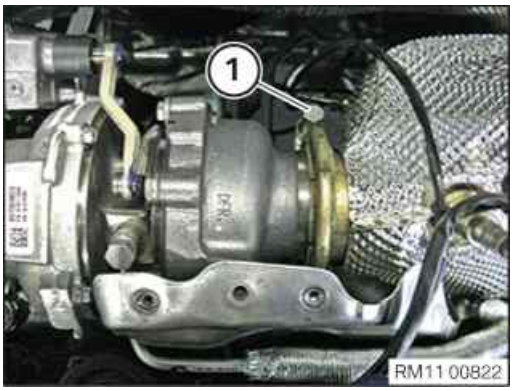


Note:
Recess (1) on exhaust turbocharger must be correctly positioned on the guide (2) on the exhaust manifold.



Install exhaust turbocharger (1) from above.

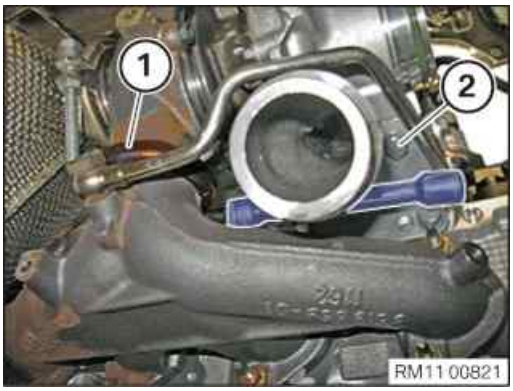


Parts: Renew V-band clamp (1).

Position exhaust turbocharger correctly.

Mount V-band clamp (1) between exhaust turbocharger and diesel particulate filter.

Tightening torque 11 65 4AZ.



Parts: Renew V-band clamp (1).

Mount V-band clamp (1) between exhaust turbocharger and exhaust manifold.

Tighten both V-band clamps.

Tightening torque 11 65 1AZ.

Tighten screw (2) on exhaust turbocharger holder on crankcase.

Tightening torque 11 65 2AZ.

Tighten oil feed line on exhaust turbocharger.

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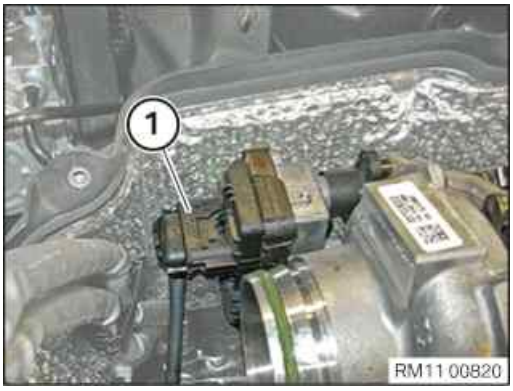

Connect the connector (1).

Required follow-up work:

- Install oil return line.
- Attach diesel particulate filter.
- Install right charge air duct.
- Install clean air pipe.
- Check engine for tightness.

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11 65 020 Removing and installing/replacing exhaust turbocharger

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Maintain conditions of absolute cleanliness.

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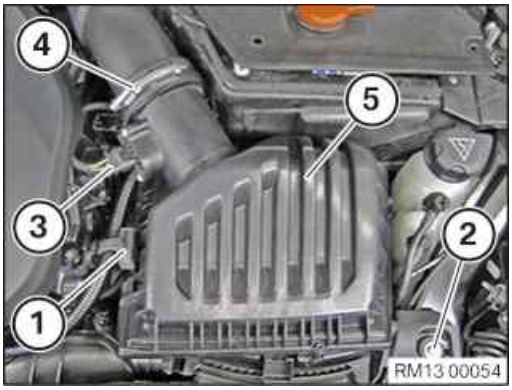
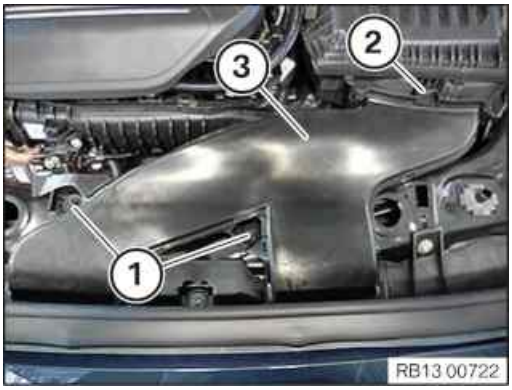
1 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

3 – Remove vehicle battery

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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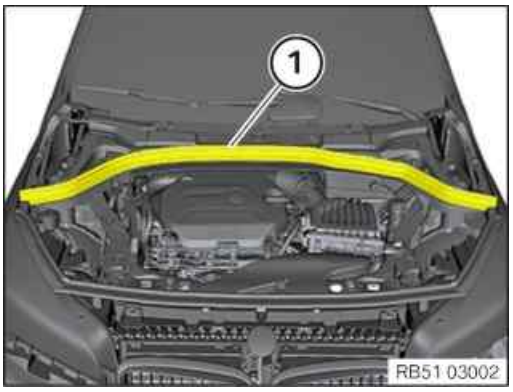
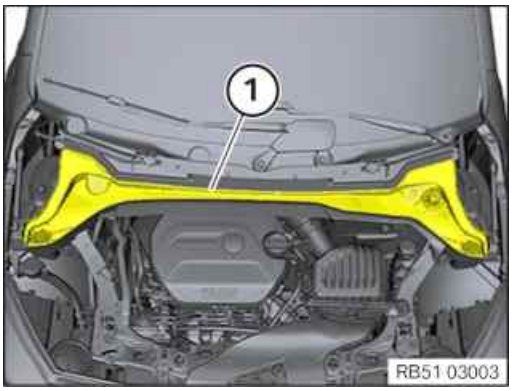
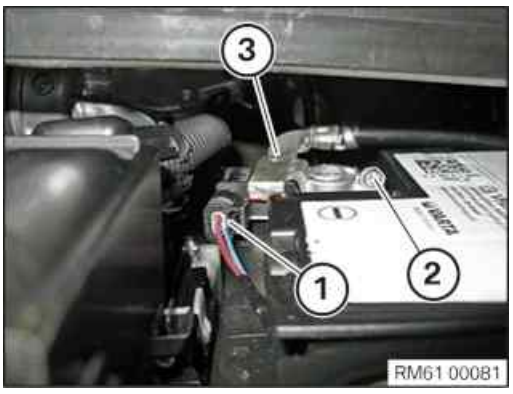


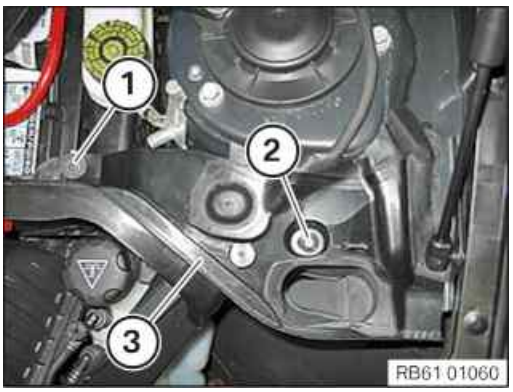
- pull off gasket (1) upwards.



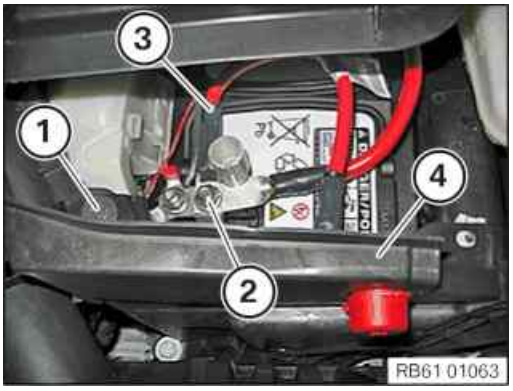
- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.

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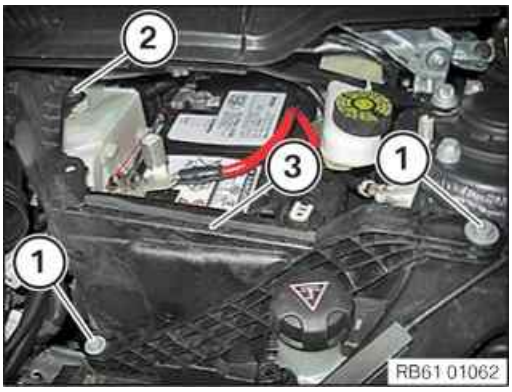
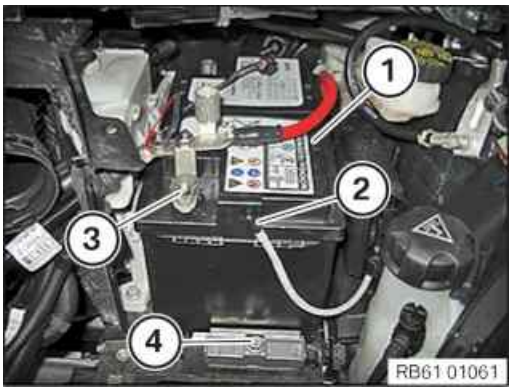


- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

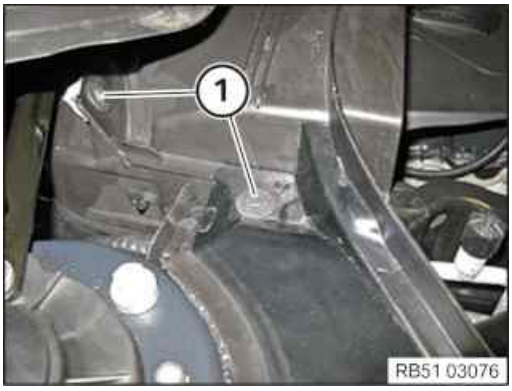
Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

4 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).

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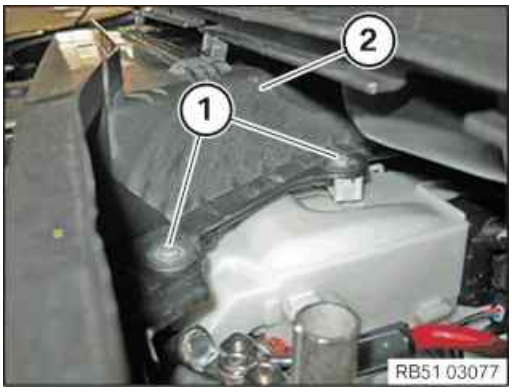


- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

5 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

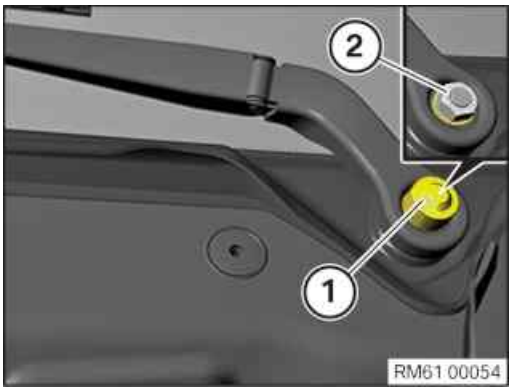
▶ **Remove the wiper arm**

RISK OF DAMAGE

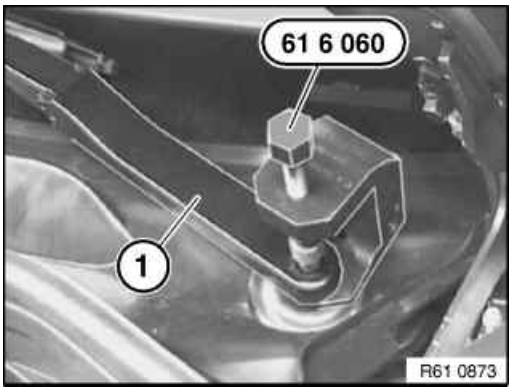
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

6 – Remove the gutter strip on the windscreen on the left and right

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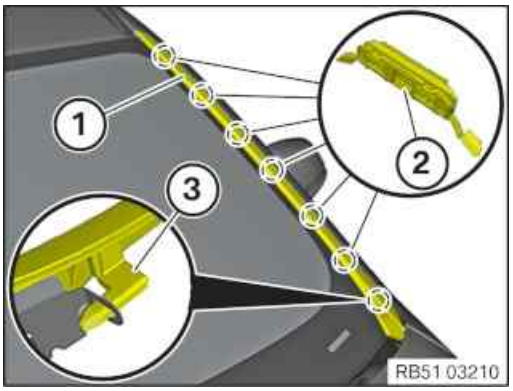
NOTICE

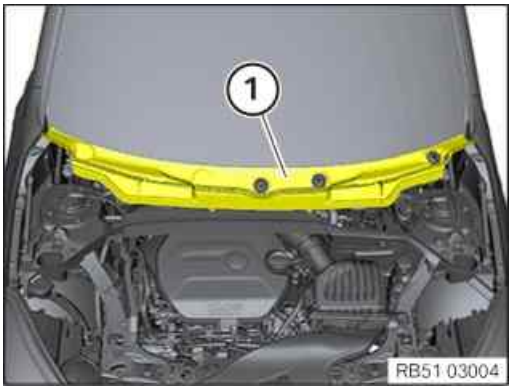
Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

7 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

8 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

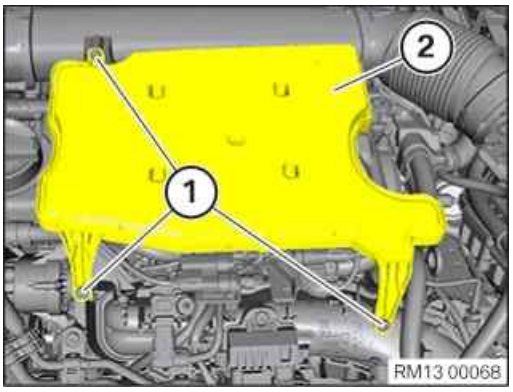
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

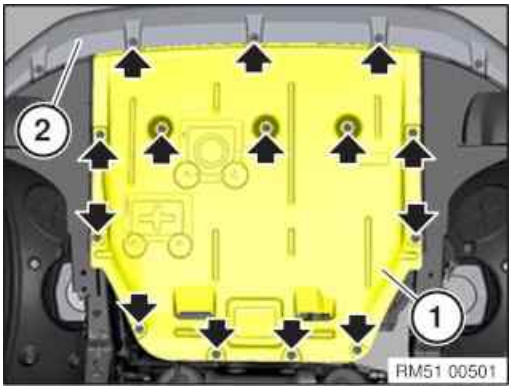
- Unclip the acoustic cover from the marked areas towards the top.

9 – Remove resonator



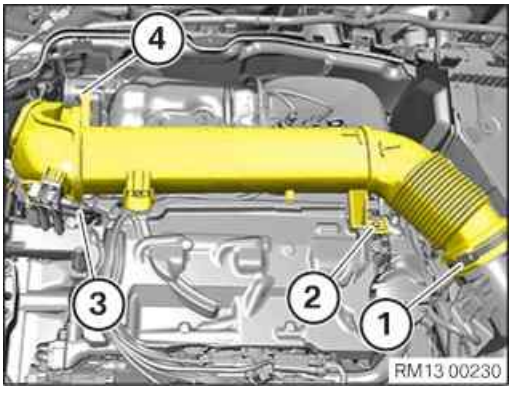
- Loosen screws (1).
- Guide out and remove the resonator (2).

10 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

11 – Removing clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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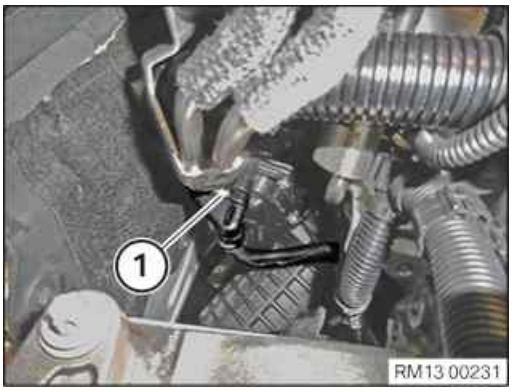
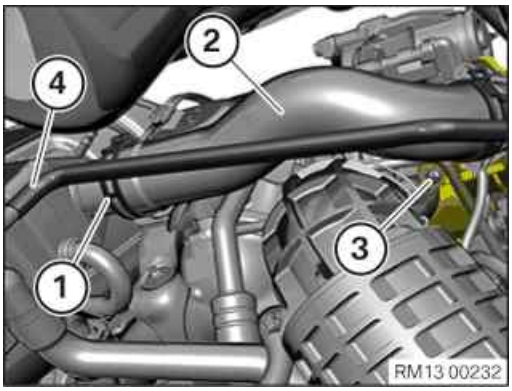
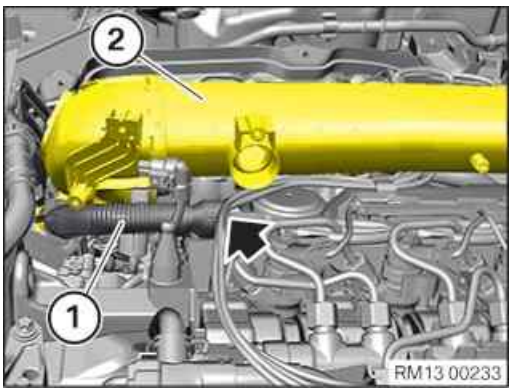


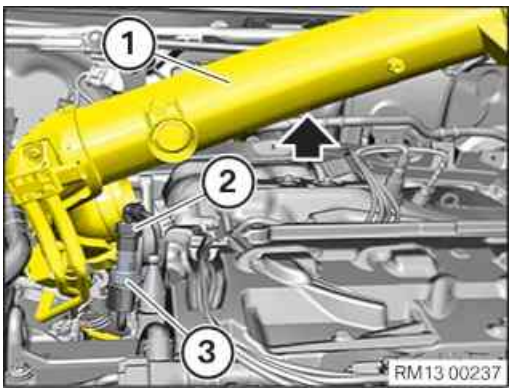
- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).



- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

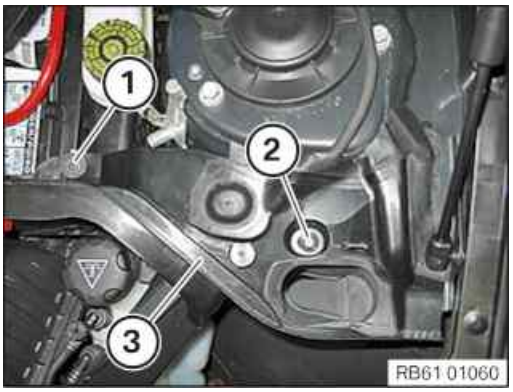
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

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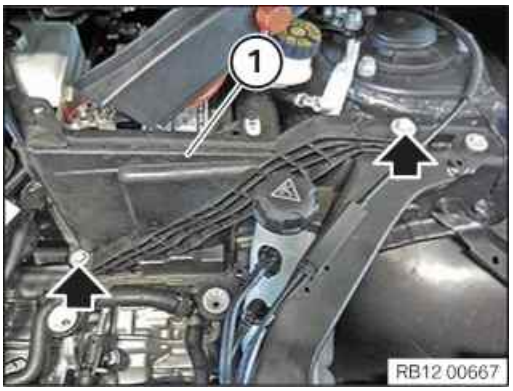
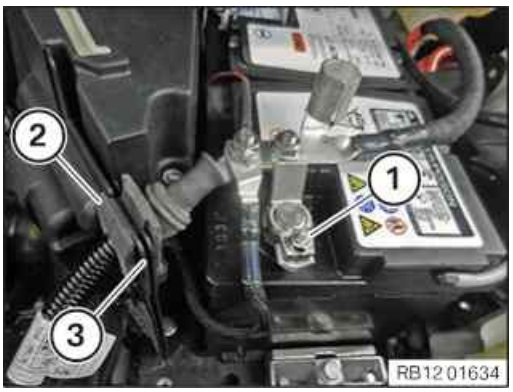
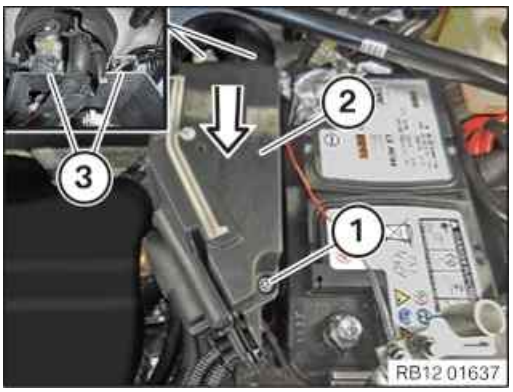
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



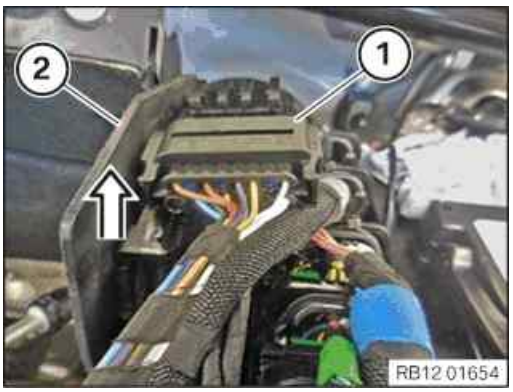
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

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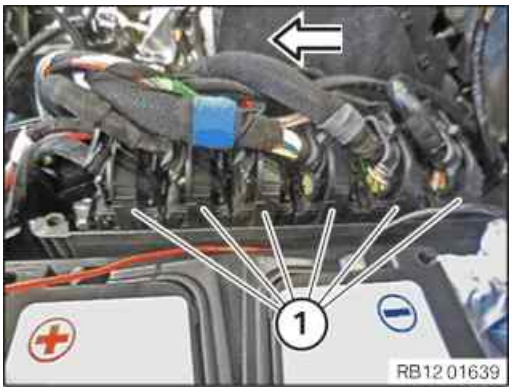
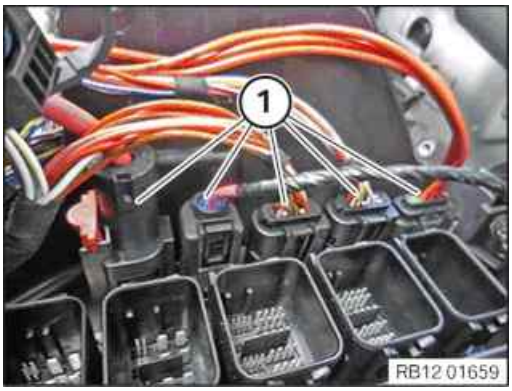
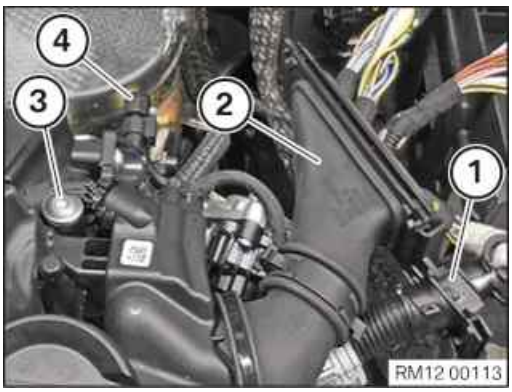


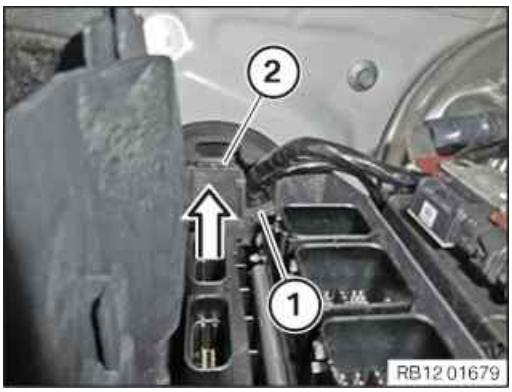
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



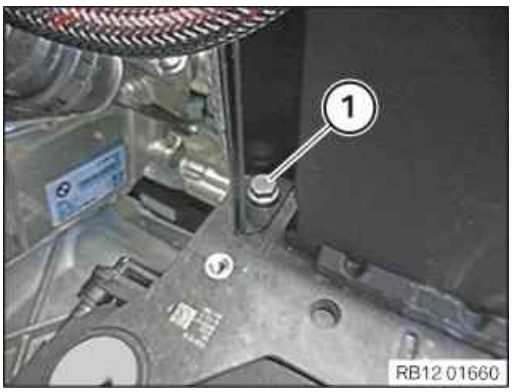
- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).

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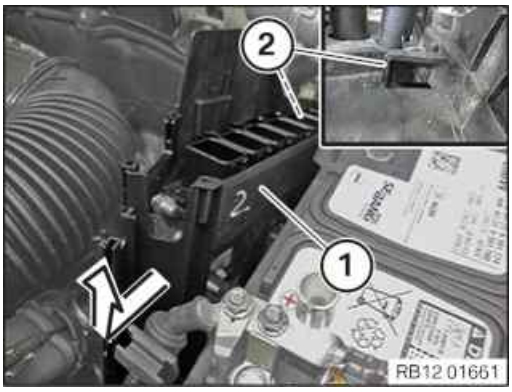
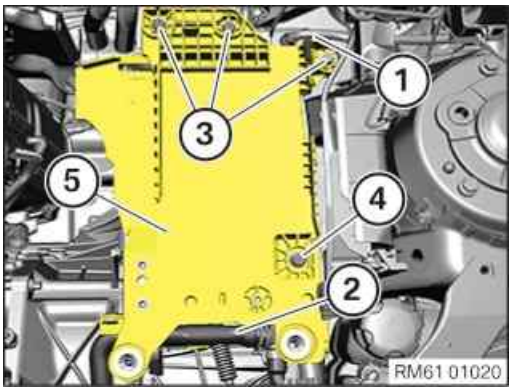


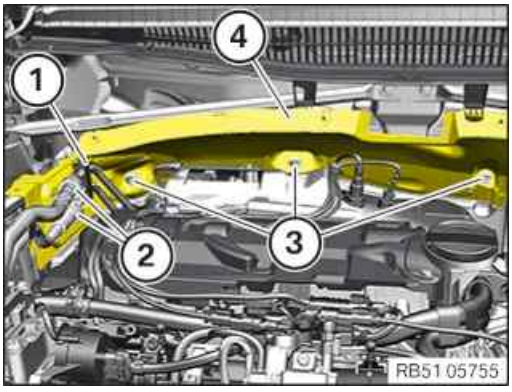
- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

13 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

14 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

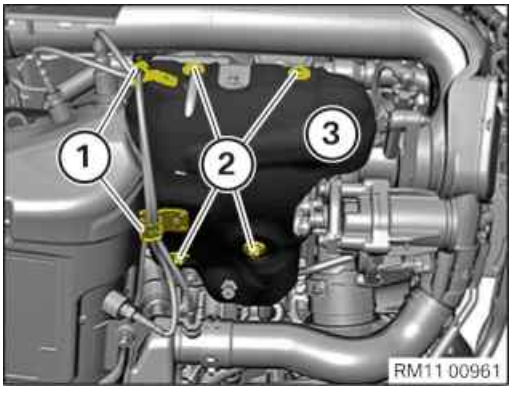
15 – Removing heat shield from top exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Release cable from brackets (1).
- Loosen screws (2).
- Feed out and remove the heat shield (3).

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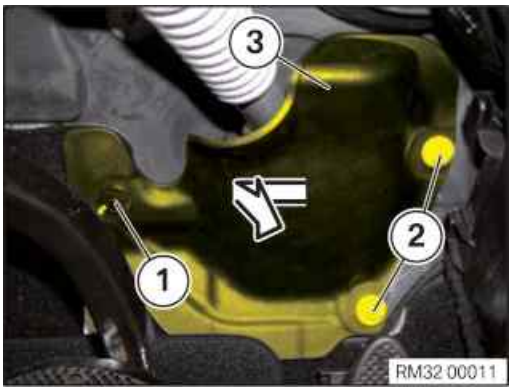
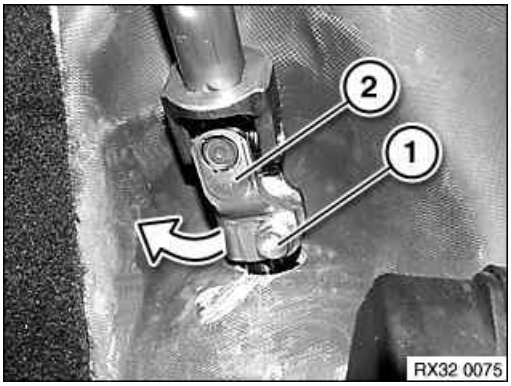
16 – Releasing lower steering shaft from steering gear



- **If installed:**
- Unfasten nut (1).
- Unscrew the nuts (2) by 1 rotation.

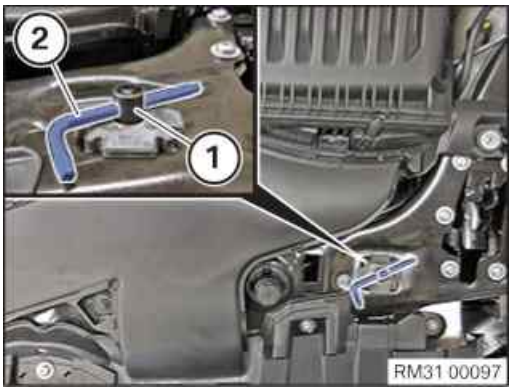
  Do not remove the nuts (2) !
- Remove the cover (3) on the steering column in the direction of the arrow.

  The side footwell trim must not be disassembled!



- Loosen screw (1).
- Swivel out the universal joint (2) of the bottom steering shaft from the steering gear in the direction of the arrow.

17 – Securing radiator on left and right



NOTICE

Perform the operations on the left and right side.

- Fasten radiator at centring pin (1) with suitable tool (2).

18 – Remove the front left and right wheel

▶ **Removing the wheel**

- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Unscrew the wheel bolts (arrows) and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

19 – If installed: Removing rear underbody protection

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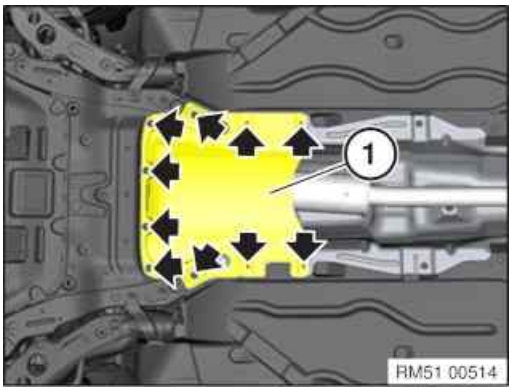
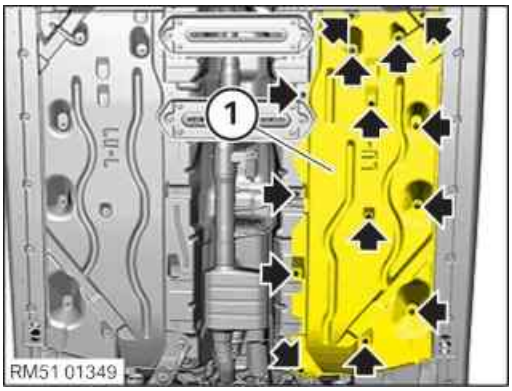


- Remove screws (arrows).
- Remove the rear underbody protection (1).

20 – Removing right underbody panelling



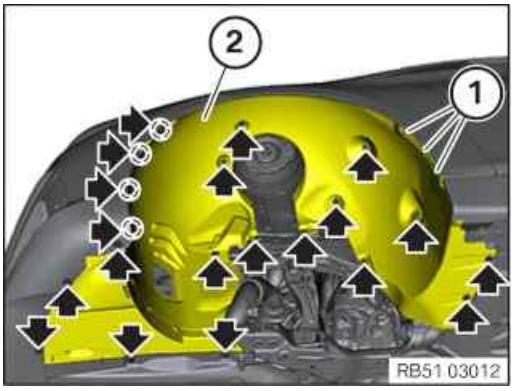
- Unscrew all bolts and nuts (arrows).
- Remove the underbody panelling (1).

21 – Removing front left and right wheel arch cover

NOTICE

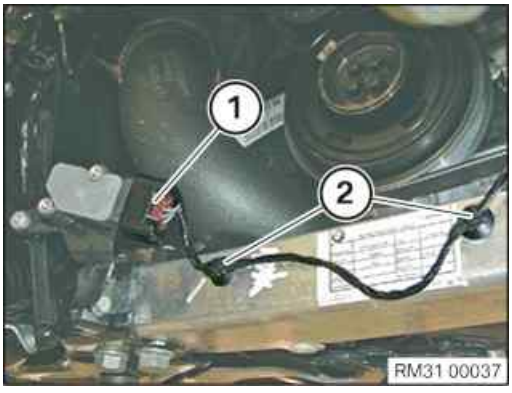
Perform the operations on the left and right side.

▸ **Remove front wheel arch cover**



- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed out front wheel arch cover (2).

22 – With right installation: Detaching ride height sensor cable



- Unlock plug connection (1) and disconnect.
- Release cable clip (2) from deformation element adapter.

23 – Releasing anti-roll bar on left and right from anti-roll bar link

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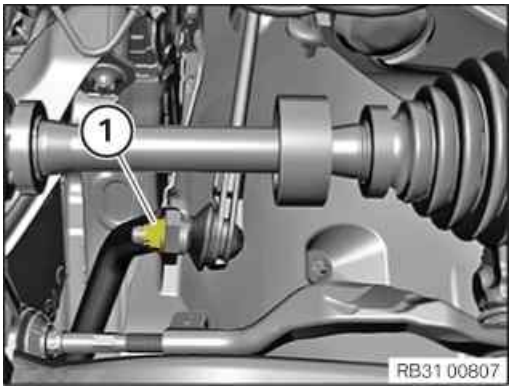
23 – Releasing anti-roll bar on left and right from anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▶ **Detach the anti-roll bar from the anti-roll bar link**

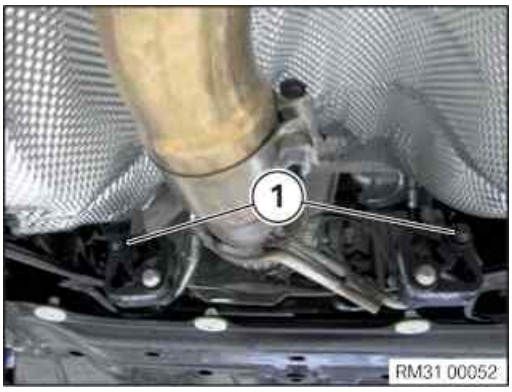


- Unfasten nut (1).

Note: Use the Torx socket for counter support.

- Loosen the anti-roll bar link from the anti-roll bar .

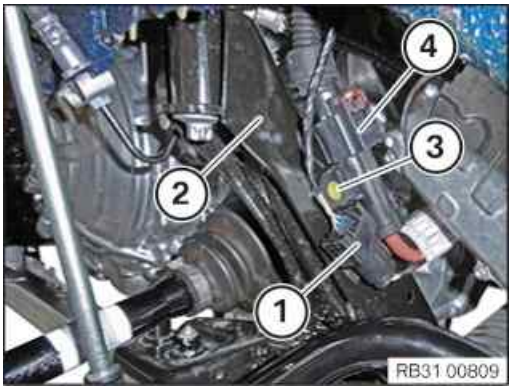
24 – Detaching rubber mount from front axle support



- Spray rubber mount (1) with lubricant and release from holder on front axle support.

25 – Disconnecting plug connections from steering gear

▶ **If installed: Detach connectors from the front axle carrier**



- Release the plug connection (1) from the front axle support (2).
- Loosen screw (3).
- Release the plug connection (4) from the front axle support (2).

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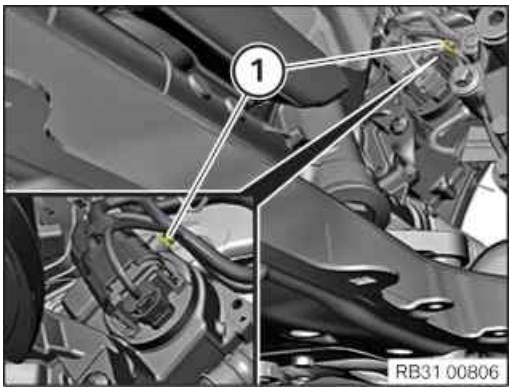
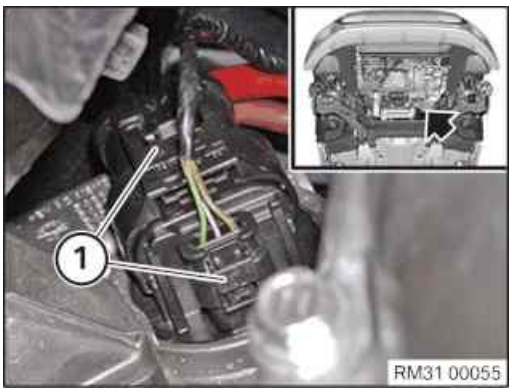


- Disconnect wiring harness (1) from steering gear.

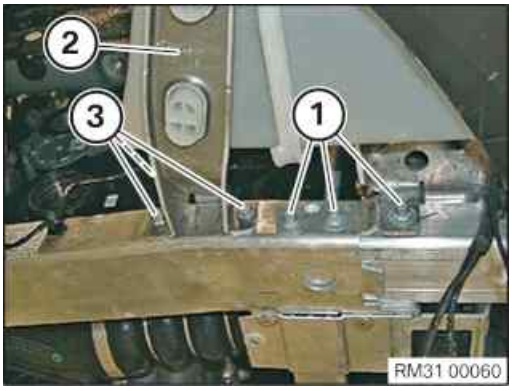
- To unlock the plug connections (see the following work step): unlock plug connections (arrow) with the right hand.

  The plug connections can be reached via the left-hand output shaft.



- Unlock plug connections (arrow) (1)and disconnect from the steering gear.
- Make sure when lowering the front axle that the cables are not damaged!

26 – Releasing the mounted part from the front axle support

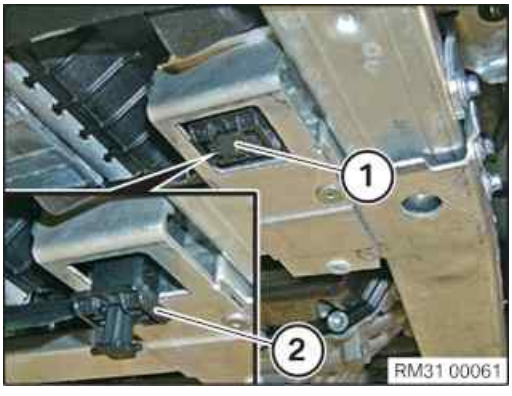


- **Only on right side:** Loosen screws (3) and remove holder for washer fluid reservoir (2).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).



NOTICE

Perform the operations on the left and right side.

- Unlock safety catch (1) of the lock (2) from the holder for the charge air cooler.
- Completely remove locks (2).

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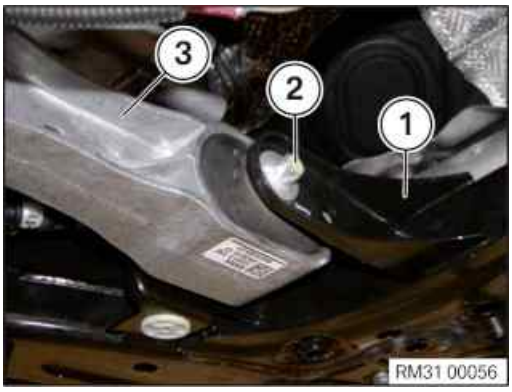


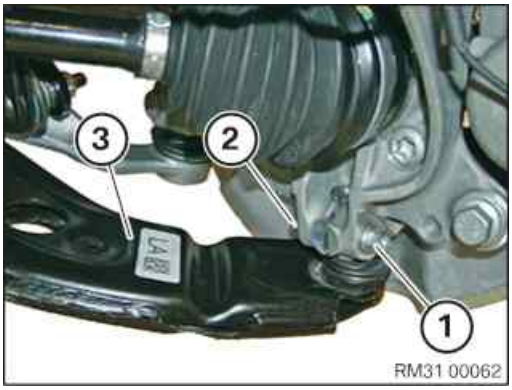
- Loosen screw (2) of the engine support (3) on the front axle (1).

NOTICE

Perform the operations on the left and right side.

- Loosen screws (1).

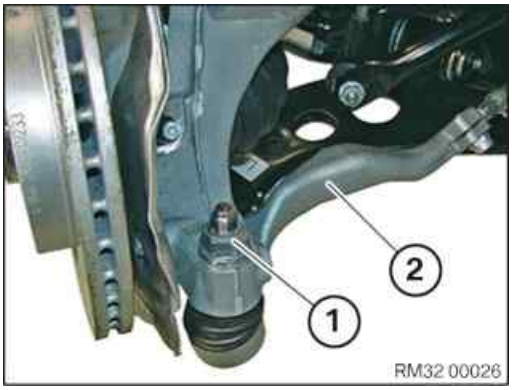
27 – Detaching and removing front axle completely



NOTICE

Perform the operations on the left and right side.

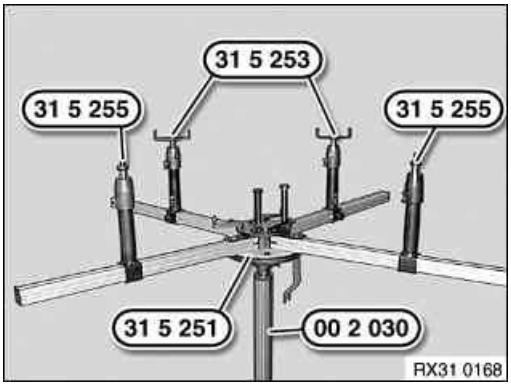
- Unfasten nut (1).
- (2)Pull out screw.
- Detach the wishbone (3) from the swivel bearing .



NOTICE

Perform the operations on the left and right side.

- Unfasten nut (1).
- Detach the track rod (2) from the swivel bearing.



- Fit the special tool **0 495 817 (31 5 251)** completely onto the workshop jack **0 490 133 (00 2 030)** with an auxiliary person.
- Insert special tools **0 495 821 (31 5 255)** in telescopic supports of a profile rail pair.
- Insert special tools **0 495 819 (31 5 253)** in telescopic supports of other profile rail pair.

Note: In a profile rail pair, two profile rails are connected to one another by gearing.

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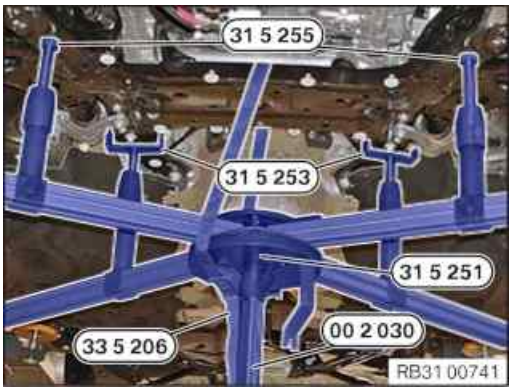
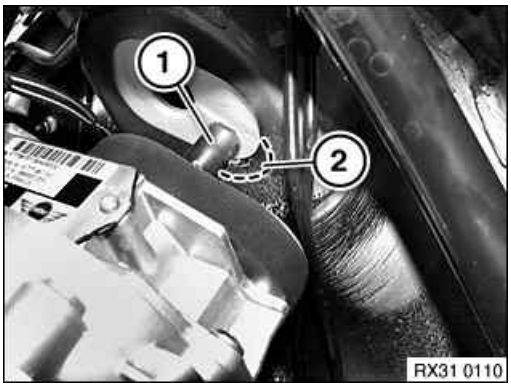


- Align special tools **0 495 821 (31 5 255)** and **0 495 819 (31 5 253)** to front axle support.
- Support front axle support by operating workshop jack **0 490 133 (00 2 030)**.

Note: The centre of gravity of the front axle support must be positioned centrally over the workshop jack!

- Secure front axle support with special tool **0 496 080 (33 5 206)** to special tool **0 495 817 (31 5 251)**.

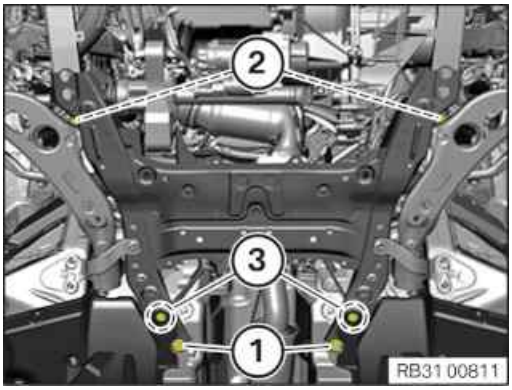


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- If applicable, release the screws in area (3).
- Release screws (1) (front axle support, rear).
- Release screws (2) (front axle support, front).
- Bend the underbody panelling to the side in area (3).
- When lowering, release charge air cooler from its rubber mounts.
- Completely lower and remove the front axle.

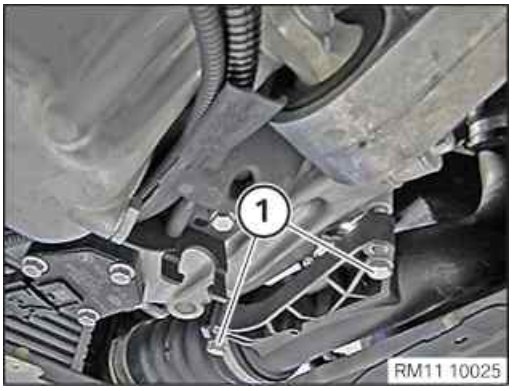
TECHNICAL INFORMATION

Note the information on thread repairs using Helicoil thread inserts.

For more information see: 41 00 ... Notes on repairing threads

- Check threads for damage; if necessary, repair with Helicoil thread inserts.

28 – Remove right charge-air line



- Release charge air duct screws (1) on oil sump.

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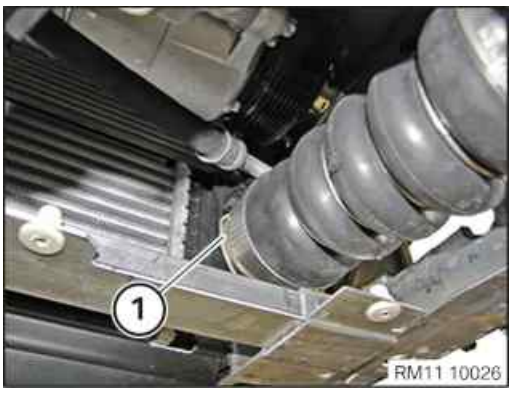
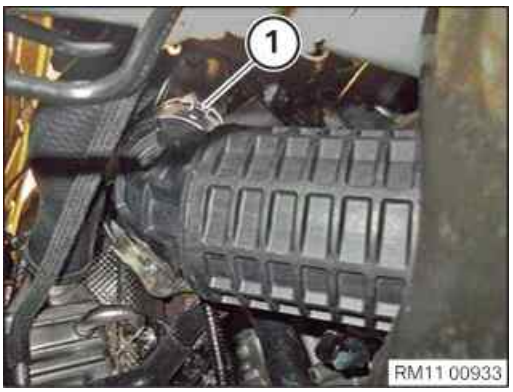
- Detach charge air duct screw connection (1) on crankcase.

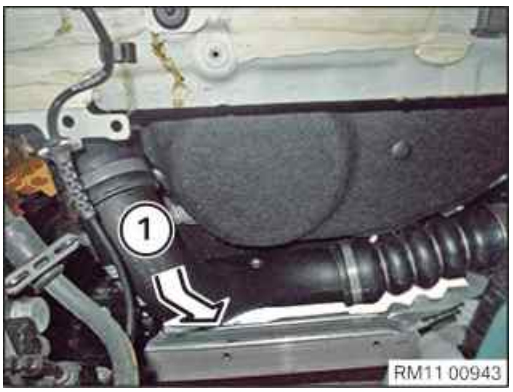
- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.



- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.



- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

29 – Removing the connecting support from the tunnel in front and back

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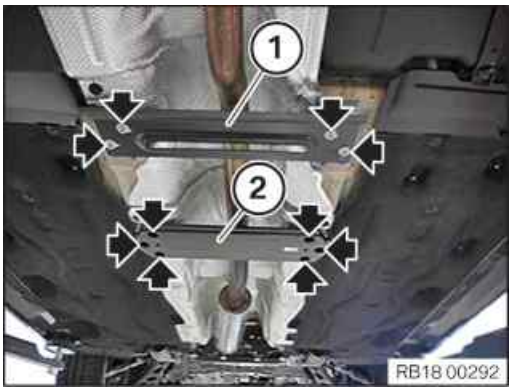
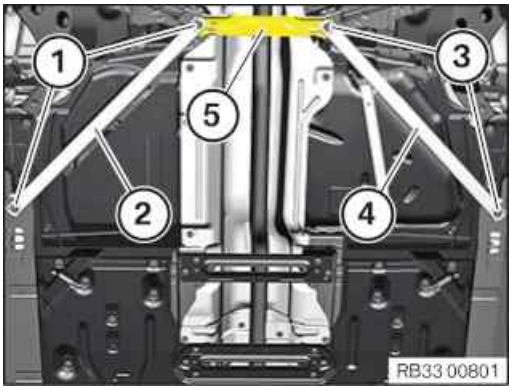


- Unscrew the bolts (arrows) from the connecting support (1).
- Feed out and remove the crossbeam (1).
- Unscrew the bolts (arrows) from the connecting support (2).
- Feed out and remove the crossbeam (2).

30 – Remove the cross strut with the torsion strut

TECHNICAL INFORMATION

Driving without a torsion strut is not permitted.



- Loosen screws (1).
- Thread out torsion strut (2) at left and remove.
- Loosen screws (3).
- Thread out torsion strut (4) at right and remove.
- Feed out and remove the cross-member (5).

31 – Remove exhaust system

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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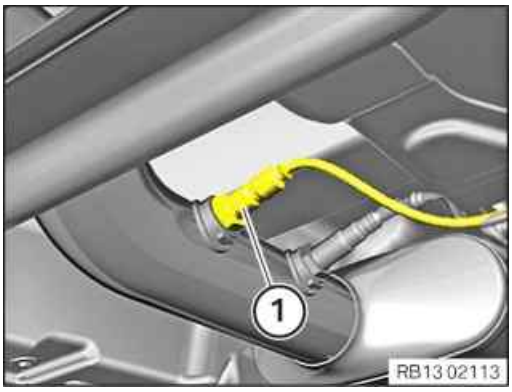
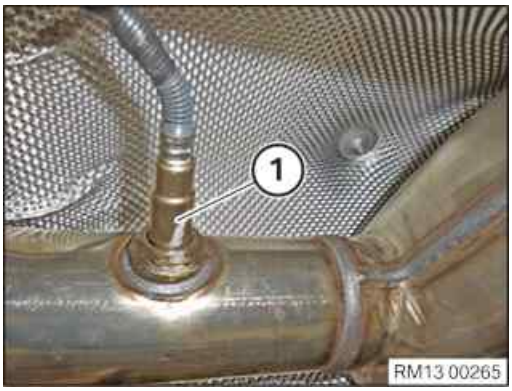
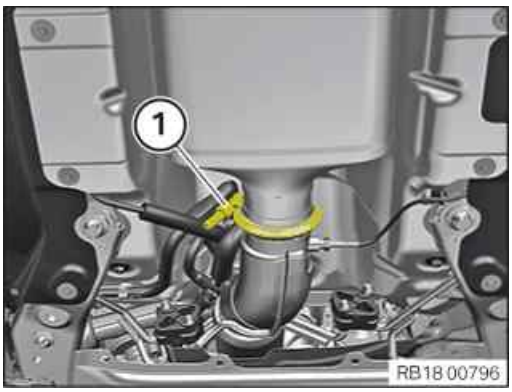


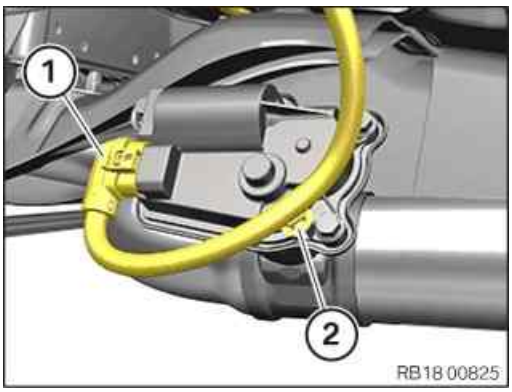
- Release the nitrogen oxide sensor (1) downstream of the SCR catalytic converter, guide it out and set it aside.



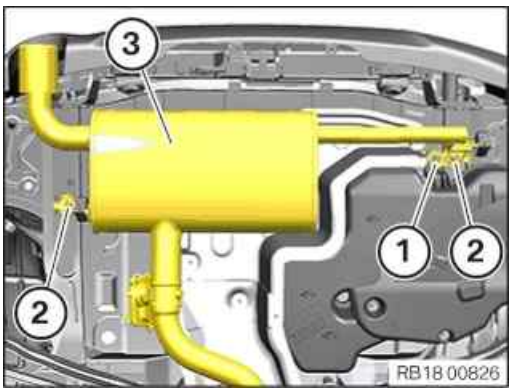
- Release the diesel particulate sensor (1), guide it out and set it aside.



- Loosen V-band clamp (1).



- Unlock and disconnect connector (1).
- Loosen clamp (2).



- Loosen screw (1).
- Loosen nuts (2).
- Lower the exhaust system (3) with an auxiliary person, guide out and remove.

32 – Removing starter motor

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

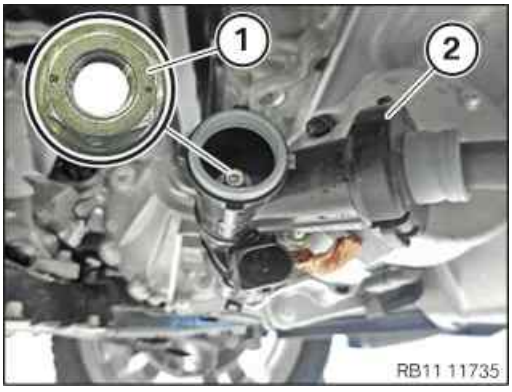
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and loosen connector (1).
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).



- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.

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- Loosen screws (1).
- Feed out starter motor and remove.

33 – Remove the monitoring oxygen sensor

WARNING

Hot surfaces.

Risk of burning!

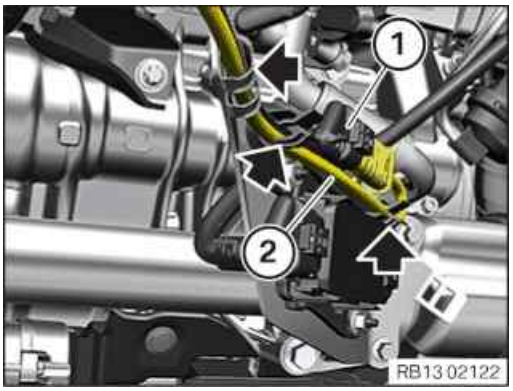
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock plug connection (1) and disconnect.
- Feed oxygen monitor sensor cable (1) out of the clamps (arrows).

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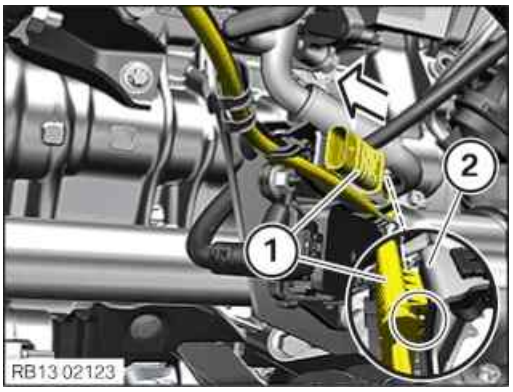
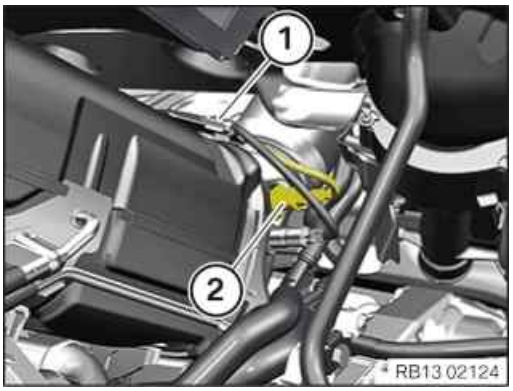


- Unlock the connector (1) in the marked area and disconnect it from the holder (2) in the direction of arrow.



- Guide the cable of the monitoring oxygen sensor (2) out of the clamp (1).
- Release the monitoring oxygen sensor (2) using special tool **0 491 074 (11 7 020)**.
- Remove the monitoring oxygen sensor (2).

34 – Removing the nitrogen oxide sensor before SCR catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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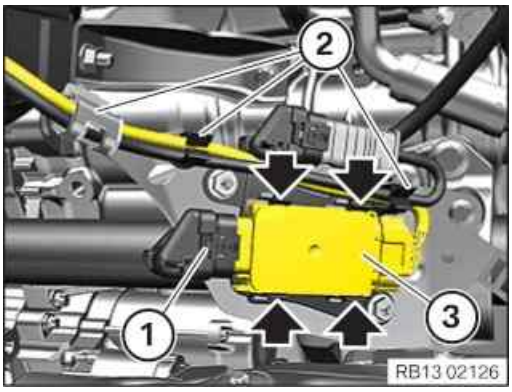
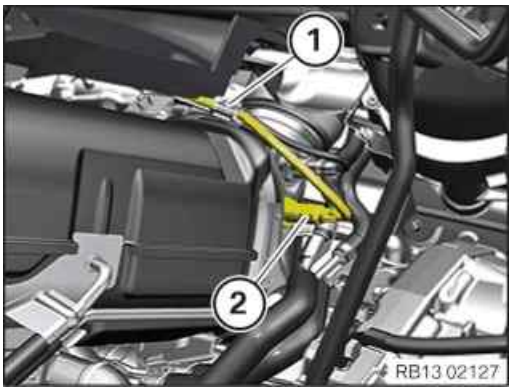
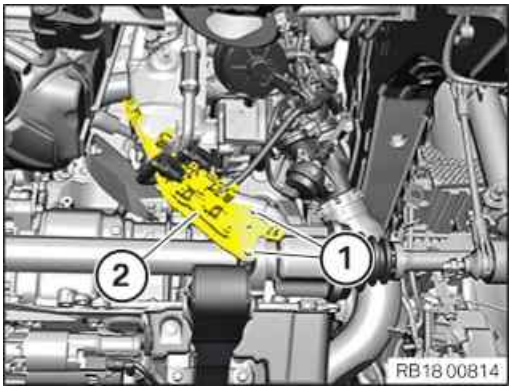


- Unlock plug connection (1) and disconnect.
- Slide the cable of the nitrogen oxide sensor evaluation electronics (3) out of the clamps (2) and remove.
- Unlock (arrows) and remove the evaluation electronics for the nitrogen oxide sensor (3).



- Slide the cable of the nitrogen oxide sensor before the SCR catalytic converter (2) out of the clamps (1) and remove.
- Detach the nitrogen oxide sensor before the SCR catalytic converter (2) using the special tool **0 491 074 (11 7 020)**.
- Guide out and remove the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

35 – Remove holder for oxygen sensor



- Loosen screws (1).
- Thread out the holder (2) for the oxygen sensor and remove.

36 – Remove the exhaust temperature sensor on the catalytic converter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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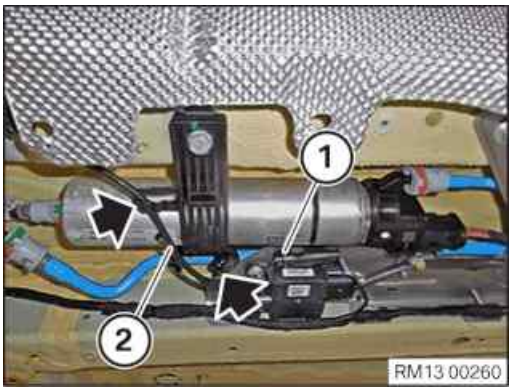
RISK OF DAMAGE

Electrostatic discharge.

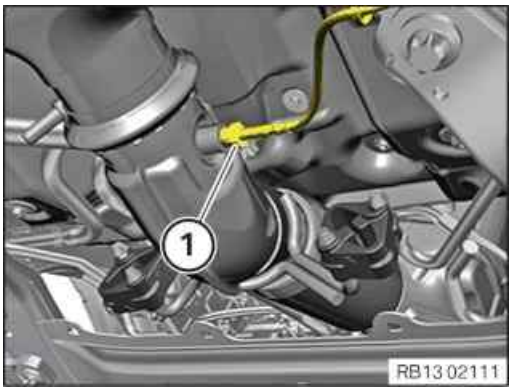
Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and loosen connector (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

- Loosen the cable clip (1).



- Loosen exhaust temperature sensor (1).
- Feed out and remove exhaust temperature sensor (1).

37 – Removing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

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WARNING

Hot surfaces.

Risk of burning!

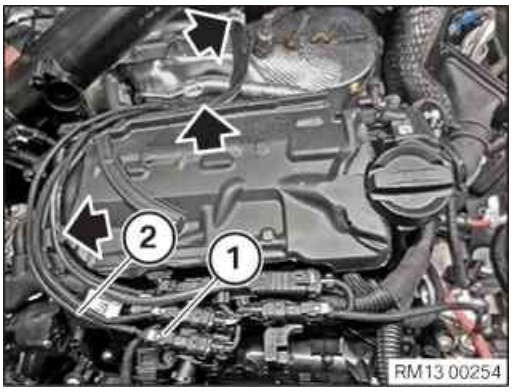
- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Feed the cable (2) from the temperature sensor out of the clamps (arrows) and remove it.

- Release the exhaust temperature sensor (1) with conventional tools (2).

- Feed out and remove exhaust temperature sensor (1).

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WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock and disconnect the plug connection (1).
- Feed out the cable (2) of the exhaust temperature sensor from the clamps (arrows) and remove.

- Guide cable (1) of the exhaust temperature sensor out of the clamp (arrow) and remove it.
- Loosen exhaust temperature sensor (2).
- Feed out and remove exhaust temperature sensor (2).

39 – Remove the control sensor

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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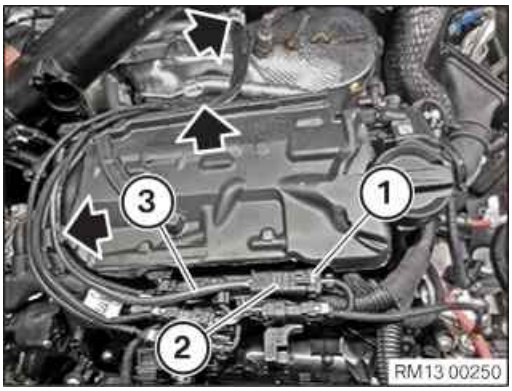
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Unlock and disconnect the plug connection (1).
- Detach the connector (2) from the holder .
- Feed out and remove cable (3) out of the oxygen control sensor from the clamps (arrows).

- Release the front oxygen control sensor (1) using special tool **0 491 075 (11 7 030)**.
- Feed out and remove the control sensor (1).

40 – Remove differential pressure sensor

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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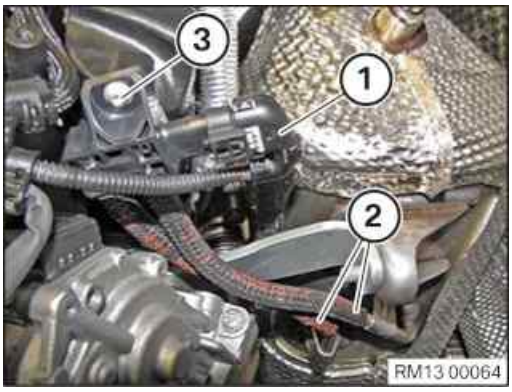


- Unlock and disconnect connector (1).
- Pull off pressure hose (2).
- Loosen screw (3).
- Feed out differential pressure sensor and remove.

41 – Removing the diesel particulate filter

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

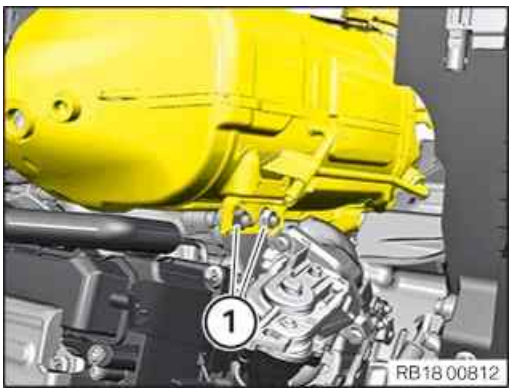
CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Loosen V-band clamp (1).
- Feed out V-band clamp (1) and remove.



- Loosen nuts (1).

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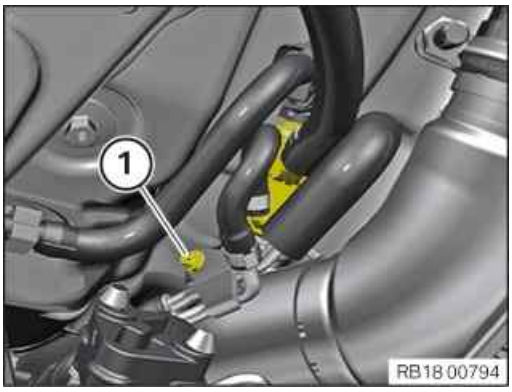
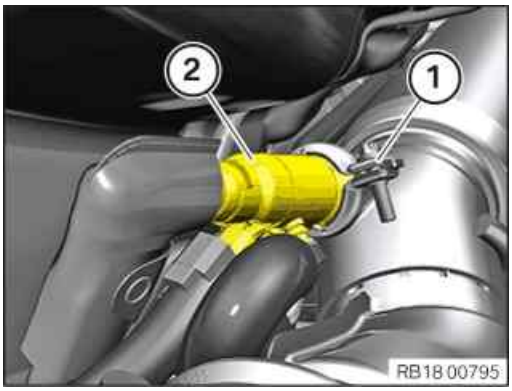
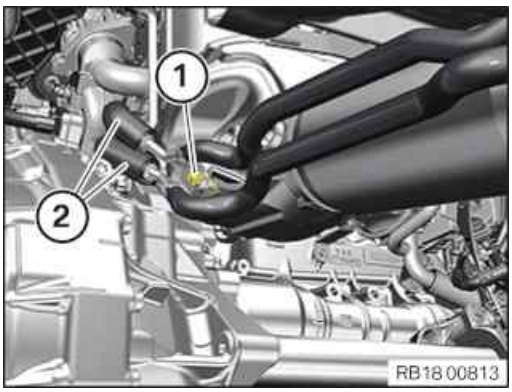


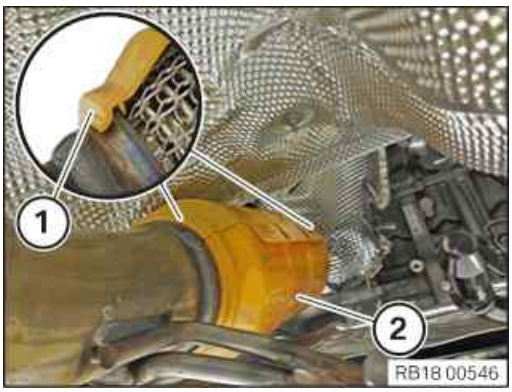
- Loosen screw (1).



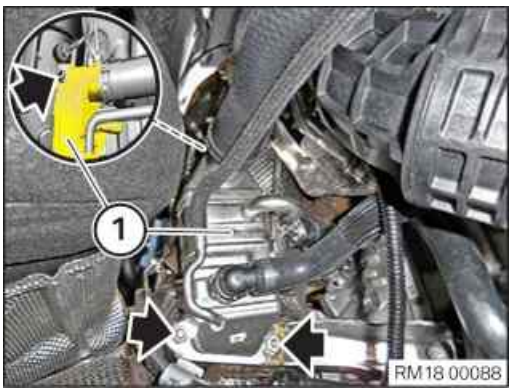
- Loosen V-band clamp (1).
- Remove the SCR metering module (2) and set it aside.



- Loosen screw (1).
- Thread out the coolant lines (2) of the SCR metering module and set aside.



- Mount fitting aid (2).
- Make sure that the fitting aid is correctly position on the edges (1) of the flexible tube.



- Detach nuts (arrows) from low pressure exhaust-gas recirculation cooler (1).

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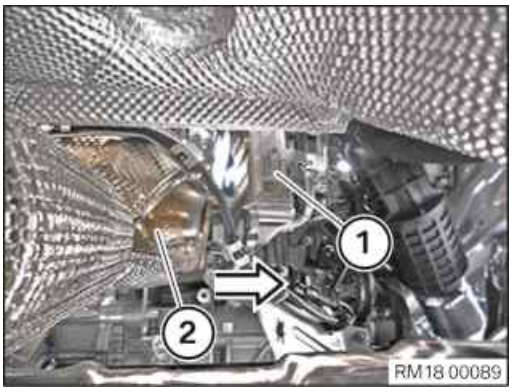
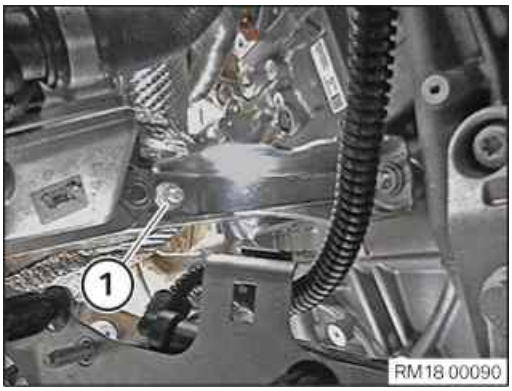
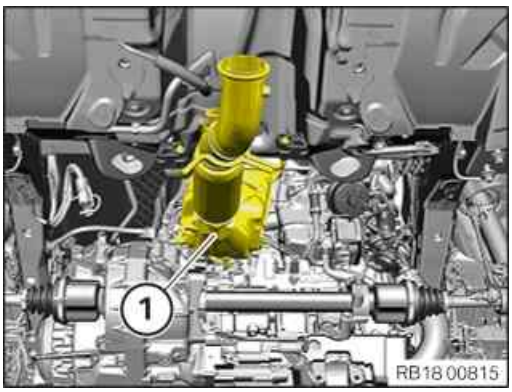


- Feed out low pressure exhaust-gas recirculation cooler (1) from diesel particulate filter (2) in direction of arrow and set aside.



- Unfasten nut (1).



- Feed out diesel particulate filter (1) toward the bottom and remove.

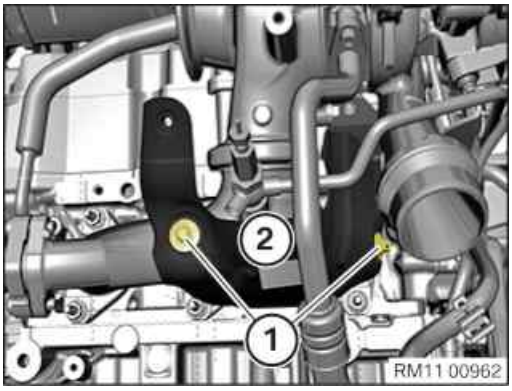
42 – Remove the heat shield from the exhaust turbocharger at the bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Feed out and remove the heat shield (2).

43 – Removing heat shield from rear exhaust turbocharger

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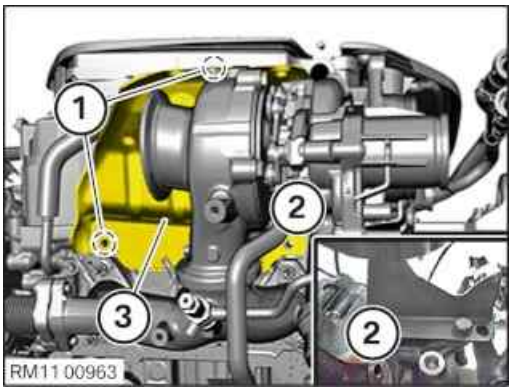
WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Loosen screws (1).
- Loosen screw (2).

  Rear screw of the bracket on the exhaust turbocharger.
- Feed out and remove the heat shield (3).

MAIN WORK

44 – Remove exhaust turbocharger

- Release screw (1) from beneath with a long extension.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen screws (1).
- Disconnect the oil return line (2) toward the bottom and set it aside.

- Release banjo bolt (1) of oil feed line from exhaust turbocharger and place to one side.

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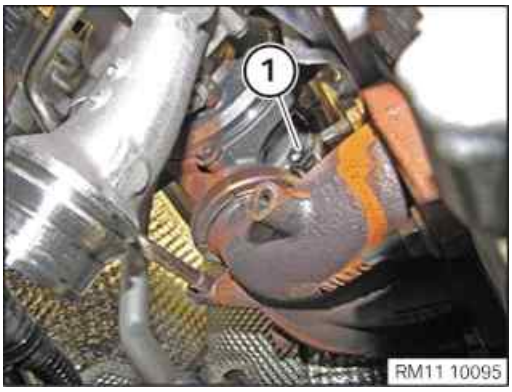

- Release screw (1) and remove V-clip.
- Pull exhaust turbocharger up and remove.
- Remove seal between exhaust turbocharger and exhaust manifold.

45 – Prepare for the installation of the exhaust turbocharger

- Check the oil feed lines and the oil return lines for contamination or obstruction, clean or renew if necessary.
- If the oil feed lines and/or oil return lines are heavily contaminated, we recommend changing the engine oil and the oil filter.
- If installed: Check the coolant feed lines and the coolant return lines for the exhaust turbocharger for contamination or obstruction, clean or renew if necessary.
- Check that the screw connections and the plug connections of all the lines are correct.
- Check air cleaner for contamination and clean or renew as needed.
- Check correct functioning of crankcase ventilation.
- Replace all gaskets.

  Parts: Seals

46 – Installing exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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RISK OF DAMAGE

Damage to the exhaust turbocharger

Inadequate initial filling of exhaust turbocharger leads to dry running.

- Make sure the initial filling is correct when replacing exhaust turbocharger.
- Fill the exhaust turbocharger with the suitable additive (see electronic Parts Catalogue).

TECHNICAL INFORMATION

With exhaust turbocharger damage, it is imperative to observe the additional information.

For additional information see: 11 65 020 Exhaust turbocharger damage due to plugged oil supply lines

TECHNICAL INFORMATION

- It is imperative to perform certain test steps to prevent subsequent damage in the event of exhaust turbocharger damage. See further information.

TECHNICAL INFORMATION

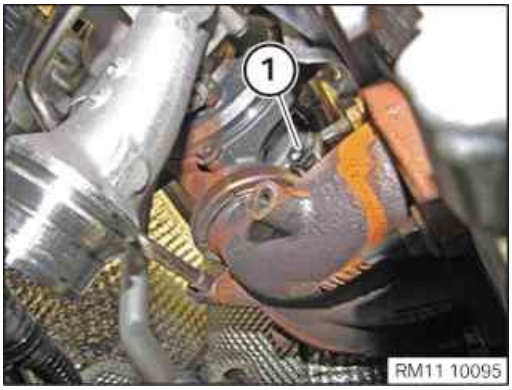
For exhaust turbocharger damage: Check the pressure pipes, charge air cooler and intake plenum for foreign matter, damage and correct functionality.

If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as the connecting pipe can coke.

TECHNICAL INFORMATION

Prior to replacing the exhaust turbocharger: Observe the notes on troubleshooting on the exhaust turbocharger.

For additional information see: FUB-FUB-FB-130003-A10 Troubleshooting on the exhaust turbocharger



- Renew gasket.

  Parts: Gasket
- Position seal on exhaust manifold.
- Guide the exhaust turbocharger in from the top and position it.
- **Ensure that gasket is correctly seated.**
- Renew V-band clamp.

  Parts: V-band clamp
- Install V-clip and tighten screw (1).

Exhaust turbocharger to exhaust manifold

V-band clamp		Tightening torque	19 Nm

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- Renew sealing rings.

  Parts: Sealing ring
- Position oil feed line with banjo bolt (1) and sealing rings and tighten hand-tight.

  There are 2 sealing rings fitted on the banjo bolt (1).
- Align oil feed line and tighten banjo bolt (1).

  The oil feed line must not sit on the exhaust turbocharger.

Oil feed line to exhaust turbocharger

Hollow bolt	Renew sealing rings.	Jointing torque	10 Nm
		Angle of rotation	45 °

- Renew gasket.

  Parts: Gasket
- Position oil return line (2) with **seal** on exhaust turbocharger.
- Tighten the screws (1).

Oil return line to turbocharger

M6x12		Tightening torque	8 Nm

- Feed in and tighten screw (1).

Holder to exhaust turbocharger and crankcase

M8x16		Tightening torque	22 Nm

POSTPROCESSES

47 – Installing heat shield on exhaust turbocharger at the rear

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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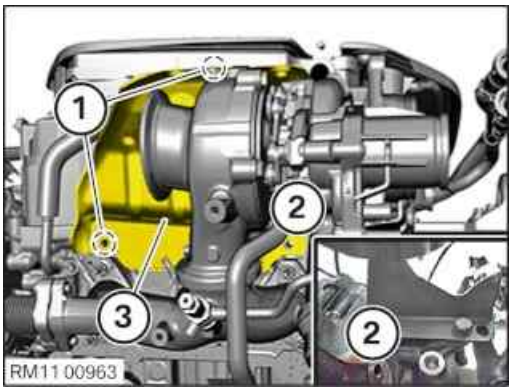


- Feed in and install the heat shield (3).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Tighten down screw (2).

Exhaust turbocharger bracket to cylinder head

Hexagon screw M 8x16		Tightening torque	19 Nm

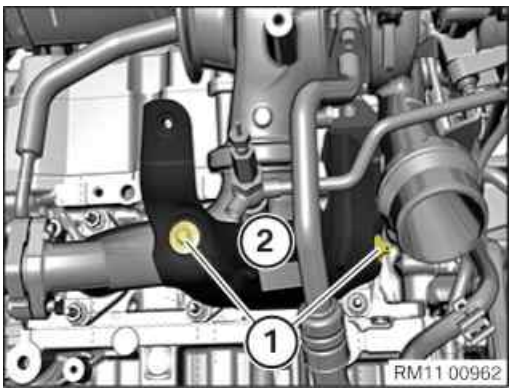
48 – Installing heat shield on exhaust turbocharger at bottom

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (2).
- Tighten the screws (1).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

49 – Installing the diesel particulate filter

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

- Renew the V-clip (1).

  Parts: V-band clamp
- Renew the gasket (2).

  Parts: Gasket

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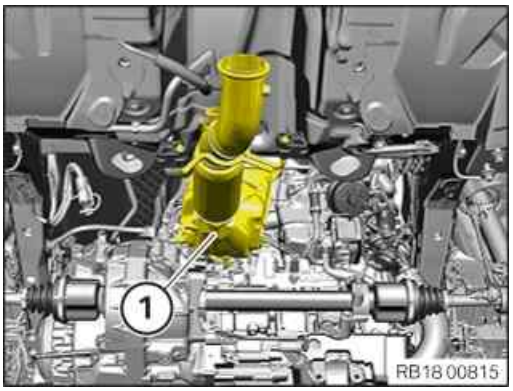
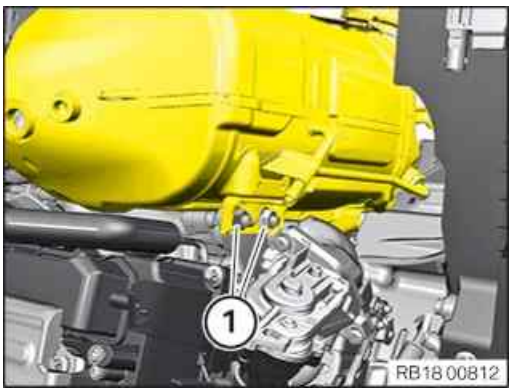
- Before installing the diesel particulate filter: Mount fitting aid (1) for the flexible tube.

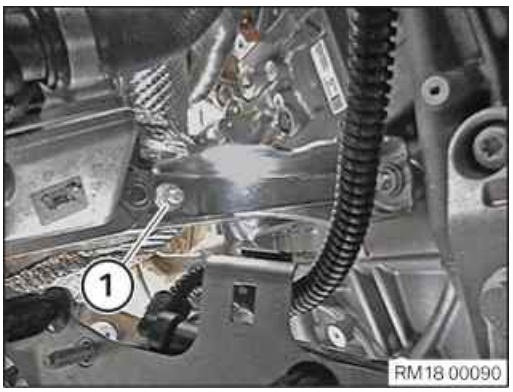


- Carefully insert and install the diesel particulate filter (1).

- Feed in and install V-band clamp (1).
- Make sure that the seal between the diesel particulate filter and the exhaust turbocharger is installed correctly.
- Align the diesel particulate filter on the exhaust turbocharger.
- Position V-clip (1).
- Hand-tighten the V-clip (1).



- Tighten nuts (1) by hand.



- Tighten the nut (1) hand-tight.

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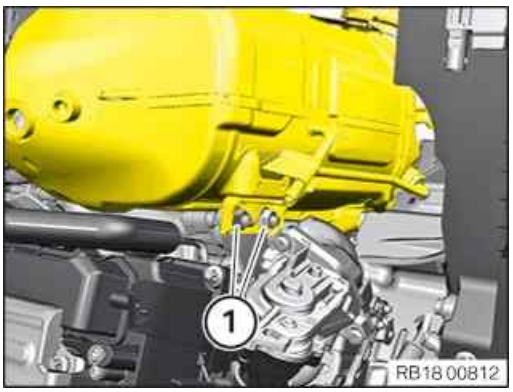
- Remove fitting aid (1) for the flexible tube.

- Tighten V-band clamp (1).

Diesel particulate filter V-clip to exhaust turbocharger

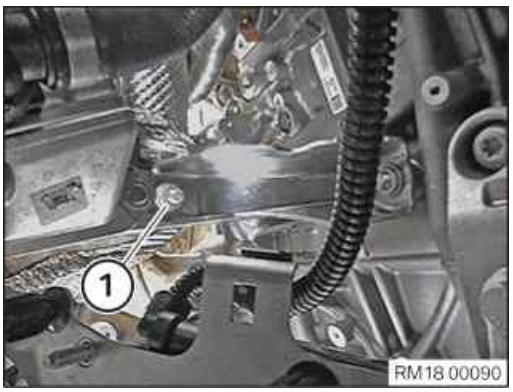
V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm



- Tighten nuts (1).

Diesel particle filter to holder

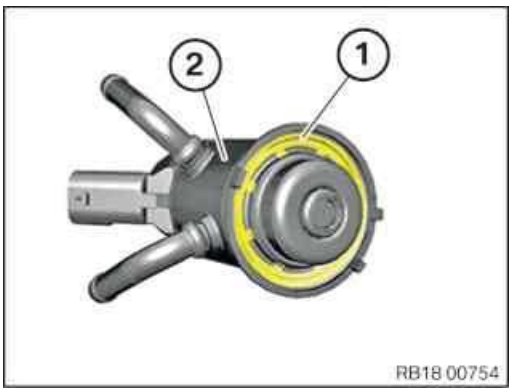
M8 hexagon nut		Tightening torque	19 Nm



- Tighten nut (1).

Diesel particle filter to holder

M8 hexagon nut		Tightening torque	19 Nm



- Renew sealing ring (1) of the SCR metering module (2).

  Parts: Sealing ring

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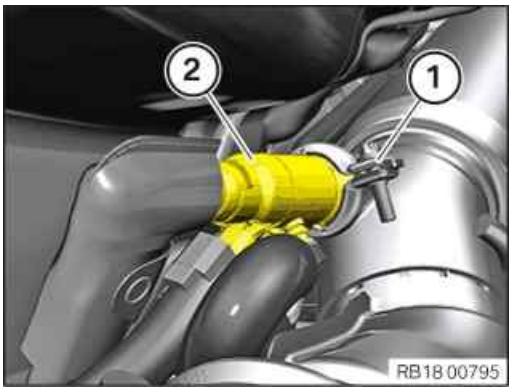
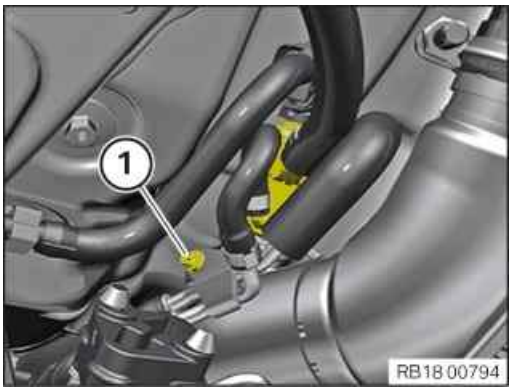


- Insert and install the SCR metering module (2).
- Renew the V-clip (1).

  Parts: V-band clamp
- Tighten V-band clamp (1).

SCR metering module V-clip to exhaust system

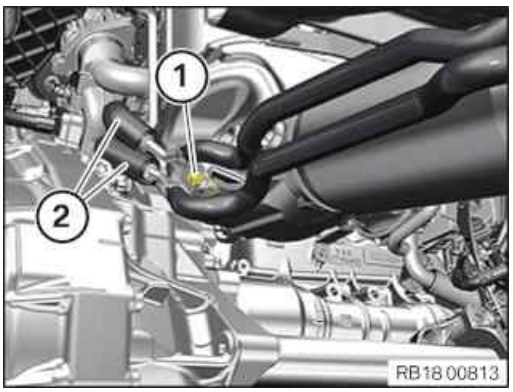
V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm



- Tighten down screw (1).

Holder for coolant lines to diesel particulate filter

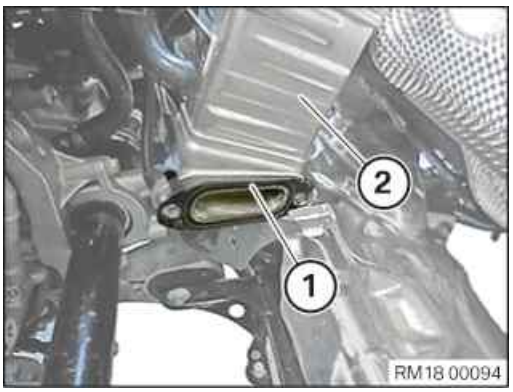
Torx bolt BM6x16		Tightening torque	8 Nm



- Thread in and install coolant line (2) of the SCR metering module.
- Tighten down screw (1).

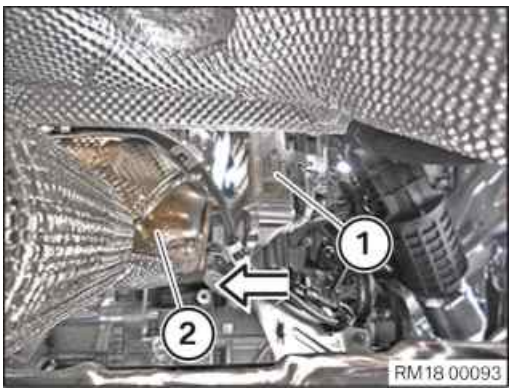
Holder for coolant lines to diesel particulate filter

Torx bolt BM6x16		Tightening torque	8 Nm



- Replace seal (1) of the low pressure exhaust-gas recirculation cooler (2).

  Parts: Gasket



- Feed in and install the low pressure exhaust-gas recirculation cooler (1) in at the diesel particulate filter (2) in the direction of arrow.

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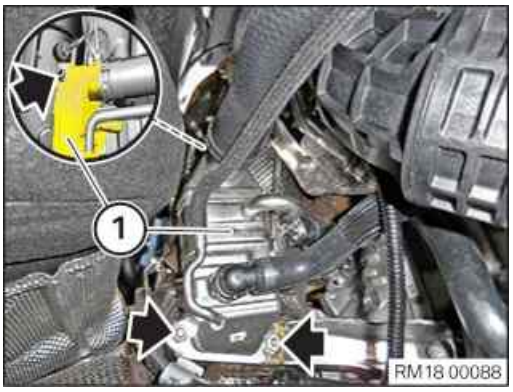
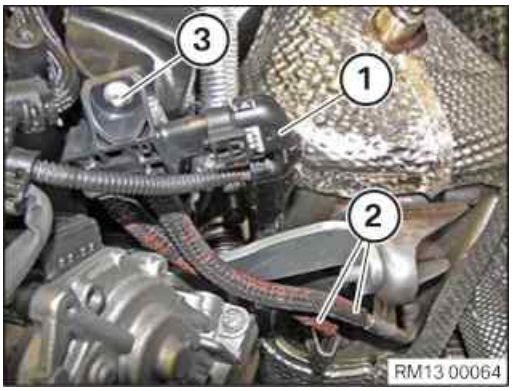


- Tighten nuts (arrows) of the low pressure exhaust-gas recirculation coolers (1).

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Flange nutM8		Tightening torque	19 Nm

50 – Installing differential pressure sensor



- Feed in and install the differential pressure sensor .
- Tighten down screw (3).

Differential pressure sensor to holder

Screw		Tightening torque	4 Nm

- Check pressure hoses (2).
- Renew any hardened pressure hoses (2).

  Parts: Pressure hoses
- Connect the pressure hoses (2) and secure them using 15 mm to 19 mm screw clamps.

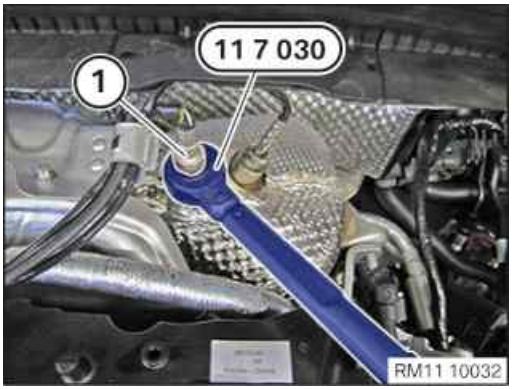
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

- Connect and lock the connector (1).

  The connector (1) must engage audibly.

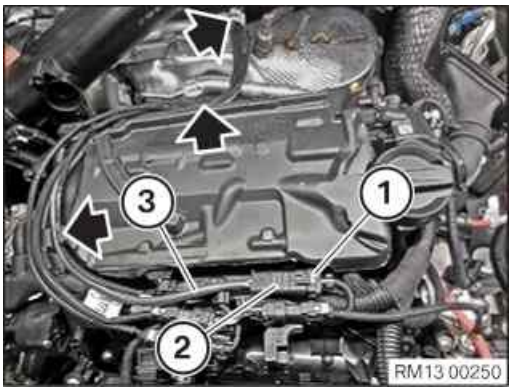
51 – Install the control sensor



- Feed in front oxygen sensor (1) and install.
- Tighten the front oxygen sensor (1) with the special tool **0 491 075 (11 7 030)**.

Control sensor

Control sensor		Tightening torque	50 Nm



- Feed in and install cable (3) from the oxygen control sensor into the clamps (arrows).
- Secure connector (2) on holder.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

52 – Install the exhaust-gas temperature sensor on the diesel particulate filter

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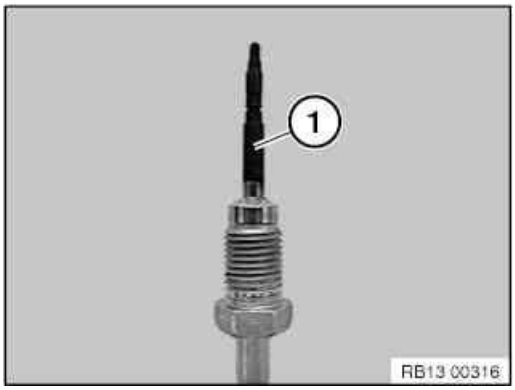


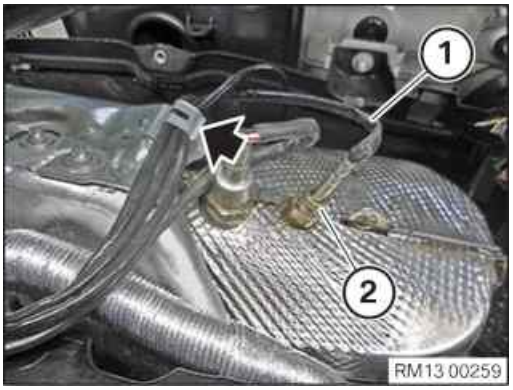
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and renew the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (2).
- Tighten the exhaust temperature sensor (2).

Exhaust temperature sensor to diesel particulate filter

Exhaust-gas temperature sensor		Tightening torque	28 Nm

- Insert and install cable (1) of the exhaust temperature sensor in the clamp (arrow).
- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

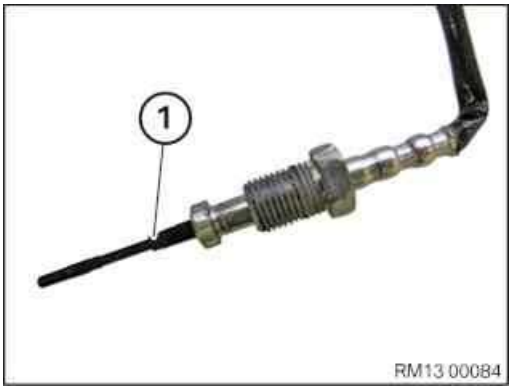
53 – Installing the exhaust temperature sensor downstream from the catalytic converter on the diesel particulate filter

RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.



- Make sure the gauge tip (1) is not damaged during installation.

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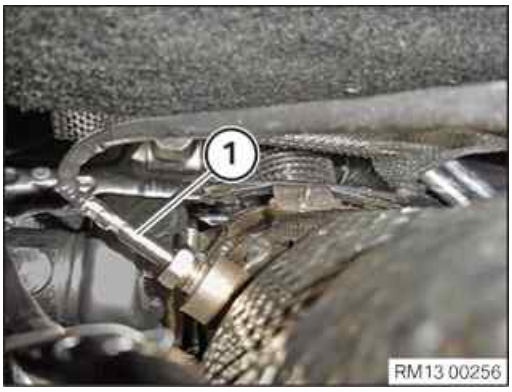
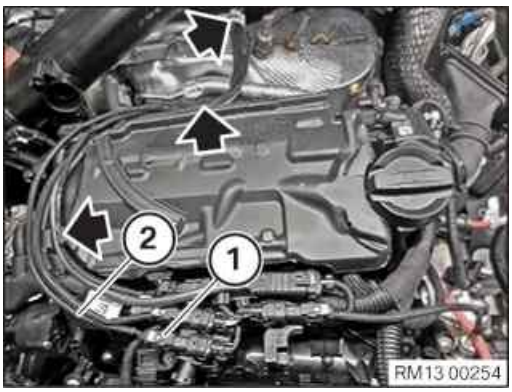


- Feed in and install the exhaust temperature sensor (1).

- Tighten the exhaust temperature sensor (1) with conventional tools (2).

Exhaust temperature sensor to diesel particulate filter

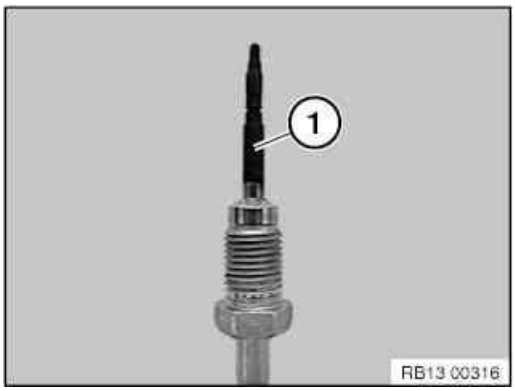
Exhaust-gas temperature sensor		Tightening torque	28 Nm



- Insert and install the cable (2) of the exhaust temperature sensor in the clamps (arrows).
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

54 – Installing exhaust temperature sensor on catalytic converter



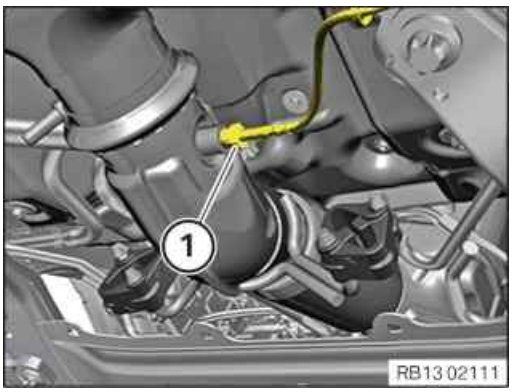
RISK OF DAMAGE

Damage of exhaust temperature sensor.

Damage to exhaust temperature sensors leads to malfunctions.

- Make sure that the gauge tip is not damaged.

- Check the gauge tip (1) for damage and replace the exhaust temperature sensor as needed.



- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1).

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

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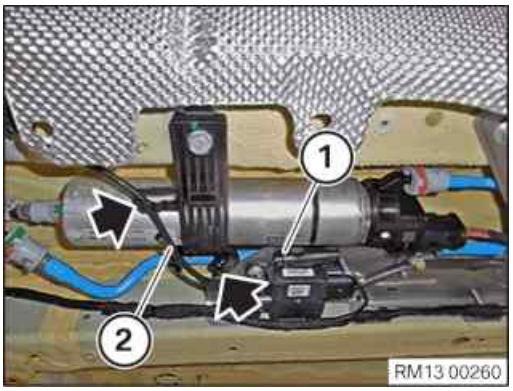
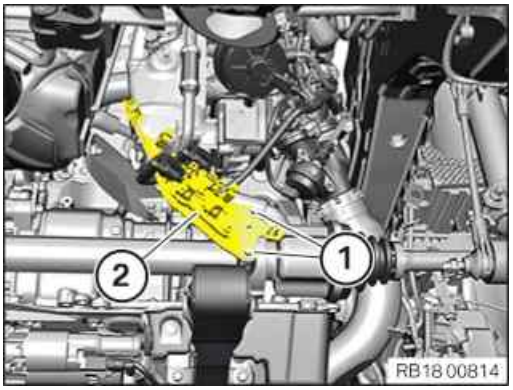
- Secure the cable clips (1).



- Feed cable (2) from exhaust temperature sensor into the clamps (arrows) and install.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

55 – Install holder for oxygen sensor

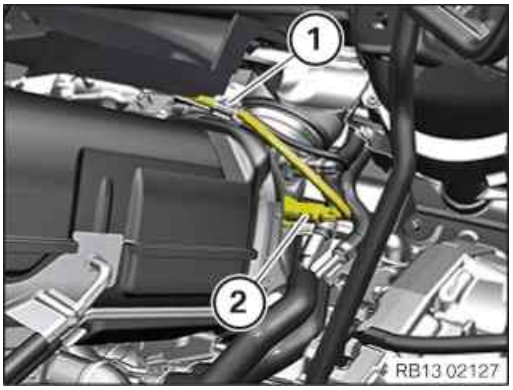


- Insert and install the holder (2).
- Tighten the screws (1).

Oxygen sensor holder to intermediate shaft

Hexagon screw M6x16		Tightening torque	8 Nm

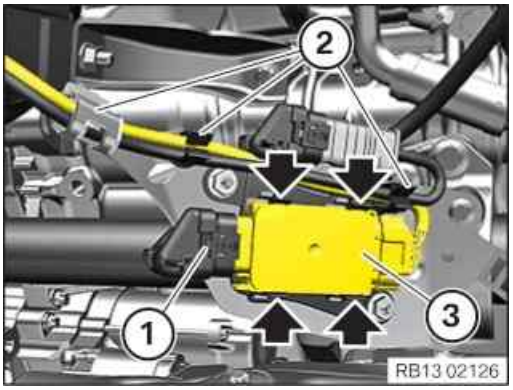
56 – Installing the nitrogen oxide sensor before SCR catalytic converter



- Insert nitrogen oxide sensor before the SCR catalytic converter (2) and install.
- Tighten the nitrogen oxide sensor upstream of the SCR catalytic converter (2).

Nitrogen oxide sensor before SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Install and lock the evaluation electronics for the nitrogen oxide sensor (3) (arrows).
- Insert the evaluation electronics cable for the nitrogen oxide sensor (3) into the clamps (2) and install.
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

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57 – Install the monitoring sensor

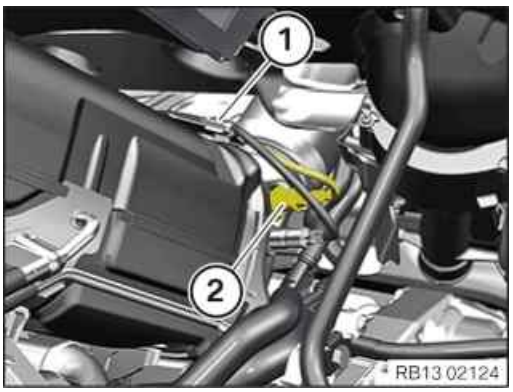
TECHNICAL INFORMATION

New oxygen sensors are to be greased lightly and evenly on the thread.

For oxygen sensors that are reused, the following should be observed:

Lightly and evenly grease the oxygen sensor only on the thread. Do not clean and grease that part of the oxygen sensor which protrudes in the exhaust branch (sensor ceramics).

For additional information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

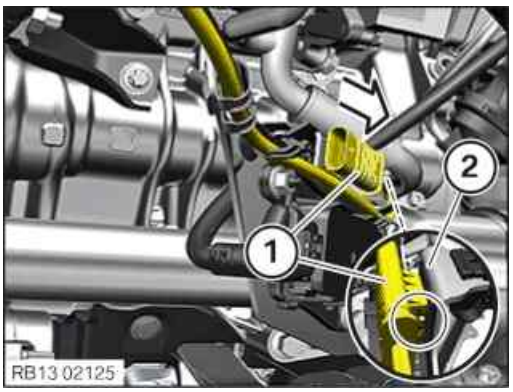


- Feed in the monitoring oxygen sensor (2) and install.
- Tighten the monitoring oxygen sensor (2) with special tool **0 491 074 (11 7 020)**.

Monitoring sensor

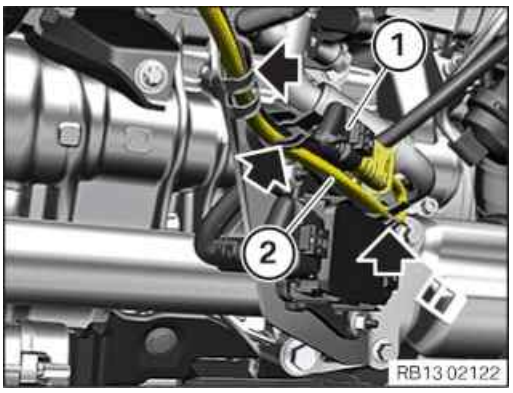
Sensor		Tightening torque	50 Nm

- Insert the cable of the monitoring oxygen sensor (2) into the clamp (1) and secure it.



- Connect the connector (1) with the bracket (2) in the direction of arrow.
- Make sure that the connector (1) is locked correctly in the marked area.

  The connector (1) must engage audibly.



- Insert and attach the cable of the monitoring oxygen sensor (2) to the clamps (arrows).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

58 – Installing starter motor

CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

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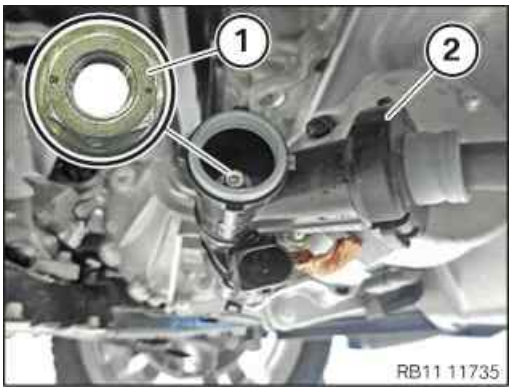
- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm



- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.

59 – Install exhaust system

CAUTION

Component with heavy weight.

Danger of injury!

- Note component's centre of gravity.
- Support component using a jack.
- Secure component against falling off the jack.

CAUTION

Heavy component.

Heavy components can lead to injury or damage.

- Remove and install heavy components with the aid of another person/other persons.

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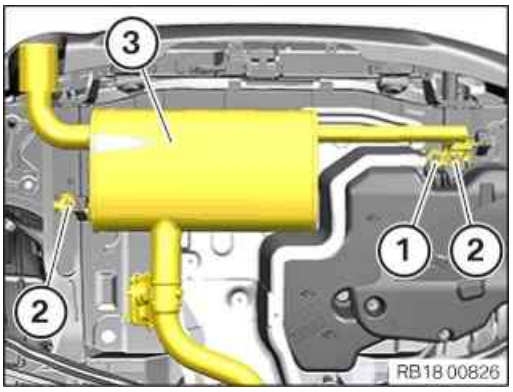


- Insert and install the exhaust system (3) with the help of another person.
- Renew nuts (2).

  Parts: Nuts
- Tighten nuts (2).

Exhaust system to body

M8	Replace nuts.	Tightening torque	19 Nm

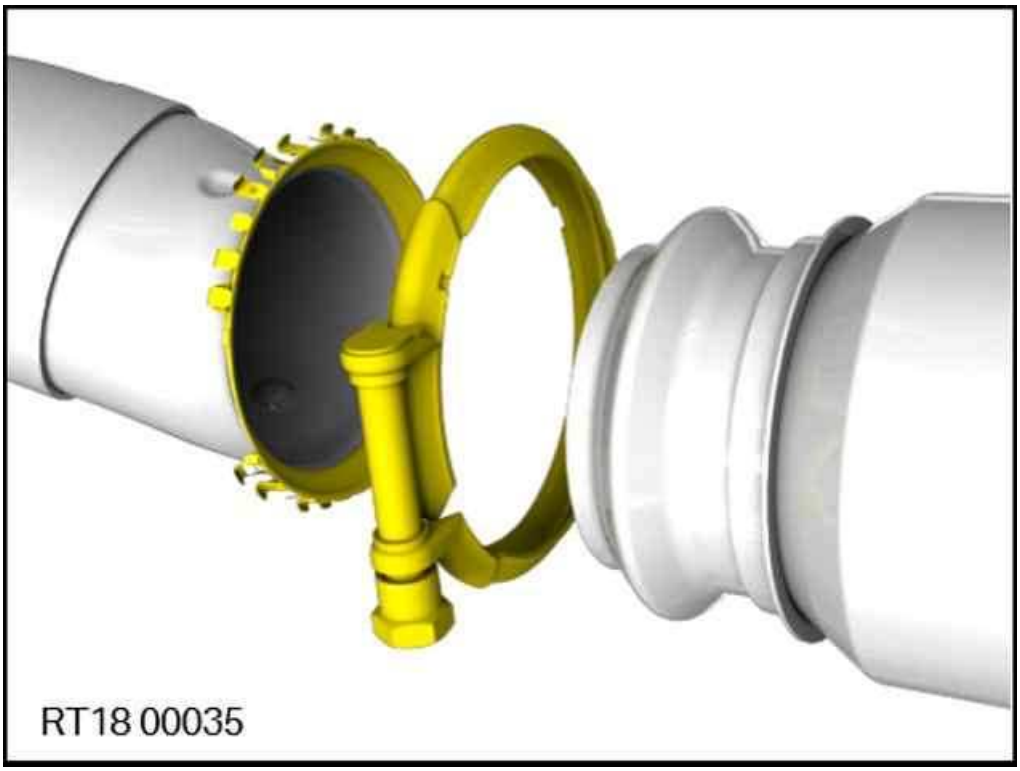
- Tighten down screw (1).

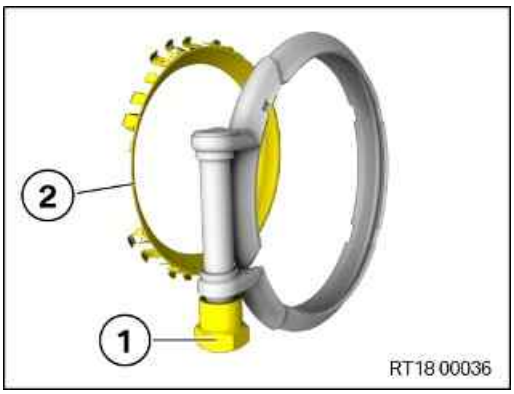
Exhaust bracket on body

Hexagon screw M8x30		Tightening torque	19 Nm

▸ **Install the V-clip**

V-band clamp





- Unscrew the nut (1) and remove the sealing ring (2).

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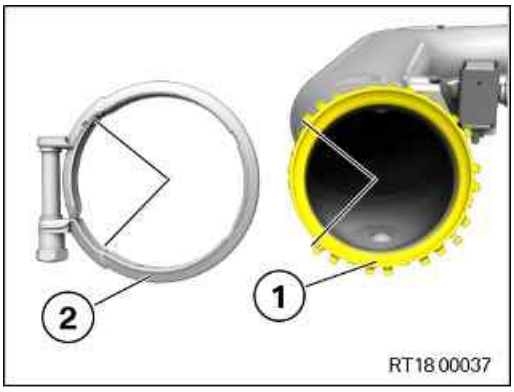
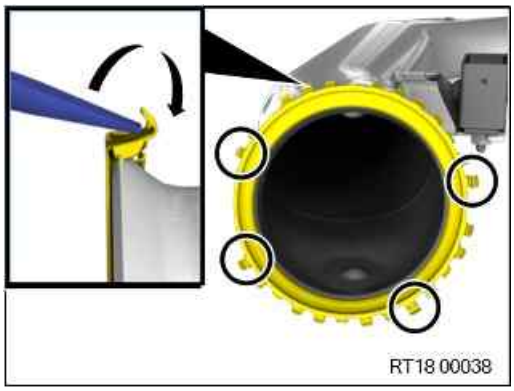
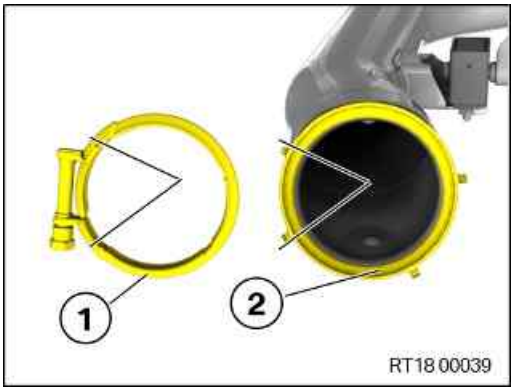


- Renew the V-clip (2).

  Parts: V-band clamp
- Mount the sealing ring (1) on the exhaust system.
- Ensure that the sealing ring (1) for the V-clip (2) is positioned correctly.

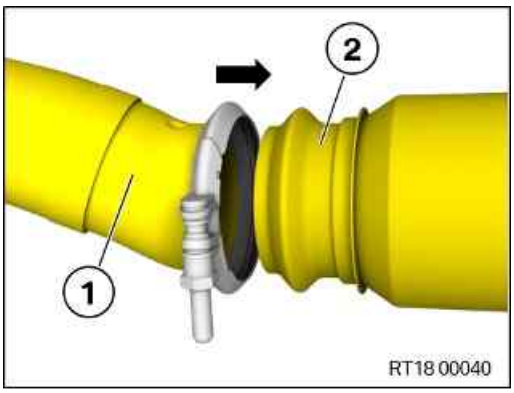


- Bend all sheet metal tabs over with a suitable tool, except those in the marked areas.



- Mount the V-clip (1) on the sealing ring (2).
- Make sure that the V-clip (1) is positioned correctly on the sealing ring (2).

- Make sure that the V-clip rests against the sheet metal tabs after mounting (marks).



- Connect the exhaust system (1) with the catalytic converter (2) and position correctly.

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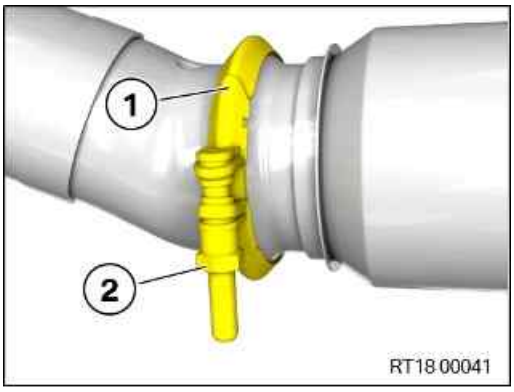
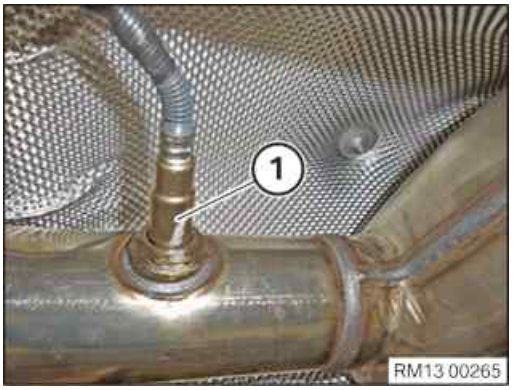


- Make sure that V-clip (1) is fitted correctly.
- Tighten down screw (2).

V-clip to catalytic converter

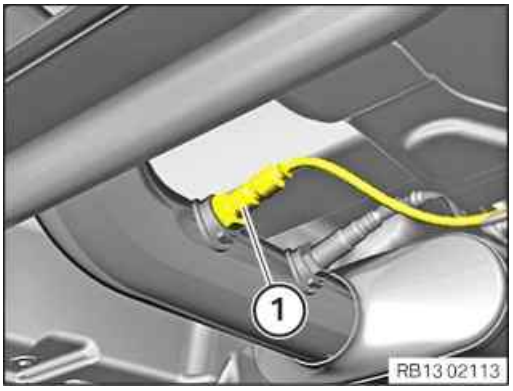
V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm



- Guide in, position and tighten the diesel particulate sensor (1).

Diesel particulate sensor to exhaust system

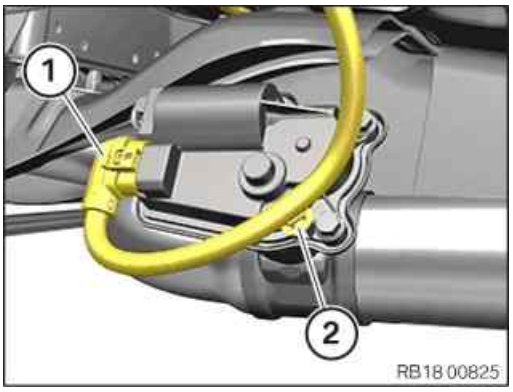
Sensor		Tightening torque	50 Nm



- Guide in, position and tighten the nitrogen oxide sensor (1).

Nitrogen oxide sensor downstream of SCR catalytic converter

Sensor		Tightening torque	50 Nm



- Secure clamps (2).
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.

60 – Install the cross-member with torsion struts

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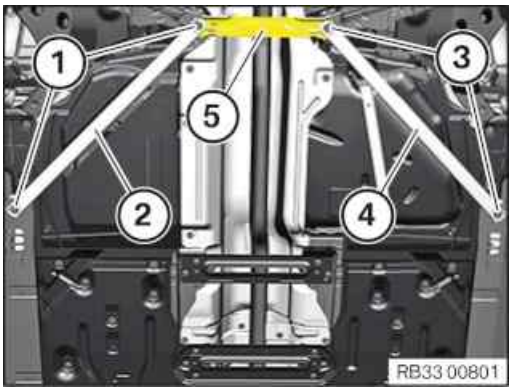


- Insert and install the cross-member (5).
- Thread in torsion strut (4) at right and install.
- Renew screws (3).

  Parts: Bolts
- Tighten down screws (3).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

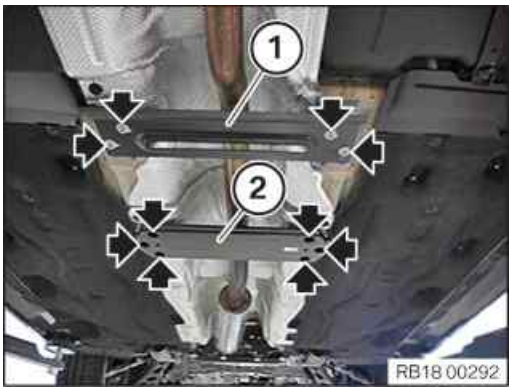
- Guide in and install the left torsion strut (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Cross-member/torsion strut to axle support and mounting

M12x48	Renew screws.	Jointing torque	100 Nm
		Angle of rotation	90 °

61 – Install the connecting support on the tunnel in front and back



- Insert and install connecting supports (2).
- Tighten the screws (arrows) from the connecting support (2).

Front connection carrier to body

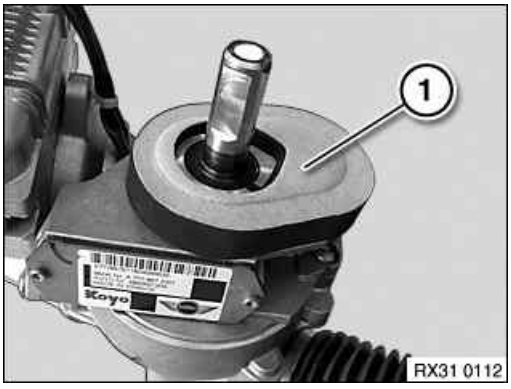
M10x18		Tightening torque	56 Nm

- Insert and install connecting supports (1).
- Tighten the screws (arrows) from the connecting support (1).

Rear connection carrier to body

M8x18		Tightening torque	28 Nm

62 – Mount and secure the complete front axle



- Remove the seal (1).
- Clean surface on steering gear.
- Renew gasket (1).

  Parts: Gasket
- Position the seal (1) and glue it on.

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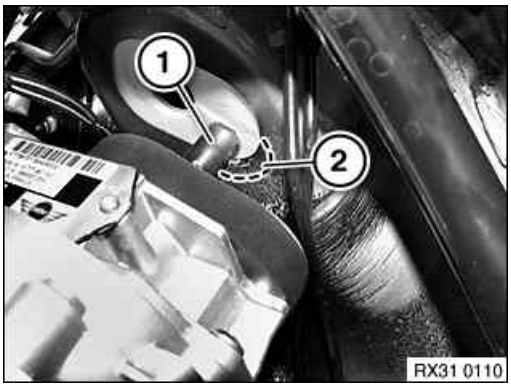
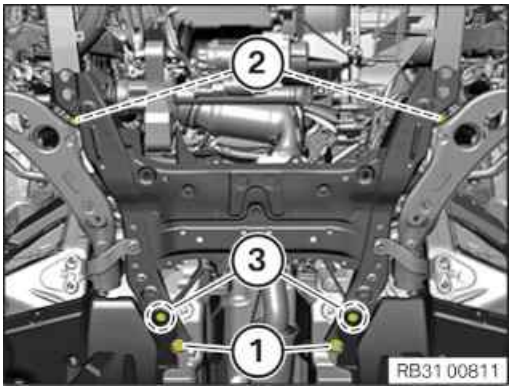


TECHNICAL INFORMATION

Non-compliance with the regulations for installation and disassembly may result in component damage. All work must be performed with care and in compliance with the regulations.

- When raising and lowering the front axle support, make sure that the torsion bar (1) of the electromechanical steering gear (EPS) in area (2) does not collide with the bulkhead!

Note: Collision with the bulkhead may result in damage to the electromechanical steering gear (EPS)!



- Position front axle support.
- Bend underbody panellings in the areas (3) to one side.
- Raise front axle support.
- When raising, insert charge air cooler into the rubber mount of the charge air cooler on cross member.
- Renew screws (1) and (2).

  Parts: Bolts
- Tighten the screws (1).

Rear end of front axle support to body

M14 screw	Renew screw.	Tightening torque	175 Nm

- Tighten down screws (2).

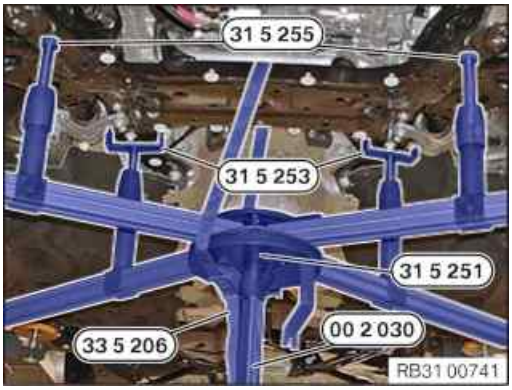
Front axle support, front to body

M12 screw	Renew screw.	Tightening torque	108 Nm

- If necessary, tighten the screws in the areas (3).

Underbody protection to body

Screw		Tightening torque	3 Nm



- Remove special tool **0 496 080 (33 5 206)** from special tool **0 495 817 (31 5 251)**.
- Lower universal jack **0 490 133 (00 2 030)** with the special tool **0 495 817 (31 5 251)** and place it to the side.

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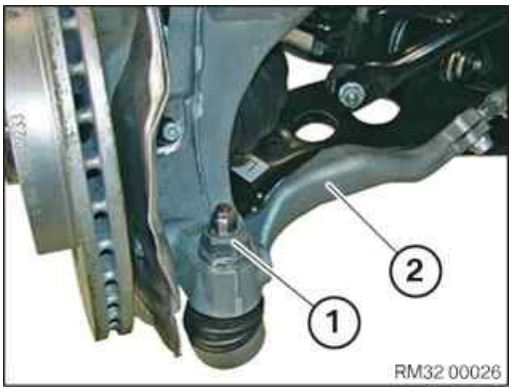


NOTICE

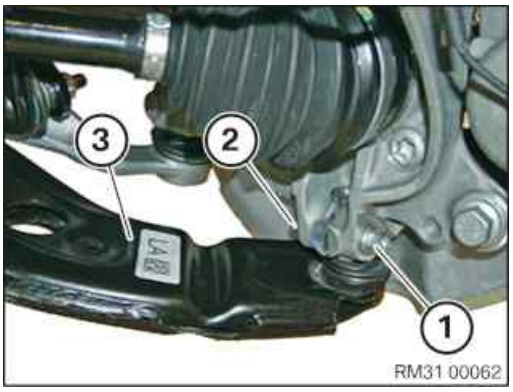
Perform the operations on the left and right side.

- Position the track rod (2) on the swivel bearing .
- Renew nut (1).

  Parts: Nut
- Tighten nut (1).

Track rod end to swivel bearing

M14	Renew nut.	Tightening torque	175 Nm



NOTICE

Perform the operations on the left and right side.

- Position the wishbone (3) on the swivel bearing .
- Renew the bolt (2) and the nut (1).

  Parts: Bolt, nut
- Insert screw (2).
- Tighten nut (1).

Wishbone to swivel bearing

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

63 – Install the mounted parts on the front axle support

NOTICE

Perform the operations on the left and right side.

- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Holder, wishbone rubber mount, to body

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

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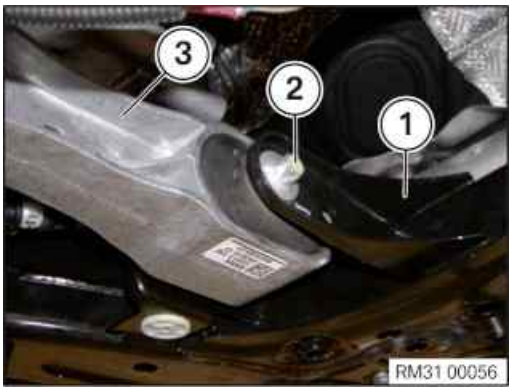
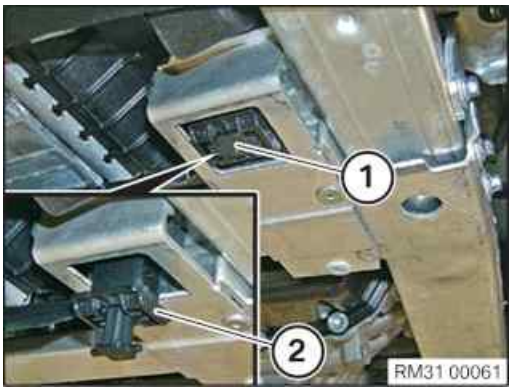


- Position the engine support (3) on the front axle support (1).
- Tighten down screw (2).

Holder with rubber mount to front axle support

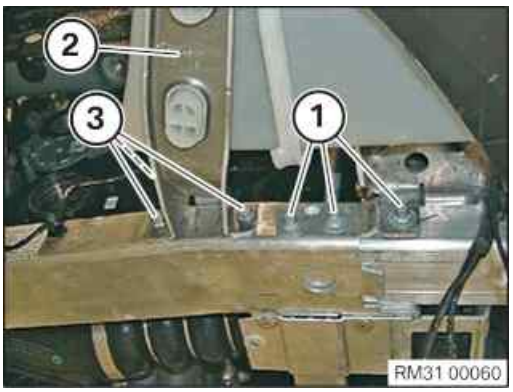
M12 screw		100 Nm



NOTICE

Perform the operations on the left and right side.

- Position the lock (2).
- Lock the bracket (1) of the lock (2) of the holder for the charge air cooler.



- **Only on right side:** Position the holder for the washer fluid reservoir (2).
- Tighten down screws (3).

Washer fluid reservoir holder to front axle support adapter plate

		Tightening torque	10 Nm

NOTICE

Perform the operations on the left and right side.

- Tighten the screws (1).

Deformation element, bottom, to adapter plate, front axle carrier

		Tightening torque	11,8 Nm

64 – Attaching connector at steering gear

- To connect the connector (see the following step): Connect the connector with the right hand.

  The connectors can be accessed via the left output shaft.

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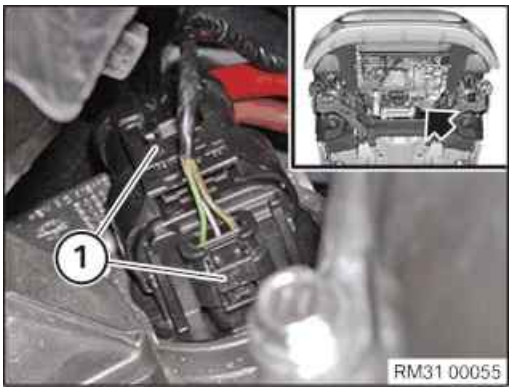
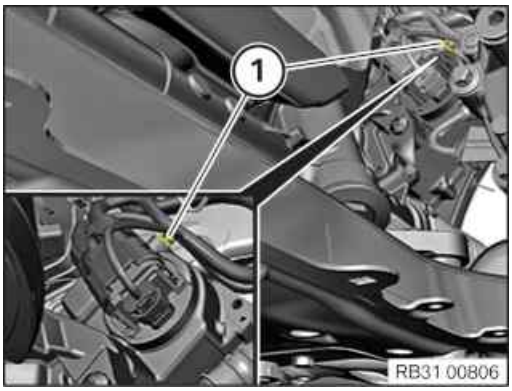
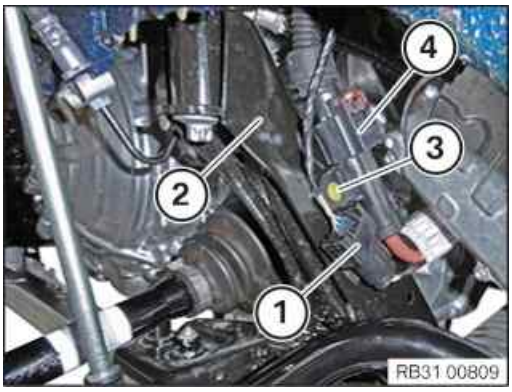


- Connect and lock connector (arrow) (1) with the steering gear.



- Fasten the wiring harness (1) on the steering gear.

▸ **If installed: Fasten the plug connections at the front axle support**



- Position the plug connection (4) at the front axle support (2).
- Tighten down screw (3).

Holder to front axle support

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

- Fasten the plug connection (1) at the front axle support (2).

65 – Securing rubber mount on front axle support

- Check rubber mount (1), replace if necessary.

  Parts: Rubber mount
- Spray rubber mount (1) with lubricant and slide onto holder on front axle support.

66 – Securing anti-roll bar on left and right on the anti-roll bar link

NOTICE

Perform the operations on the left and right side.

▸ **Fastening anti-roll bar on the anti-roll bar link**

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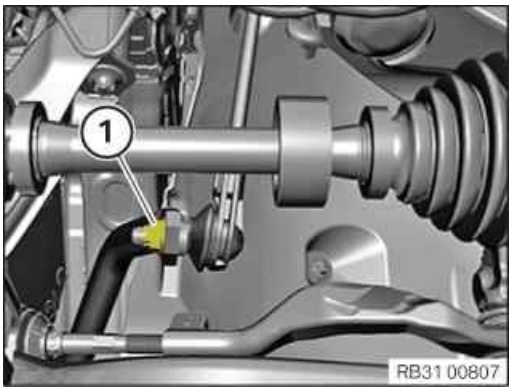


- Position the anti-roll bar link on the anti-roll bar .
- Renew nut (1).

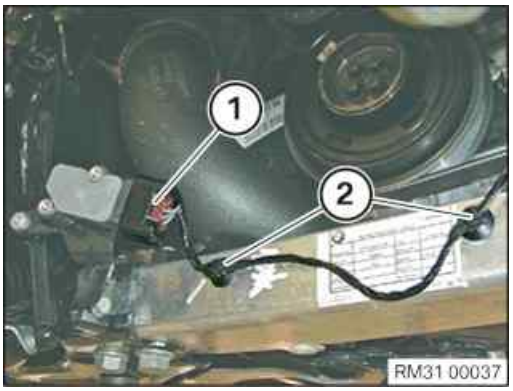
  Parts: Nut
- Tighten nut (1).

Note: Use the Torx socket for counter support.

Anti-roll bar link to anti-roll bar

M10	Renew nut.	Tightening torque	56 Nm

67 – With right installation: Securing the cable for the ride height sensor



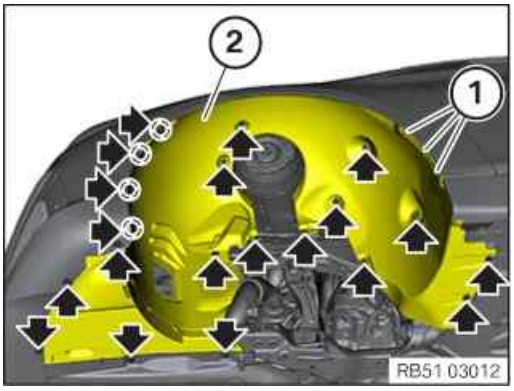
- Secure the cable clip (2) on the adapter of the deformation element.
- Connect connectors (1) and lock.

68 – Installing front left and right wheel arch cover

NOTICE

Perform the operations on the left and right side.

▸ **Installing the front wheel arch cover**



- Guide the wheel arch cover (2) in.
- Tighten all bolts and nuts (arrows).

Wheel arch cover to body

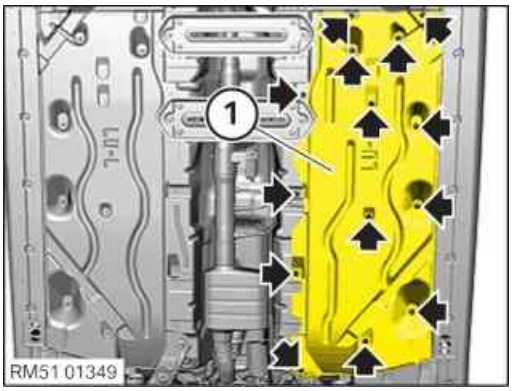
Screw		Tightening torque	2,5 Nm

Wheel arch cover to body

Plastic nut		Tightening torque	3 Nm

- Secure expanding rivet (1).

69 – Installing underbody panelling , right



- Correctly position the underbody panelling (1).
- Tighten all bolts and nuts (arrows).

Underbody panelling, side

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side

Plastic nut		Tightening torque	2,6 Nm

70 – If installed: Installing underbody protection at rear

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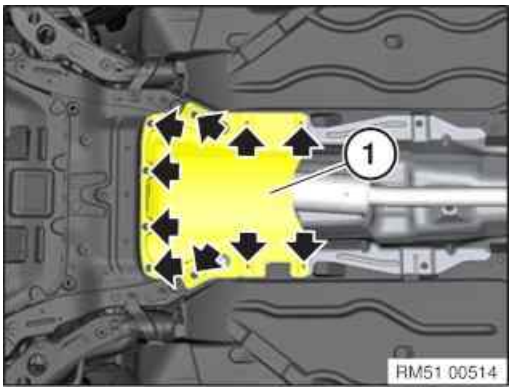
70 – If installed: installing underbody protection at rear



- Position rear underbody protection (1).
- Tighten screws (arrows).

Underbody protection to body

Screw		Tightening torque	3 Nm

71 – Mount the front left and right wheels

▶ **Mounting the wheel**

▷ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

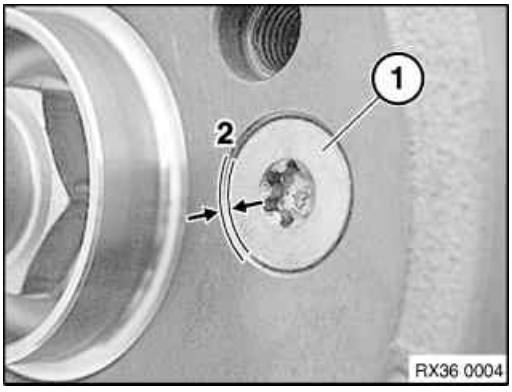
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).



- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub

M8	Renew screw.		16 Nm

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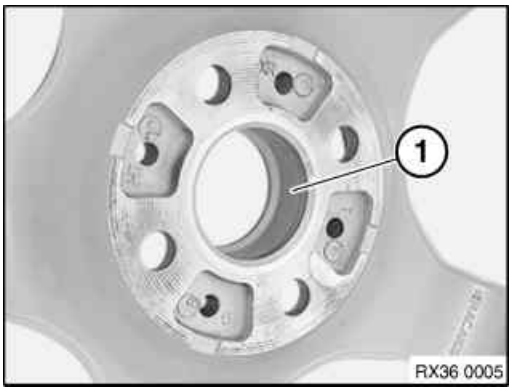

- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

◁

TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts.
- Check wheel bolts (arrows) and threads for damage, renew the wheel bolts if necessary.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

72 – Removing fastener for left and right radiator

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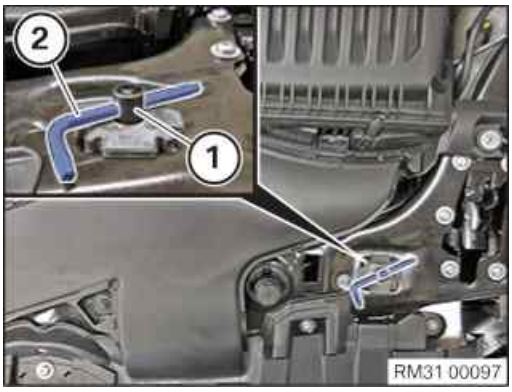
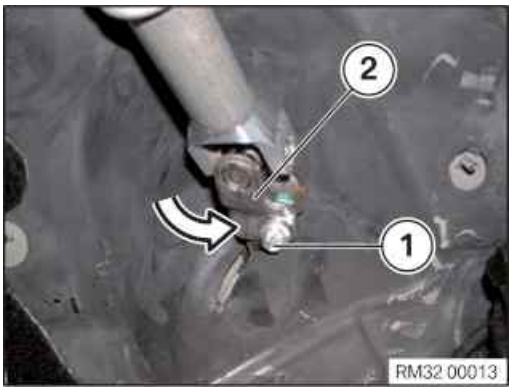


NOTICE

Perform the operations on the left and right side.

- Remove suitable tool (2) from the centering pin (1).

73 – Secure the steering shaft at the bottom on the steering gear



- Clean the screw lock residue from the screw thread in the universal joint (2).
- Pivot the universal joint (2) in the direction of the arrow to the steering gear.
- Renew the screw (1).

  Parts: Screw
- Tighten down screw (1).

Lower steering shaft to steering gear

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

- **If installed:**
- Position the cover on the steering column (2).
- Tighten nuts (1).

Steering column cover to bulkhead

Plastic nut		Tightening torque	3 Nm

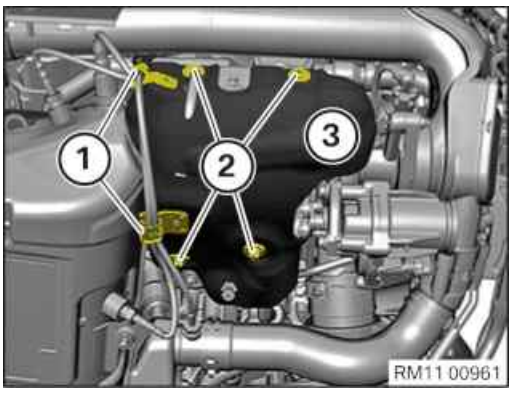
74 – Install the heat shield on the exhaust turbocharger

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Feed in and install the heat shield (3).
- Tighten down screws (2).

Heat shield for exhaust turbocharger

Torx screw BM 6x12		Tightening torque	10 Nm

- Secure cable in holders (1).

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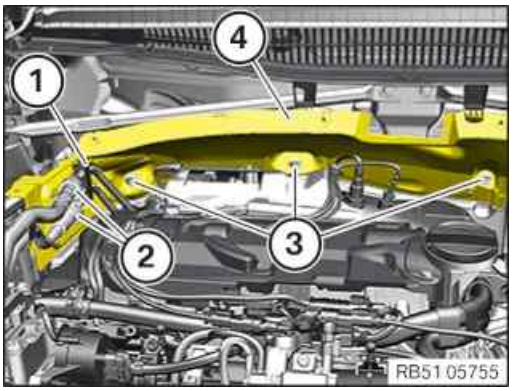
75 – Installing rear bulkhead upper part



- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

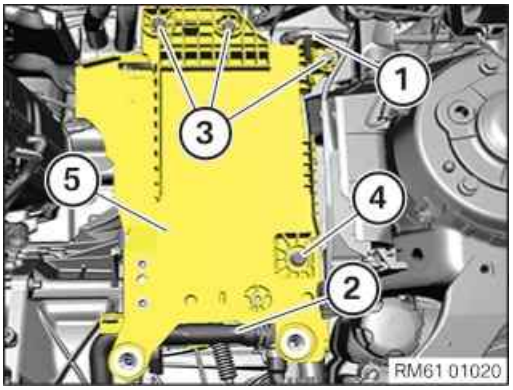
Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).

  The holder (1) must engage audibly.

76 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

77 – Install electronics box

Prerequisite

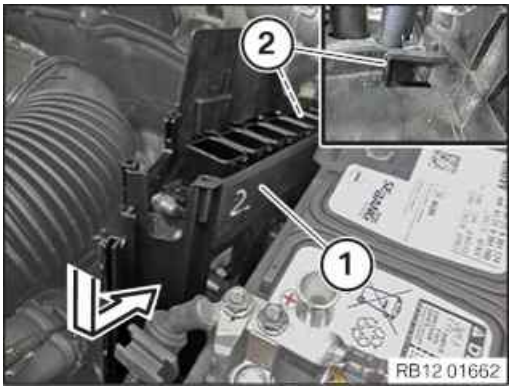
Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.



- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

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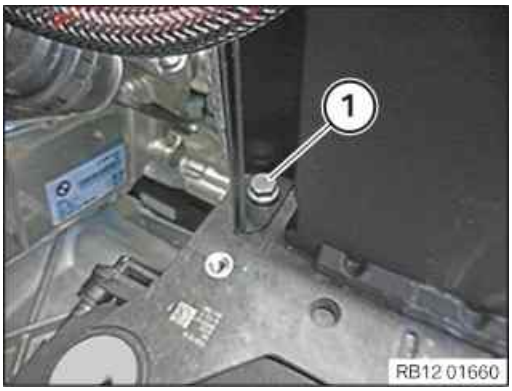
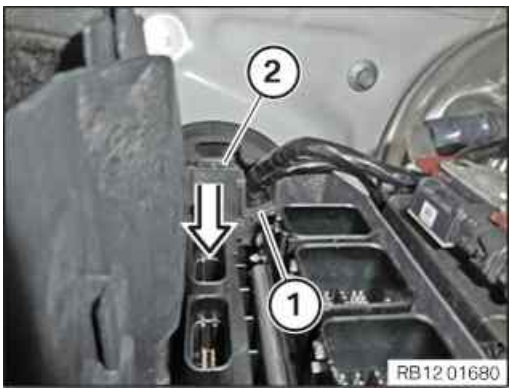
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



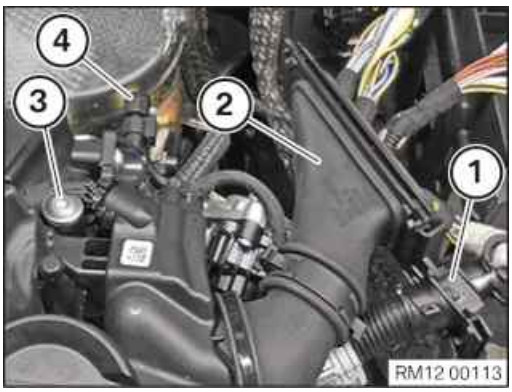
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.

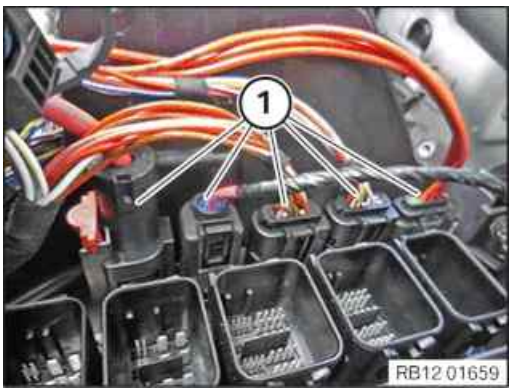


- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

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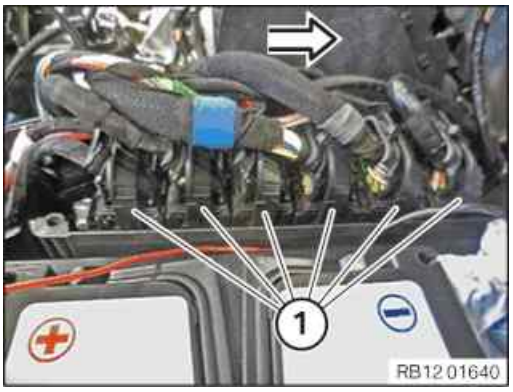
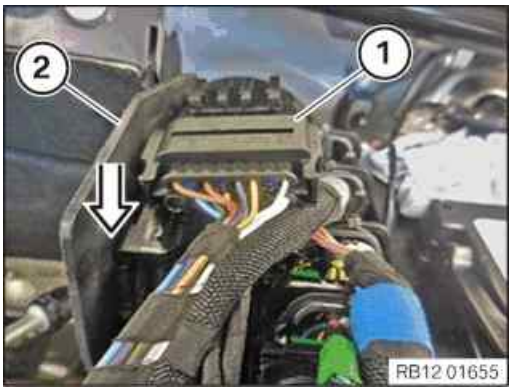
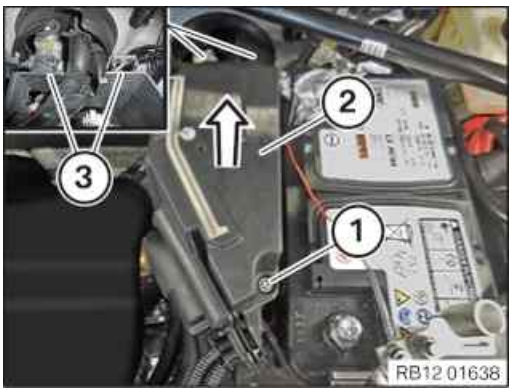


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



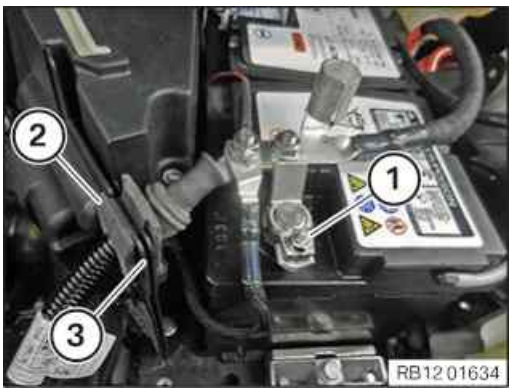
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

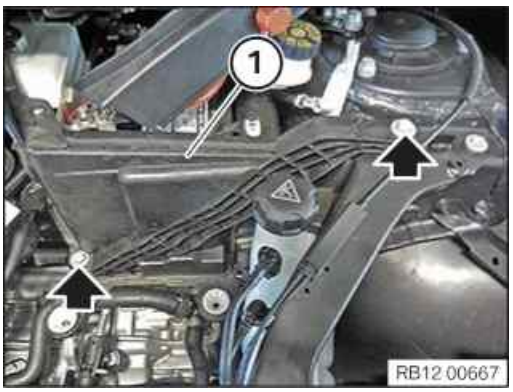
RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

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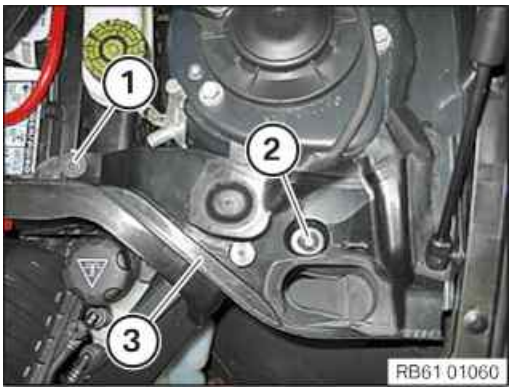
- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

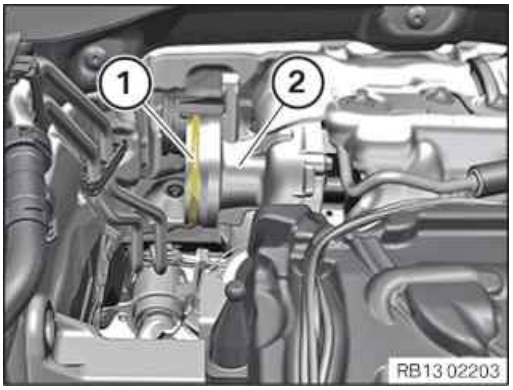


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

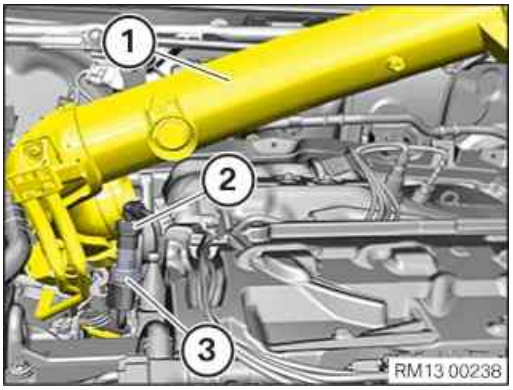
Battery cover

Screw		2,8 Nm

78 – Installing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



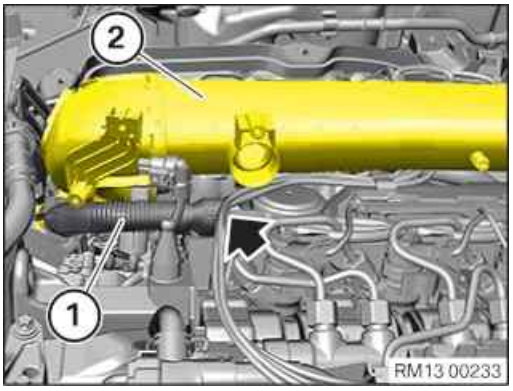
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.

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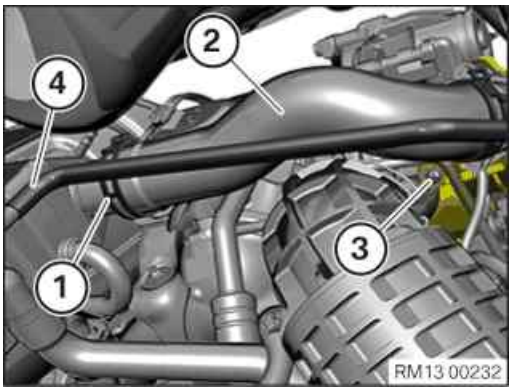


- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

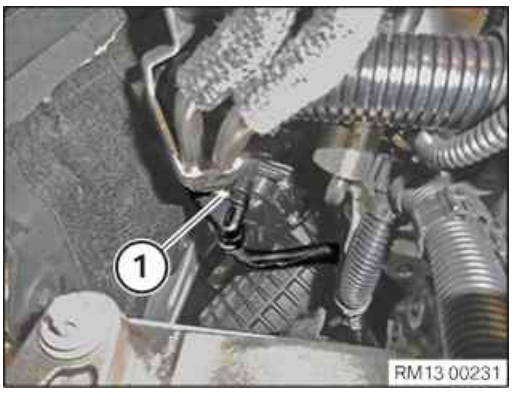
Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

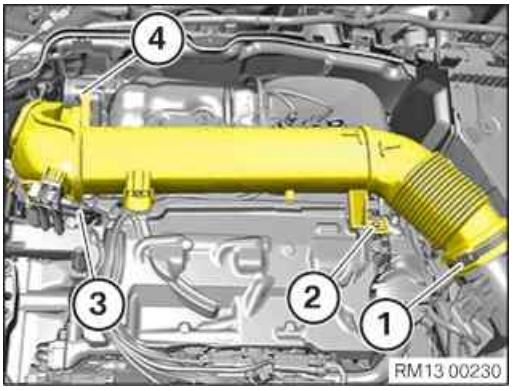
Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm



- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

79 – Installing the front underbody protection

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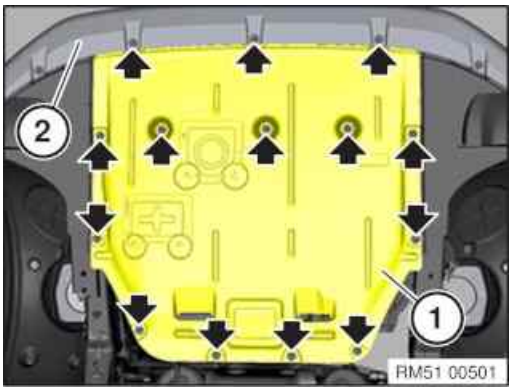
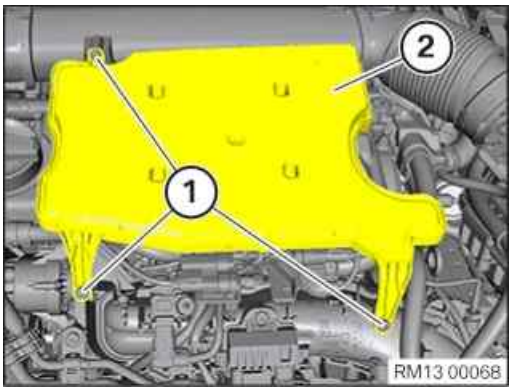


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

80 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

81 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

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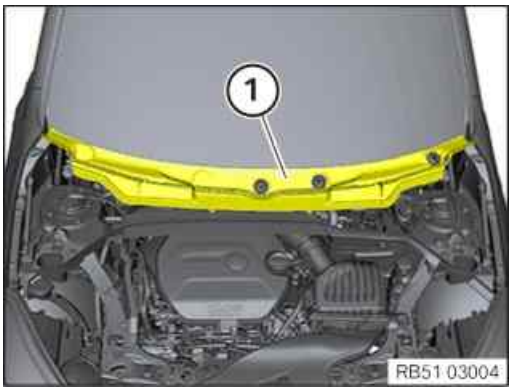
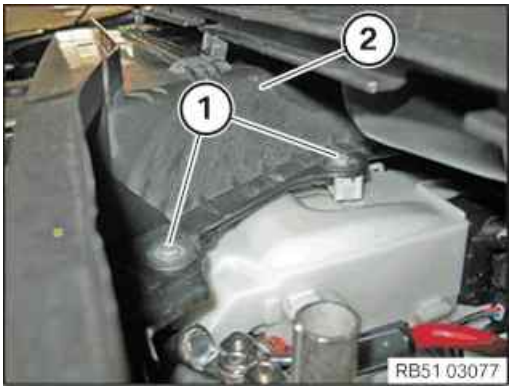
- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

82 – Install the rear cowl panel cover



- Feed in and engage the rear cowl panel cover (1).

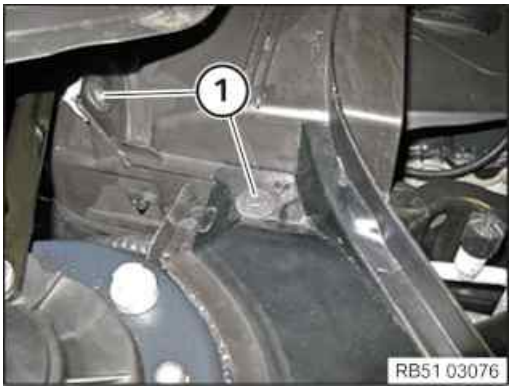
83 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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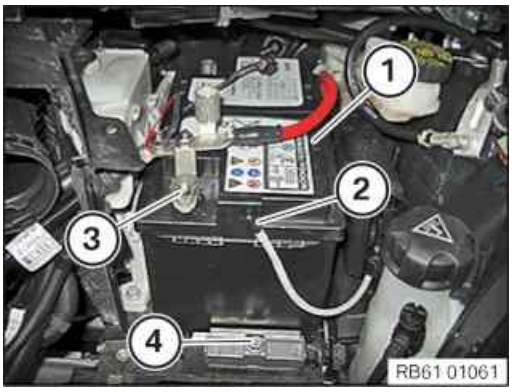
84 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)



- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

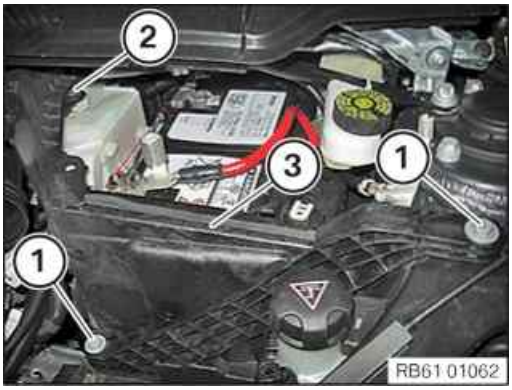
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

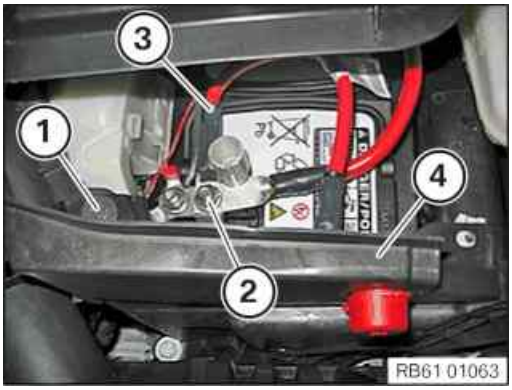
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

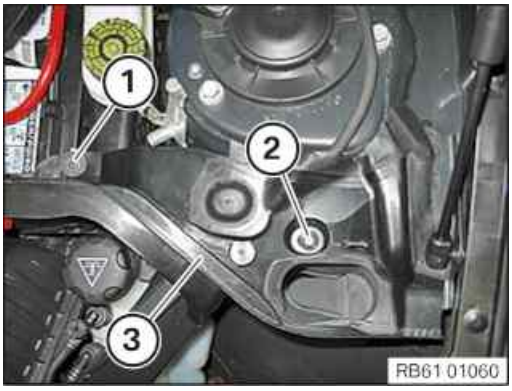
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

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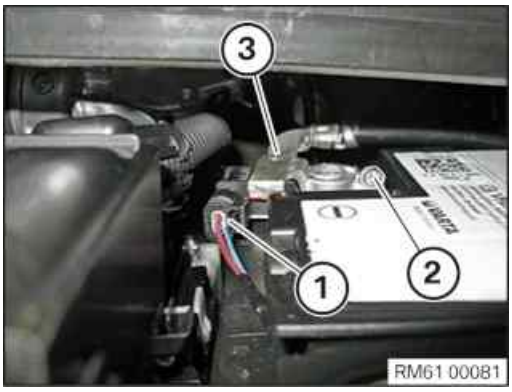
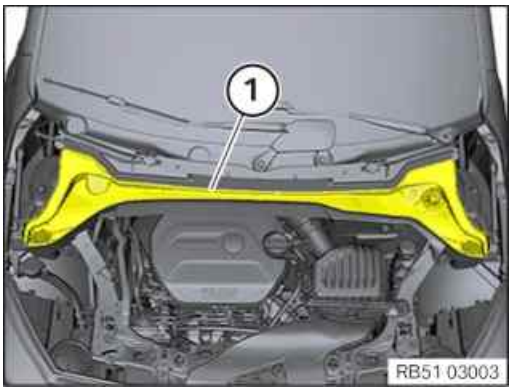


- Position the negative battery terminal (3).
- Tighten nut (2).

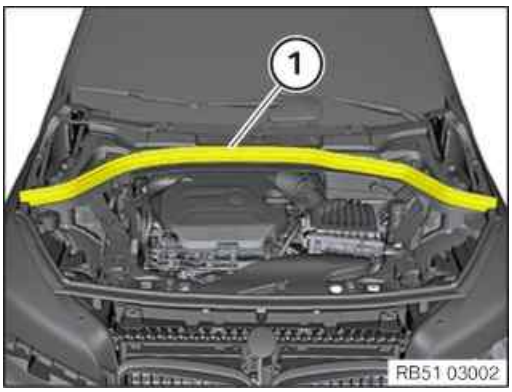
Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.



- Feed in the cowl panel cover (1).



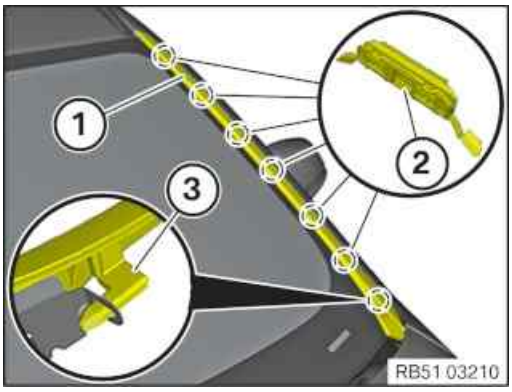
- Press the gasket (1) in a downwards direction.

85 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

86 – Install left and right wiper arm

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NOTICE

Description is for left component only. Procedure on the right side is identical.

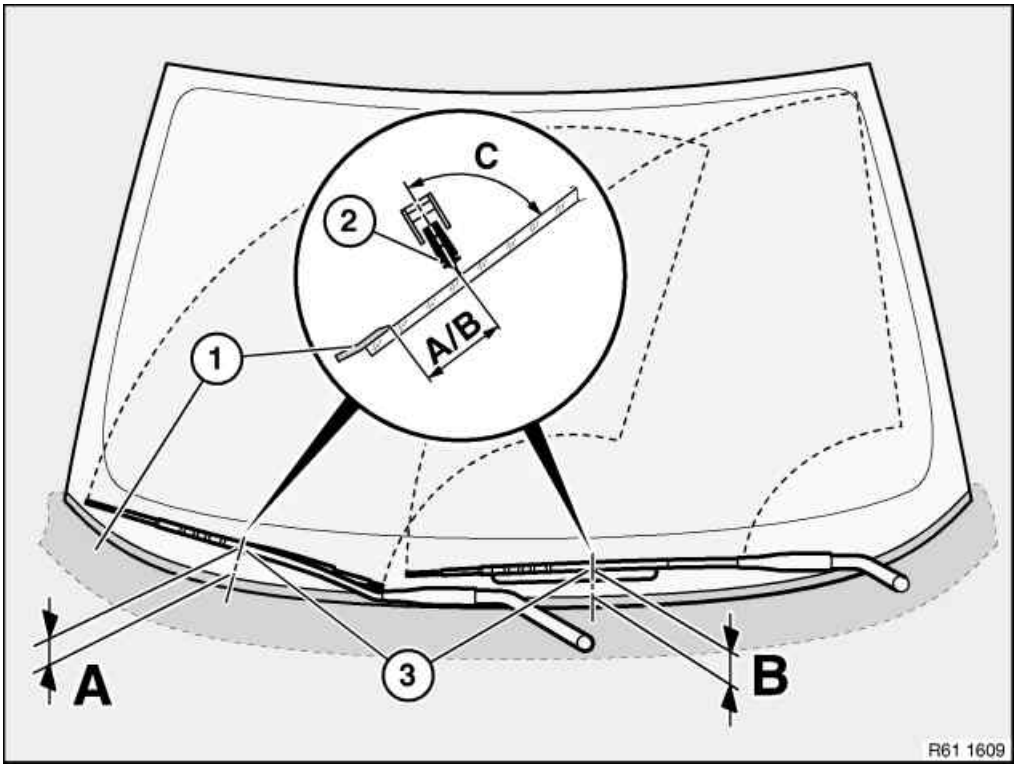
▸ **Install the wiper arm**

TECHNICAL INFORMATION

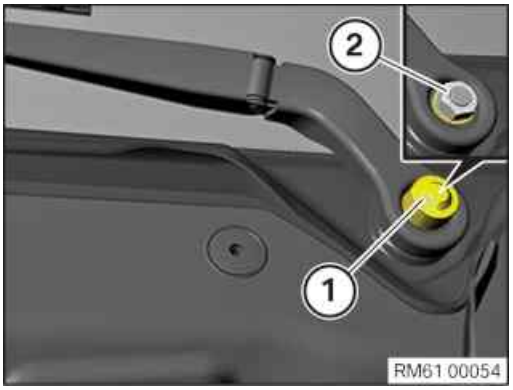
The wiper system must be in zero position.

After installing the cowl panel cover and before fitting the wiper arm:

Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

87 – Installing intake silencer housing

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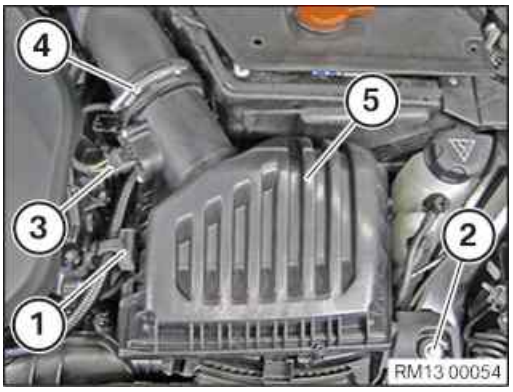


- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

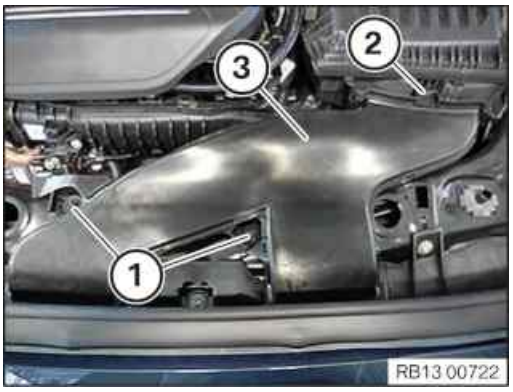
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

88 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

Additional Information

Overview of Tightening Torques

Exhaust turbocharger to exhaust manifold Used in step 46

V-band clamp		Tightening torque	19 Nm

Oil feed line to exhaust turbocharger Used in step 46

Hollow bolt	Renew sealing rings.	Jointing torque Angle of rotation	10 Nm 45 °

Oil return line to turbocharger Used in step 46

M6x12		Tightening torque	8 Nm

Holder to exhaust turbocharger and crankcase Used in step 46

M8x16		Tightening torque	22 Nm

Heat shield for exhaust turbocharger Used in step 47 48 74

Torx screw BM 6x12		Tightening torque	10 Nm

Exhaust turbocharger bracket to cylinder head Used in step 47

Hexagon screw M 8x16		Tightening torque	19 Nm

Diesel particulate filter V-clip to exhaust turbocharger Used in step 49

V-band clamp	Renew V-band clamp.	Tightening torque	15 Nm

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Diesel particle filter to holder — Used in step 49

M8 hexagon nut		Tightening torque	19 Nm

SCR metering module V-clip to exhaust system — Used in step 49

V-band clamp	Renew V-band clamp.	Tightening torque	8 Nm

Holder for coolant lines to diesel particulate filter — Used in step 49

Torx bolt BM6x16		Tightening torque	8 Nm

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter — Used in step 49

Flange nutM8		Tightening torque	19 Nm

Differential pressure sensor to holder — Used in step 50

Screw		Tightening torque	4 Nm

Clamp for the pressure hose on the differential pressure sensor — Used in step 50 78

Clamp 15–19mm		Tightening torque	3 Nm

Control sensor — Used in step 51

Control sensor		Tightening torque	50 Nm

Exhaust temperature sensor to diesel particulate filter — Used in step 52 53

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Exhaust-gas temperature sensor to exhaust system — Used in step 54

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Oxygen sensor holder to intermediate shaft — Used in step 55

Hexagon screw M6x16		Tightening torque	8 Nm

Nitrogen oxide sensor before SCR catalytic converter — Used in step 56

Sensor		Tightening torque	50 Nm

Monitoring sensor — Used in step 57

Sensor		Tightening torque	50 Nm

Starter motor to transmission — Used in step 58

M8x45		Tightening torque	19 Nm

Battery positive lead to starter — Used in step 58

M8		Tightening torque	13,5 Nm

Exhaust system to body — Used in step 59

M8	Replace nuts.	Tightening torque	19 Nm

Exhaust bracket on body — Used in step 59

Hexagon screw M8x30		Tightening torque	19 Nm

V-clip to catalytic converter — Used in step 59

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V-band clamp	Renew V-band clamp.	Tightening torque	22 Nm

Diesel particulate sensor to exhaust system Used in step 59

Sensor		Tightening torque	50 Nm

Nitrogen oxide sensor downstream of SCR catalytic converter Used in step 59

Sensor		Tightening torque	50 Nm

Cross-member/torsion strut to axle support and mounting Used in step 60

M12x48	Renew screws.	Jointing torque Angle of rotation	100 Nm 90 °

Front connection carrier to body Used in step 61

M10x18		Tightening torque	56 Nm

Rear connection carrier to body Used in step 61

M8x18		Tightening torque	28 Nm

Rear end of front axle support to body Used in step 62

M14 screw	Renew screw.	Tightening torque	175 Nm

Front axle support, front to body Used in step 62

M12 screw	Renew screw.	Tightening torque	108 Nm

Underbody protection to body Used in step 62 70

Screw		Tightening torque	3 Nm

Track rod end to swivel bearing Used in step 62

M14	Renew nut.	Tightening torque	175 Nm

Wishbone to swivel bearing Used in step 62

M10	Exclusively use the screw to tighten! Renew screw and nut.	Tightening torque	60 Nm

Holder, wishbone rubber mount, to body Used in step 63

M10 screw	Renew screw.	Jointing torque Angle of rotation	56 Nm 90 °

Holder with rubber mount to front axle support Used in step 63

M12 screw			100 Nm

Washer fluid reservoir holder to front axle support adapter plate Used in step 63

		Tightening torque	10 Nm

Deformation element, bottom, to adapter plate, front axle carrier Used in step 63

		Tightening torque	11,8 Nm

Holder to front axle support Used in step 64

Oval-head screw TS5 x 16		Tightening torque	2,6 Nm

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Anti-roll bar link to anti-roll bar — Used in step 66

M10	Renew nut.	Tightening torque	56 Nm

Wheel arch cover to body — Used in step 68

Screw		Tightening torque	2,5 Nm

Wheel arch cover to body — Used in step 68

Plastic nut		Tightening torque	3 Nm

Underbody panelling, side — Used in step 69

Hexagon screw		Tightening torque	2,6 Nm

Underbody panelling, side — Used in step 69

Plastic nut		Tightening torque	2,6 Nm

Brake disc to front wheel hub — Used in step 71

M8	Renew screw.		16 Nm

Brake disc to rear wheel hub — Used in step 71

M8	Renew screw.		16 Nm

Wheel bolts — Used in step 71

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Lower steering shaft to steering gear — Used in step 73

M10	Clean screw thread and remove remains of screw locking agent. Renew screw.	Tightening torque	28 Nm

Steering column cover to bulkhead — Used in step 73

Plastic nut		Tightening torque	3 Nm

Rear bulkhead upper part to lower section of bulkhead — Used in step 75

Oval-head screw		Tightening torque	5 Nm

Battery holder to engine support — Used in step 76

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray — Used in step 77

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover — Used in step 77

TS5x20		Tightening torque	3,5 Nm

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Cover to electronics box — Used in step 77

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery — Used in step 77

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray — Used in step 77

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 77

		Tightening torque	3 Nm

Battery cover — Used in step 77 84

Screw			2,8 Nm

Exhaust gas pressure sensor — Used in step 78

Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger — Used in step 78

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 78

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 78 87

Clamp		Tightening torque	3 Nm

Underbody protection front — Used in step 79

			3 Nm

Resonator to manifold and clean air pipe — Used in step 80

Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top — Used in step 83

Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray — Used in step 84

M8 screw			19 Nm

Positive battery terminal — Used in step 84

NutM6			5 Nm

Trailing link — Used in step 84

M8 screw			19 Nm

Positive battery cable to battery terminal — Used in step 84

Nut M8			15,2 Nm

Negative battery terminal (with IBS) — Used in step 84

NutM6			5 Nm

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Windscreen wiper arm Used in step 86

Combination hexagon nut		Tightening torque	35 Nm

Intake silencer housing to lock bridge Used in step 87

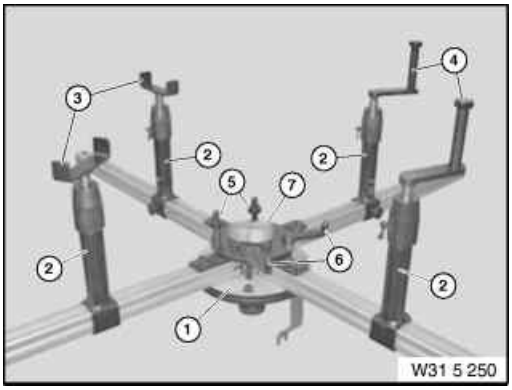
M6X30		Tightening torque	8 Nm

Intake neck to cross connection Used in step 88

M6		Tightening torque	8 Nm

Overview of Special Tools

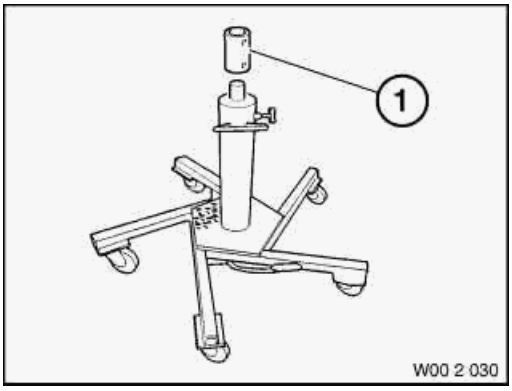
0 495 817 (31 5 251) Basic body



Common Used in step 27 62

Usage	(Basic body) No longer available separately, only via special tool set 31 5 250 (83 30 0 495 567)
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 490 133 (00 2 030) Device



Common Used in step 27 62

Usage	(universal hydraulic lifter base unit) Chassis and hydraulic lifter - For removing and installing rear axle supports and gearboxes. Also for soft top mounts. Is replaced by 81 22 2 219 012
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	01 05 90 (207)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 490 134 (00 2 031)		**Adapter** (adapter for gearbox holder) Model series: E30, E31, E32, E34, E36	

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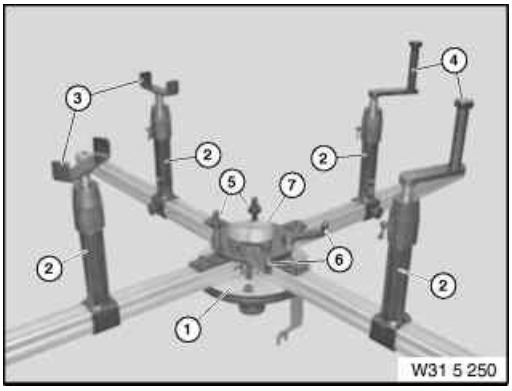
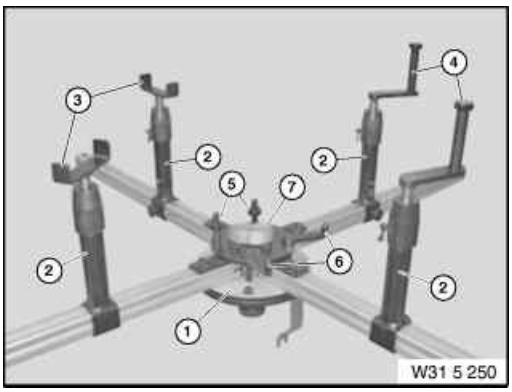
0 495 821 (31 5 255) Adapter



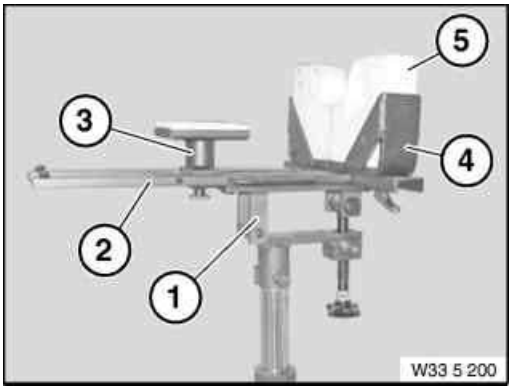
Common	Used in step 27
Usage	(take-up adapter for bore holes (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 495 819 (31 5 253) Adapter



Common	Used in step 27
Usage	(take-up adapter U-section (2 x))
Included in the tool or work	0 495 567
Storage location	
Replaced by	
In connection with	
SI-Number	01 24 06 (309)

0 496 080 (33 5 206) Belt



Common	Used in step 27 62
Usage	(Tensioning strap)
Included in the tool or work	0 496 009
Storage location	
Replaced by	
In connection with	
SI-Number	

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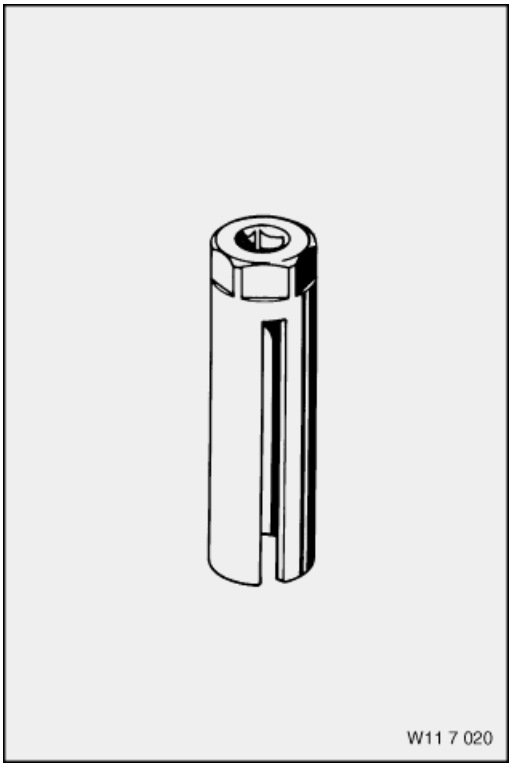
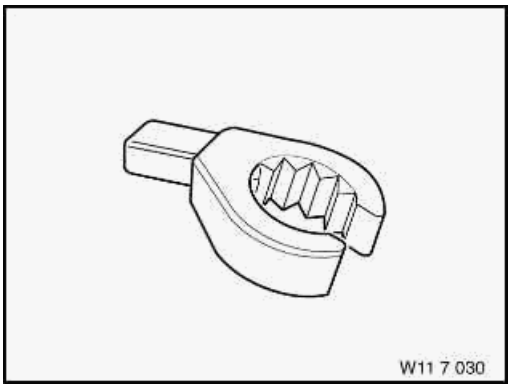
0 491 074 (11 7 020) Socket wrench insert



Common	Used in step 33 34 57
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	

0 491 075 (11 7 030) Socket wrench insert



Common	Used in step 39 51
Usage	(Socket wrench insert 22 mm) For loosening and tightening the oxygen sensor
Included in the tool or work	
Storage location	A9
Replaced by	
In connection with	
SI-Number	01 06 95 (963)

2 344 011 Tool

Common	Used in step 71
Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

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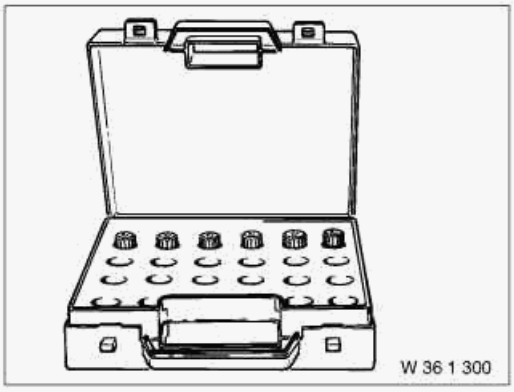
0 495 221 (36 1 323) Wheel stud



Common	Used in step 18
Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 224 (36 1 326) Wheel stud

Common	Used in step 18
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 18
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 226 (36 1 328) Wheel stud

Common	Used in step 18
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 227 (36 1 329) Wheel stud

Common	Used in step 18
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 18
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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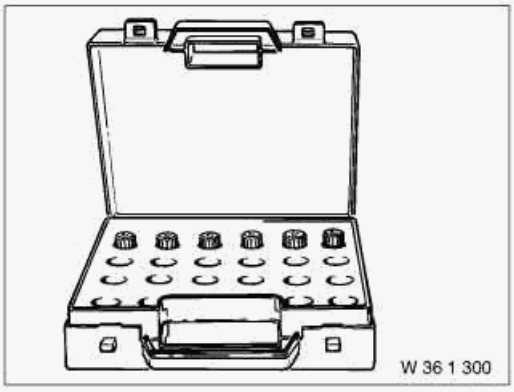
0 495 229 (36 1 332) Wheel stud



Common	Used in step 18
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 18
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Links

Functional descriptions	Used in step
Troubleshooting on the exhaust turbocharger	46

General repair instructions	Used in step
61 20 ... Notes on AGM battery	3 84
61 12 ... Notes on intelligent battery sensor (IBS)	3 84
61 00 ... Notes for disconnecting and connecting battery	3 84

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	12 33 34 36 37 38 39 40
11 65 020 Turbocharger damage due to blocked oil supply lines	46
11 65 ... Test steps in the event of turbocharger damage	46

Operating materials	Used in step

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11 65 ... Test steps in the event of turbocharger damage

Attention!

The following components must always be checked for foreign bodies, damage and function before installing the new turbocharger.

- Pressure pipe and hoses
- Charge air cooler
- Intake plenum
- If the oil return line is exchanged, then the connecting pipe to the oil sump must ALWAYS be cleaned, as this can even coke!

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11 66 000 Removing and installing or replacing oil/vacuum pump (B37C)

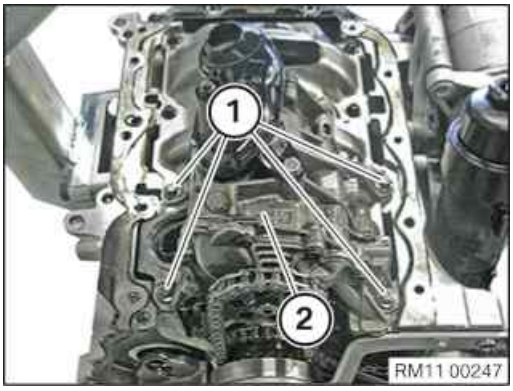
Important!

It is possible to remove and install the oil/vacuum pump **without** removing the transmission.

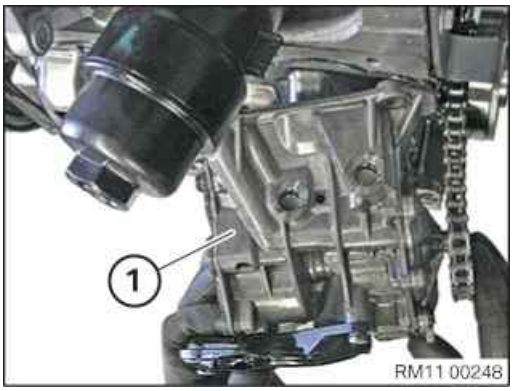
Necessary preliminary tasks:

- Remove oil sump.

REMOVAL:



Release screws (1) of oil/vacuum pump (2).



Remove oil/vacuum pump (1).

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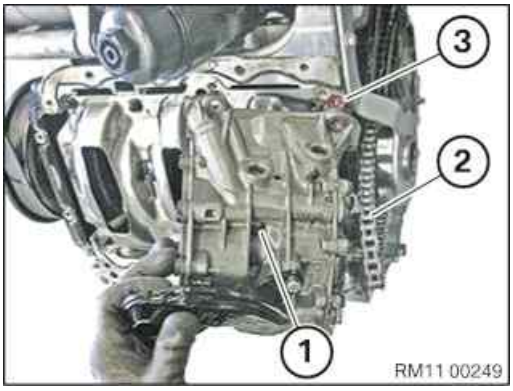
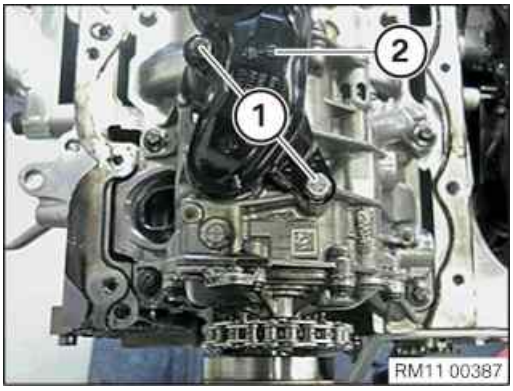


Feed oil/vacuum pump (1) out of drive chain (2) and remove.

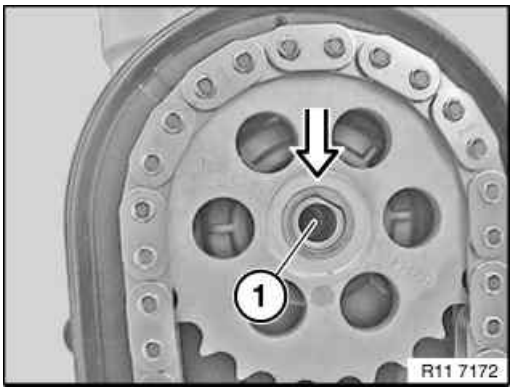


Replacement:

Release screws (1). Remount intake pipe (2).

Tighten down screws (1).

Tightening torque: 11 41 1AZ.

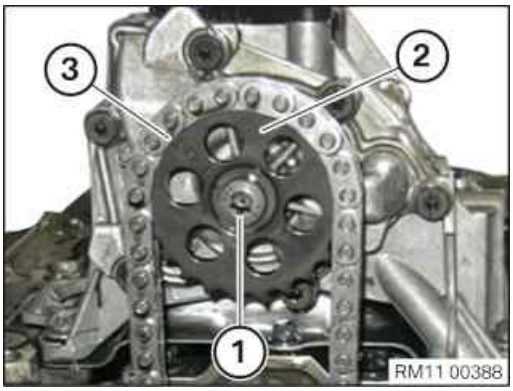


Replacement: Important!

Pay attention to mounting flats (1) on oil pump (see arrow).

The label "Front" must be visible.

Note:
Figure N47.



Replacement:

Important!

Screw (1) has left-hand thread.

"Front" (3) must be readable.

Hold down camshaft sprocket (2) with a suitable tool. Release screw (1). Remount camshaft sprocket.

Parts: Replace screw (1).

Mount camshaft sprocket (2) and hold down with a suitable tool. Tighten screw (1).

Tightening torque: 11 41 4AZ.

INSTALLATION:

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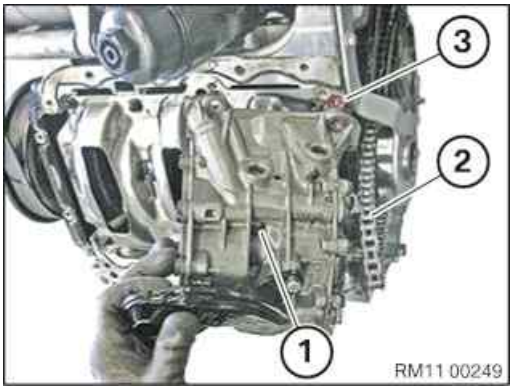
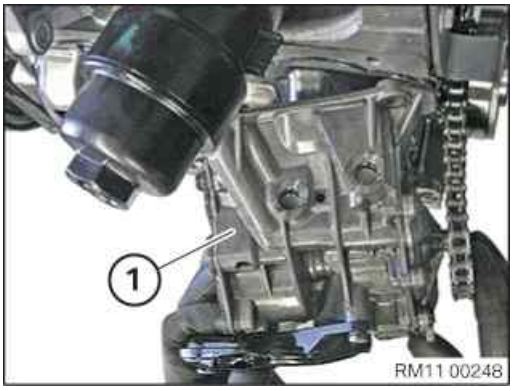


Important!

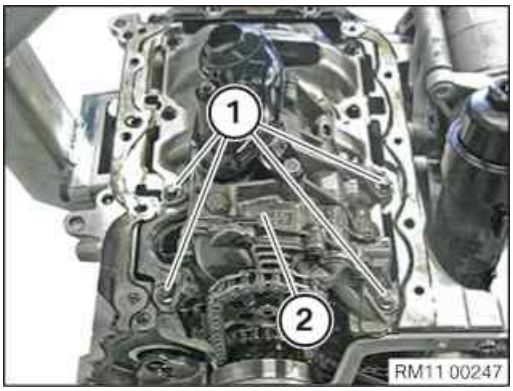
Sealing ring (3) must not be damaged or missing.

Check centring bushes for damage, replace if necessary.

Feed oil/vacuum pump (1) into drive chain (2).



Install oil/vacuum pump (1).



Tighten down screws (1) of oil/vacuum pump (2).

Tightening torque: 11 41 2AZ.

Required follow-up work:

- Install oil sump.

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11 66 006 Removing and installing/replacing the non-return valve

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

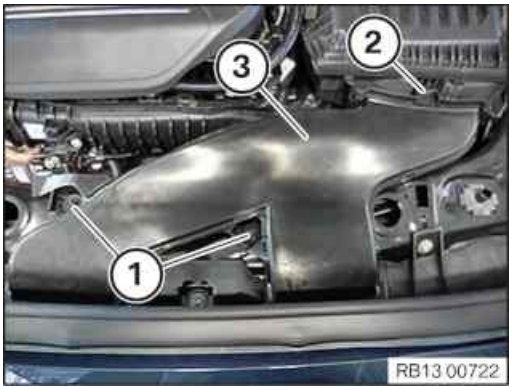
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

3 – Removing intake silencer housing

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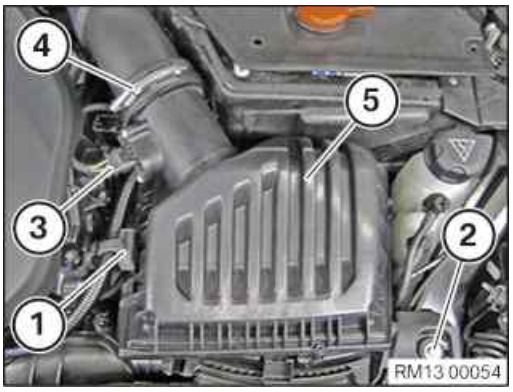
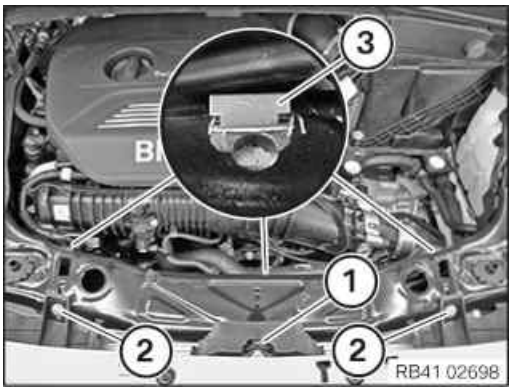
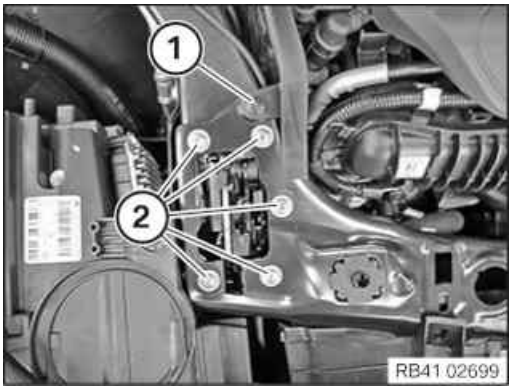


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

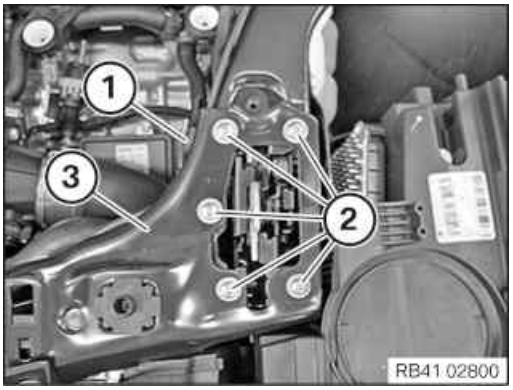
4 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

5 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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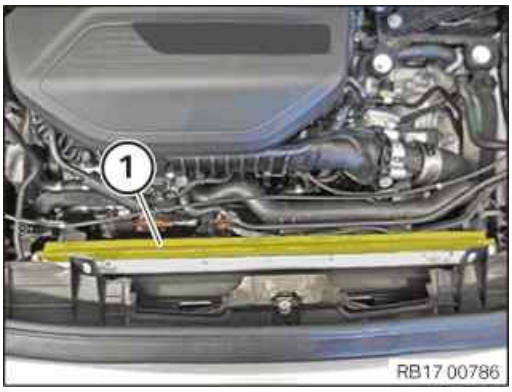
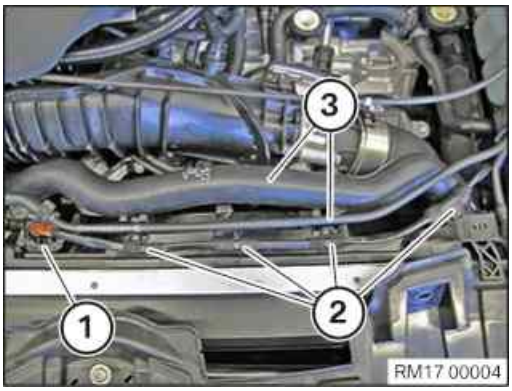
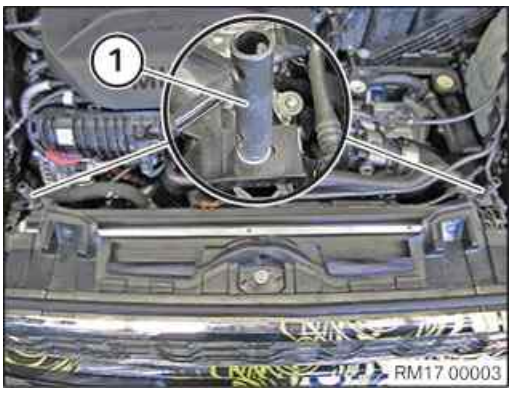


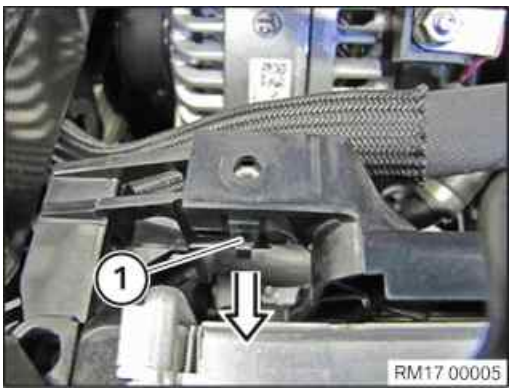
- Feed out and remove the sealing (1) from the radiator.



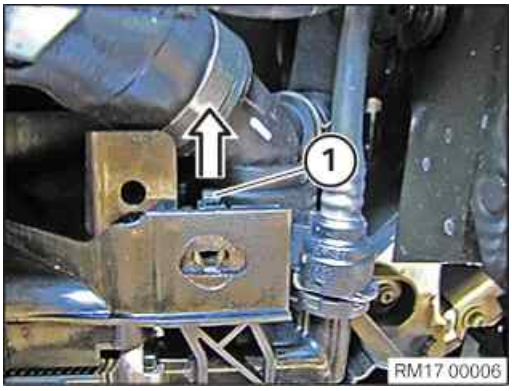
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

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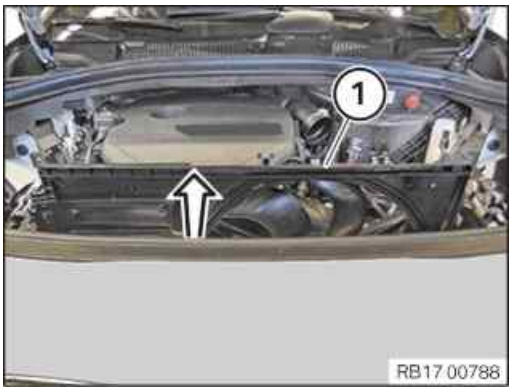
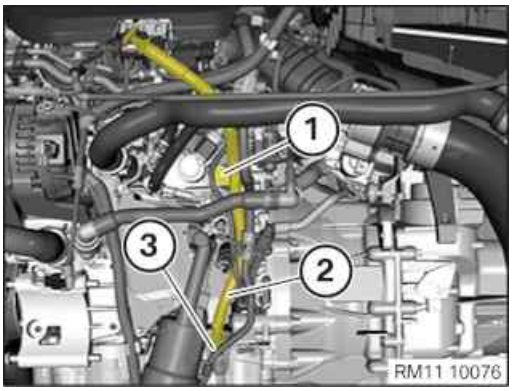


- Guide out fan cowl (1) in direction of arrow and remove.

6 – Removing the guide tube for the oil dipstick



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

MAIN WORK

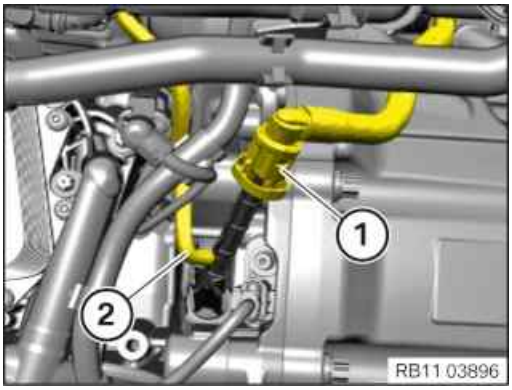
7 – Remove non-return valve

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.



- Unlock and pull off the vacuum line (1).
- Pull off the vacuum hose (2).

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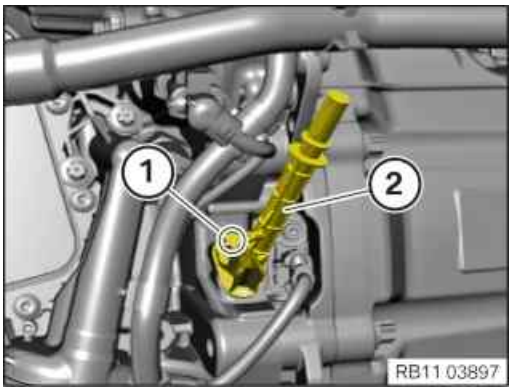


- Loosen screw (1).
- Feed out the non-return valve (2) and remove.

8 – Installing non-return valve

- Renew gasket (1) using special tool **0 496 714 (00 9 030)**.

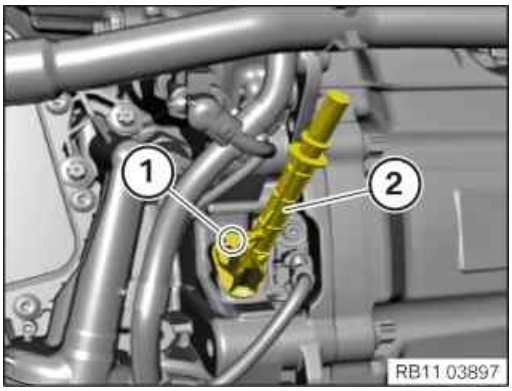
  Parts: Gasket

RISK OF DAMAGE

Damage to the surface.

The use of metal-cutting tools (e.g. emery cloth) to clean the surfaces can damage them and lead to leaks or engine damage.

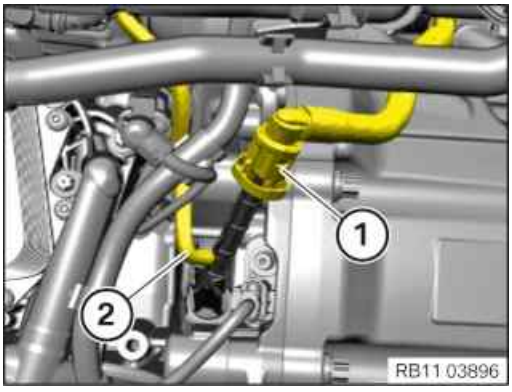
- Do not use any metal-cutting tools.
- Clean sealing surface.



- Feed in non-return valve (2) and install.
- Tighten down screw (1).

Vacuum line for oil vacuum pump to crankcase

M6x22		Tightening torque	8 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect the vacuum line (1) and lock it audibly.
- Connect vacuum hose(2).

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9 – Installing guide tube for oil dipstick

RISK OF DAMAGE

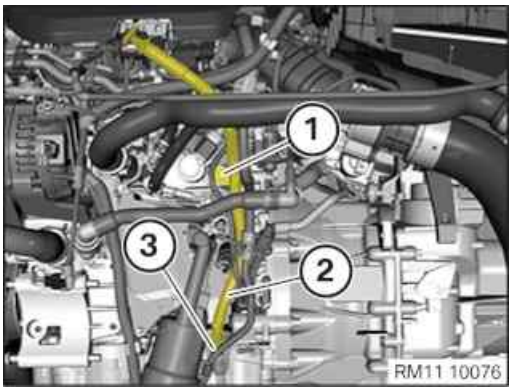
Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and slide it into the oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

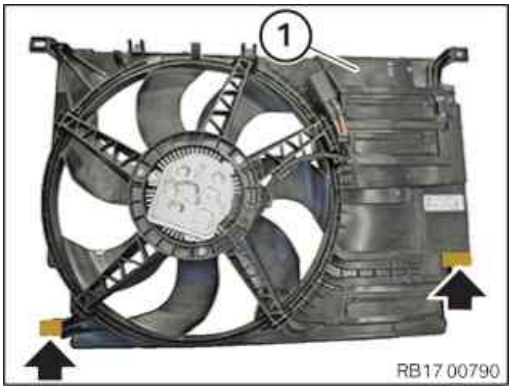
Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

10 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.

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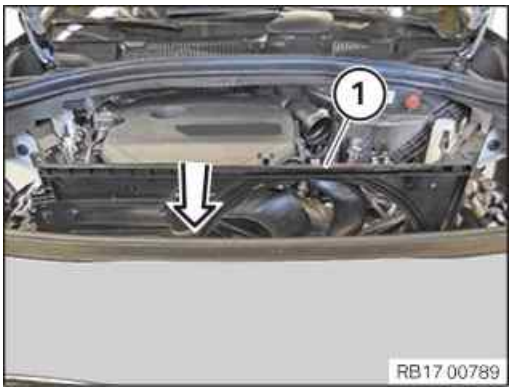
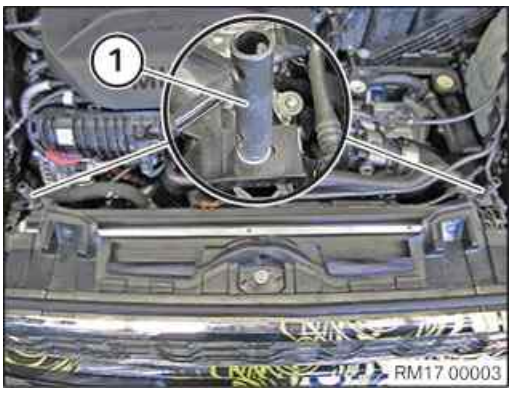


- Feed in and install the fan cowl (1) in the direction of the arrow.

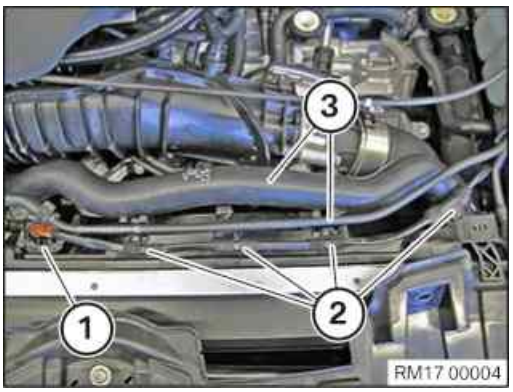
- Lock the left and right locks (arrows).



- Tighten the screws (1).

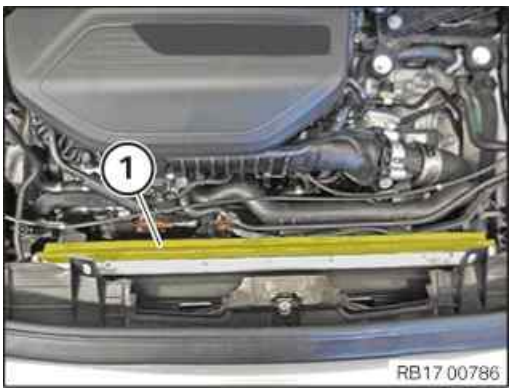
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



- Guide the sealing (1) on the radiator in and install it.

11 – Install cross connection

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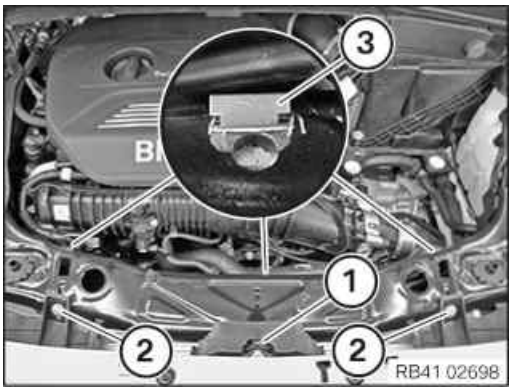


- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

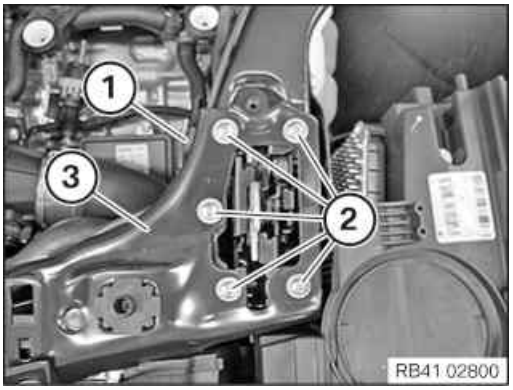
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

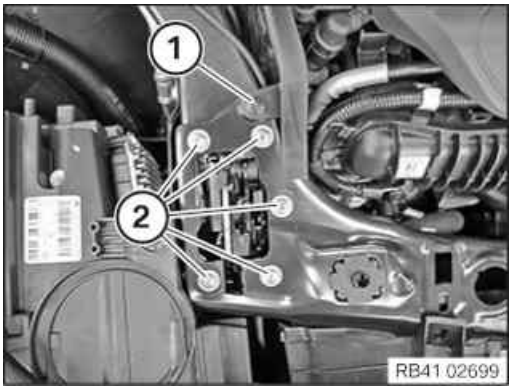


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



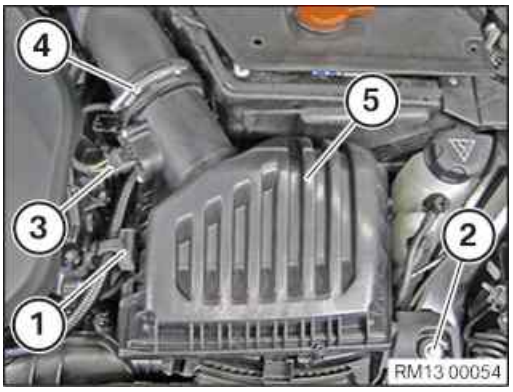
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

12 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

13 – Install the intake neck for the intake filter housing

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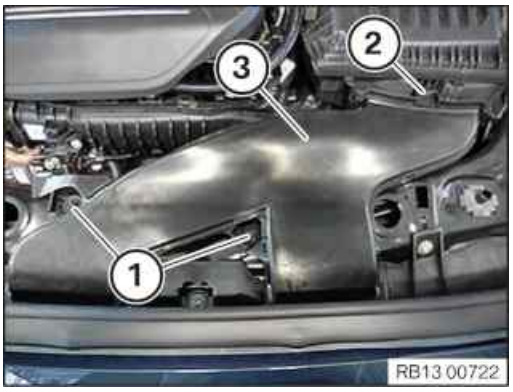

- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

14 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Vacuum line for oil vacuum pump to crankcase Used in step 8

M6x22		Tightening torque	8 Nm

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Guide tube for oil dipstick on engine			Used in step 9
M8x16		Tightening torque	19 Nm

Fan cowl on radiator			Used in step 10
M6X12		Tightening torque	6 Nm

Bracing strut to top cross connection			Used in step 11
M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection			Used in step 11
M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection			Used in step 11
M6x20		Tightening torque	12 Nm

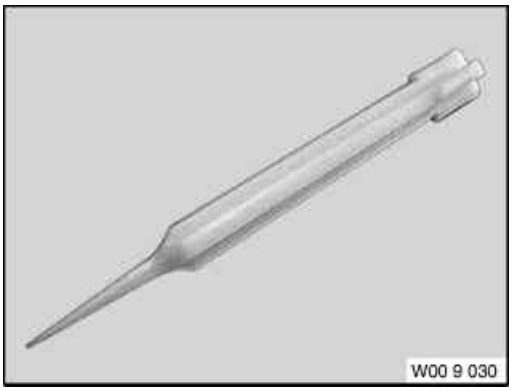
Intake silencer housing to lock bridge			Used in step 12
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 12
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 13
M6		Tightening torque	8 Nm

Overview of Special Tools

0 496 714 (00 9 030) Wedge



Common	Used in step 8
Usage	For dismantling O-rings, gaskets and trim panels. This special tool replaces special tool 00 9 316.
Included in the tool or work	
Storage location	A50
Replaced by	
In connection with	
SI-Number	01 20 09 (581)

Links

Functional descriptions	Used in step
Oil supply	9

Parts

Parts required

Designation	Used in step
Seal of vacuum line for oil vacuum pump to crankcase	8
Seal, guide tube for oil dipstick on oil sump	9

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This documentation refers to special tools that were not yet available when going to press.

11 66 000 Removing and installing/replacing vacuum pump

PRELIMINARY WORK

1 – Disconnecting all battery earth leads

- See additional information.

2 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

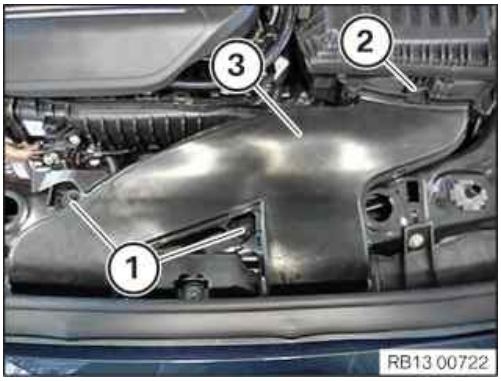
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

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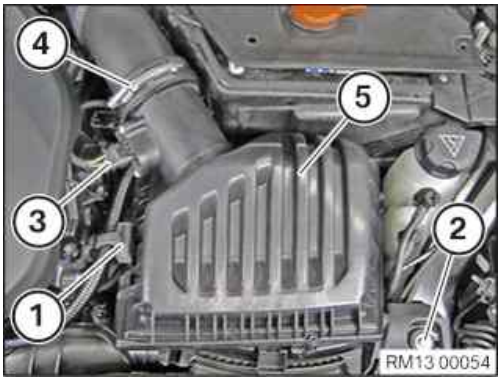
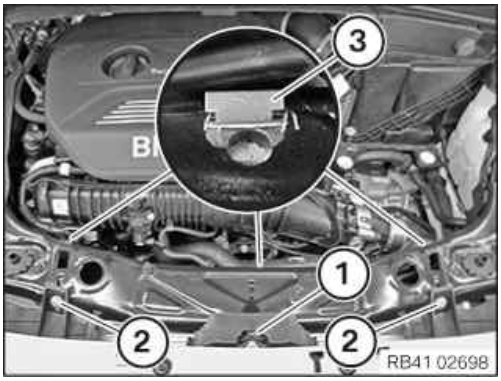
4 – Removing intake silencer housing

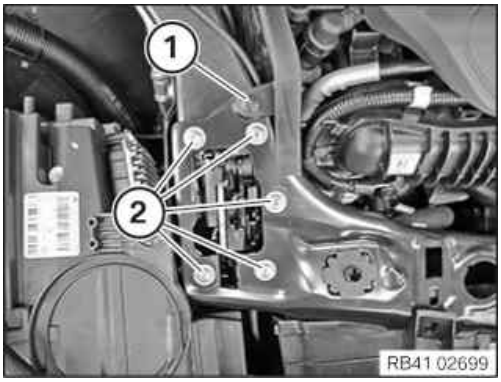


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

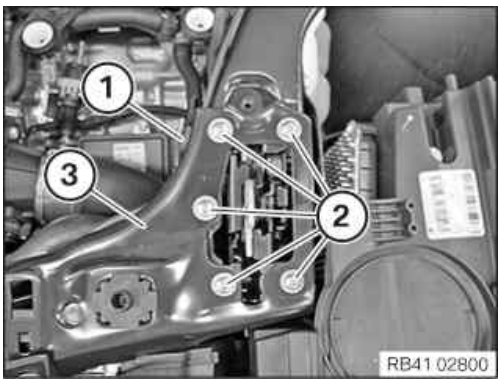
5 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

6 – Removing the fan cowl with electric fan

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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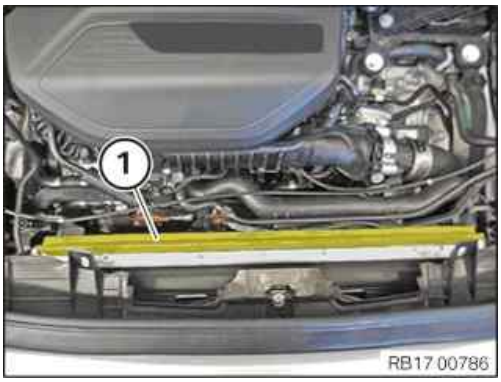
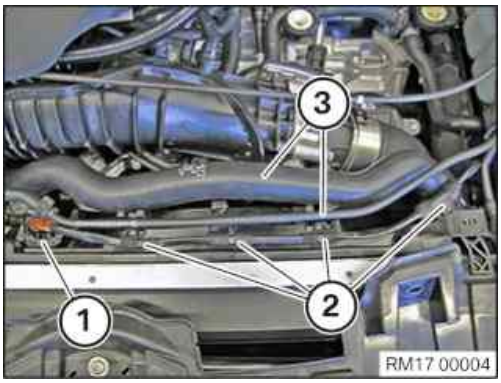
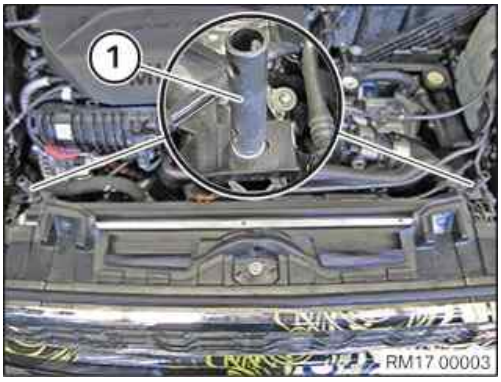


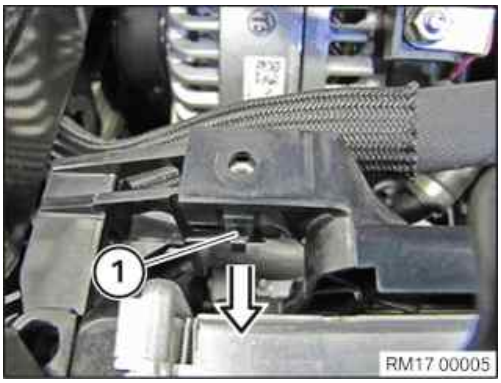
- Feed out and remove the sealing (1) from the radiator.



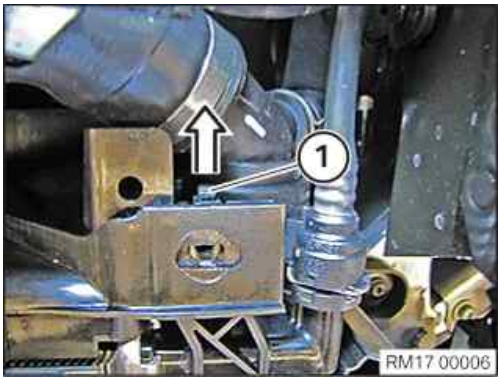
- Unlock plug connection (1) and disconnect.
- Unlock and loosen the clamps (2).
- Feed out connector (1) and place to one side.
- Thread off coolant line (3) and place to the side.



- Loosen screws (1).



- Unlock the right lock (1) on the fan cowl in the direction of the arrow.



- Unlock the left lock (1) on the fan cowl in the direction of the arrow.

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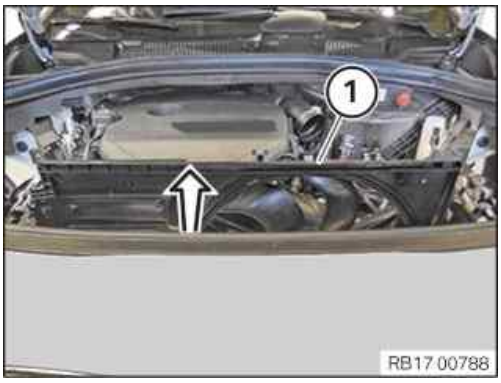
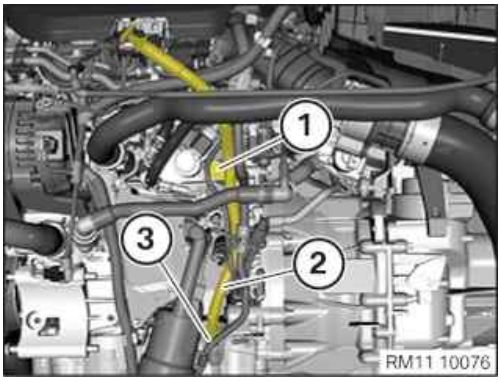


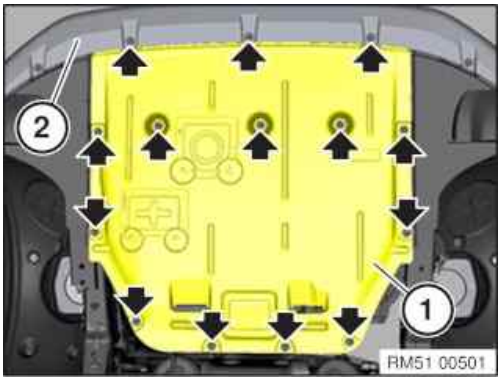
- Guide out fan cowl (1) in direction of arrow and remove.

7 – Removing the guide tube for the oil dipstick



- Unscrew the bolt (1) in the marked area.
- Disconnect the guide tube (2) for the oil dipstick toward the top from the oil sump and remove it.
- Remove sealing ring (3) from oil sump if necessary.

8 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

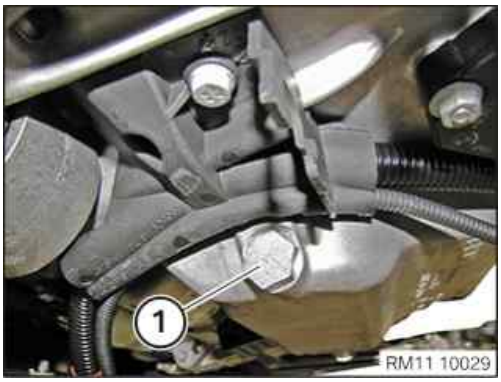
9 – Releasing the oil drain plug

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.



TECHNICAL INFORMATION

Catch and dispose of drained engine oil in a suitable collecting vessel.
Observe country-specific waste disposal regulations.

- Release oil drain plug (1).
- Drain engine oil.

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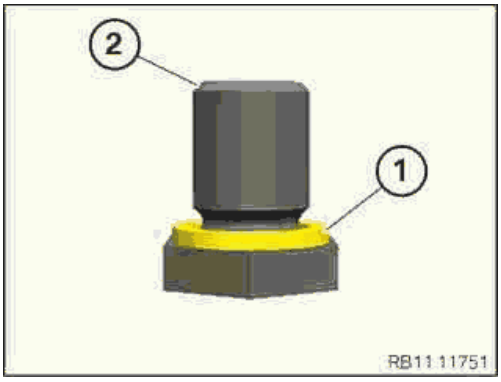
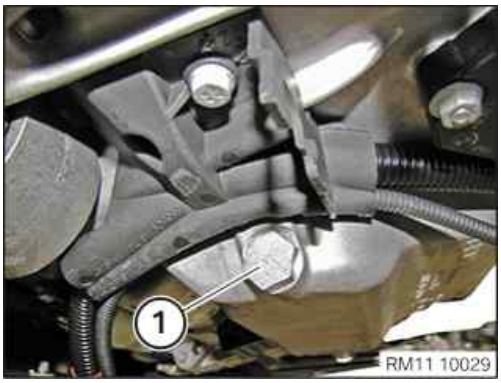
10 – Tightening the oil drain plug



- Renew sealing ring (1) on the oil drain plug (2).

  Parts: Sealing ring

- Guide in the sealing ring (1) on the oil drain plug (2) and install.



- Renew the sealing ring.

  Parts: Sealing ring

- Position oil drain plug (1) on the oil sump and tighten.

Oil drain plug on oil sump

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

11 – Remove front right wheel

TECHNICAL INFORMATION

The wheel can be balanced electronically at the vehicle. In this case, it is important not to change the position of the wheel relative to the wheel hub.

TECHNICAL INFORMATION

Strictly observe the specified procedure to prevent clamping errors and imbalance.

- Turn the wheel so that the valve (arrow) points down.
- If several wheels are removed simultaneously: Use a piece of chalk to mark on each tyre the axle and side on which the corresponding wheel is fitted.
- Mark the alignment of the wheel with respect to the wheel hub.
- Mark the position of the lockable wheel bolt (arrow).
- Unscrew the wheel bolts and remove the wheel.

  Use the matching adapter from tool set (wheel bolt adapter set) to loosen and tighten down the wheel bolt with security code.

12 – Removing the front right wheel arch cover

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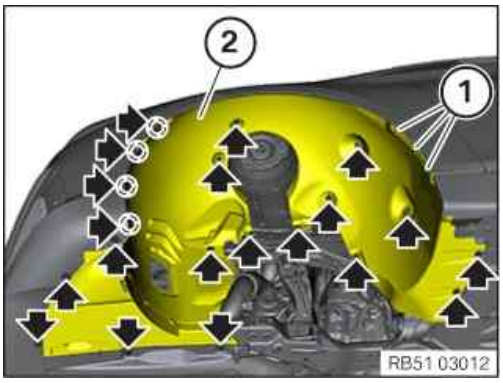
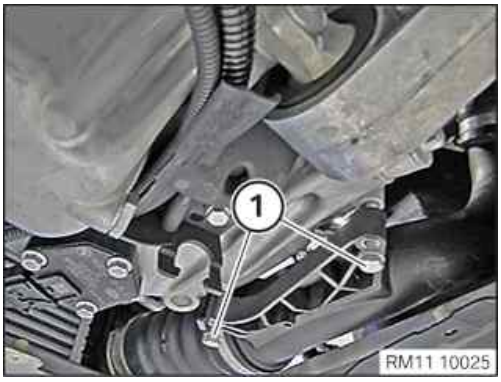


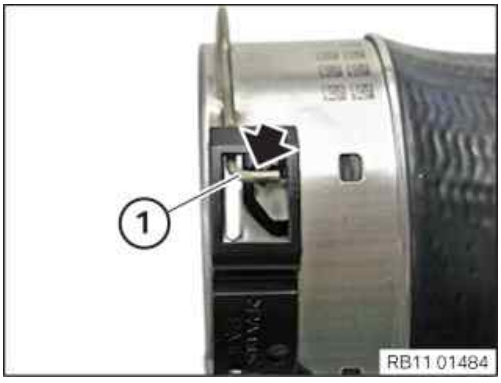
- Loosen the expanding rivet (1).
- Unscrew all bolts and nuts (arrows).
- Feed the wheel arch cover (2) out at the front right and remove it.

13 – Remove right charge-air line

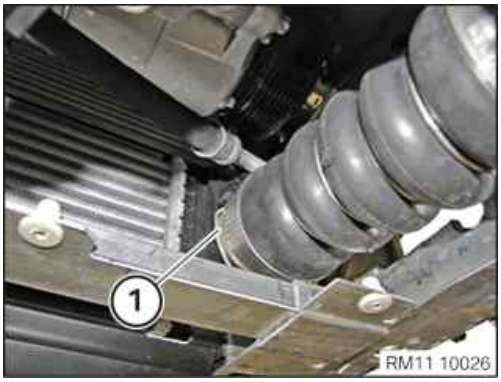


- Release charge air duct screws (1) on oil sump.

- Detach charge air duct screw connection (1) on crankcase.



- Unfasten lock (1) on exhaust turbocharger and charge air cooler.
- Let the lock (1) engage at the holder (arrow).



- Ensure that lock (1) on charge air cooler is unlocked on both sides.
- Detach charge air duct from charge air cooler.

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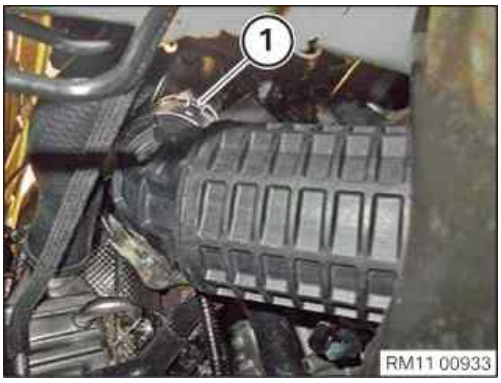


- Ensure that locks (1) from exhaust turbocharger are both unlocked.
- Pull charge air line from exhaust turbocharger.

- Feed out and remove charge air line between side member and front axle support through the wheel arch downwards and to the side.

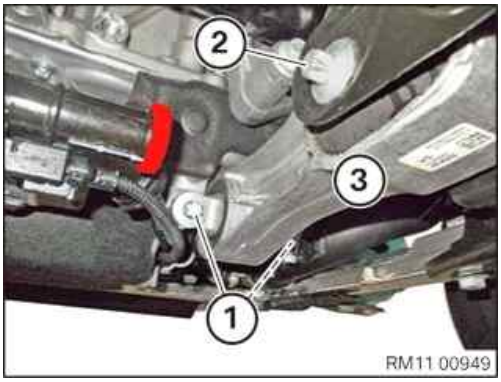
14 – Remove bracket with rubber mount

WARNING

Motor vehicle may slip off the vehicle hoist where components are supported.

Danger! Life-threatening injuries!

- Secure the vehicle hoist against lowering and lifting.



- Support the engine with the jack at a suitable point.
- Loosen screws (1) and (2).
- Guide out and remove holder (3).

15 – Removing the acoustic cover of the oil sump

- Unlock connector (1) and pull off.
- Detach the sealing cap (2) in the direction of the arrow.
- Feed out and remove the sealing cap (2).

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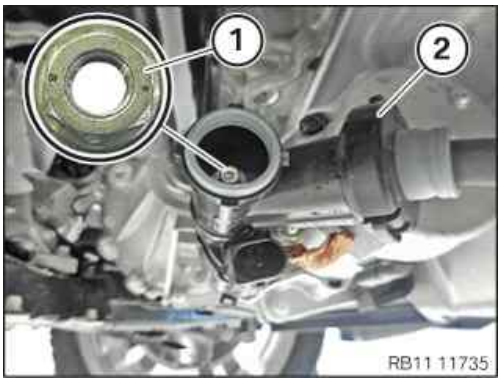
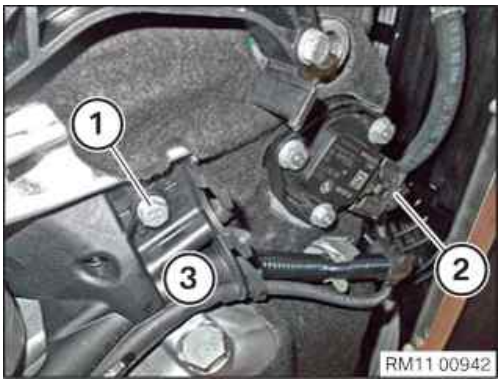
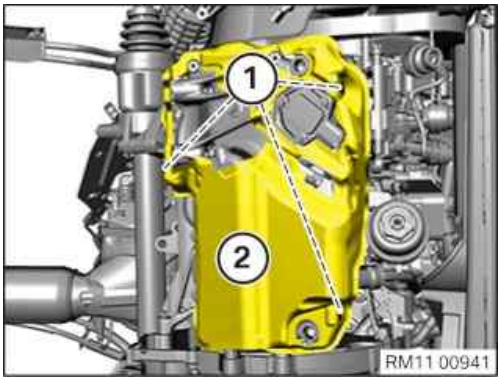


- Unfasten nut (1).
- Feed out the positive battery cable (2) of the starter motor and set it aside.



- Unscrew the screw (1) on the wiring harness to the oil sump.
- Unlock and pull off connector (2) on the oil-level sensor.
- Place wiring harness (3) to one side.



- Remove the expanding rivets (1) on both sides of the acoustic cover.
- Feed out and remove the acoustic cover (2).

16 – Remove oil sump

- Loosen screws (1).
- Feed out starter motor and remove.

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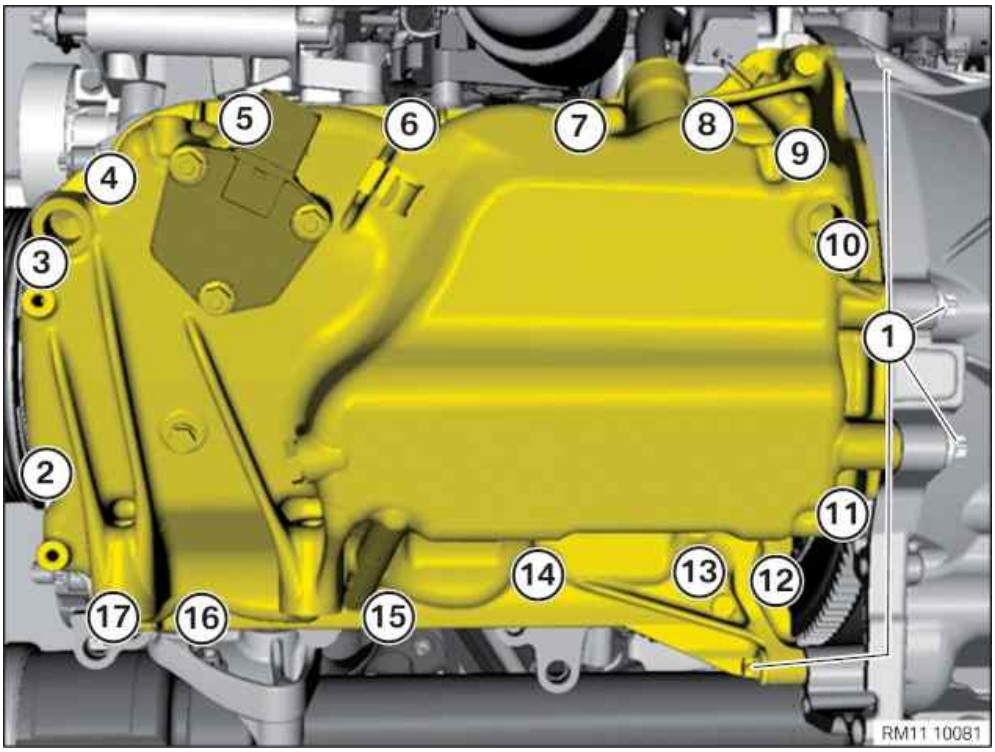
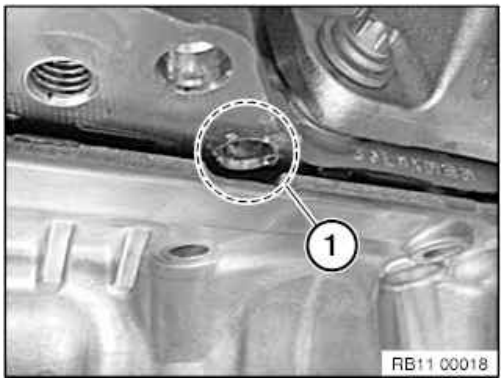
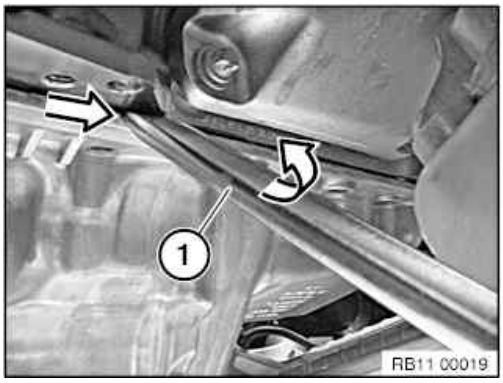


- Release transmission bolts (1) on the oil sump.
- Loosen screws (2) to (17).



- Release the oil sump only in area (1).



- Release the oil sump carefully using a suitable mounting lever (1) at the appropriate position in the direction of the arrow.
- Secure the oil sump to prevent it from falling.

MAIN WORK

17 – Remove the oil vacuum pump

- Loosen screws (1) of the oil vacuum pump (2).

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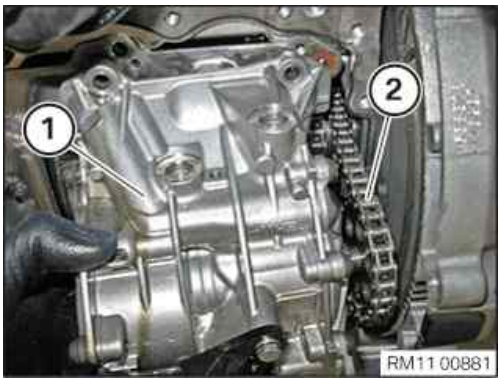
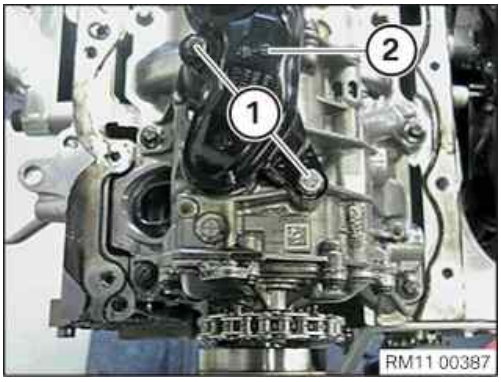


- Remove oil vacuum pump (1) and remove from the drive chain (2).

18 – Replacing the oil vacuum pump: Remount components

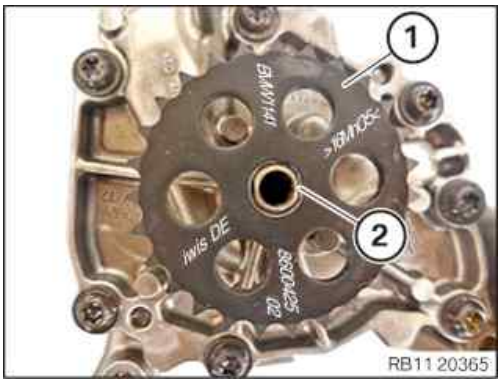


- Loosen screws (1).
- Renew the oil vacuum pump.

  Parts: Oil vacuum pump
- Remount the intake pipe (2).
- Tighten the screws (1).

Intake pipe to oil vacuum pump

M6x25		Tightening torque	8 Nm



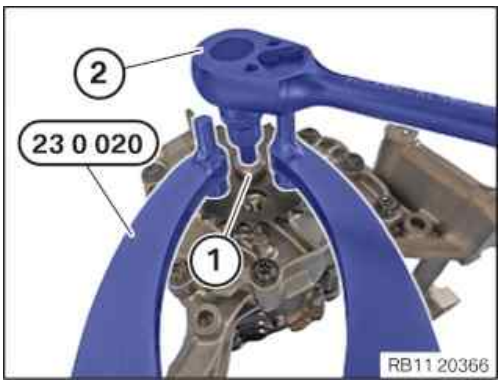
- Counterhold the camshaft sprocket with the special tool **(23 0 020)**.

TECHNICAL INFORMATION

The thread is a left-hand thread.

- Release the screw on the camshaft sprocket (1) and remove the camshaft sprocket.
- Position the camshaft sprocket on the new oil vacuum pump.

  The Front labelling on the camshaft sprocket must be legible.



- Counterhold the camshaft sprocket with the special tool **(23 0 020)**.
- Renew screw.

  Parts: Screw
- Tighten the screw (1) using a commercially available tool (2).

Camshaft sprocket to oil vacuum pump

M8x35 Left-hand thread	*Renew screws.*	Jointing torque Angle of rotation	5 Nm 90 °

19 – Install the oil vacuum pump

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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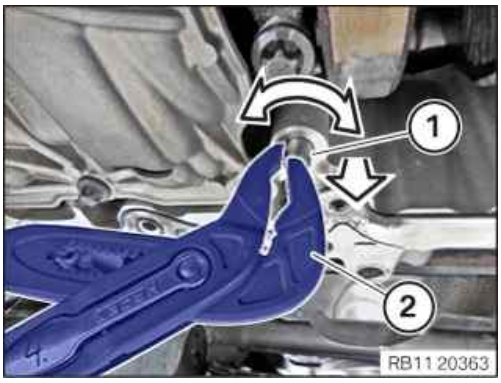
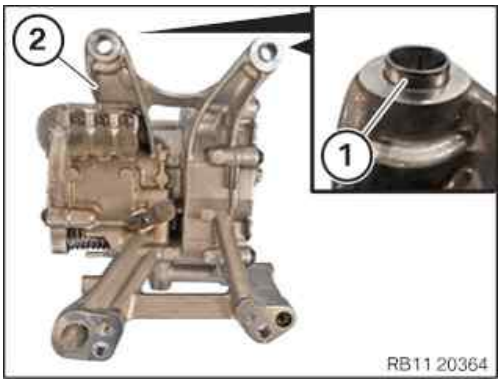
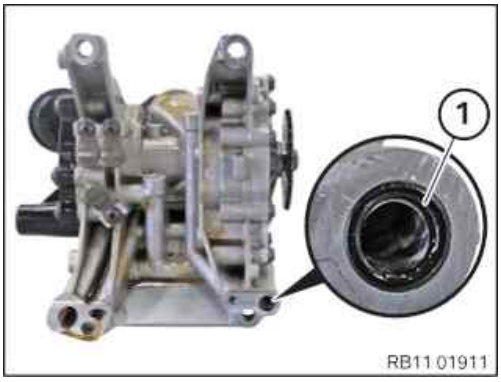


- Remove centering sleeves from the crankcase (1) using a standard tool (2).
- Renew the centring sleeves (1).

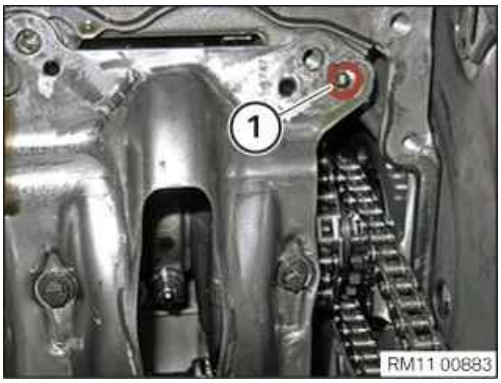
  Parts: Centring sleeves



- Install centering sleeves (1) in the oil vacuum pump (2).

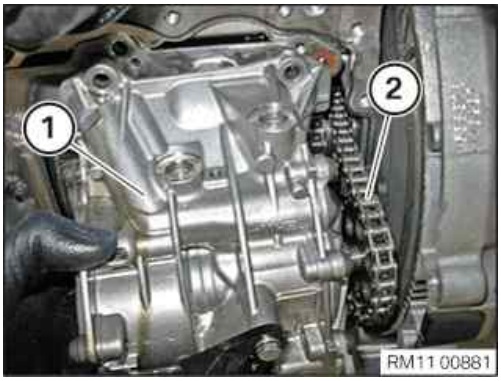


- Check the sealing ring (1) for damage and renew where required.
- Make sure the sealing ring (1) is installed correctly.



- Check sealing ring (1) for damage and replace oil deflector if necessary.

  Parts: Oil deflector



- Insert oil vacuum pump (1) into the drive chain (2).

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- Renew screws (1).

  Parts: Bolts

- Tighten the screws (1) of the oil vacuum pump (2).

Oil vacuum pump to crankcaseB37

M8x35	*Renew screws.*	Tightening torque	15 Nm
		Angle of rotation	45 °

POSTPROCESSES

20 – Refitting sump

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove fine sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

- Remove coarse sealing remains on the sealing surface (1)and the sealing surface on the engine block with the special tool **0 495 102 (11 4 470)**.
- Clean sealing surface (1) with brake cleaner.

Expendable materials

Brake cleaner2.0	500 ml, Spray can	83192365214
	20 , Canister	83192365215

- Have the special tool ready.

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TECHNICAL INFORMATION

For more information see: 11 00 ... Overview of consumables in Electronic Parts Catalogue

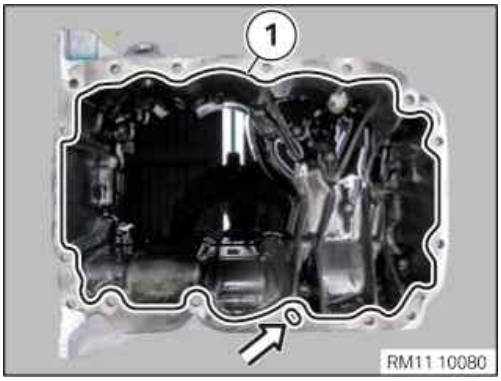
- Position the sealing compound (1) on special tool as shown.

  Parts: Sealing compound

Sealing compound

Loctite 5970 liquid sealing compound	50 ml, Cartridge	83190404517

Overview of consumables (Electronic Parts Catalogue)



TECHNICAL INFORMATION

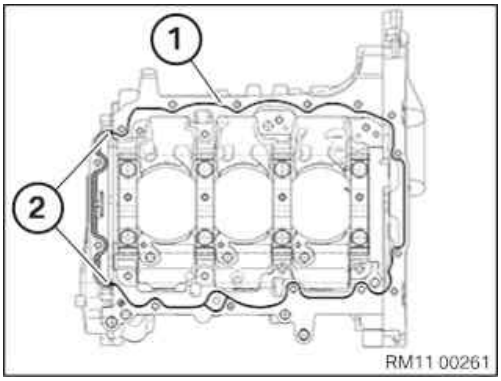
The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound without replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Completely surround the oil return orifice (arrow) with the sealing compound.

  No sealing compound may enter the oil return orifice.



TECHNICAL INFORMATION

The sealing surfaces must be free from oils, grease and cleaning agents.

TECHNICAL INFORMATION

The maximum application time of the liquid sealing compound is 12 minutes.

- **Applying sealing compound after replacing front bottom gear case cover:**
- The height of the sealing compound must be approx. between **2.0 mm** and **2.5 mm**.
- Apply the sealing bead along the inner edge (1) of the oil sump.
- Sealing bead (1) must overlap the seal (2) of the timing case cover by approx. **5 mm**.
- Completely surround the oil return orifice (arrow) with sealing compound.

  No sealing compound may enter the oil return orifice.
- Fix oil sump within the prescribed application time of the sealing compound.

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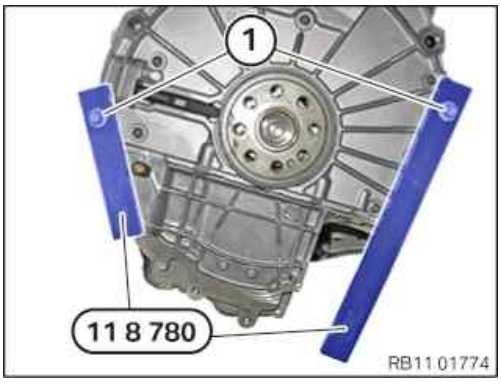
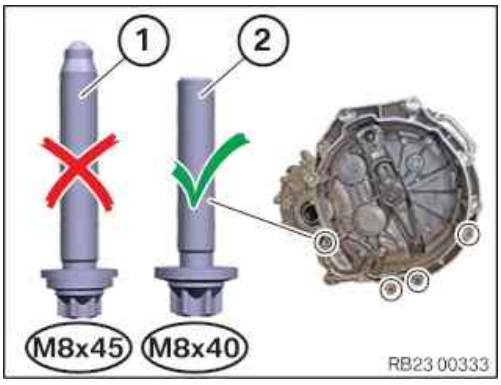


TECHNICAL INFORMATION

The special tool 11 8 780 is only required when the transmission is removed.

- Position the special tool **0 496 120 (11 8 780)** with the transmission bolts (1) so that the oil sump is exactly flush with engine block.
- Renew the fitting sleeves if required.



RISK OF DAMAGE

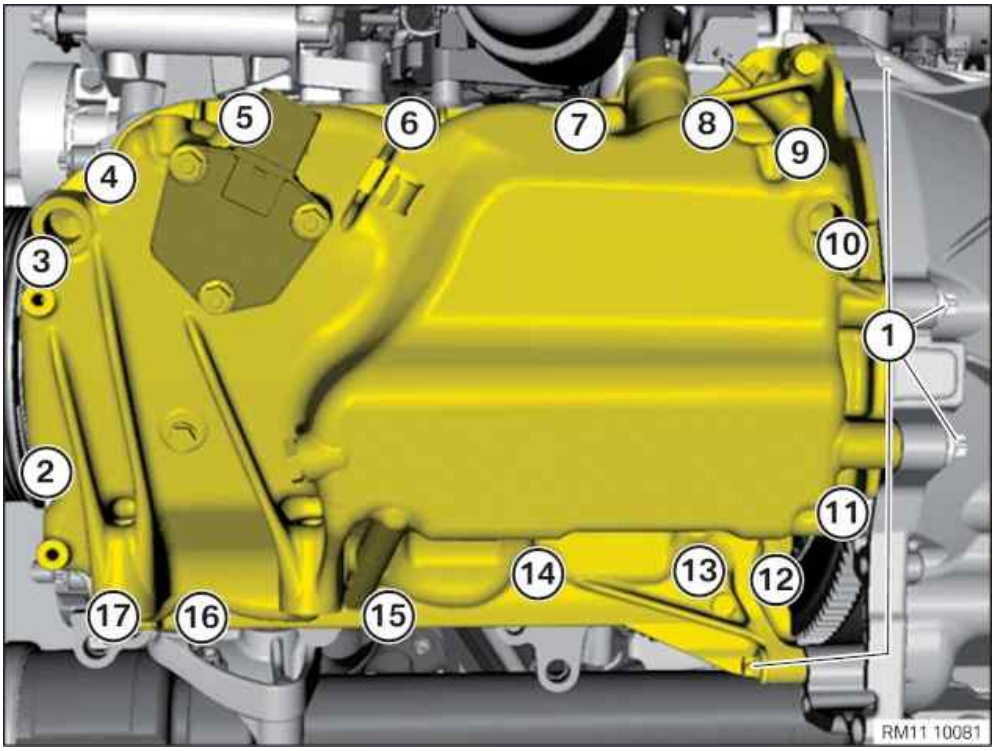
Component damage caused by incorrect screw length.

The use of screws with the incorrect screw length can damage the component.

- Check for correct screw length.
- Re-install screws that correspond to the original screw length.

- Ensure that the **correct** screw (2) (M8x40) is used for mounting the oil sump on the transmission.

  The screw (1) (mounting bolt of the starter motor) may **never** be used for mounting the oil sump.



- Position and install the oil sump.
- Tighten screws (2) to (17) **hand-tight**, do **not** tighten fully.
- Join transmission bolts (1) with 5 Nm.
- Tighten screws (2) to (17) on the oil sump.

Oil sump to crankcase

M8x30		Tightening torque	2 Nm
M8x110		Tightening torque	2 Nm

- Tighten the transmission bolts (1) on the oil sump.

Transmission to oil sump

M8		Tightening torque	1 Nm

- Insert and install the starter motor .
- Tighten the screws (1).

Starter motor to transmission

M8x45		Tightening torque	19 Nm

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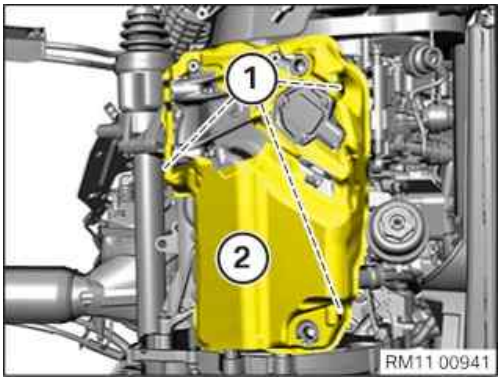
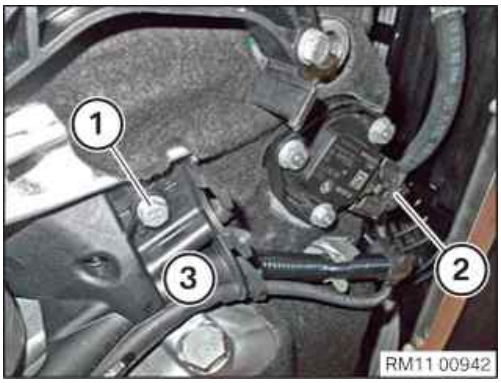
21 – Installing the acoustic cover for the oil sump



- Thread in and position the acoustic cover (2).
- Install the expanding rivet (1).



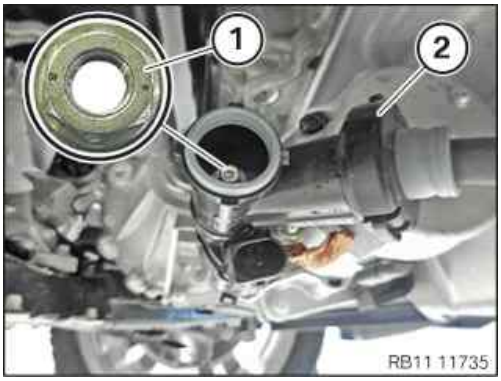
- Position wiring harness (3).
- Tighten down screw (1).

Bracket to oil sump

M6		Tightening torque	8 Nm

- Connect and lock the connector (2) on the oil-level sensor.

  The connector must lock audibly.



CAUTION

Improper routing of the positive battery cable.

Risk of short circuits!

- Route the positive battery cable without abrasions and do not trap.

- Feed the positive battery cable (2) in on the starter and install.
- Tighten nut (1).

Battery positive lead to starter

M8		Tightening torque	13,5 Nm

- Insert and install the new sealing cap (2).
- Secure the sealing cap (2) in the direction of the arrow.
- Connect and lock the connector (1).

  The connector must engage audibly.

22 – Install the holder with the rubber mount

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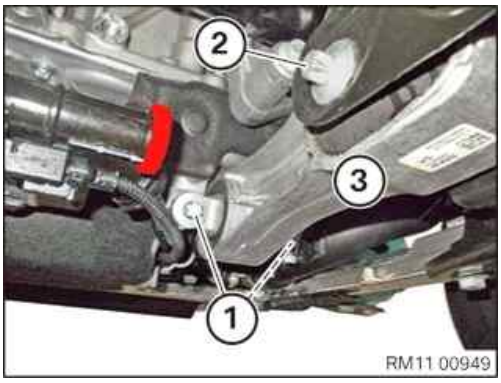


- Insert and install the holder (3).
- Tighten the screws (1) and (2) hand-tight.
- Release jack.
- Tighten down screw (2).

Holder to front axle support

M12		Tightening torque	100 Nm

- Tighten the screws (1).

Bracket to oil sump

M12		Tightening torque	100 Nm

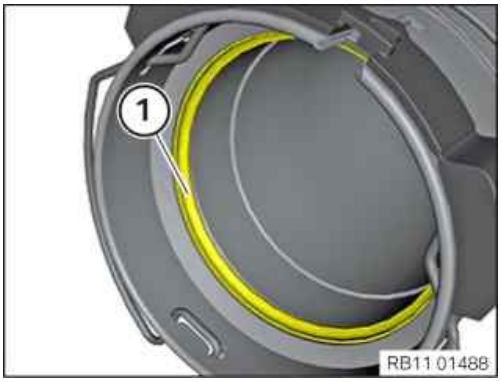
23 – Install right charge air duct

RISK OF DAMAGE

Damage to the exhaust turbocharger.

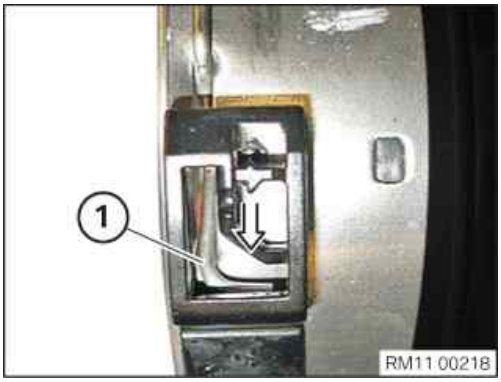
A leak at the pressure pipe can damage the exhaust turbocharger.

- Replace the gaskets and pressure pipe if necessary.

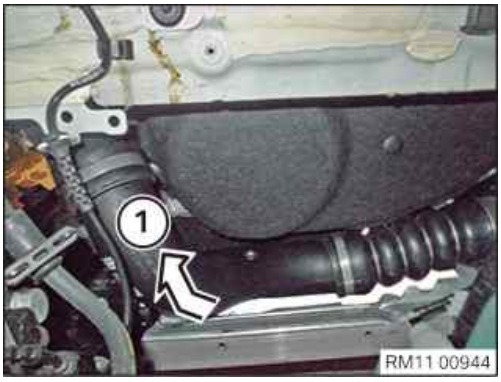


- Check the sealing ring (1) for damage and renew the sealing ring (1) as needed.

  Parts: Gasket



- Let the lock (1) engage at the holder (arrow).



- Feed in charge air duct (1) to the side and upwards through the wheel arch between the side member and front axle support and install.

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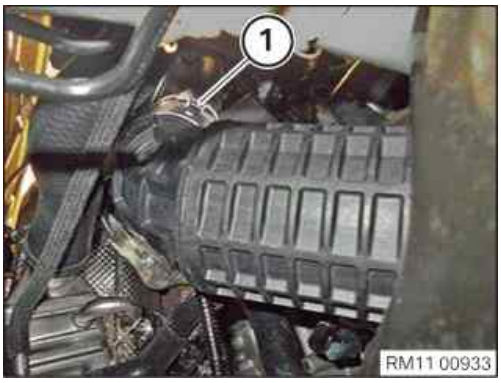
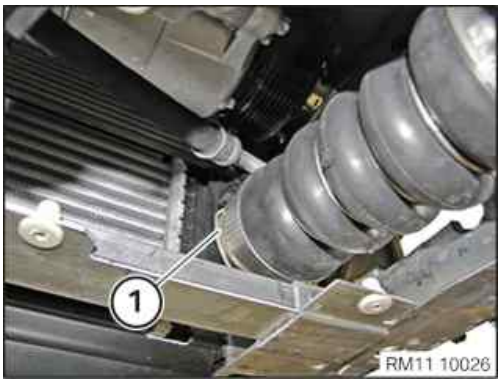


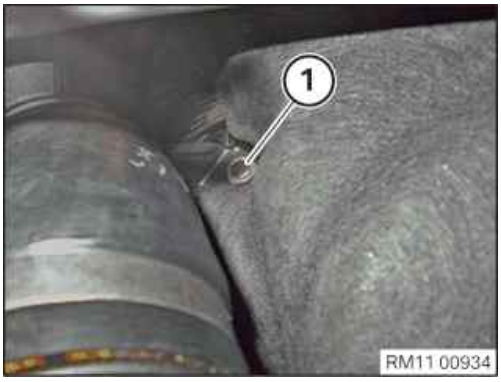
- Attach charge air duct on the exhaust turbocharger until locks (1) engage on both side.

  The lock (1) must audibly engage.



- Attach the pressure pipe to the charge air cooler until the lock (1) engages on both sides.

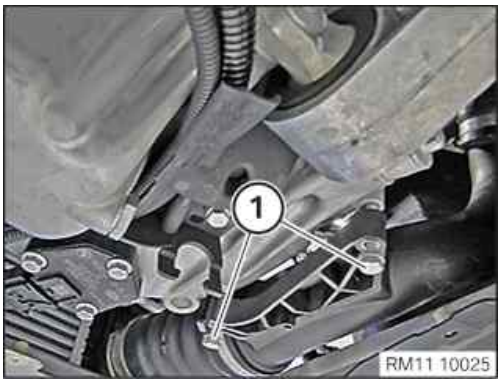
  The lock (1) must audibly engage.



- Tighten screw (1) of the charge air duct on the crankcase.

Charge air line to crankcase

M6x25		Tightening torque	5 Nm

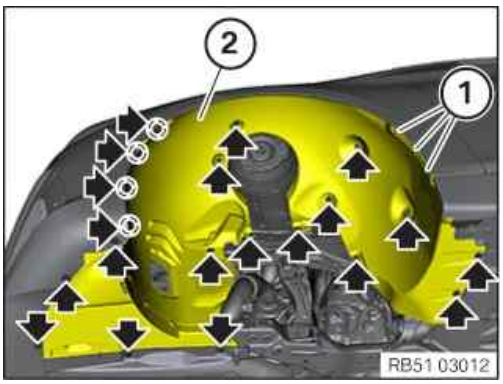


- Tighten charge air duct screws (1) on oil sump.

Charge air duct to oil sump

M6		Tightening torque	8 Nm

24 – Installing the front right wheel arch cover



- Guide in and install the front right wheel arch cover (2).
- Tighten all bolts and nuts (arrows).

Wheel arch cover

Screw		3 Nm
Plastic nut		2,6 Nm

- Secure expanding rivet (1).

25 – Installing the front right wheel

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▶ **Clean the contact surfaces between the brake disc and the wheel rim**

TECHNICAL INFORMATION

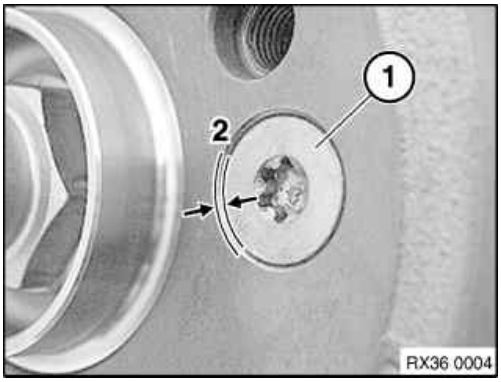
The contact surface between the brake disc and the wheel rim must be clean and free from oil and grease. There is otherwise a risk of the wheel becoming loose at a later time.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).
- In the event of grease residue around the wheel bolt holes: remove and clean the brake disc.

- Remove dirt, grease residues and corrosion from the contact surface with a drill and the special tool **2 344 011**.

  Do not operate special tool **2 344 011** with an impact screwdriver.
- Degrease the contact surfaces with the universal cleaner (see BMW Group Parts).

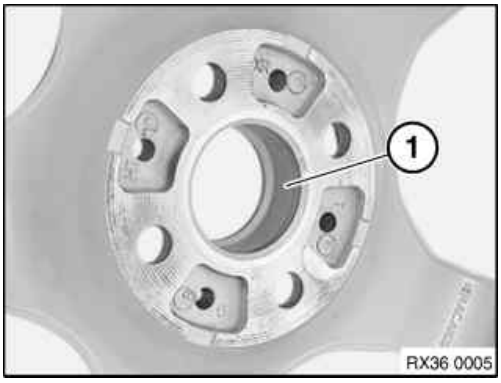


- Check the mounting bolt for the brake disc (1) for secure fit.

  The mounting bolt for the brake disc (1) must not protrude under any circumstances on the contact surface (2) between the brake disc and the wheel rim.

Brake disc to front wheel hub

M8	Renew screw.		16 Nm



- Lightly grease the wheel centring (1) in the wheel rim; refer to additional information for grease for the wheel centring.

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TECHNICAL INFORMATION

Never use impact screwdrivers or electric screwdrivers to screw in and tighten the wheel bolts.

The wheel rim must rest uniformly against the brake disc.

In the case of non-original BMW wheel bolts/wheel rims, it may be necessary to retighten the wheel bolts on account of setting properties (refer to the documentation from the manufacturer).

Do not apply oil to new wheel bolts.

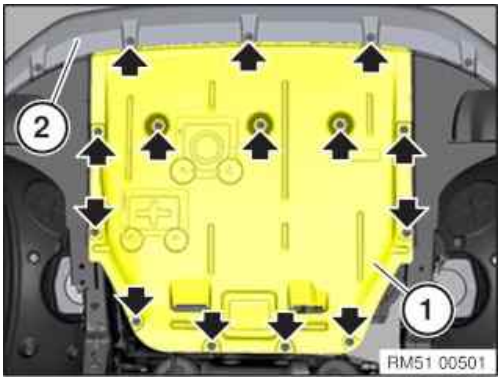
- Renew corroded wheel bolts.

  Parts: Wheel bolts
- Clean the wheel bolts and check the threads for damage. Renew the wheel bolts as needed.
- Mount wheel bolts and tighten.

Wheel bolts

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim.	Tightening torque	140 Nm
	Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence.	Check	140 Nm
	Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.		

26 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

27 – Installing guide tube for oil dipstick

RISK OF DAMAGE

Contaminant or foreign body.

Contamination can result in malfunctions, operating failure or leaks.

- Adhere to the utmost cleanliness.
- Protect components from contamination e.g. by covering.
- Close off line connections with seal plugs.

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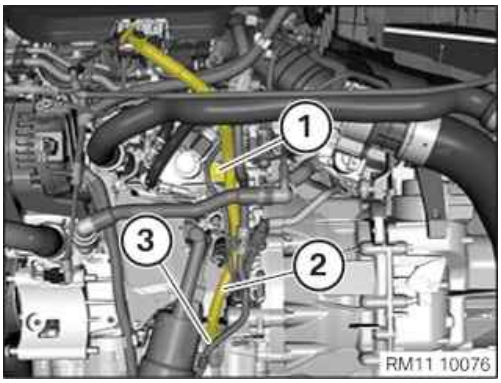
- Renew O-ring (1).

  Parts: O-ring



- Guide in guide tube (2) for oil dipstick and slide it into the oil sump.
- Make sure the sealing ring (3) is positioned correctly in the oil sump.
- Tighten down screw (1).

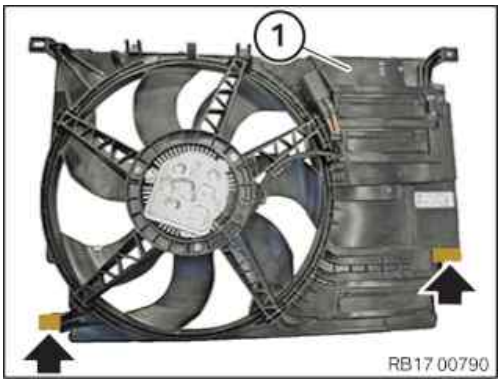
Guide tube for oil dipstick on engine

M8x16		Tightening torque	19 Nm

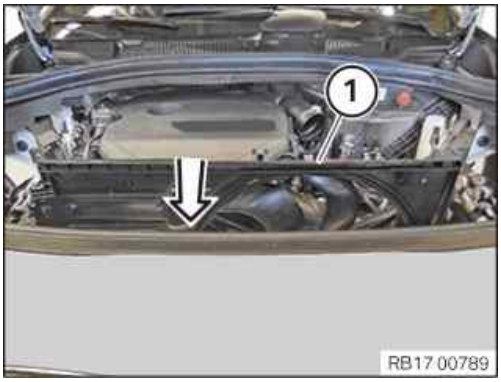
28 – Installing fan cowl with electric fan

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.



- Feed the guides (arrows) of the fan cowl (1) into the charge air cooler.



- Feed in and install the fan cowl (1) in the direction of the arrow.

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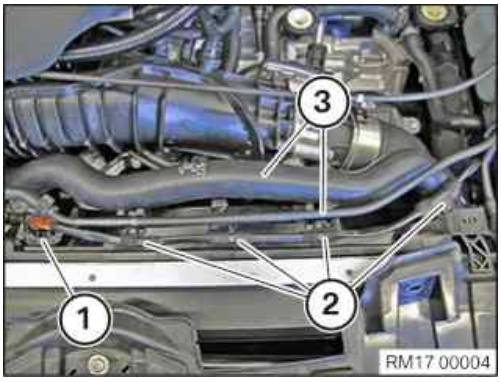
- Lock the left and right locks (arrows).

- Tighten the screws (1).

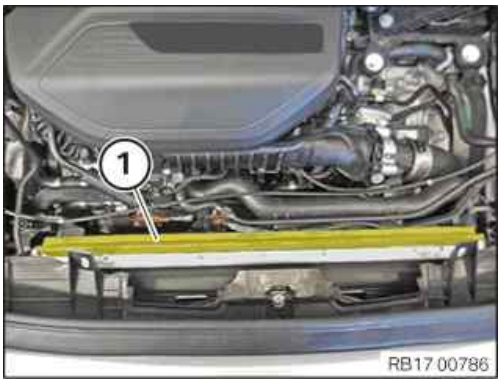
Fan cowl on radiator

M6X12		Tightening torque	6 Nm



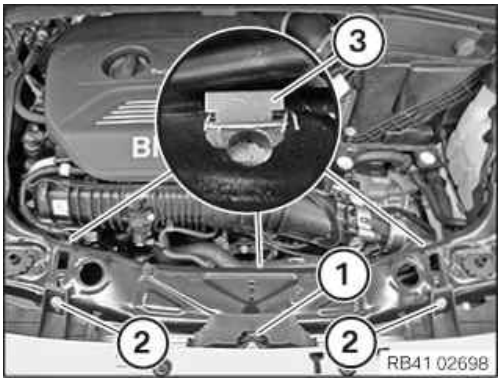
- Connect connectors (1) and lock.

  The connector (1) must engage audibly.
- Secure clamps (2).
- Thread in and install coolant line (3).



- Guide the sealing (1) on the radiator in and install it.

29 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

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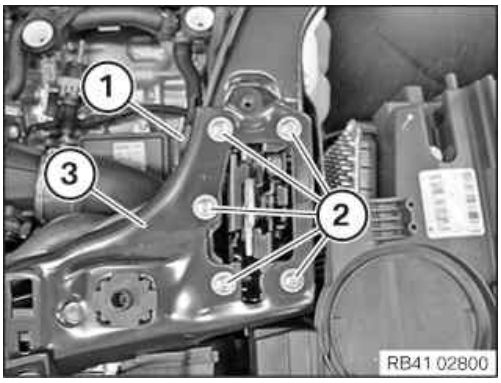
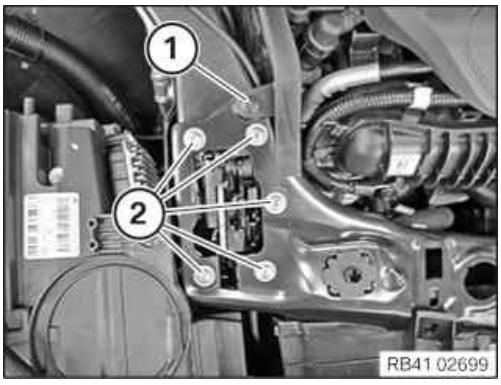


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



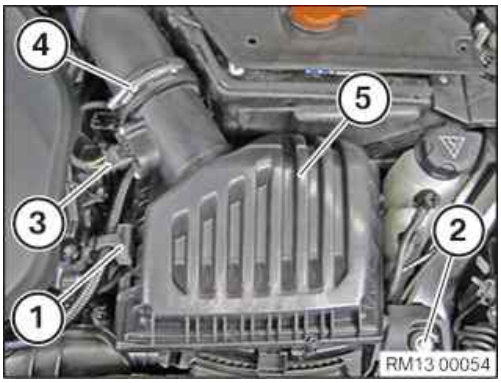
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

30 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

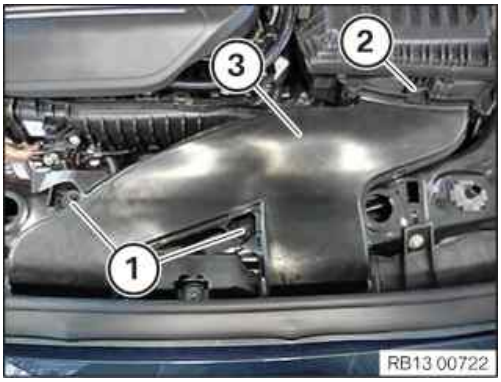
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

31 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

32 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

33 – Disconnecting all battery earth leads

- See additional information.

34 – Removing the oil filler cap

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- Open oil filler cap (1).

35 – Topping up the engine oil

RISK OF DAMAGE

Damage to the petrol particulate filter.

Vehicles equipped with a petrol particulate filter must be operated with low-ash engine oil only.

- Use BMW Longlife-04 , BMW Longlife-12 FE or BMW Longlife-17 FE+ engine oils or engine oils approved by BMW matching the same specifications only.
- For additional information see: Overview of approved engine oils for BMW Group engines.

RISK OF DAMAGE

Engine damage caused by excessively filling the engine with engine oil.

Filling an excessive quantity of engine oil may cause engine damage.

- Observe the exact engine oil filling capacity.
- Drain the engine oil.

- Pour in engine oil.

Engine oilB37C15U1

Capacity of engine oil	4,8 l

Engine oil: Technically suitable engine oils for BMW Group engines

36 – Installing the oil filler cap

- Close oil filler cap (1).

37 – Check engine oil level

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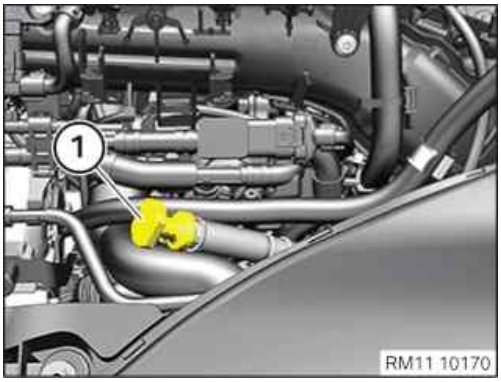
- Park vehicle on a horizontal surface.
- In the case of automatic transmission, shift to selector lever position N or P.
- Accelerator pedal is not pressed.
- Engine is running and is at operating temperature.
- Read off the engine oil level in the instrument cluster (KOMBI) or on the control display.
- Top up engine oil if necessary.

▶ **Check engine oil level**

TECHNICAL INFORMATION

Always check the engine oil level when the engine is at operating temperature (engine oil temperature > 70°C).

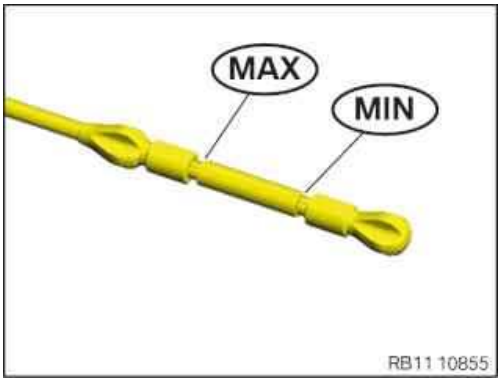


- Park vehicle on a horizontal surface.
- Stop the engine and wait for 5 minutes.
- Pull out the oil dipstick (1) and wipe off using a lint-free cloth.

TECHNICAL INFORMATION

Do not pull out or insert the oil dipstick into the guide tube too quickly or slowly.

- Push the oil dipstick (1) into the guide tube up to the limit position and pull it out again.



TECHNICAL INFORMATION

The engine oil level must be between the minimum mark and the maximum mark of the oil dipstick.

- Read the engine oil level on the oil dipstick.
- Top up engine oil if necessary.

Additional Information

Overview of Tightening Torques

Oil drain plug on oil sump — Used in step 10

M12x1.5	Renew the sealing ring.	Tightening torque	25 Nm

Intake pipe to oil vacuum pump — Used in step 18

M6x25		Tightening torque	8 Nm

Camshaft sprocket to oil vacuum pump — Used in step 18

M8x35 Left-hand thread	*Renew screws.*	Jointing torque	5 Nm
		Angle of rotation	90 °

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Oil vacuum pump to crankcaseB37

Used in step 19

M8x35	*Renewscrews.*	Tightening torque	15 Nm
		Angle of rotation	45 °

Oil sump to crankcase

Used in step 20

M8x30		Tightening torque	24 Nm
M8x110		Tightening torque	24 Nm

Transmission to oil sump

Used in step 20

M8		Tightening torque	19 Nm

Starter motor to transmission

Used in step 20

M8x45		Tightening torque	19 Nm

Bracket to oil sump

Used in step 21

M6		Tightening torque	8 Nm

Battery positive lead to starter

Used in step 21

M8		Tightening torque	13,5 Nm

Holder to front axle support

Used in step 22

M12		Tightening torque	100 Nm

Bracket to oil sump

Used in step 22

M12		Tightening torque	100 Nm

Charge air line to crankcase

Used in step 23

M6x25		Tightening torque	5 Nm

Charge air duct to oil sump

Used in step 23

M6		Tightening torque	8 Nm

Wheel arch cover

Used in step 24

Screw			3 Nm
Plastic nut			2,6 Nm

Brake disc to front wheel hub

Used in step 25

M8	Renew screw.		16 Nm

Wheel bolts

Used in step 25

M 14/AF 17	Screw in wheel bolts and evenly tighten crosswise by hand in order to centre the wheel rim. Tighten wheel bolts to the prescribed tightening torque with a calibrated torque wrench in a crosswise sequence. Check all the wheel bolts in the same order or retighten to the prescribed tightening torque again.	Tightening torque Check	140 Nm 140 Nm

Underbody protection front

Used in step 26

			3 Nm

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Guide tube for oil dipstick on engine Used in step 27

M8x16		Tightening torque	19 Nm

Fan cowl on radiator Used in step 28

M6X12		Tightening torque	6 Nm

Bracing strut to top cross connection Used in step 29

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection Used in step 29

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection Used in step 29

M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge Used in step 30

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing Used in step 30

Clamp		Tightening torque	3 Nm

Intake neck to cross connection Used in step 31

M6		Tightening torque	8 Nm

Overview of Special Tools

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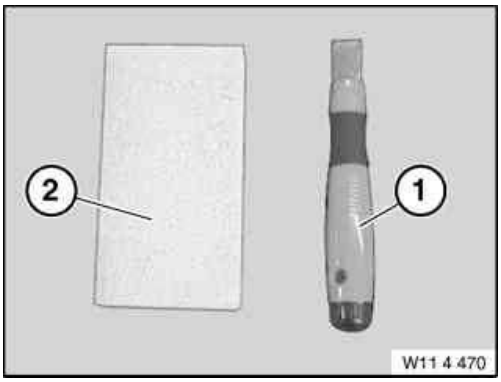
0 495 102 (11 4 470) Tool



Common

Used in step 20

Usage	(cleaning kit) For cleaning sealing surfaces on magnesium crankcase/cylinder head.
Included in the tool or work	
Storage location	C52
Replaced by	
In connection with	
SI-Number	01 17 04 (130)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 495 103 (11 4 471)		**Scraper**	
2	0 495 104 (11 4 472)		**Extractor** (grindstone)	

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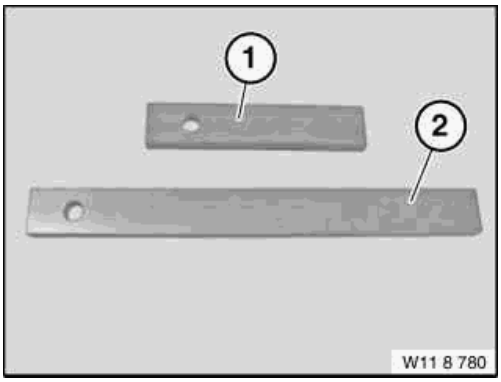
0 496 120 (11 8 780) Plate



Common Used in step 20

Usage	(Mounting plates) For securing transmission oil sump when gearbox is removed.
Included in the tool or work	
Storage location	B24
Replaced by	
In connection with	
SI-Number	01 05 07 (353)

Consisting of

Pos	BMW Order number	Replaced by	Designation	In Connection with
1	0 496 121 (11 8 781)		**Plate** (Mounting plate, short)Discontinued; only available via set 11 8 780 = 0496120.	
2	0 496 122 (11 8 782)		**Plate** (Mounting plate, long) Discontinued; only available via set 11 8 780 = 0496120.	

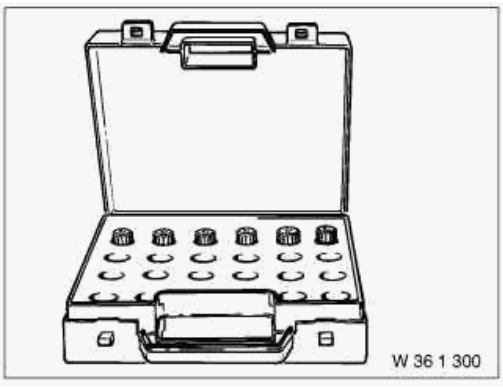
2 344 011 Tool

Common Used in step 25

Usage	Tool (wheel hub grinder) for cleaning the connection of the wheel rim (wheel contact face) to the wheel hub.
Included in the tool or work	
Storage location	
Replaced by	
In connection with	
SI-Number	08 08 12 (872)

Replacement tools:

0 495 221 (36 1 323) Wheel stud



Common Used in step 11

Usage	(Code 30) Code 39 available separately, (see EPC) under 36 13 1 181 259
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 224 (36 1 326) Wheel stud

Common	Used in step 11
Usage	(Code 33) With centring bore available separately, (see EPC) under 36 13 6 765 546
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 225 (36 1 327) Wheel stud

Common	Used in step 11
Usage	(Code 34) With centring bore available separately (see EPC) under 36 13 6 765 547
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 226 (36 1 328) Wheel stud

Common	Used in step 11
Usage	(Code 35) With centring bore available separately, (see EPC) under 36 13 6 762 340
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 227 (36 1 329) Wheel stud

Common	Used in step 11
Usage	(Code 36) With centring bore available separately (see EPC) under 36 13 6 762 341
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 228 (36 1 331) Wheel stud

Common	Used in step 11
Usage	(Code 37) With centring bore available separately (see EPC) under 36 13 6 762 342
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

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0 495 229 (36 1 332) Wheel stud

Common	Used in step 11
Usage	(Code 38) With centring bore available separately (see EPC) under 36 13 6 762 343
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

0 495 230 (36 1 333) Wheel stud

Common	Used in step 11
Usage	(Code 40) With centring bore available separately (see EPC) under 36 13 6 762 344
Included in the tool or work	0 492 518
Storage location	
Replaced by	
In connection with	
SI-Number	

Overview Technical Data

Engine oilB37C15U1	Used in step 35
Capacity of engine oil	4,8 l

Engine oil: Technically suitable engine oils for BMW Group engines

Links

Functional descriptions	Used in step
Oil supply	27

General repair instructions	Used in step
11 00 ... Overview of consumables (Electronic Parts Catalogue)	20

Repair instructions	Used in step
61 20 900 Disconnecting and connecting battery earth lead	1 33
61 20 900 Disconnecting and connecting battery earth lead	1 33

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61 20 900 Disconnecting and connecting battery earth lead	1 33
61 20 900 Disconnecting and connecting battery earth lead	1 33
61 20 900 Disconnecting and connecting battery earth lead	1 33
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61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 33
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 33
61 20 900 Disconnecting and connecting battery earth lead	1 33
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1 33
61 20 900 Disconnect and connect battery earth lead (Plug-in Hybrid Electric Vehicle)	1 33
61 20 900 Disconnecting and connecting battery earth lead	1 33
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61 20 900 Disconnecting and connecting battery earth lead	1 33

Operating materials	Used in step
2.0 Grease for wheel centring	25
3.0 Technically appropriate engine oils for BMW Group engines	35

Parts

Parts required

Designation	Used in step
Seal, guide tube for oil dipstick on oil sump	27

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11 71 100 Remove and install/replace the exhaust-gas recirculation cooler

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

PRELIMINARY WORK

1 – Remove vehicle battery

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

TECHNICAL INFORMATION

For additional information see:

61 00 ... Safety information on handling the vehicle battery

61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery

61 12 ... Notes on the intelligent battery sensor (IBS)

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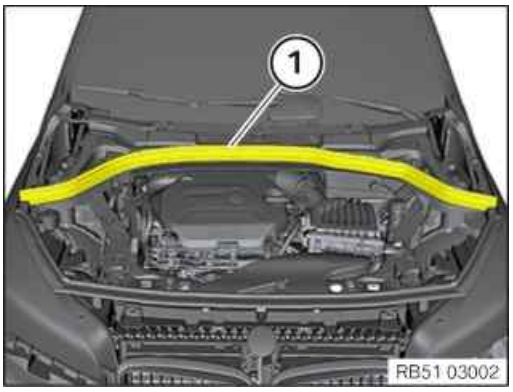
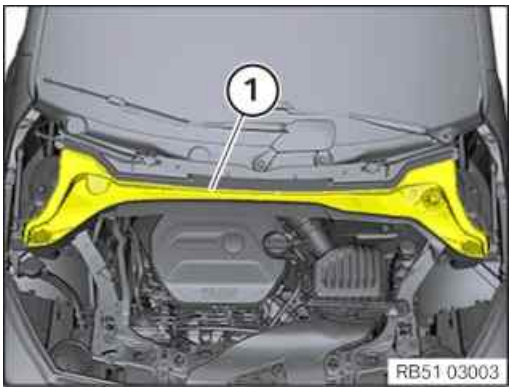
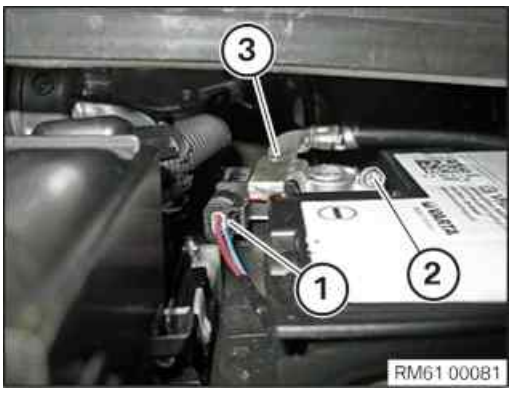


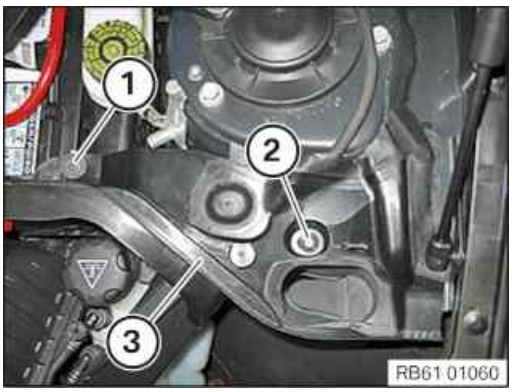
- pull off gasket (1) upwards.



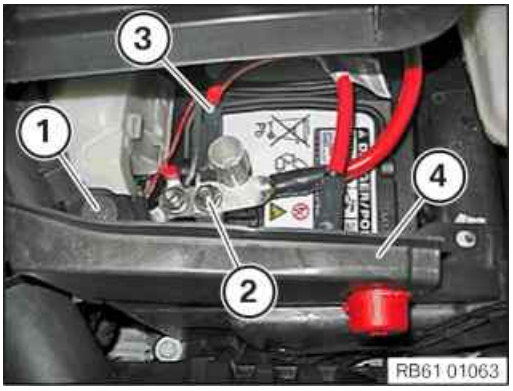
- Remove the cowl panel cover (1) to the top.



- Unlock and disconnect connector (1).
- Slacken nut (2).
- Disconnect the negative battery terminal (3).



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).



- Loosen screw (1).
- Unscrew the nut (2) and remove the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten nuts (2) on the positive terminal hand-tight.

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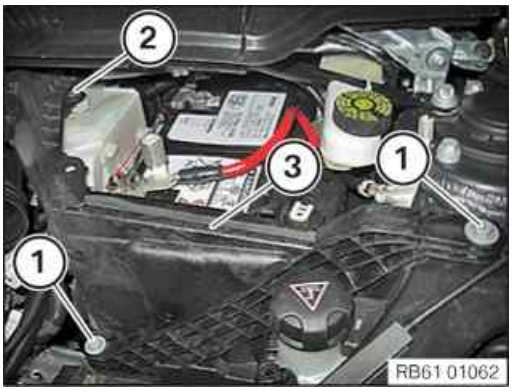
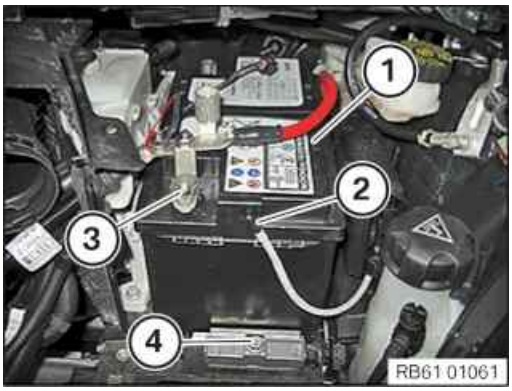


- Loosen screws (1).
- Unscrew the bolt (2) and guide the tension strut (3) out.



- Pull off the vent hose (2).
- Slacken the nut (3) on the positive terminal and remove the positive terminal.

WARNING

Unprotected battery terminals.

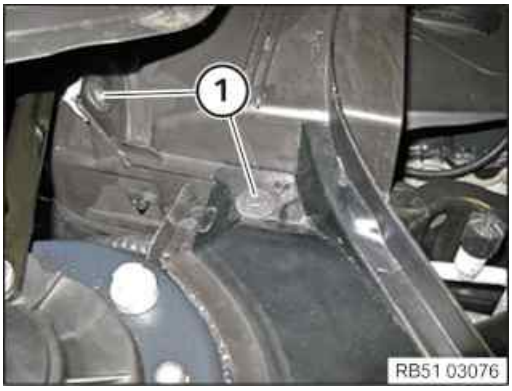
Risk of short circuits! Risk of fire!

- Cover the vehicle battery.

- Loosen the screw (4) and remove the holder.
- Remove vehicle battery (1).

2 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).

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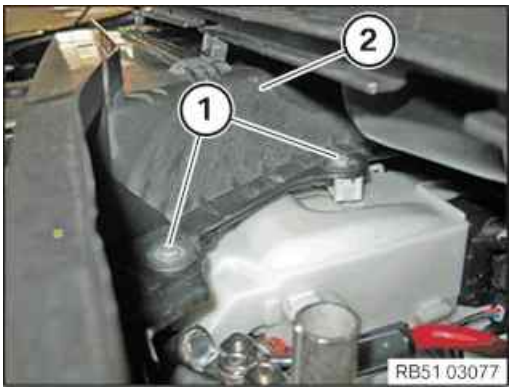
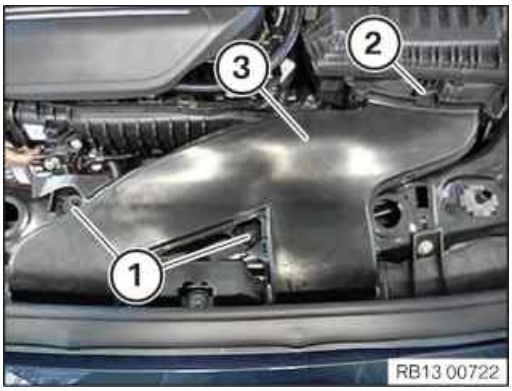


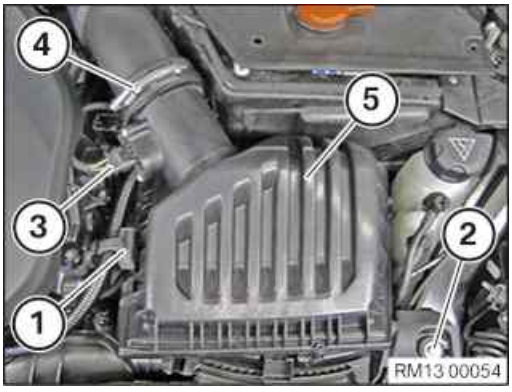
- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

3 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

4 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

5 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

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RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

- Do not pull on the wires when disconnecting connectors and plug connections.

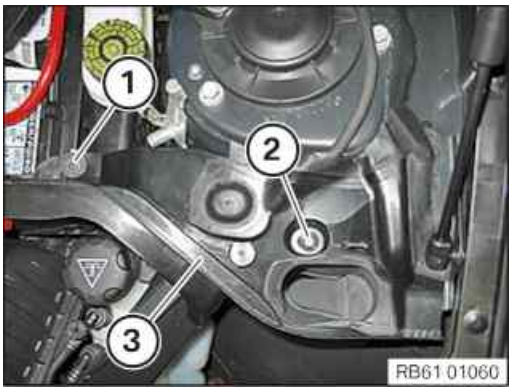
TECHNICAL INFORMATION

Follow instructions for removing and installing control units.

For additional information see: 12 00 ... Notes on removal and installation of control units

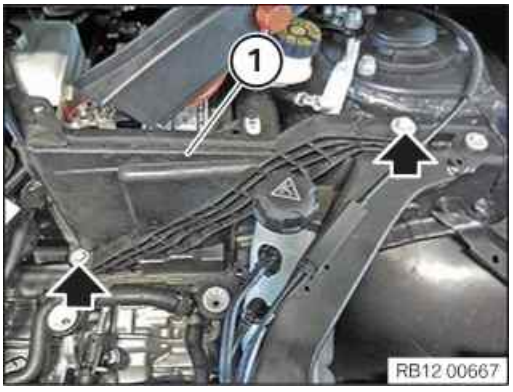
TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



- Remove screws (arrows).
- Guide out tension strut (1) and remove.

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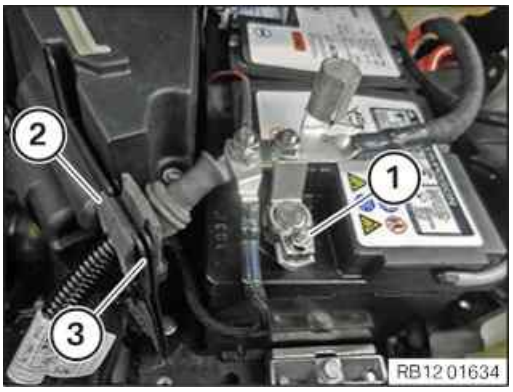
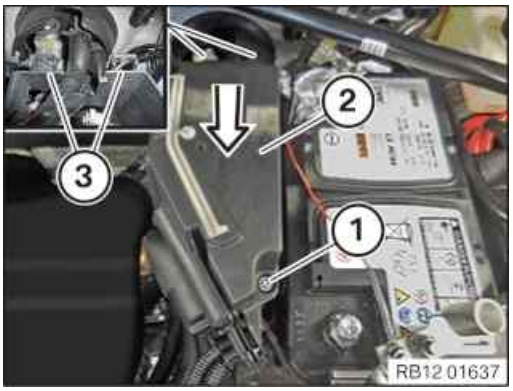
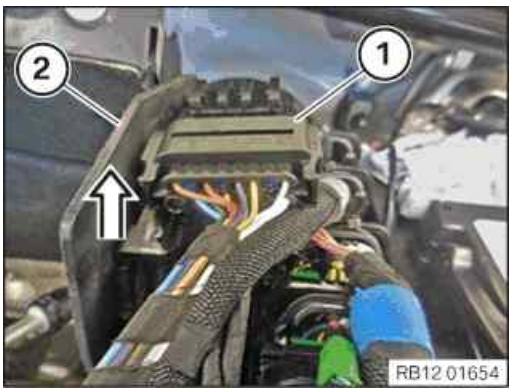


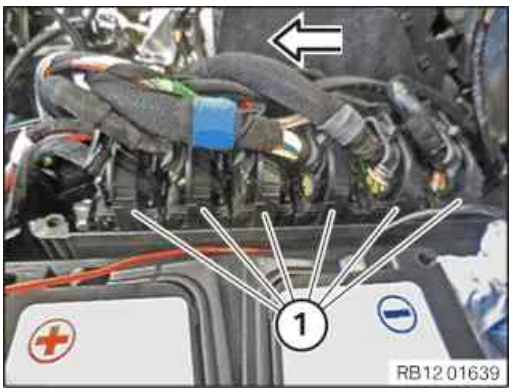
- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



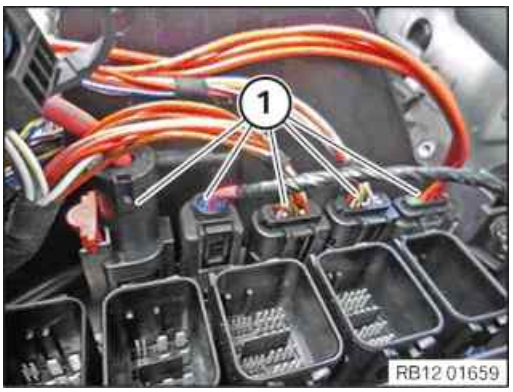
- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).



- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



- Unlock and loosen connector (1).

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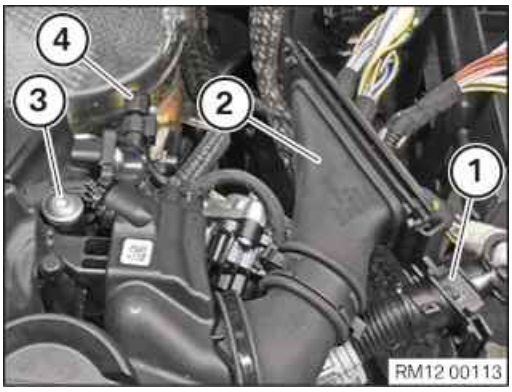
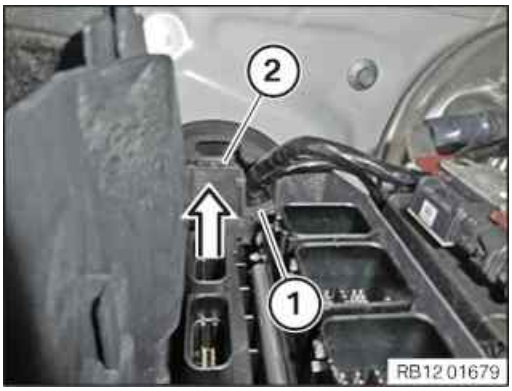
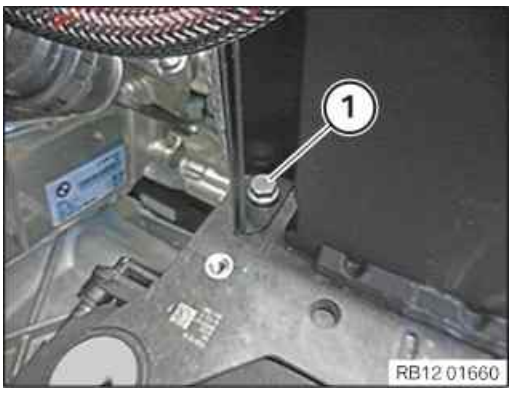


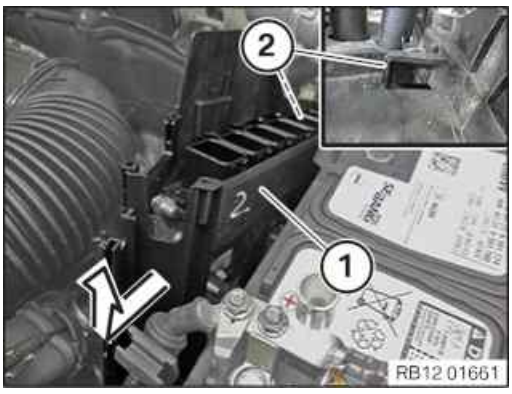
- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.

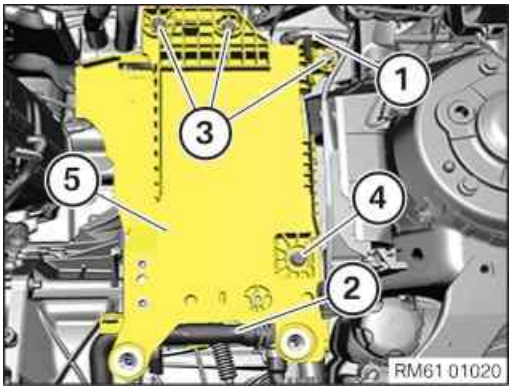


- Loosen screw (1).



- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

6 – Remove battery holder



- Detach the cable clip (1) from the battery holder (5).
- Detach the coolant line (2) from the battery holder (5).
- Loosen screws (3).
- Loosen screw (4).
- Thread out and remove the battery holder (5).

7 – Remove cross connection

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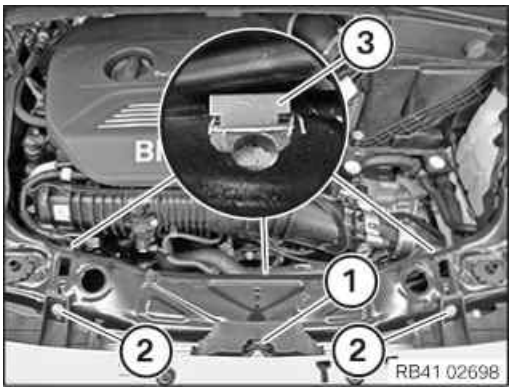
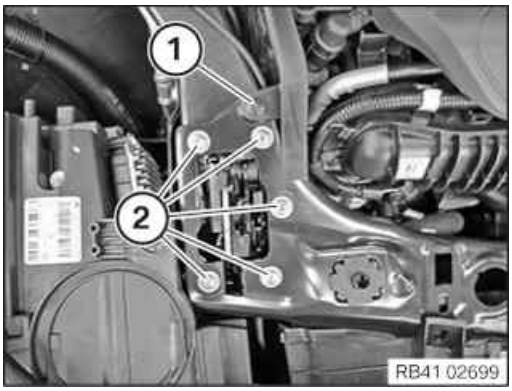
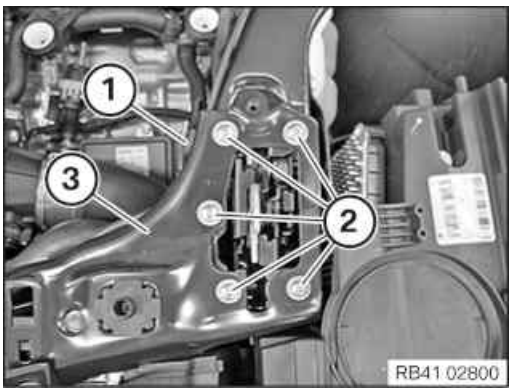


- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.

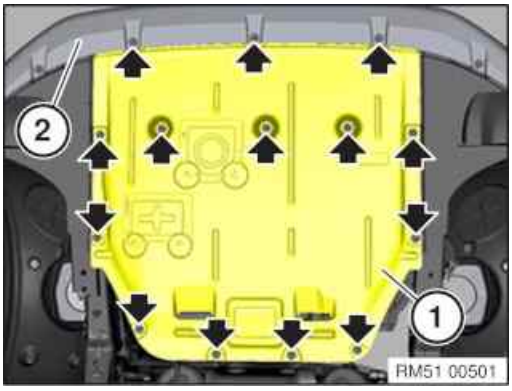


- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

8 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

9 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

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TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

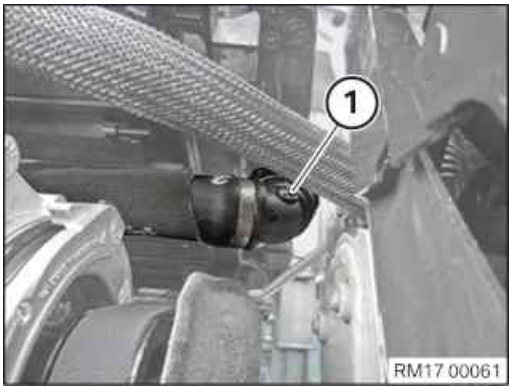
When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

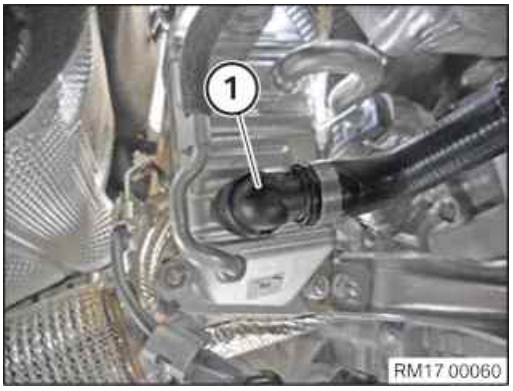
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

MAIN WORK

10 – Removing the exhaust-gas recirculation cooler

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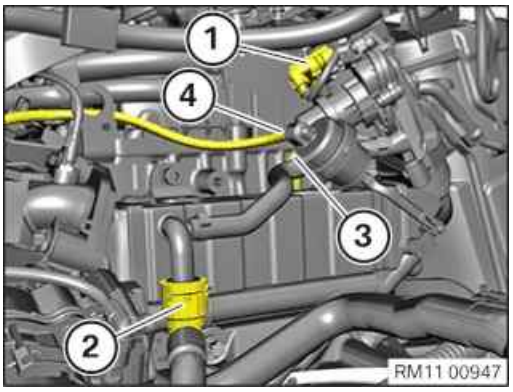
WARNING

Hot surfaces.

Risk of burning!

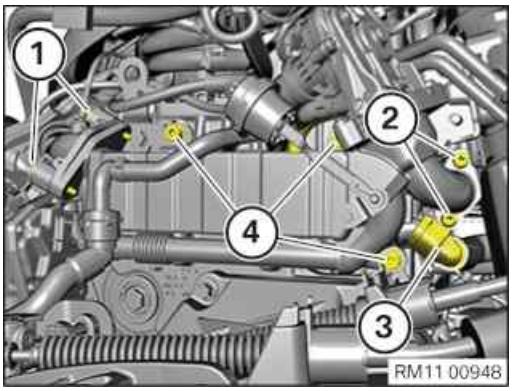
- Perform all work only on components that have cooled down.



TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Unlock the plug connection (1) on exhaust-gas recirculation valve and pull it off.
- Unlock the coolant hose (2) and pull off from the exhaust-gas recirculation cooler.
- Release the hose clamp from the rear coolant hose (3) at the exhaust-gas recirculation valve and pull off the coolant hose (3).
- Release the vacuum hose (4) and pull off.



- Loosen screws (1).
- Loosen screws (2).
- Unlock coolant hose (3) and pull off.
- Loosen screws (4).
- Guide out and remove exhaust-gas recirculation cooler.

11 – Replacement: Check part number of the exhaust-gas recirculation cooler

NOTICE

For vehicles with Real Driving Emissions (RDE) with a production date from 03/2019:

The intake plenum and the exhaust-gas recirculation cooler vary.

When replacing the intake plenum or the exhaust-gas recirculation cooler: Make sure the part number is correct. Note the part number of the removed component and assign the corresponding, suitable part number.

In the electronic Parts Catalogue (EPC), components with the auxiliary "RDE" and components without the auxiliary "RDE" will be provided. Only the following combinations are permitted:

Intake plenum **with** the auxiliary **"RDE"** and exhaust-gas recirculation cooler **with** the auxiliary **"RDE"**.

Intake plenum **without** the auxiliary **"RDE"** and exhaust-gas recirculation cooler **without** the auxiliary **"RDE"**.

Components without the auxiliary "RDE" must not be installed with components with auxiliary "RDE".

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NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

- Note the part number (1).
- Select new part using the noted part number from the Electronic Parts Catalogue (EPC).

12 – When replacing exhaust-gas recirculation cooler: Delete adaptations

- Replace exhaust-gas recirculation cooler.

  Parts: Exhaust-gas recirculation cooler

▶ **Delete adaptations**

- Connect diagnosis system.
  - Power train
  - Digital Diesel Electronics
  - Reset adaptations
  - Delete adaptations

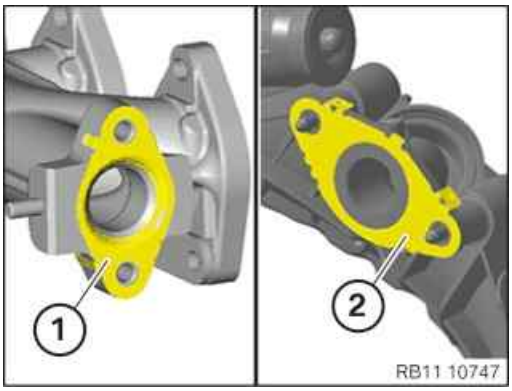
13 – Installing the exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.



- Renew the seal (1) between the exhaust manifold and the exhaust-gas recirculation cooler.

  Parts: Gasket

- Renew the seal (2) between exhaust-gas recirculation cooler and intake air plenum.

  Parts: Gasket

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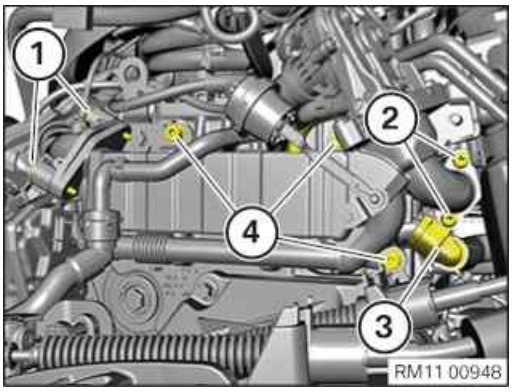


- Feed in and install the exhaust-gas recirculation cooler.

TECHNICAL INFORMATION

When assembling, it is essential to observe screwing sequences and tightening torques.

Non-observance of these requirements may result in leaks and damage.

- Tighten the bolts (4) and then slacken them again.

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	5 Nm
		Release angle	90 °

- Install seal .
- Make sure the seal is correctly installed.
- Tighten the screws (1).

Intake plenum to exhaust-gas recirculation cooler

M6		Tightening torque	11 Nm

- Make sure the seal is correctly installed.
- Renew screws (2).

  Parts: Bolts
- Tighten down screws (2).

Exhaust-gas recirculation cooler to exhaust manifold

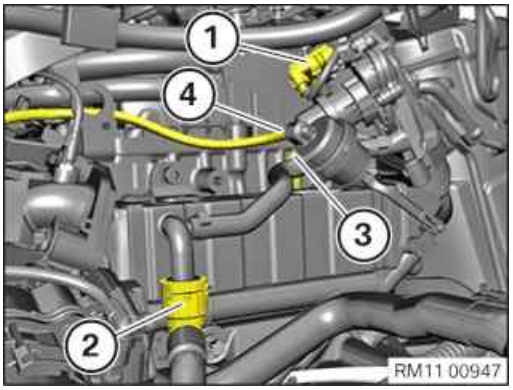
M8x28	Replace screws	Tightening torque	32 Nm

- Connect coolant hose (3) and lock.

  The coolant hose (3) must audibly engage.
- Tighten down screws (4).

Exhaust-gas recirculation cooler to cylinder head

M8x20		Tightening torque	19 Nm



TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

- Connect connectors (1) and lock.
- Attach the coolant hose (2) and lock.
- Replace hose clamp.

  Parts: Hose clamp
- Slide the coolant hose (3) with hose clamp onto the exhaust-gas recirculation valve at rear.
- Secure the hose clamp on the coolant hose (3).
- Route and connect the vacuum hose (4) correctly.

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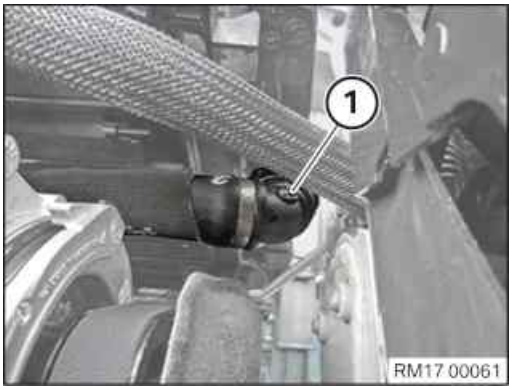
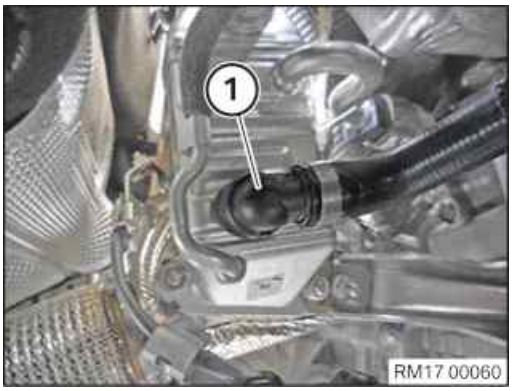
14 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

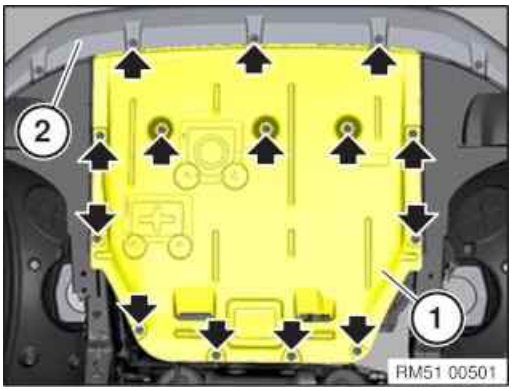


- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

15 – Installing the front underbody protection

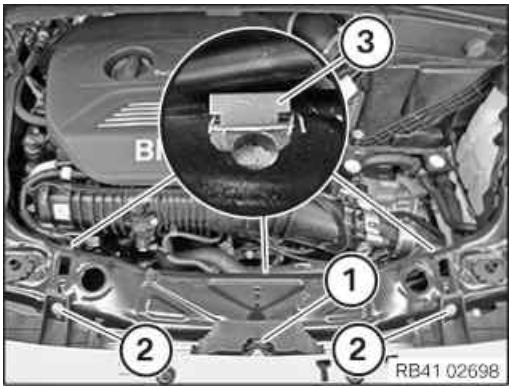


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

16 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.

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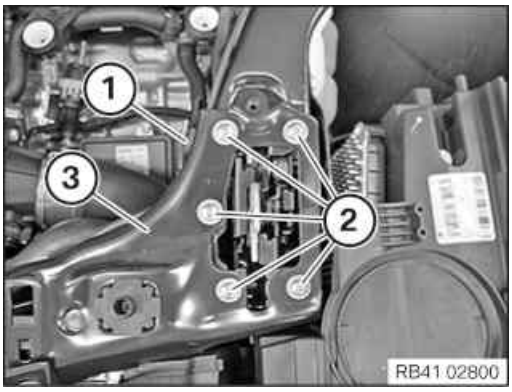
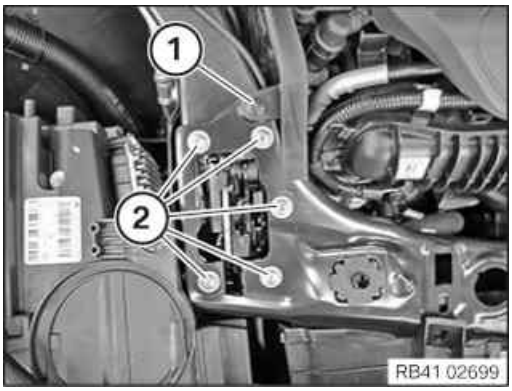


- Tighten screws (2) of cross connection (3).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



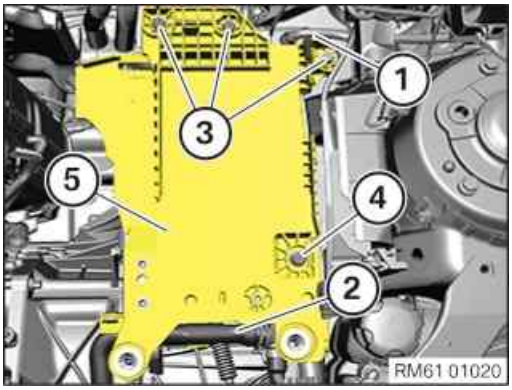
- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

17 – Install the battery holder



- Feed in and install the battery holder (5).
- Hand-tighten the bolt (4).
- Hand-tighten the bolts (3).
- Tighten down screw (4).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Tighten down screws (3).

Battery holder to engine support

Hexagon screw M8x30		Tightening torque	19 Nm

- Fasten the coolant line (2) on the battery holder (5).
- Fasten the cable clip (1) on the battery holder (5).

18 – Install electronics box

Prerequisite

Battery earth lead is disconnected.

RISK OF DAMAGE

Improper routing of cables and wiring harnesses.

Trapped, crushed or damaged cables may cause short circuits and malfunctions.

- Route all cables without abrasions, do not trap and crush.

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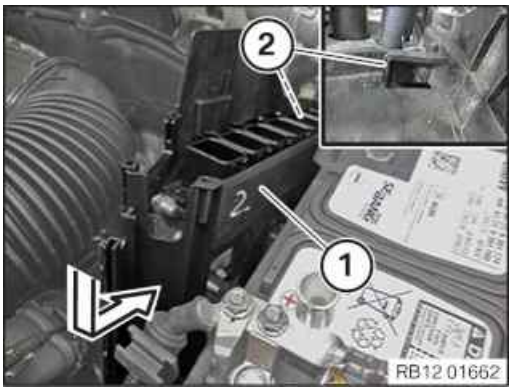
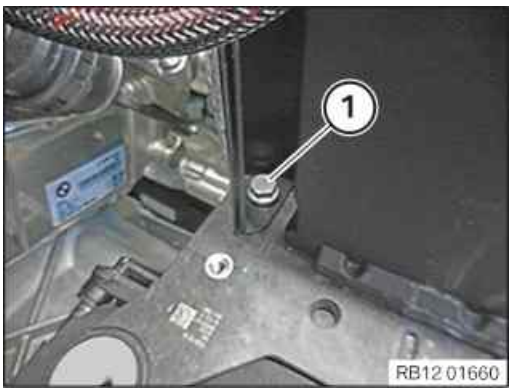


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

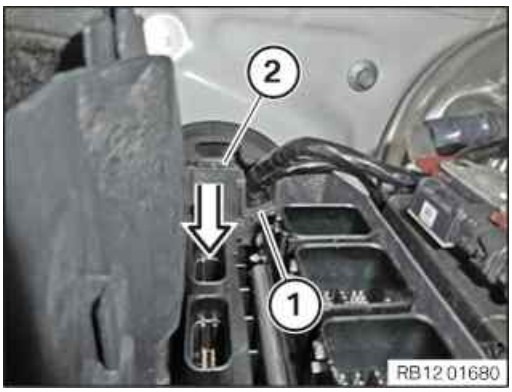
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



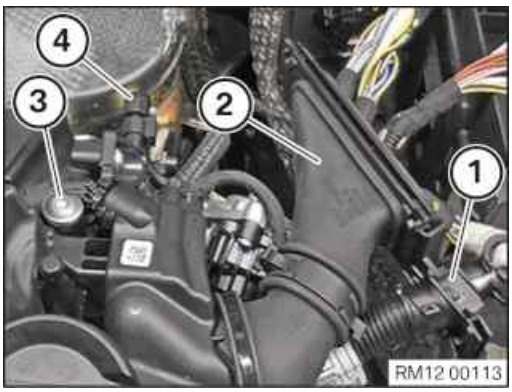
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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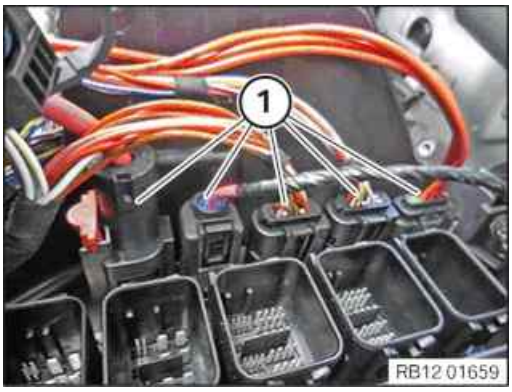
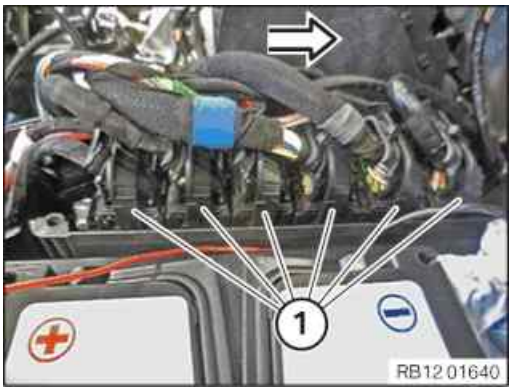
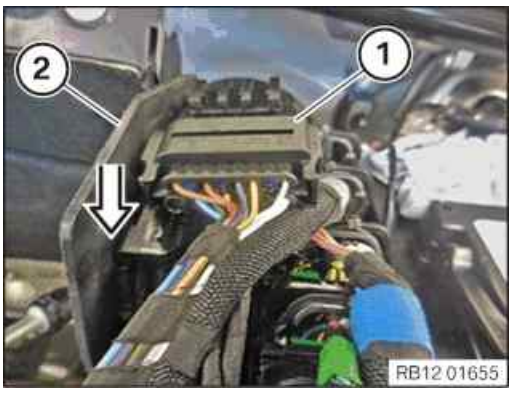


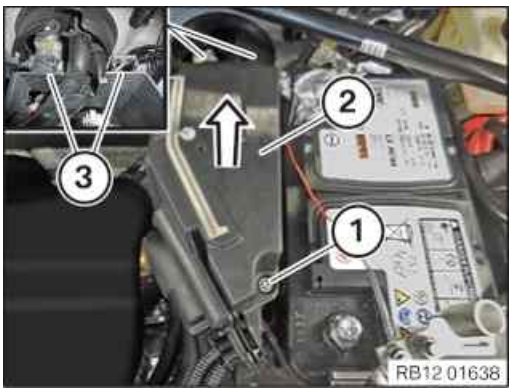
- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.



- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.



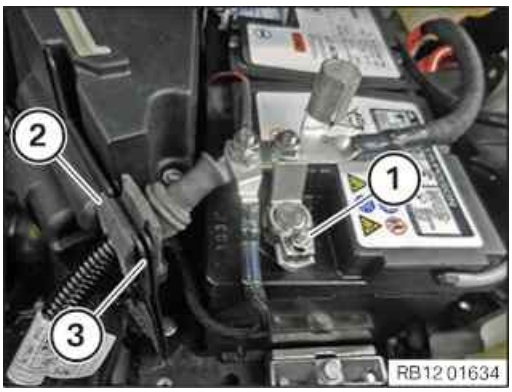
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides (3) in the direction of arrow and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm



- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

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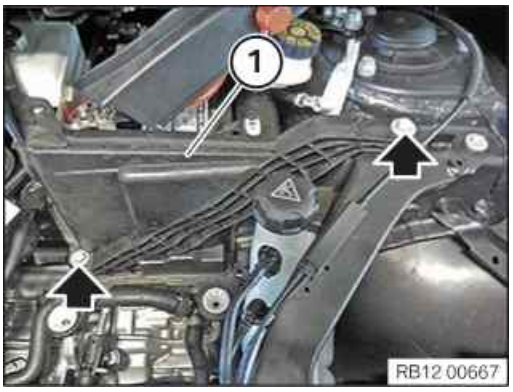


- Feed in and install tension strut (1).
- Tighten screws (arrows).

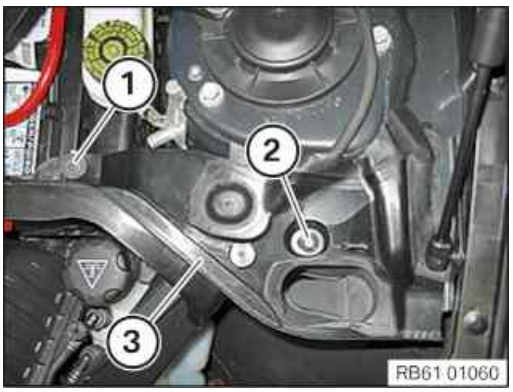
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm

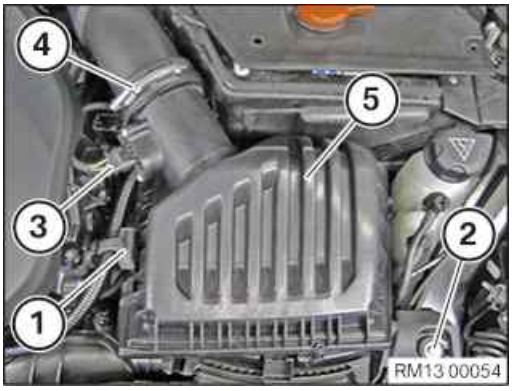


- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

19 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

20 – Install the intake neck for the intake filter housing

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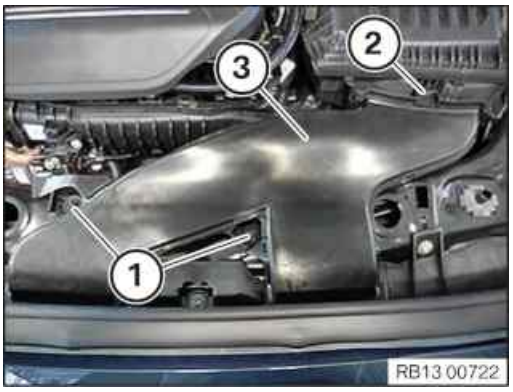


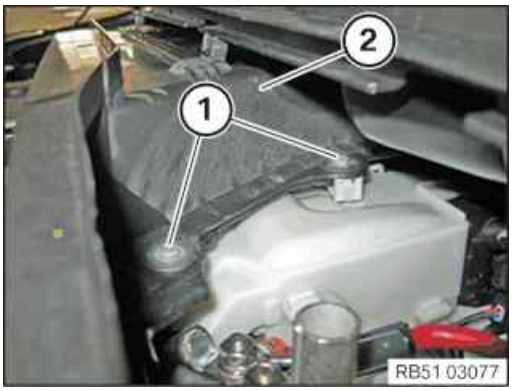
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

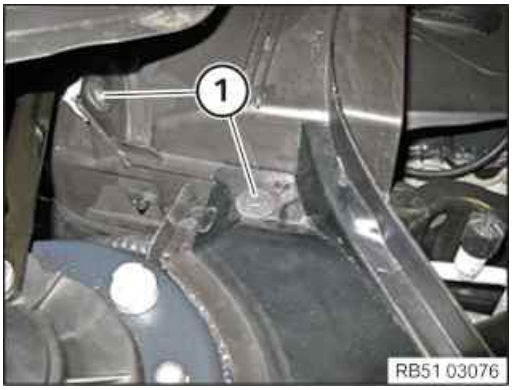
21 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

22 – Install vehicle battery

TECHNICAL INFORMATION

For additional information see:
61 00 ... Safety information on handling the vehicle battery
61 00 / 12 00 ... Notes on disconnecting and connecting the vehicle battery
61 12 ... Notes on the intelligent battery sensor (IBS)

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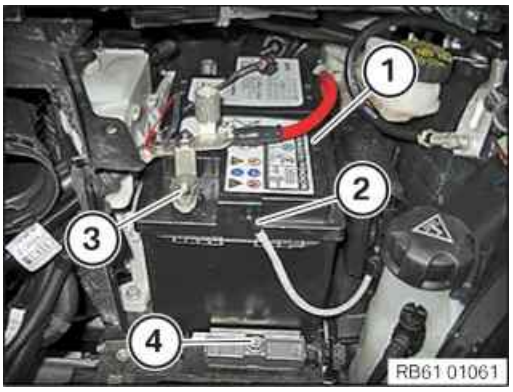


- Install vehicle battery (1).
- Tighten the holder with the bolt (4).

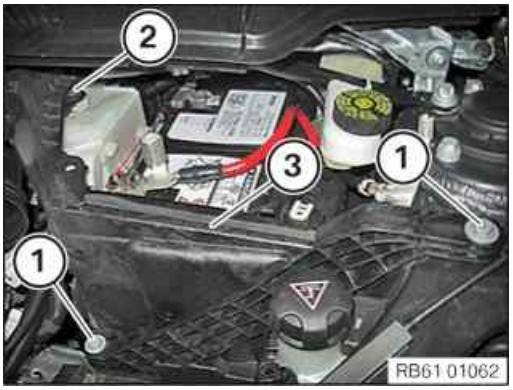
Battery terminal rail to battery tray

M8 screw		19 Nm

- Position the vent hose (2).
- Position the positive terminal.
- Tighten the nut (3) on the positive terminal.

Positive battery terminal

NutM6		5 Nm



- Insert the tension strut (3).
- Tighten down screw (2).

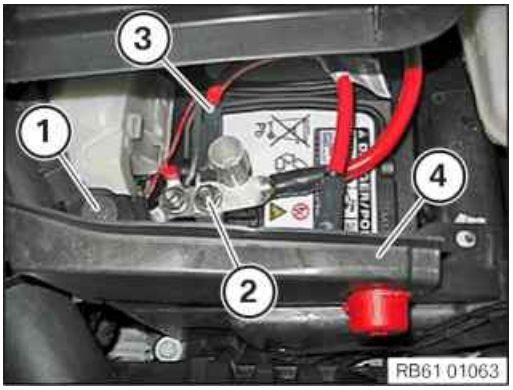
Battery cover

Screw		2,8 Nm

- Tighten the screws (1).

Trailing link

M8 screw		19 Nm



- Position the positive battery cable (3) with the cover of the remote positive terminal (4).
- Tighten down screw (1).

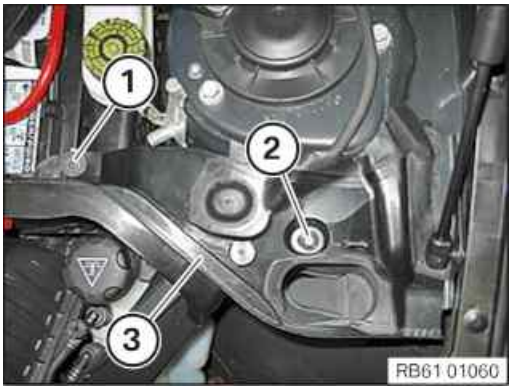
Battery cover

Screw		2,8 Nm

- Tighten the nut (2) on the positive terminal.

Positive battery cable to battery terminal

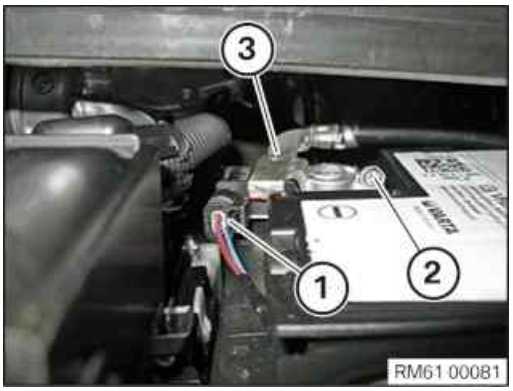
Nut M8		15,2 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm



- Position the negative battery terminal (3).
- Tighten nut (2).

Negative battery terminal (with IBS)

NutM6		5 Nm

- Connect connectors (1) and lock.

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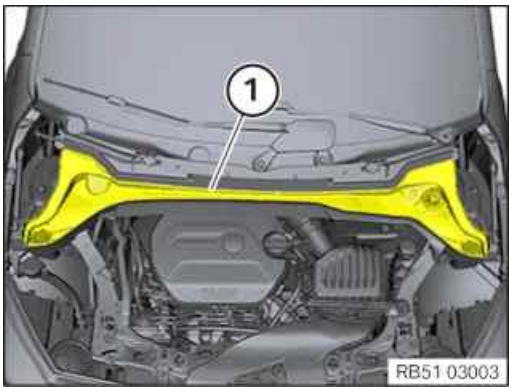
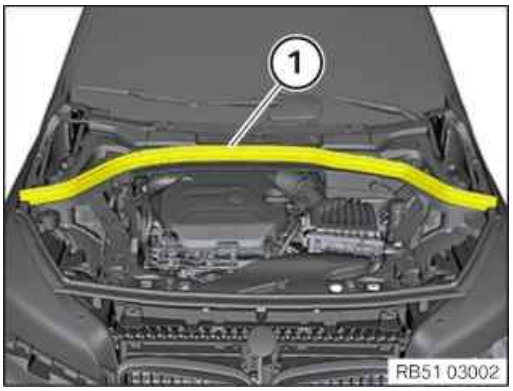


- Feed in the cowl panel cover (1).



- Press the gasket (1) in a downwards direction.

23 – If a new exhaust-gas recirculation valve is installed: Delete adaptations

Check

- Check if a new exhaust-gas recirculation valve is already installed on the new exhaust-gas recirculation cooler.

Result

» A new exhaust-gas recirculation valve is installed.

Measure

- Delete adaptations.

▸ **Delete adaptations**

- Connect diagnosis system.
  - Power train
  - Digital diesel electronics (DDE)
  - Reset adaptations
  - Delete adaptations

24 – Fill and bleed the coolant circuit

▸ **Filling and bleed the high-temperature coolant circuit**

- See additional information.

Additional Information

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Overview of Tightening Torques

Exhaust-gas recirculation cooler to cylinder head

Used in step 13

M8x20		Tightening torque	5 Nm
		Release angle	90 °

Intake plenum to exhaust-gas recirculation cooler

Used in step 13

M6		Tightening torque	11 Nm

Exhaust-gas recirculation cooler to exhaust manifold

Used in step 13

M8x28	Replace screws	Tightening torque	32 Nm

Exhaust-gas recirculation cooler to cylinder head

Used in step 13

M8x20		Tightening torque	19 Nm

Underbody protection front

Used in step 15

			3 Nm

Bracing strut to top cross connection

Used in step 16

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection

Used in step 16

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection

Used in step 16

M6x20		Tightening torque	12 Nm

Battery holder to engine support

Used in step 17

Hexagon screw M8x30		Tightening torque	19 Nm

Electronics box to battery tray

Used in step 18

M8X16		Tightening torque	15 Nm

Wiring harness to cylinder head cover

Used in step 18

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box

Used in step 18

RF5x26.5		Tightening torque	2,5 Nm

Positive battery terminal to battery

Used in step 18

NutM6		Tightening torque	5 Nm

Tension strut to spring strut dome/battery tray

Used in step 18

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall

Used in step 18

		Tightening torque	3 Nm

Battery cover

Used in step 18 22

Screw			2,8 Nm

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Intake silencer housing to lock bridge			Used in step 19
M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 19
Clamp		Tightening torque	3 Nm

Intake neck to cross connection			Used in step 20
M6		Tightening torque	8 Nm

Bulkhead cover, top			Used in step 21
Screw		Tightening torque	3 Nm

Battery terminal rail to battery tray			Used in step 22
M8 screw			19 Nm

Positive battery terminal			Used in step 22
NutM6			5 Nm

Trailing link			Used in step 22
M8 screw			19 Nm

Positive battery cable to battery terminal			Used in step 22
Nut M8			15,2 Nm

Negative battery terminal (with IBS)			Used in step 22
NutM6			5 Nm

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	10 13
EGR controller	10 13
Reset adaptations	12 23

General repair instructions	Used in step
61 20 ... Notes on AGM battery	1 22
61 12 ... Notes on intelligent battery sensor (IBS)	1 22
61 00 ... Notes for disconnecting and connecting battery	1 22
12 00 ... Instructions for removal and replacement of control units	

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	5
17 00 008 Draining and topping up coolant for high-temperature circuit	24
17 00 008 Draining and topping up coolant for high-temperature circuit	24
17 00 008 Draining and topping up coolant for high-temperature circuit	24
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
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17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
17 00 039 Bleed the cooling system and check for watertightness with the special tool (coolant circuit for low temperature)	24
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
17 00 039 Bleeding the cooling system (B36, B38, B46, B48)	24
17 00 039 Bleeding cooling system (B37, B47)	24
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
17 00 039 Filling and bleeding the high-temperature cooling system vacuum filler device (B48)	24
17 00 008 Draining and topping up the high-temperature coolant circuit	24
17 00 008 Draining and topping up the high-temperature coolant circuit	24
17 00 016 Draining and topping up coolant circuit for Range Extender \PREMIUM	24
17 00 008 Draining and topping up the high-temperature coolant circuit	24
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	24
17 00 039 Bleed the cooling system and check it for watertightness with the special tool	24
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	24
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	24
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	24

Parts

Parts required

Designation	Used in step

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Exhaust-gas recirculation cooler seal on exhaust manifold 13
Exhaust-gas recirculation cooler seal on intake plenum 13

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11 71 501 Removing and installing/replacing exhaust-gas recirculation valve (B37C)

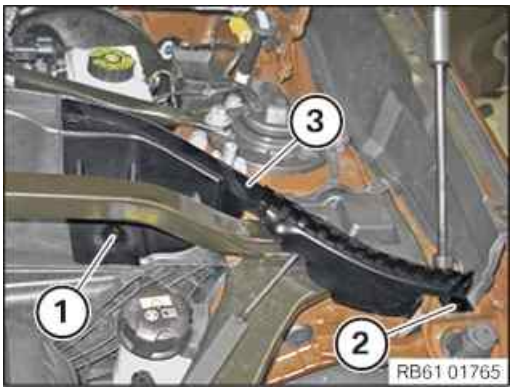
Attention!

Read and comply with notes on protection against electrostatic damage (ESD protection).

Necessary preliminary work:

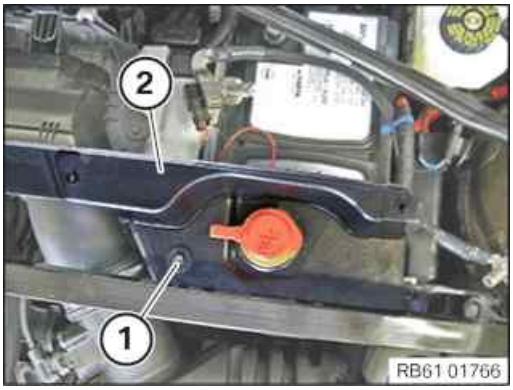
- Remove bulkhead upper section
- Remove intake silencer housing
- Remove clean air pipe
- Remove resonator
- Disconnect battery negative cable

Removal:



Release screw (1) and expanding rivet (2).

Remove the mounting for the gasket (3).



Release screw (1).

Remove cover (2).

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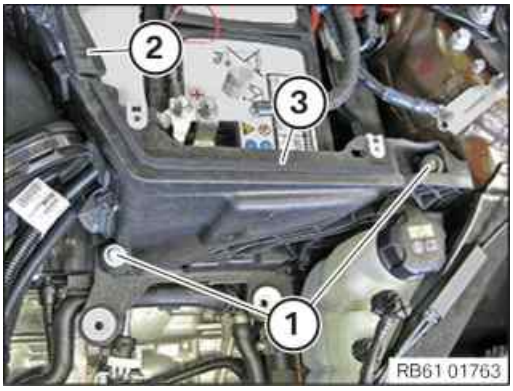
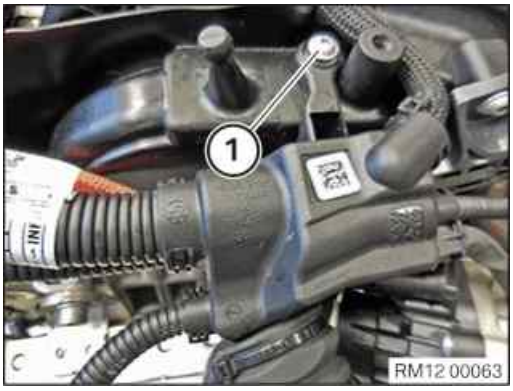
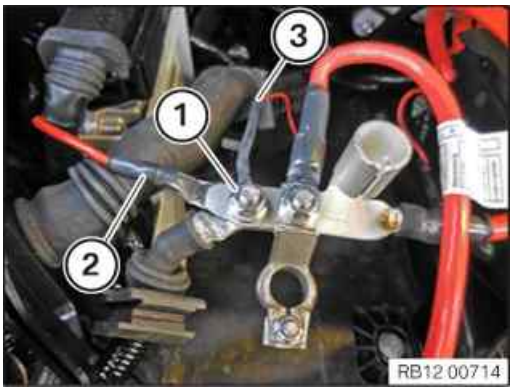


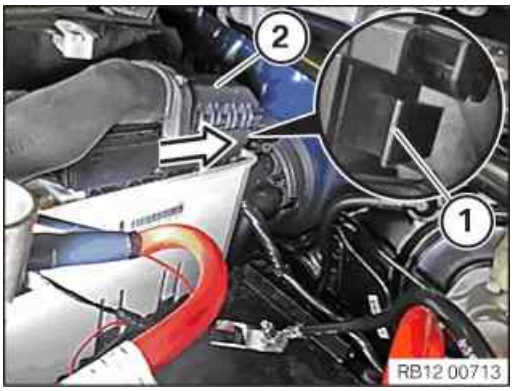
Release screws (1).
Lift cover (2) slightly and feed out tension strut (3).



Release screw (1). Remove the wiring harness from the cylinder head cover.



Slacken nut (1).
Feed out cables (2) and (3) and lay to one side.



Undo lock (1) as shown by arrow.
Remove connector (2).

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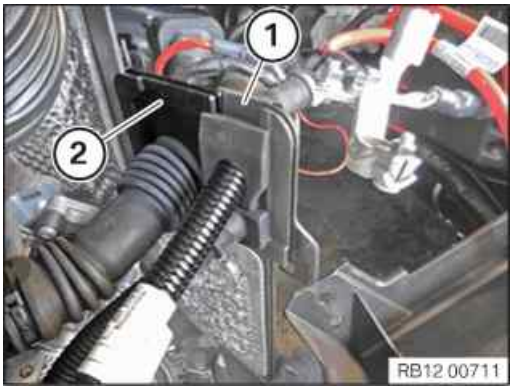
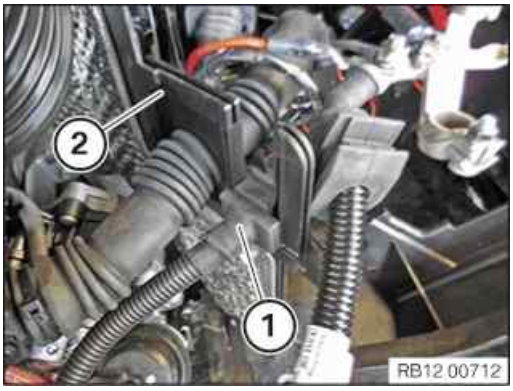
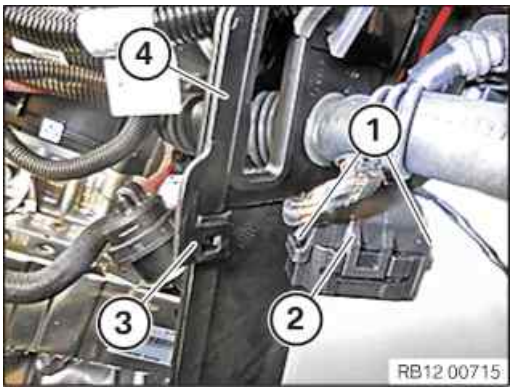


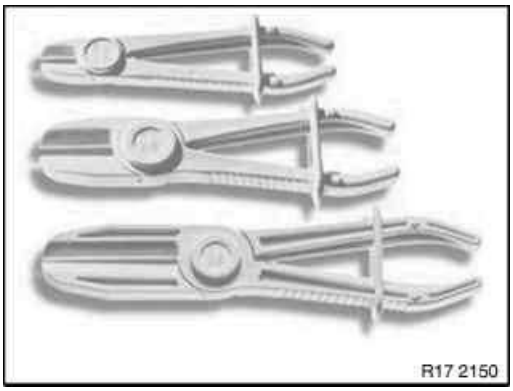
Remove cable (1) from cable clip (2).



Remove cable (1) from cable clip (2).



Release lock (1).
Remove connector (2).
Release lock (3).
Remove cable clip (4) with connector.



Use commercially available pinch-off tools to pinch off the coolant hoses.

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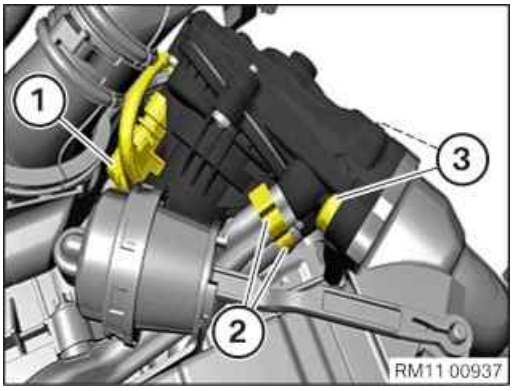


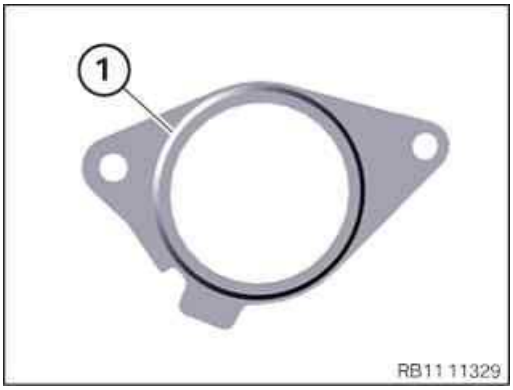
Unlock connector (1) and pull off.

Loosen screws (3).

Loosen hose clamps (2) and pull off coolant lines.

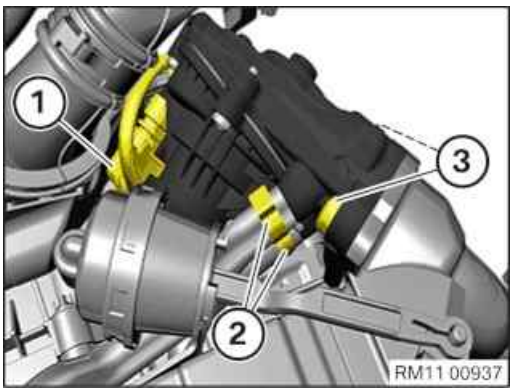
Remove the exhaust-gas recirculation valve .

Installation:



Replace gasket (1).

Parts: Gasket



Renew the hose clamps for the coolant lines (2).

Parts: Hose clamps.

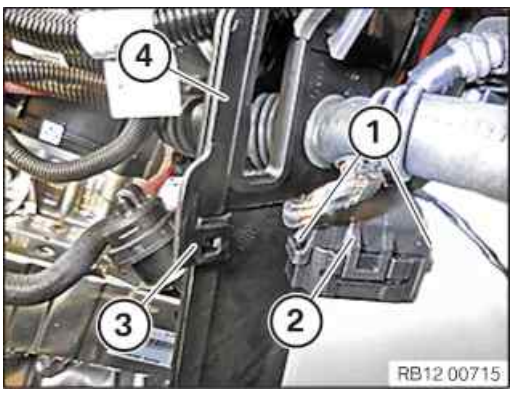
Slide coolant lines with hose clamps (2) onto the exhaust-gas recirculation valve.

Make sure the coolant lines are not mounted twisted.

Secure hose clamps (2).

Position the exhaust-gas recirculation valve with new seal.

Loosens screws (3) by **one turn**.



Connect connector (2) and lock.

Lock (1) must snap audibly into place.

Install cable clip (4) with connector.

Lock (3) must snap audibly into place.

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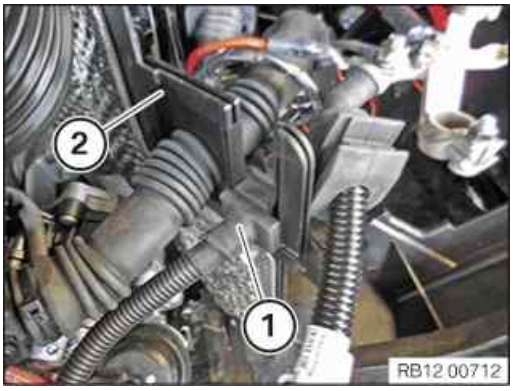
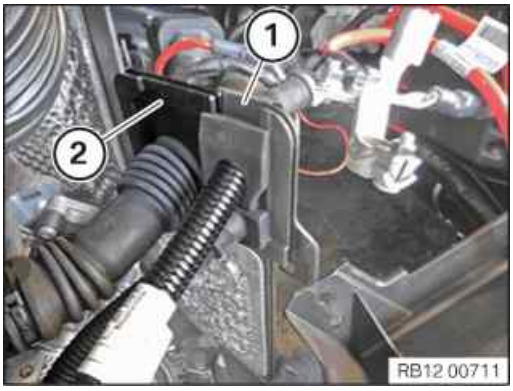
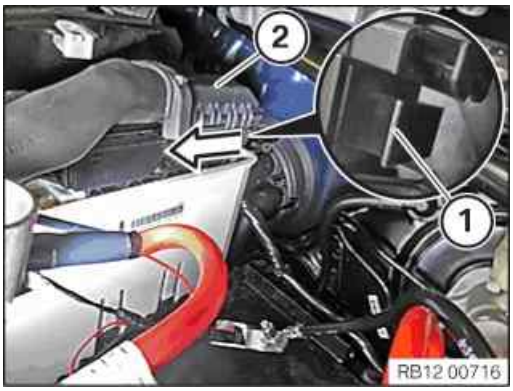


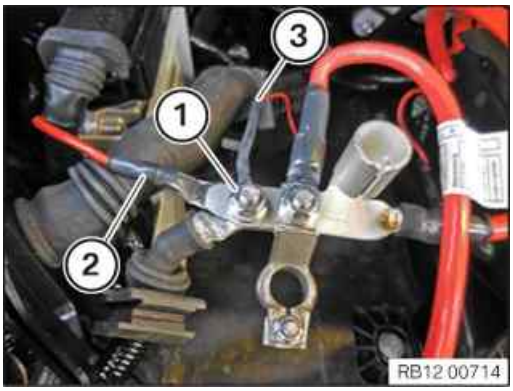
Feed cable (1) into the cable clip (2) and install.



Feed cable (1) into the cable clip (2) and install.



Fit connector (2).
Engage the lock (1) as shown by arrow.
Lock (1) must snap audibly into place.



Feed in and install cables (2) and (3).
Tighten nut (1).
Tightening torque 12 52 6AZ

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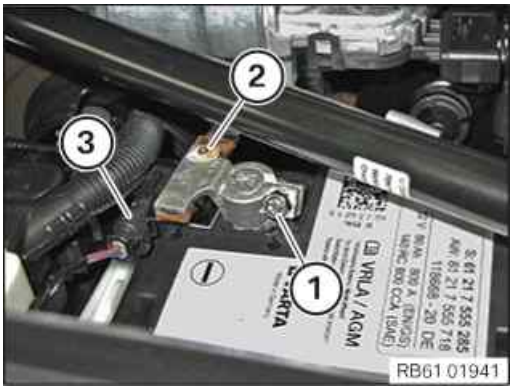


Connect negative battery cable (2).

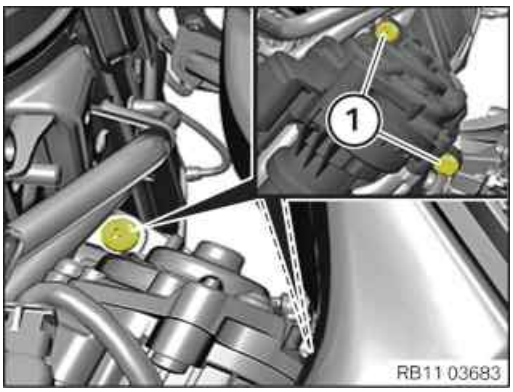
Tighten nut (1).

Tightening torque 61 21 2AZ.

Connect the connector (3) and audibly lock it.

Connect diagnosis system, Service function: Carry out "Setting the exhaust-gas recirculation valve installation position".

Diagnosis path: 01 Drive - Digital diesel electronics - Exchanging the exhaust-gas recirculation valve - Exhaust-gas recirculation valve installation position



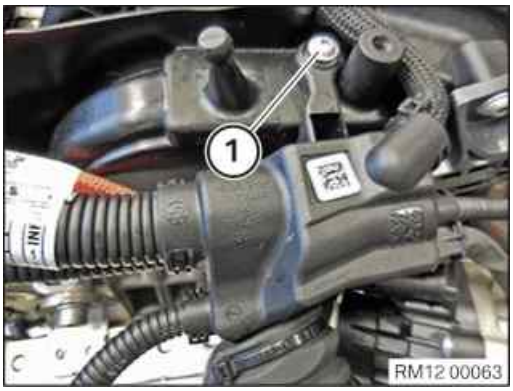
Tighten down screws (1).

Tightening torque 11 71 3 AZ.

Replacement.

Resetting adaptations.

Diagnosis path: 01 Drive - DDE - Reset adaptation - Delete adaptations.



Install wiring harness on cylinder head cover.

Tighten screw (1).

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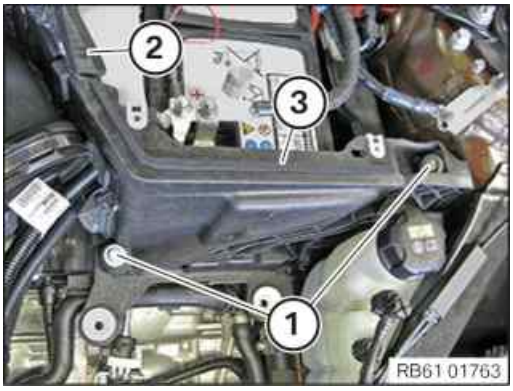
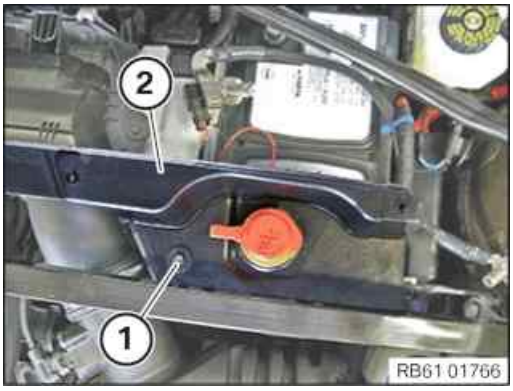
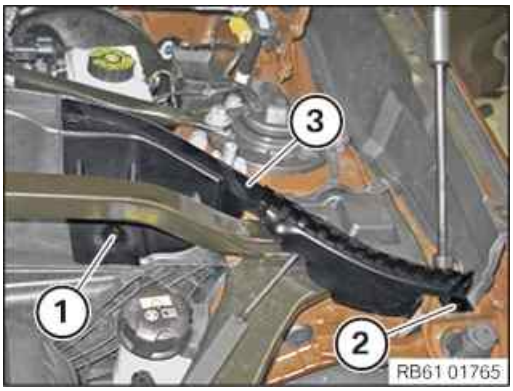


Lift cover (2) slightly and install tension strut (3).
Tighten screws (1).
Tightening torque 61 21 2AZ.



Install cover (2).
Tighten screw (1).



Install the mounting for the seal (3).
Tighten screw (1).
Install expanding rivet (2).

Required follow-up work:

- Install intake silencer housing
- Install clean air pipe
- Install resonator
- Install bulkhead upper section
- Add coolant

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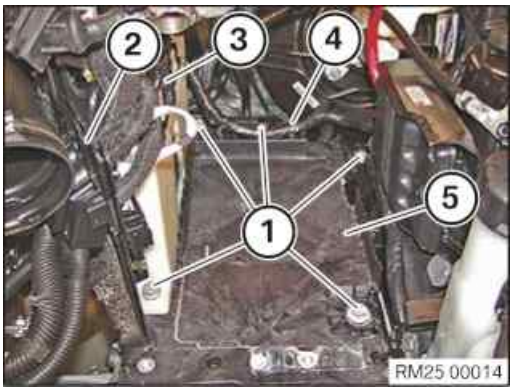
11 71 100 Removing and installing/replacing exhaust-gas recirculation cooler (B37C)

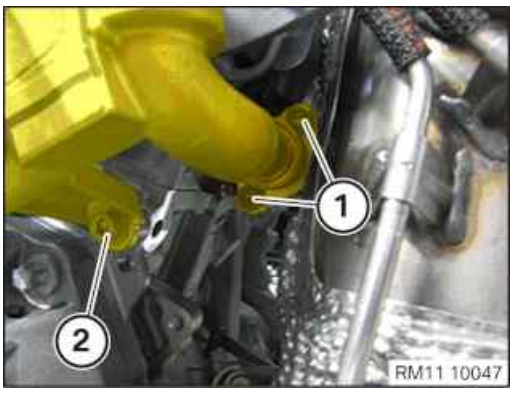
Necessary preliminary work:

- Remove acoustic cover
- Remove resonator.
- Remove clean air pipe.
- Remove battery.
- Drain coolant.

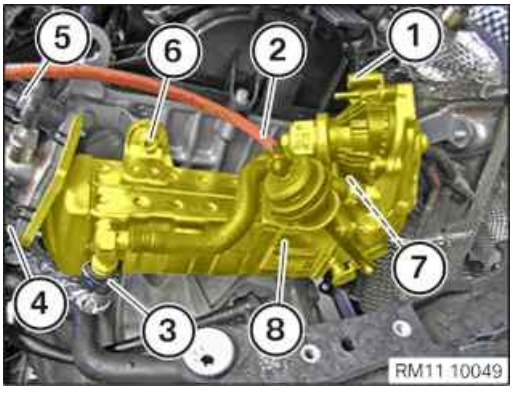
Removal:



Release screws (1).
Release battery housing (2) from bracket and remove.
Release control unit (3) from bracket.
Detach wiring harness (4) from battery tray (5).
Remove battery tray (5).



Loosen screws (1) on exhaust manifold.
Release screw (2).



Unlock plug connection (1) and disconnect.
Pull off vacuum line (2).
Unlock coolant line (3) and pull off.
Release screws (4 and 5).
Release screws (6 and 7).
Remove exhaust-gas recirculation cooler (8) upwards.

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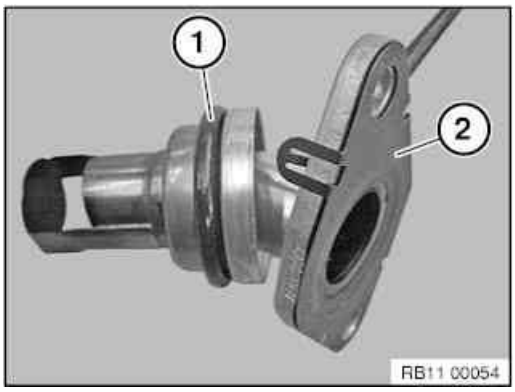
Installation:

Install pipe neck (1).

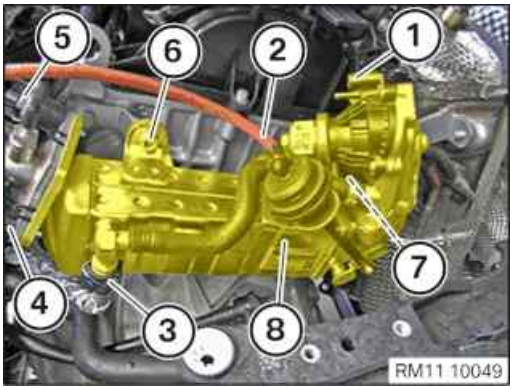
Part: Replace pipe neck.



Clip in beaded metal gasket (2).

Replace beaded metal gasket.

Parts: Beaded metal gasket



Installation note:
Make sure that the pipe neck (8) is correctly fitted in the cylinder head.

Tighten all screw connection.

Join screws (7) and (6).

Join screws (4) and (5).

Tighten screws (7) and (6).

Tightening torque: 11 71 2AZ.

Tighten screws (4) and (5).

Tightening torque: 11 61 2AZ.

Connect vacuum line (2).

Connect and lock coolant line (3).

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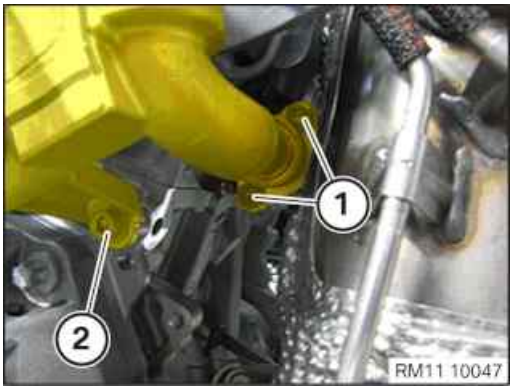


Installation note:
Renew screws (1) and seal.

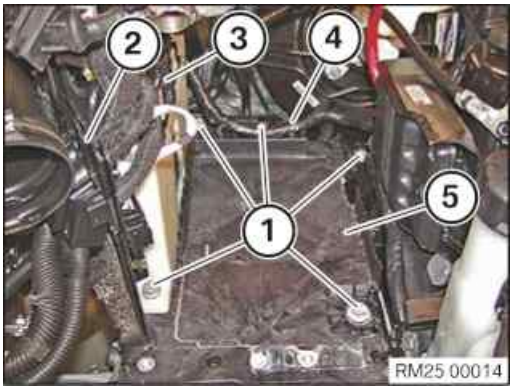
Grease screw thread (1) with assembly paste 4.2.

Tighten screws (1) on exhaust manifold.

Tightening torque: 11 71 1AZ.

Tighten screw (2).

Tightening torque: 11 71 2AZ.



Install battery tray (5).

Tighten screws (1).

Install wiring harness (4) on battery tray (5).

Insert control unit (3) in bracket.

Insert battery housing (2) in bracket.

Required follow-up work:

- Install acoustic cover.
- Install battery.
- Install clean air pipe.
- Install resonator.
- Top up coolant.

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11 71 705 Replace EGR low pressure cooler

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CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Filling **without** the vacuum filler device (watering can filling) is **not permitted**.

Non-compliance will result in danger of component damage and/or engine damage.

Filling specification **absolutely must** be adhered to.

The operation of the vehicle is not permitted unless the filling procedure has been completed. Otherwise, functional limitations (degradation) and/or overheating may occur.

A bleeding procedure is required after a part has been exchanged in the cooling system and/or after refilling the cooling system.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

- When the engine is stopped after the end of the journey, it may be necessary to run the electric fan. In rare cases, operation of the electric fan can last up to 11 min. This protects the components. In this case, replacing the electric fan will not remedy the problem!

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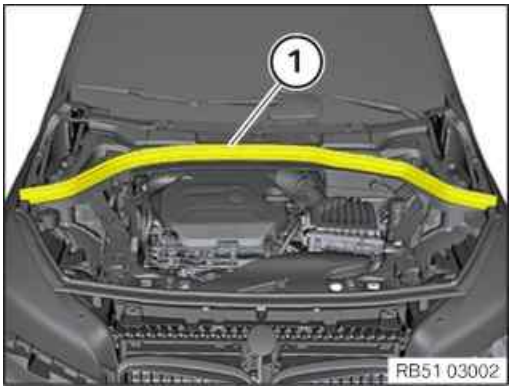
1 – Remove the seal for the rear bonnet

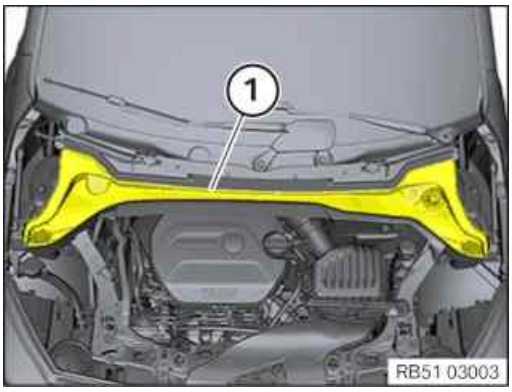
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

2 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

3 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Remove the wiper arm**

RISK OF DAMAGE

Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.

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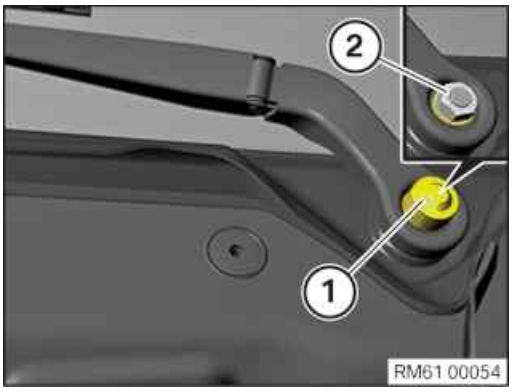
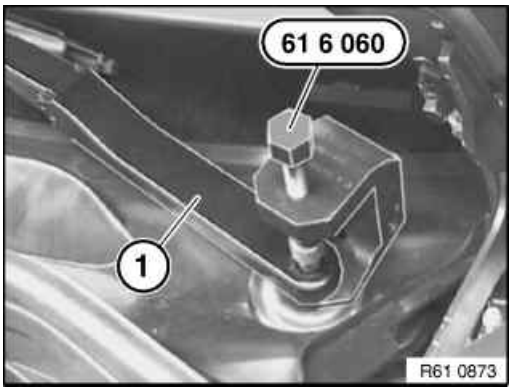


- Remove the protective cap (1).
- Loosen nut (2).



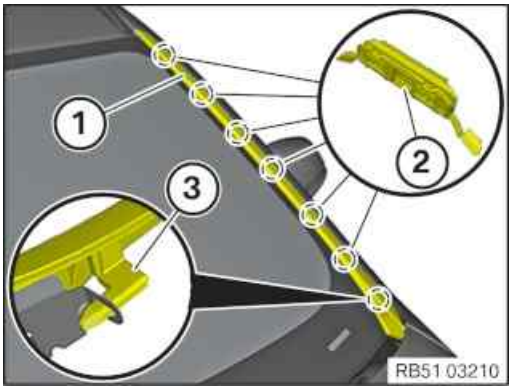
- Pull off the wiper arm (1) using special tool .

4 – Remove the gutter strip on the windscreen on the left and right

NOTICE

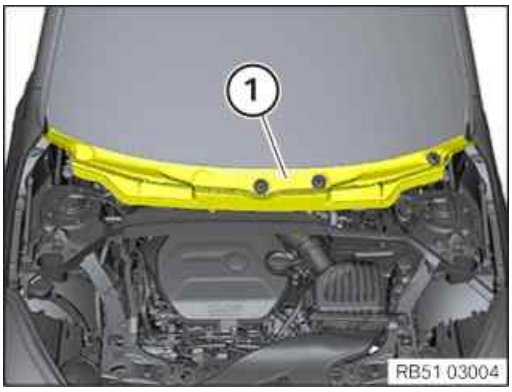
Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

5 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

6 – Removing the upper bulkhead cover

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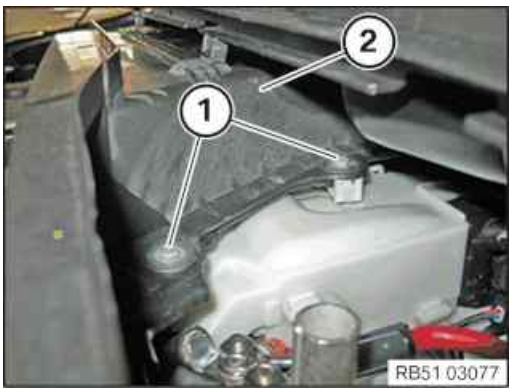
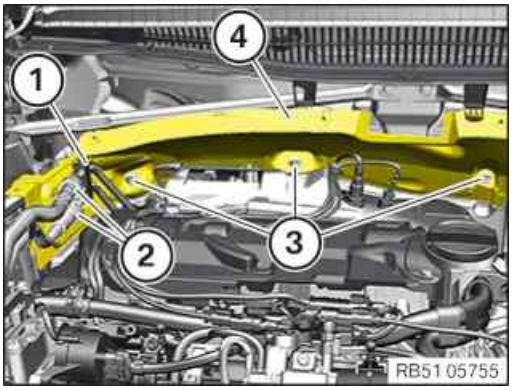
- Loosen screws (1).

- Loosen screws (1).



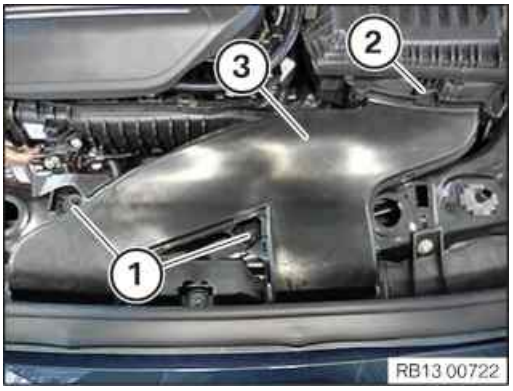
- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

7 – Remove the rear bulkhead upper part



- Unlock the holder (1) and disconnect.
- Guide out and remove the fuel lines (2).
- Loosen screws (3).
- Guide out the rear bulkhead upper part (4) and remove.

8 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

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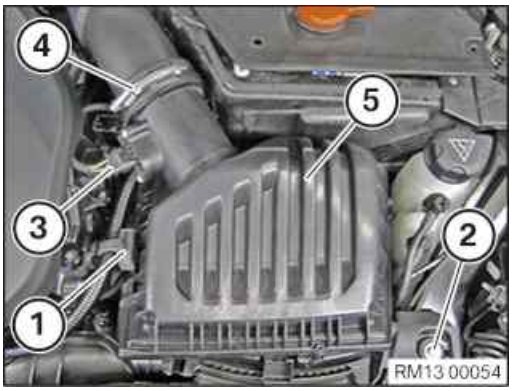
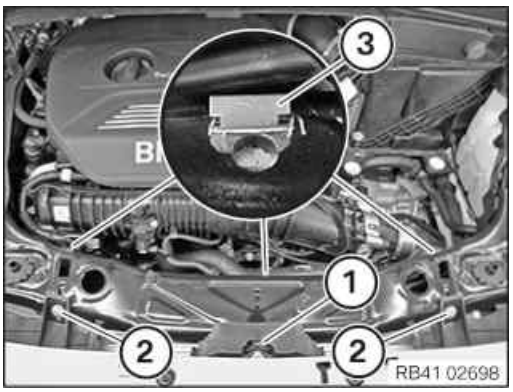
9 – Removing intake silencer housing

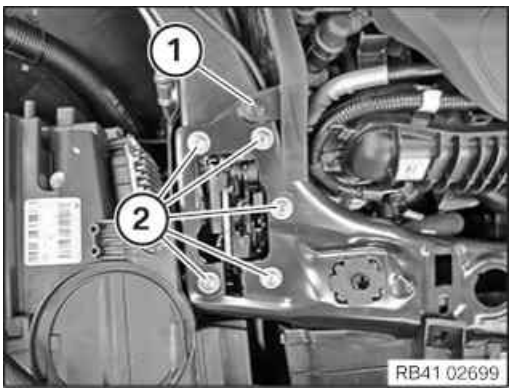


- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

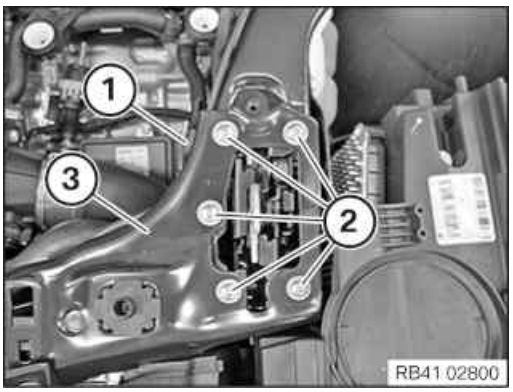
10 – Remove cross connection



- Loosen screws (1) and (2).
- Detach clamps (3) for bonnet lock Bowden cable.



- Lever out expanding rivet (1).
- Loosen screws (2).



- Lever out expanding rivet (1).
- Loosen the screws (2) and remove the cross connection (3).

11 – Partially releasing the exhaust temperature sensor for low-pressure exhaust-gas recirculation

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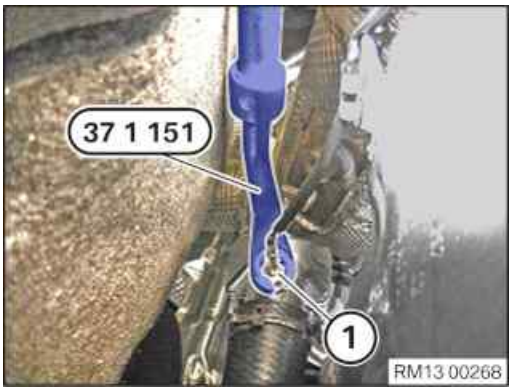
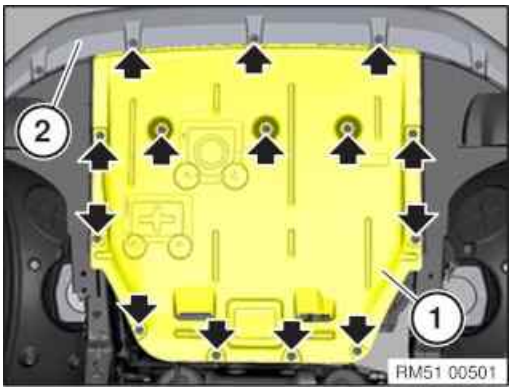


- Release the exhaust temperature sensor (1) using the special tool **0 495 909 (37 1 151)** and place it to one side.

12 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

13 – Draining coolant

WARNING

Hot fluids.

Risk of scalding!

- Conduct all work in the vehicle wearing appropriate personal protective equipment only.

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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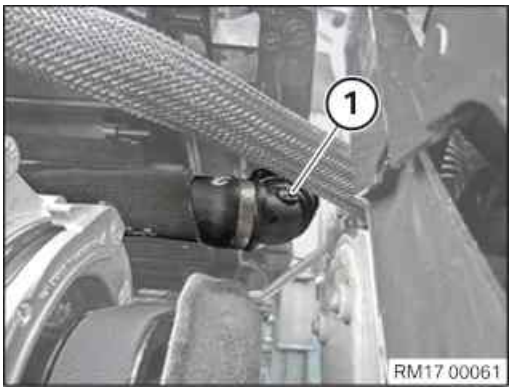
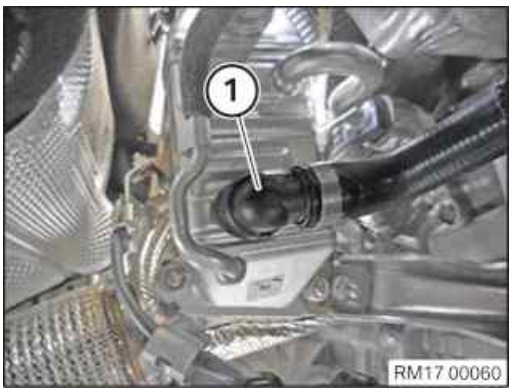
- Loosen sealing cap (1).



- Unlock and disconnect the coolant line (1) from the radiator on the right.
- Catch and dispose of escaping coolant.



- Unlock and pull off the coolant line (1) from the low pressure exhaust-gas recirculation cooler on the diesel particulate filter.
- Catch and dispose of escaping coolant.

MAIN WORK

14 – Removing the low-pressure exhaust-gas recirculation cooler

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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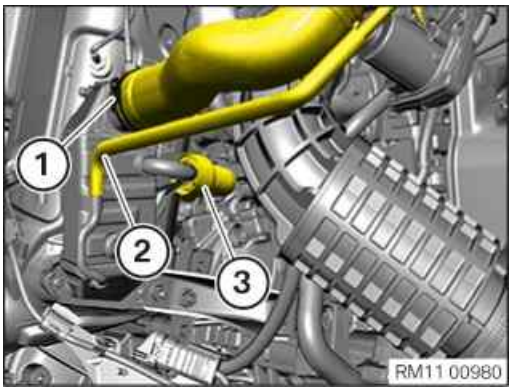
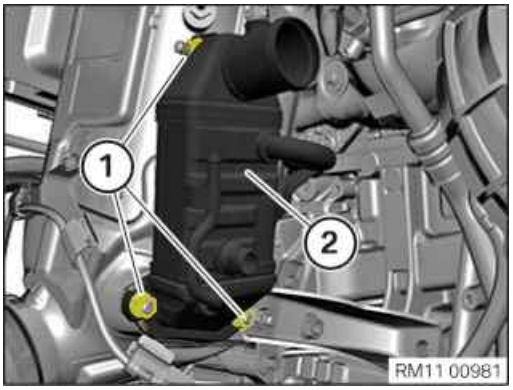


TECHNICAL INFORMATION

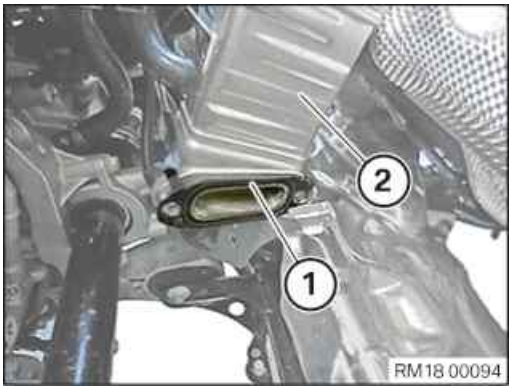
Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

- Release the hose clamp (1) and pull the coolant hose off the low-pressure exhaust-gas recirculation cooler.
- Release the pressure hose (2) from the low-pressure exhaust-gas recirculation cooler and pull it off.
- Unlock and pull off the coolant hose (3) on the low pressure exhaust-gas recirculation cooler.



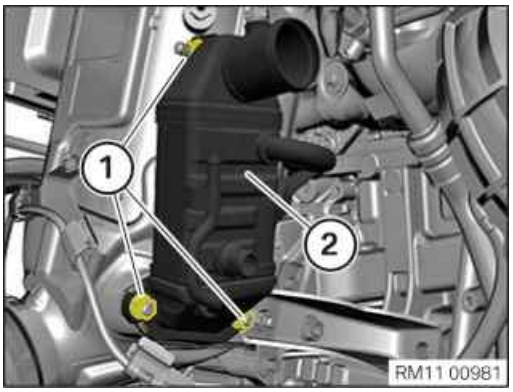
- Release the nuts (1) on the low-pressure exhaust-gas recirculation cooler.
- Feed out and remove the low pressure exhaust-gas recirculation cooler (2).

15 – Installing the low-pressure exhaust-gas recirculation cooler



- Renew the seal (1) on the low-pressure exhaust-gas recirculation cooler (2).

  Parts: Gasket



- Guide in and install the low-pressure exhaust-gas recirculation cooler (2).
- Tighten nuts (1).

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter

Flange nutM8		Tightening torque	19 Nm

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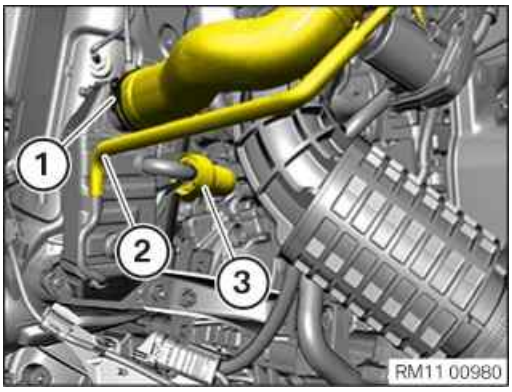


- Connect and lock coolant hose (3).

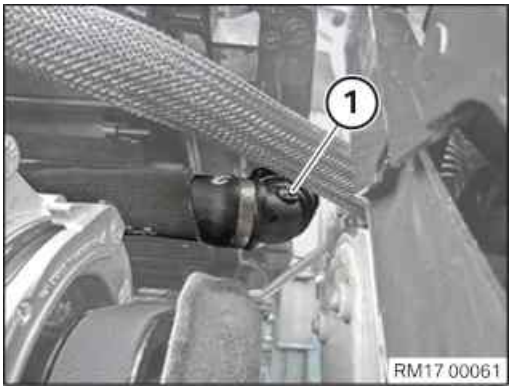
  The coolant hose (3) must audibly engage.
- Connect the pressure hose (2).
- Connect the coolant hose (1) to the exhaust-gas recirculation cooler.
- Position and secure the hose clamp.

POSTPROCESSES

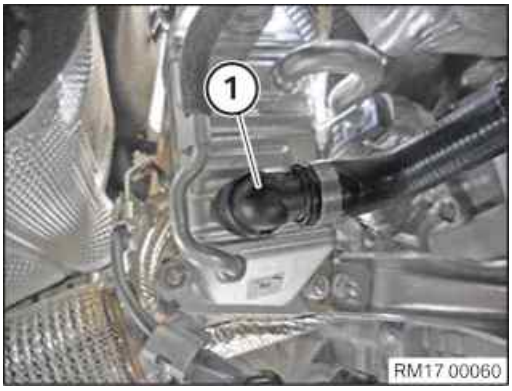
16 – Connect the coolant line

TECHNICAL INFORMATION

Make sure that the connections are locked correctly. The locks must engage audibly.

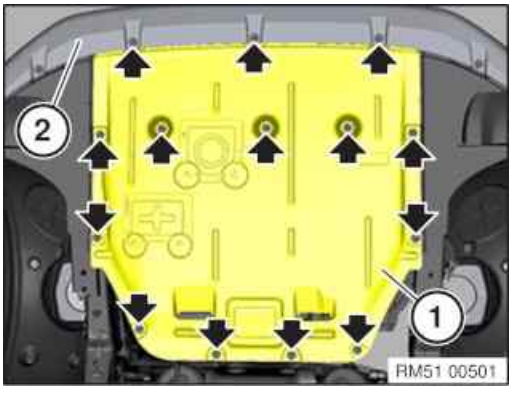


- Connect the right coolant line (1) to the radiator and lock audibly.



- Connect the coolant line (1) to the low pressure exhaust-gas recirculation cooler on the diesel particulate filter and lock audibly.

17 – Installing the front underbody protection



- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

18 – Partially secure the exhaust temperature sensor for the low-pressure exhaust-gas recirculation

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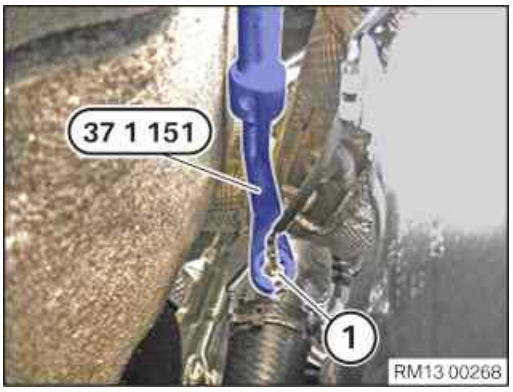
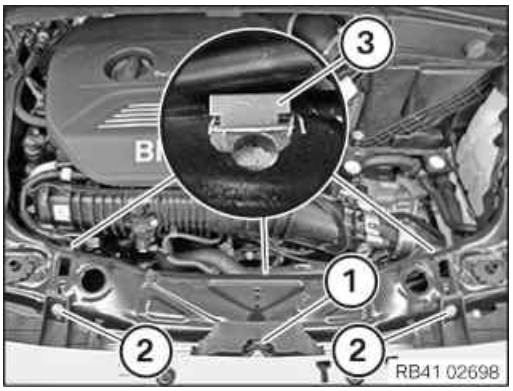


- Feed in and install the exhaust temperature sensor (1).
- Tighten the exhaust temperature sensor (1) with the special tool **0 495 909 (37 1 151)**.

Exhaust-gas temperature sensor to exhaust system

Exhaust-gas temperature sensor		Tightening torque	28 Nm

19 – Install cross connection



- Install cross connection.
- Position all screws.
- Tighten down screw (1).

Bracing strut to top cross connection

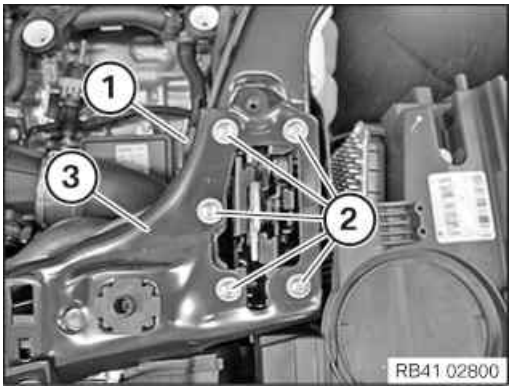
M8		Tightening torque	25 Nm

- Tighten down screws (2).

Air duct to deformation element/cross connection

M6x20 screw		Tightening torque	6 Nm

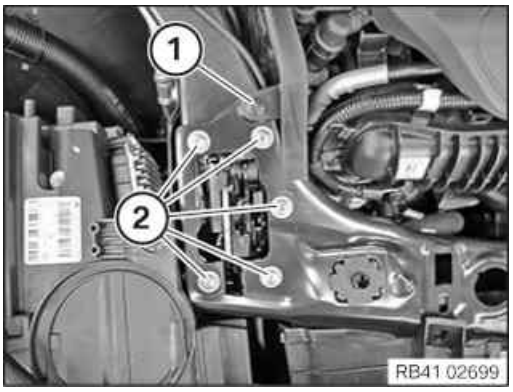
- Fasten clamps (3) for bonnet lock Bowden cable to cross connection.
- Tighten screws (2) of cross connection (3).



Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).



- Tighten down screws (2).

Cross connection on support for cross connection

M6x20		Tightening torque	12 Nm

- Fasten expanding rivet (1).

20 – Installing intake silencer housing

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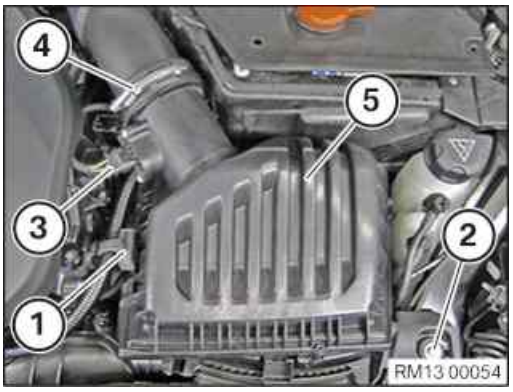


- Insert the intake silencer housing (5) into the rubber mounts and install it.
  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

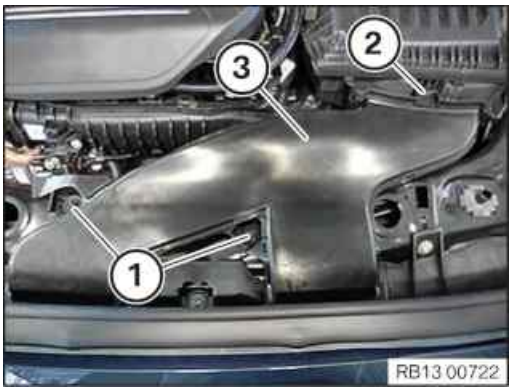
- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).
  The connector (3) must engage audibly.
- Insert and install the holder (1).

21 – Install the intake neck for the intake filter housing

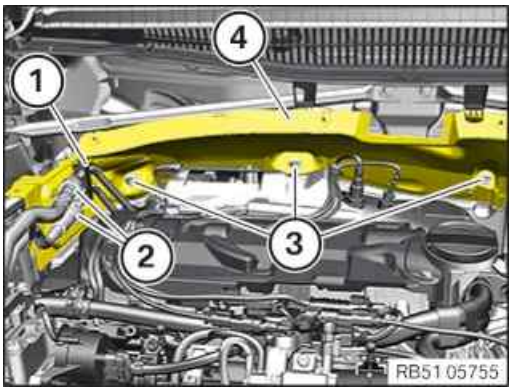


- Insert and install the intake neck (3).
  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

22 – Installing rear bulkhead upper part



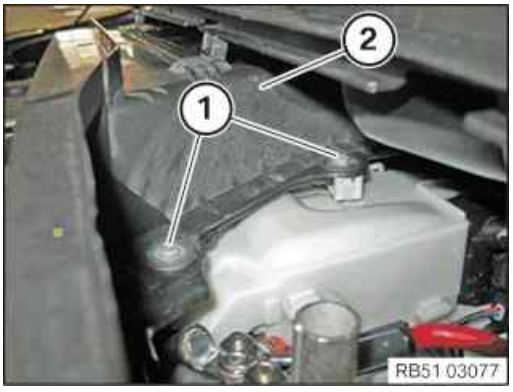
- Feed in and install the rear bulkhead upper part (4).
- Tighten down screws (3).

Rear bulkhead upper part to lower section of bulkhead

Oval-head screw		Tightening torque	5 Nm

- Feed the fuel line (2) into the holder (1) and install.
- Connect and lock the holder (1).
  The holder (1) must engage audibly.

23 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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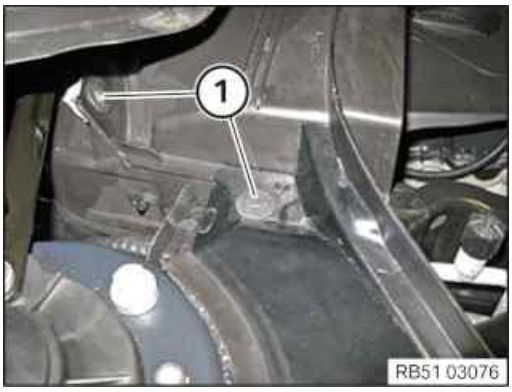


- Tighten the screws (1).

Bulkhead cover, top

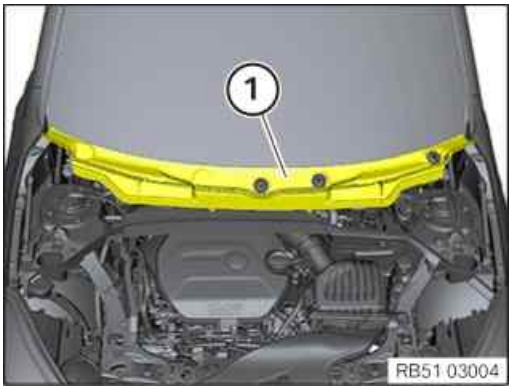
Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

24 – Install the rear cowl panel cover



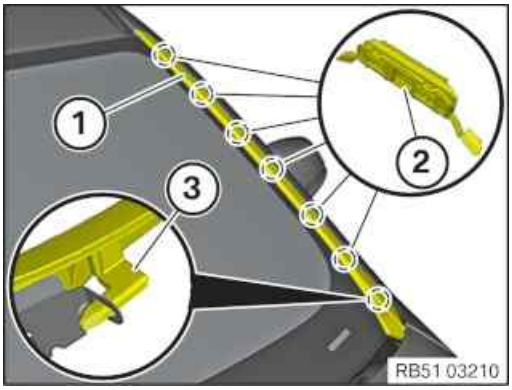
- Feed in and engage the rear cowl panel cover (1).

25 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

26 – Install left and right wiper arm

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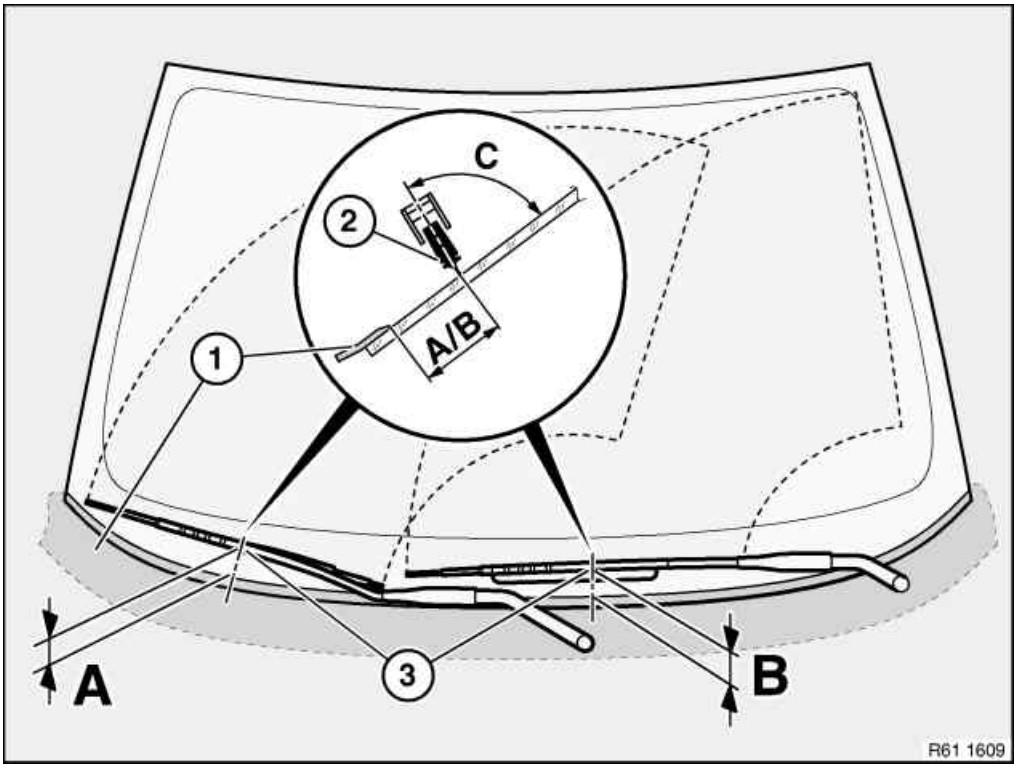
NOTICE

Description is for left component only. Procedure on the right side is identical.

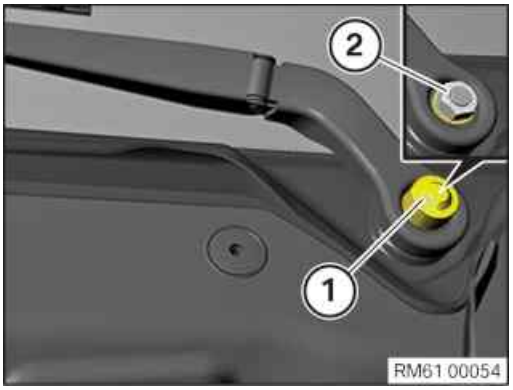
▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

27 – Installing front cowl panel cover

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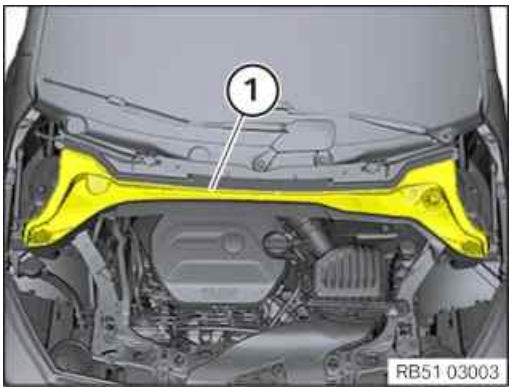
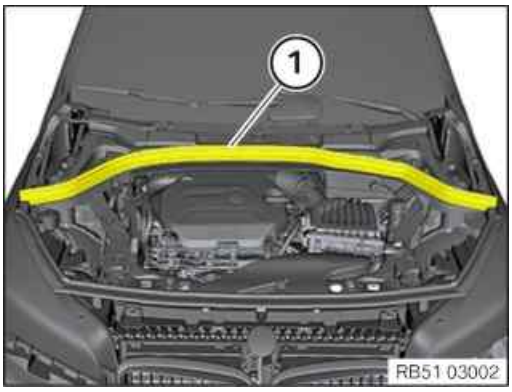


- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

28 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

29 – Fill and bleed the coolant circuit

▶ **Filling and bleed the high-temperature coolant circuit**

- See additional information.

Additional Information

Overview of Tightening Torques

Low-pressure exhaust-gas recirculation cooler to diesel particulate filter — Used in step 15

Flange nutM8		Tightening torque	19 Nm

Underbody protection front — Used in step 17

			3 Nm

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Exhaust-gas temperature sensor to exhaust system — Used in step 18

Exhaust-gas temperature sensor		Tightening torque	28 Nm

Bracing strut to top cross connection — Used in step 19

M8		Tightening torque	25 Nm

Air duct to deformation element/cross connection — Used in step 19

M6x20 screw		Tightening torque	6 Nm

Cross connection on support for cross connection — Used in step 19

M6x20		Tightening torque	12 Nm

Intake silencer housing to lock bridge — Used in step 20

M6X30		Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 20

Clamp		Tightening torque	3 Nm

Intake neck to cross connection — Used in step 21

M6		Tightening torque	8 Nm

Rear bulkhead upper part to lower section of bulkhead — Used in step 22

Oval-head screw		Tightening torque	5 Nm

Bulkhead cover, top — Used in step 23

Screw		Tightening torque	3 Nm

Windscreen wiper arm — Used in step 26

Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

0 495 909 (37 1 151) Socket wrench

Common — Used in step 11 18

Usage	(Socket wrench)SW14
Included in the tool or work	0 495 908
Storage location	B21
Replaced by	
In connection with	
SI-Number	01 01 07 (333)

Overview Technical Data

Links

Functional descriptions	Used in step
Exhaust-gas recirculation control	14

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Repair instructions	Used in step
17 00 008 Draining and topping up coolant for high-temperature circuit	29
17 00 008 Draining and topping up coolant for high-temperature circuit	29
17 00 008 Draining and topping up coolant for high-temperature circuit	29
17 00 039 Bleed the cooling system and check it for watertightness with the special tool

17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29
17 00 039 Bleeding the cooling system and checking watertightness using a special tool (coolant circuit for high temperatures)	29

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11 71 508 Replacing exhaust-gas recirculation valve for low pressure

WARNING

Hot surfaces.

Risk of burning!

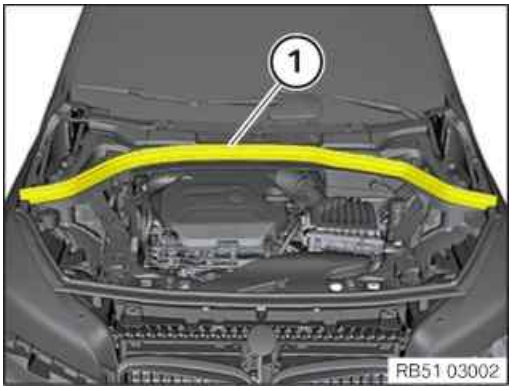
- Perform all work only on components that have cooled down.

PRELIMINARY WORK

1 – Remove the seal for the rear bonnet

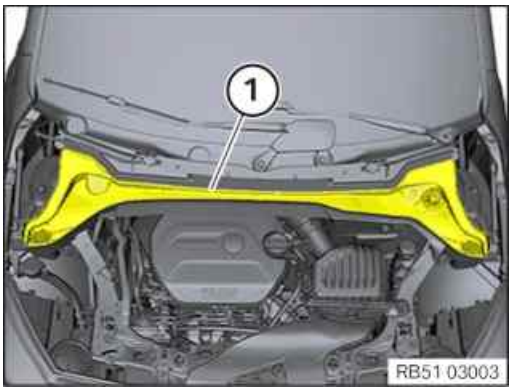
NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

2 – Removing front cowl panel cover



- Guide the front cowl panel cover (1) out toward the top and remove it.

3 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Remove the wiper arm**

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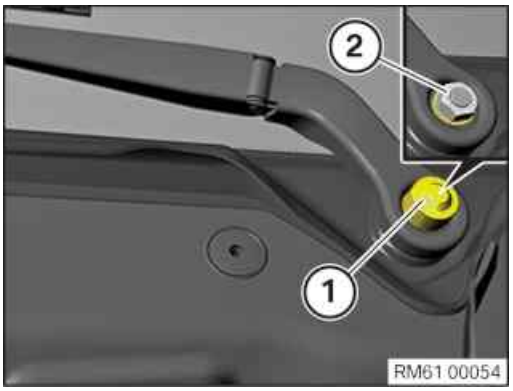
RISK OF DAMAGE

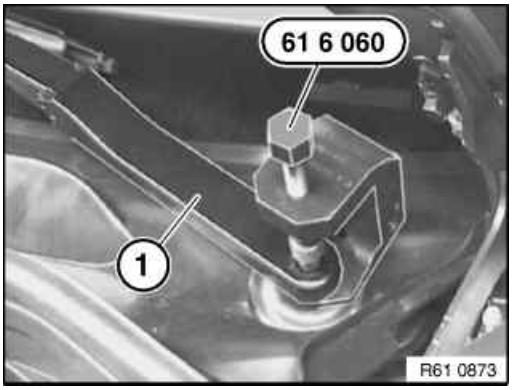
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



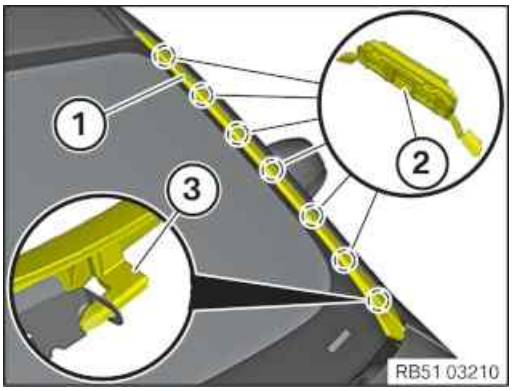
- Pull off the wiper arm (1) using special tool .

4 – Remove the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

5 – Remove the rear cowl panel cover

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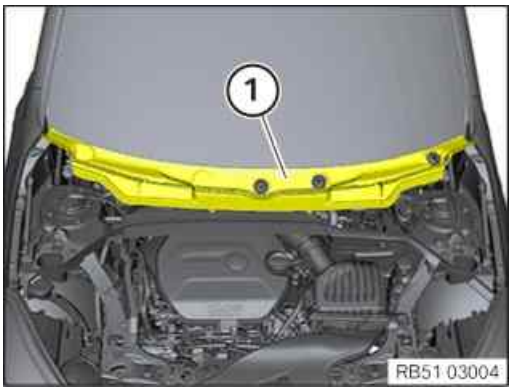
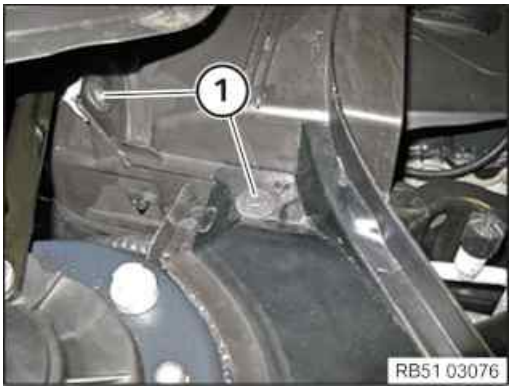


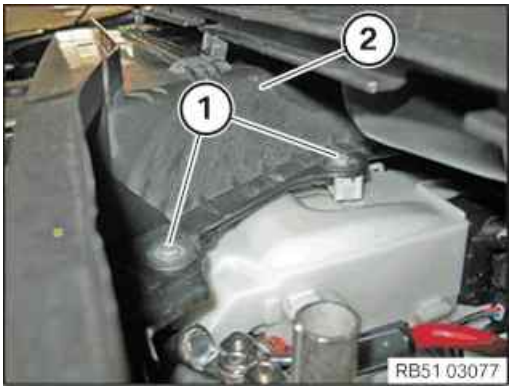
- Disengage and guide out the rear cowl panel cover (1) towards the top.

6 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).



- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

7 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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RISK OF DAMAGE

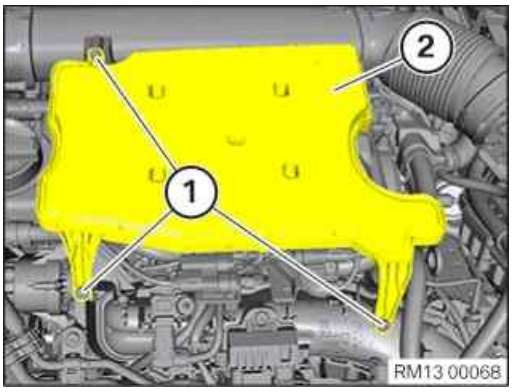
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

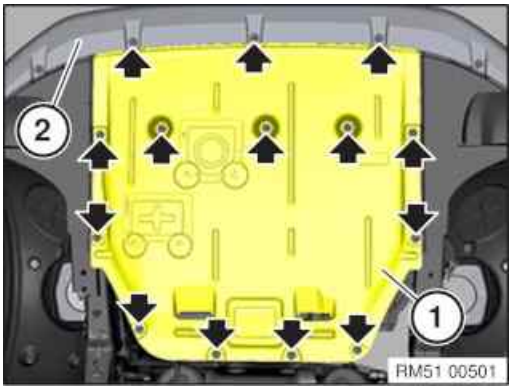
- Unclip the acoustic cover from the marked areas towards the top.

8 – Remove resonator



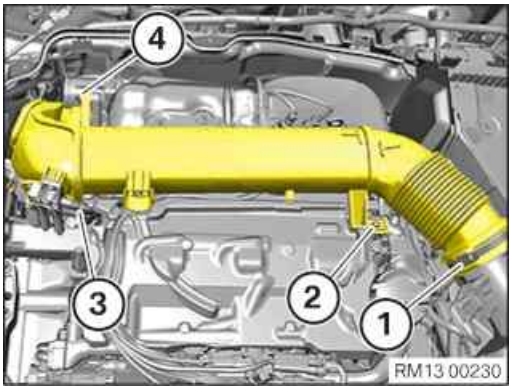
- Loosen screws (1).
- Guide out and remove the resonator (2).

9 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

10 – Removing clean air pipe



- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).

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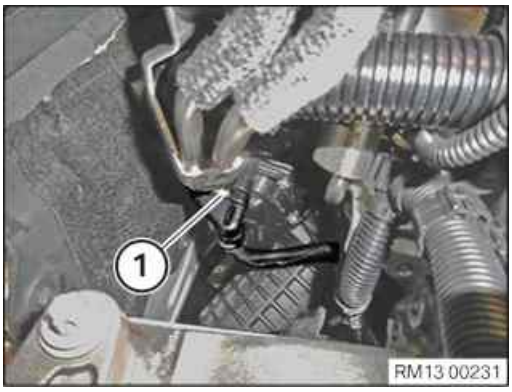
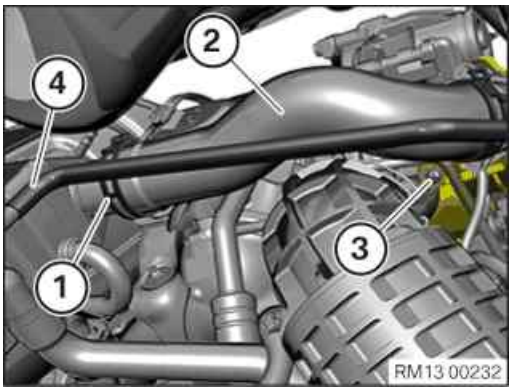
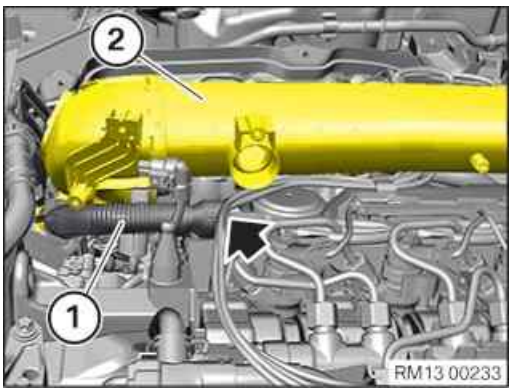


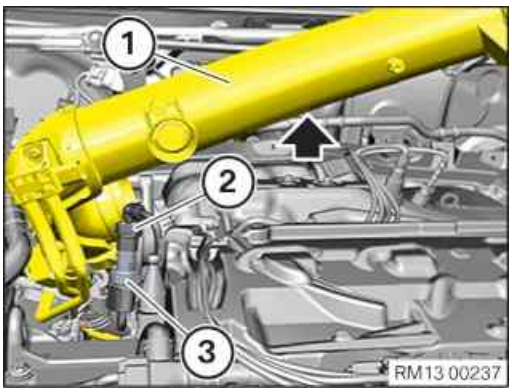
- Unlock and loosen connector (1).



- Unfasten clamp (1).
- Feed out pressure hose (2) and set it aside.
- Loosen screw (3).
- Pull off pressure hose (4) and set it aside.



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).



- Thread out clean air pipe (1) upwards in direction of arrow and set it aside.
- Unlock and loosen connector (2).
- Detach exhaust gas pressure sensor (3).
- Guide out and remove the exhaust gas pressure sensor (3).
- Feed out clean air pipe and remove (1).

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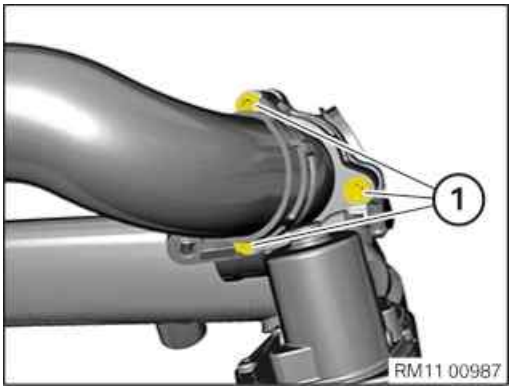
MAIN WORK

11 – Removing the low pressure exhaust-gas recirculation valve

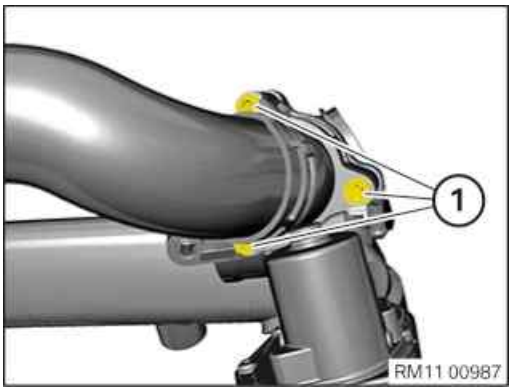


- Screws (1) loose.
- Remove connecting branch and low pressure exhaust-gas recirculation valve from clean air pipe.

12 – Installing the low pressure exhaust-gas recirculation valve

- The seals (1) on the clean air pipe and connecting branch must be renewed.

  Parts: Gaskets.



- Position low pressure exhaust-gas recirculation valve with connecting branch.
- Tighten the screws (1).

Low-pressure exhaust-gas recirculation valve to clean air pipe

M6x40		Tightening torque	8 Nm

POSTPROCESSES

13 – Installing clean air pipe

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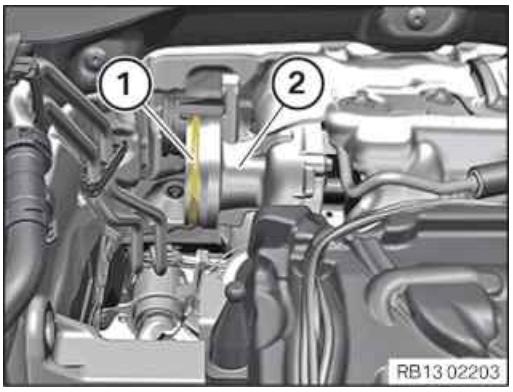
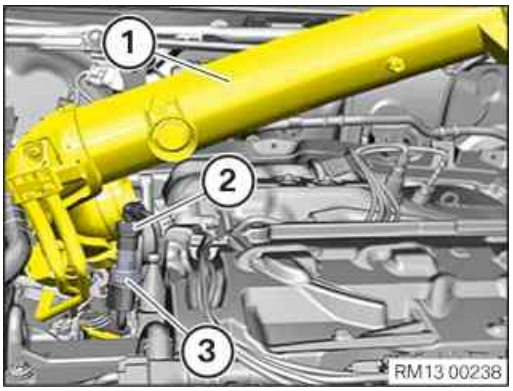


- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.



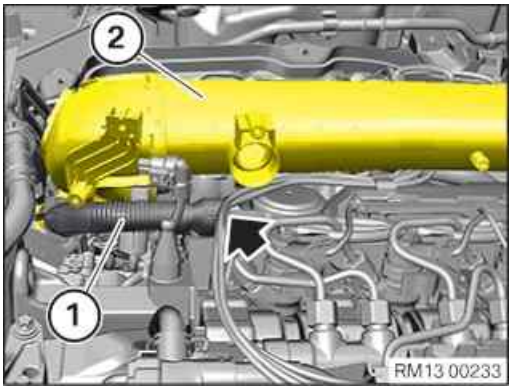
- Feed in clean air pipe (1) and lay it down as shown.
- Insert and install the exhaust gas pressure sensor (3).
- Tighten the exhaust gas pressure sensor (3).

Exhaust gas pressure sensor

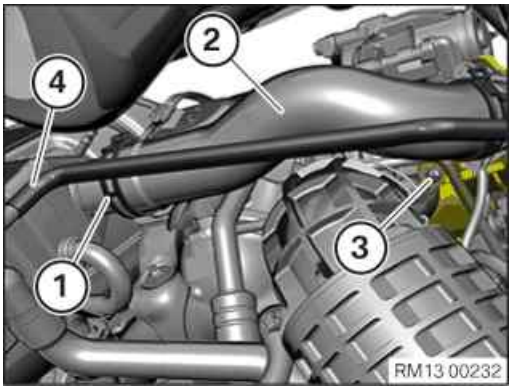
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

- Connect and lock the connector (2).

  The connector (2) must engage audibly.
- Install the clean air pipe (1).



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.



- Tighten down screw (3).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Feed the pressure hose (2) in and install.
- Position and secure the clamp (1).
- Check pressure hose (4).
- Renew hardened pressure hoses (4).

  Parts: Pressure hose
- Connect pressure hose (4) and secure with 15 mm to 19 mm screw clamps.

Clamp for the pressure hose on the differential pressure sensor

Clamp 15–19mm		Tightening torque	3 Nm

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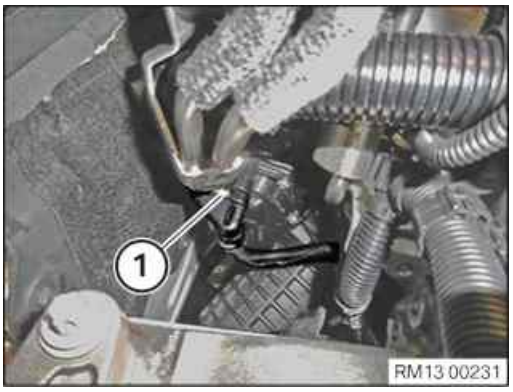
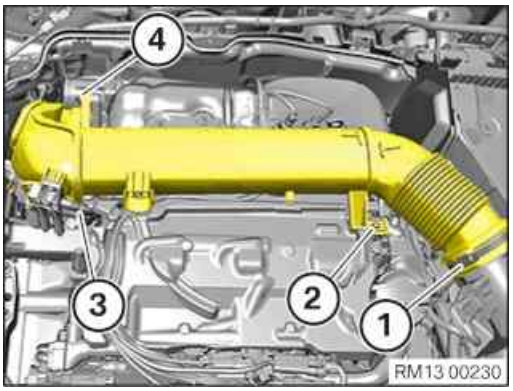


- Connect and lock the connector (1).

  The connector (1) must lock audibly.



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

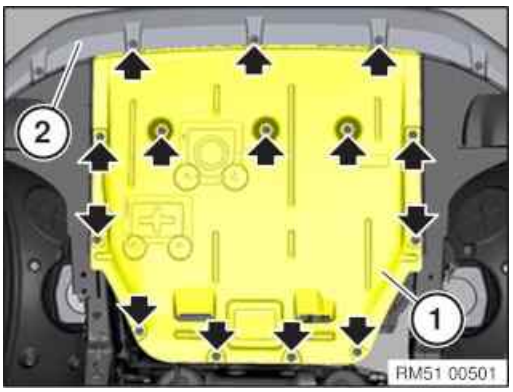
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

14 – Installing the front underbody protection

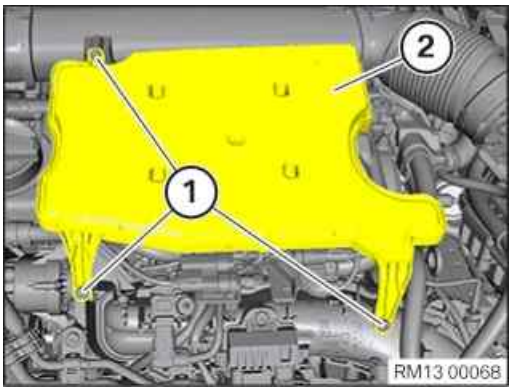


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

			3 Nm

15 – Install resonator



- Insert and install the resonator (2).
- Renew screws (1).

  Parts: Bolts
- Tighten the screws (1).

Resonator to manifold and clean air pipe

Screw TS6	Renew screw.	Tightening torque	5 Nm

16 – Install acoustic cover

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RISK OF DAMAGE

Damage to the acoustic cover.

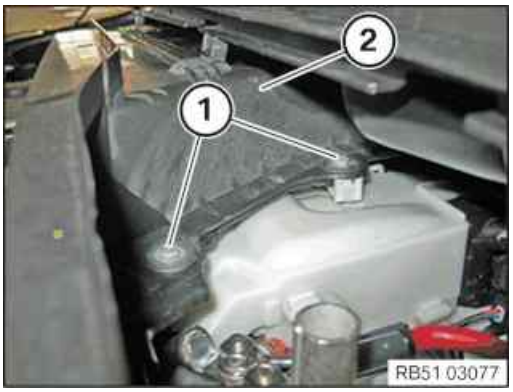
Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

17 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

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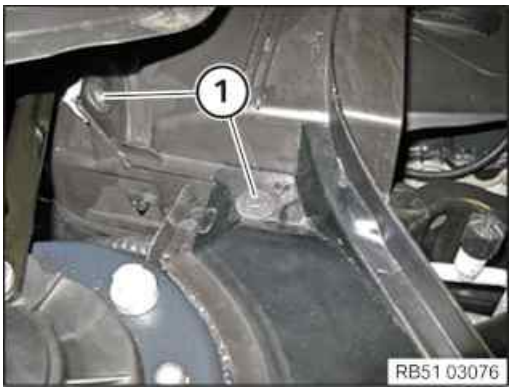


- Tighten the screws (1).

Bulkhead cover, top

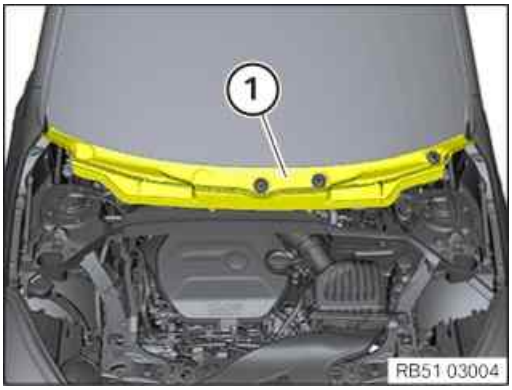
Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

18 – Install the rear cowl panel cover



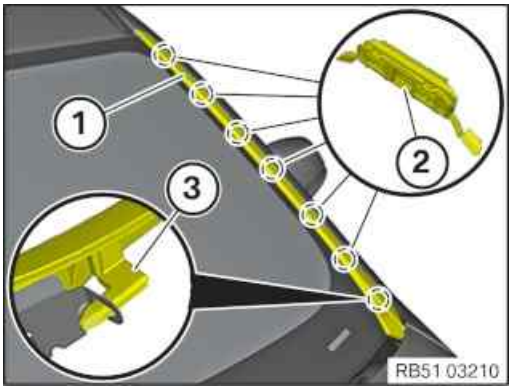
- Feed in and engage the rear cowl panel cover (1).

19 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.

▶ **Install the gutter strip on the windscreen**



- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

20 – Install left and right wiper arm

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NOTICE

Description is for left component only. Procedure on the right side is identical.

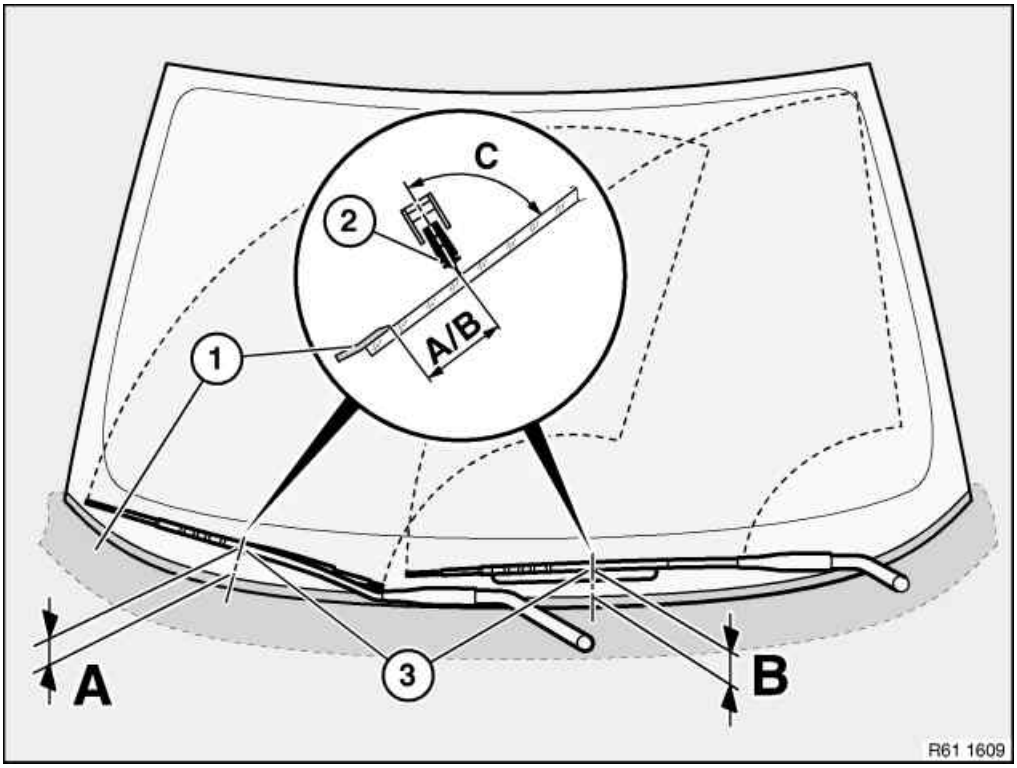
▸ **Install the wiper arm**

TECHNICAL INFORMATION

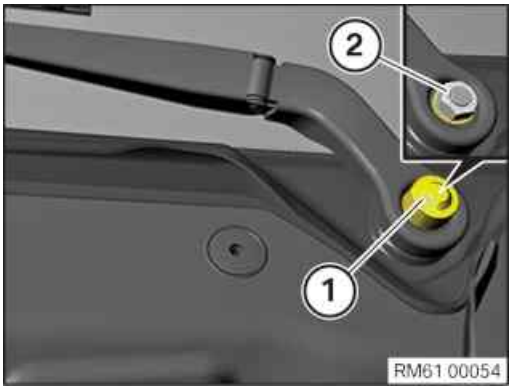
The wiper system must be in zero position.

After installing the cowl panel cover and before fitting the wiper arm:

Activate the wiper system once to ensure that it has the correct installation position.



- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

21 – Installing front cowl panel cover

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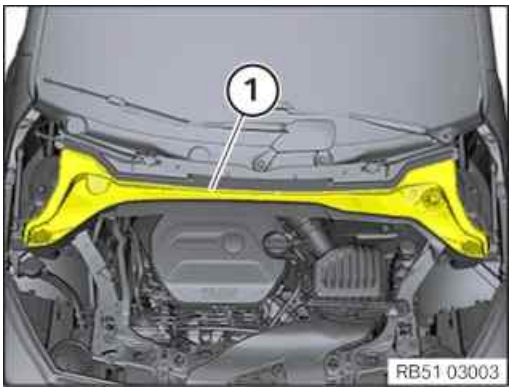
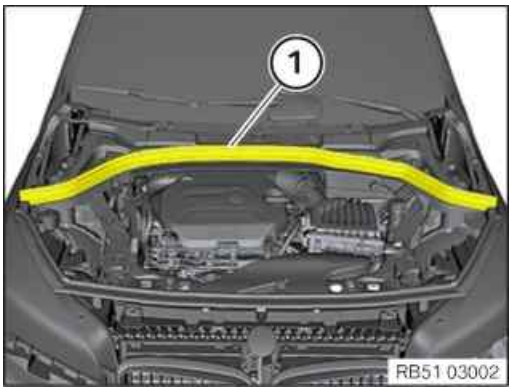


- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

22 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

23 – Reset the adaptations of the exhaust-gas recirculation valve

TECHNICAL INFORMATION

- The **Reset adaptation** service function must be carried out when the exhaust-gas recirculation valve is renewed.

- Connect diagnosis system:
  - Service functions
  - Power train
  - Digital Diesel Electronics
  - Reset adaptations

Additional Information

Overview of Tightening Torques

Low-pressure exhaust-gas recirculation valve to clean air pipe Used in step 12

M6x40		Tightening torque	8 Nm

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Exhaust gas pressure sensor			Used in step 13
Exhaust gas pressure sensor		Tightening torque	13,5 Nm

Clean air pipe to exhaust turbocharger			Used in step 13
Torx bolt BM8x25		Tightening torque	8 Nm

Clamp for the pressure hose on the differential pressure sensor			Used in step 13
Clamp 15–19mm		Tightening torque	3 Nm

Clean air pipe to cylinder head cover			Used in step 13
Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing			Used in step 13
Clamp		Tightening torque	3 Nm

Underbody protection front			Used in step 14
			3 Nm

Resonator to manifold and clean air pipe			Used in step 15
Screw TS6	Renew screw.	Tightening torque	5 Nm

Bulkhead cover, top			Used in step 17
Screw		Tightening torque	3 Nm

Windscreen wiper arm			Used in step 20
Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

Overview Technical Data

Links

Functional descriptions	Used in step
Reset adaptations	23

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11 71 501 Replacing the exhaust-gas recirculation valve

WARNING

Working on 12 V vehicle electrical system.

Risk of short circuits! Risk of fire!

- Detach battery earth lead from battery.
- For additional batteries: Detach all battery earth leads from additional batteries.

PRELIMINARY WORK

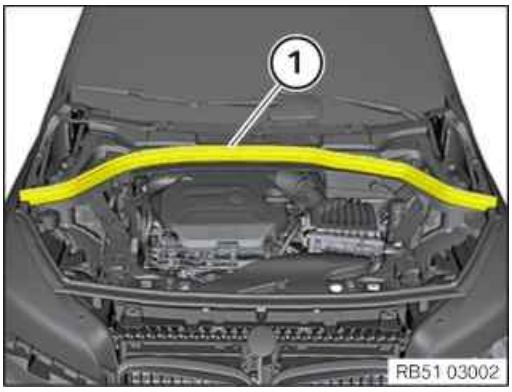
1 – Disconnecting all battery earth leads

- See additional information.

2 – Remove the seal for the rear bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.



- Pull off rear bonnet seal (1) towards the top and remove.

3 – Removing front cowl panel cover

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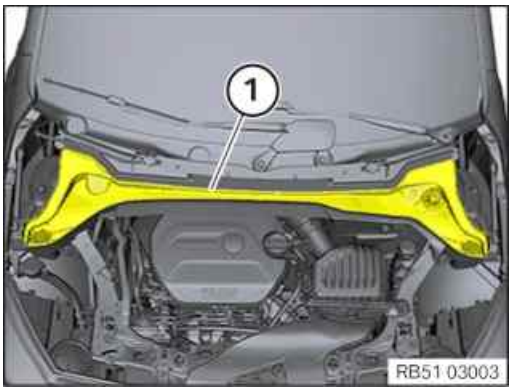


- Guide the front cowl panel cover (1) out toward the top and remove it.

4 – Remove left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

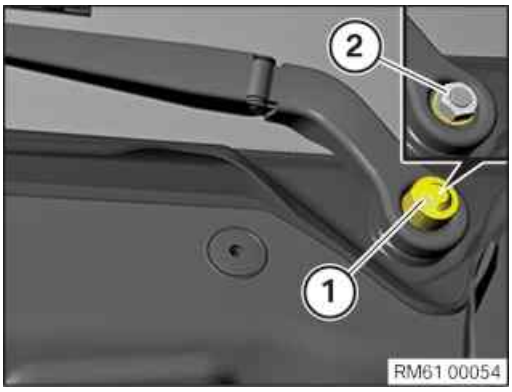
▶ **Remove the wiper arm**

RISK OF DAMAGE

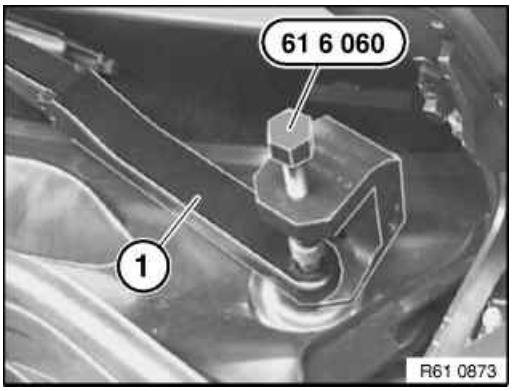
Damage to wiper console

While removing the wiper arms without using special tool, the wiper console can break.

- Removing the wiper arms must be carried out only using the prescribed special tool.
- Do not lift off wiper arm, else the wiper console may break on the predetermined breaking point for the pedestrian protection.



- Remove the protective cap (1).
- Loosen nut (2).



- Pull off the wiper arm (1) using special tool .

5 – Remove the gutter strip on the windscreen on the left and right

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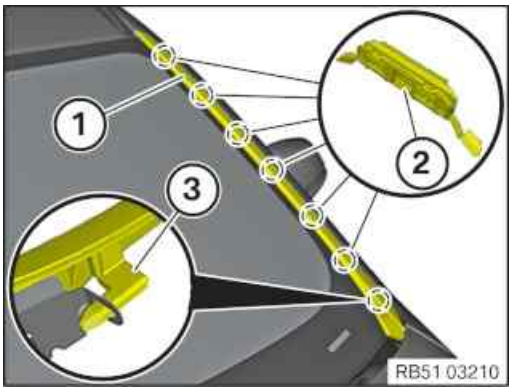
NOTICE

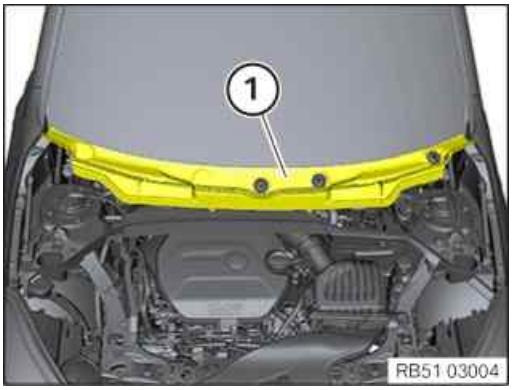
Description is for left component only. Procedure on the right side is identical.

▶ **Remove the gutter strip on the windscreen**



- Unclip the gutter strip (1) from the clips (2) beginning at the roof to the top.
- Feed the gutter strip (1) out of the guide (3).

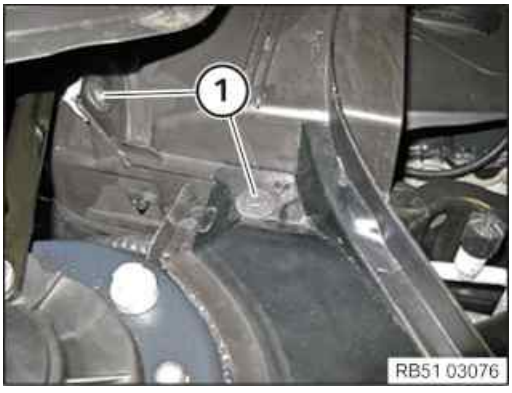
6 – Remove the rear cowl panel cover



- Disengage and guide out the rear cowl panel cover (1) towards the top.

7 – Removing the upper bulkhead cover

- Loosen screws (1).



- Loosen screws (1).

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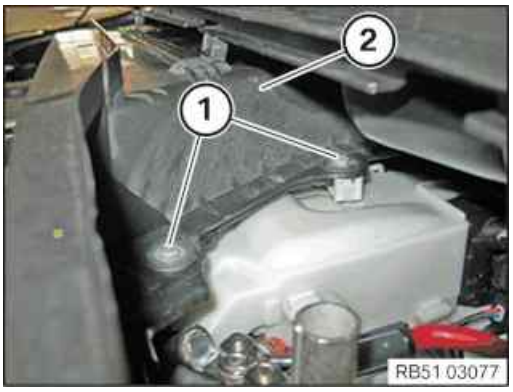
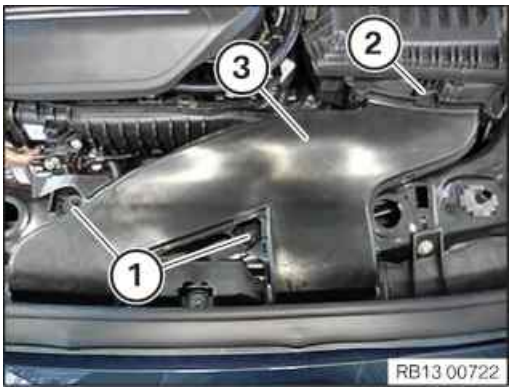


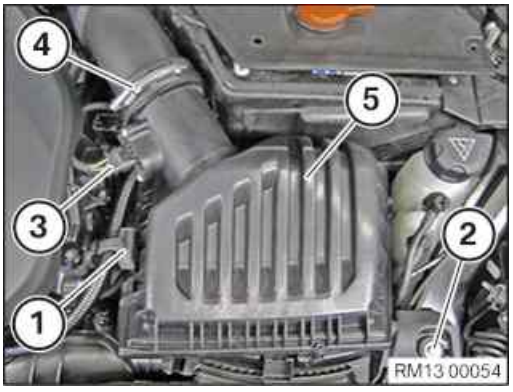
- Loosen screws (1).
- Feed out and remove the upper bulkhead cover (2).

8 – Remove the intake neck for intake silencer housing



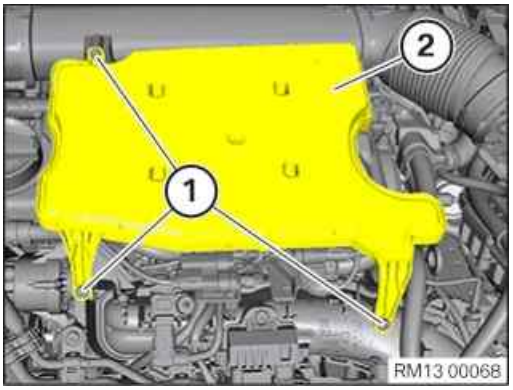
- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

9 – Removing intake silencer housing



- Loosen the holder (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Unfasten clamp (4).
- Pull out and remove the intake silencer housing (5) from the rubber mounts towards the top.

10 – Remove resonator



- Loosen screws (1).
- Guide out and remove the resonator (2).

11 – Partially detach the clean air pipe

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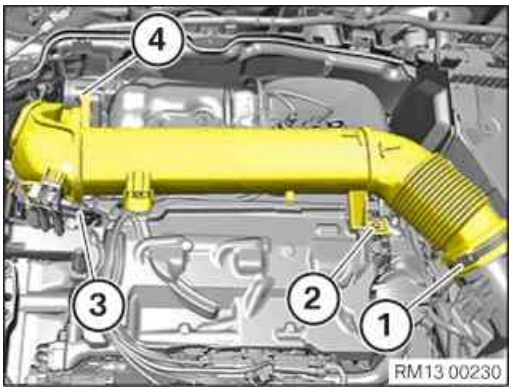
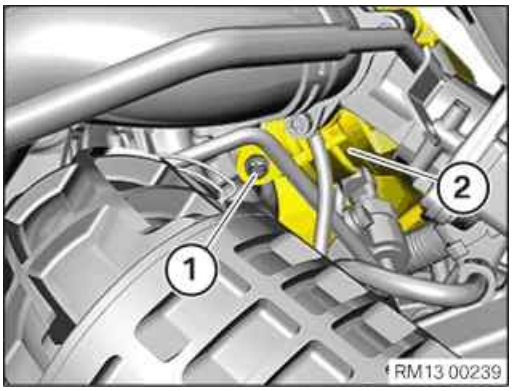
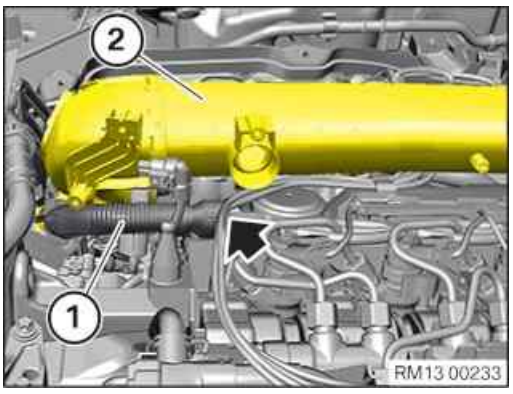


- Release the screw clamp (1).
- Loosen screw (2).
- Unlock and loosen connector (3).
- Loosen screw (4).



- Unscrew the screw (1) from the clean air pipe (2).



- Detach ventilation line (1) from clean air pipe (2) and set it aside.
- Detach ventilation line (1) from cylinder head cover (arrow).
- Remove the ventilation line (1).

- Thread out the clean air pipe (1) and set it aside as shown.

12 – Remove electronics box

Prerequisite

Battery earth lead is disconnected.

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RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to wires when disconnecting connectors and plug connections.

Sheared wires can cause a short circuit.

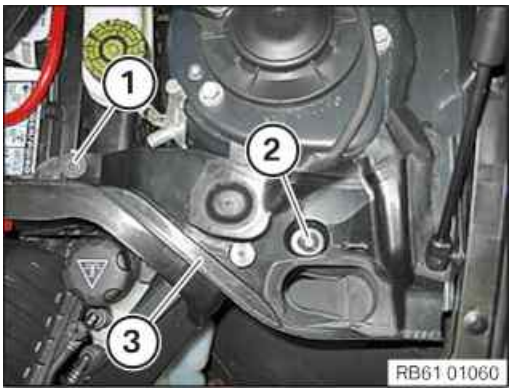
- Do not pull on the wires when disconnecting connectors and plug connections.

TECHNICAL INFORMATION

Follow instructions for removing and installing control units.
For additional information see: 12 00 ... Notes on removal and installation of control units

TECHNICAL INFORMATION

Disconnecting control units may cause fault code entries and functional limitations. Fault code entries must be read out and deleted if necessary.



- Release the screw (1) and the expanding rivet (2).
- Remove the fixture for the gasket (3).

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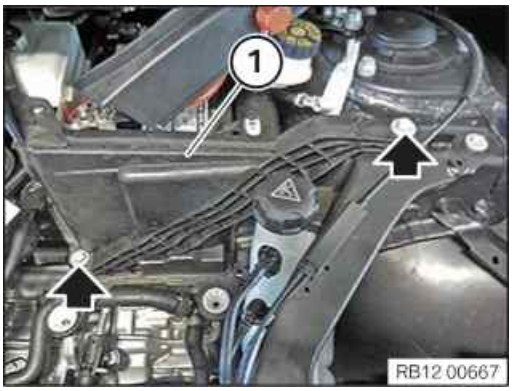
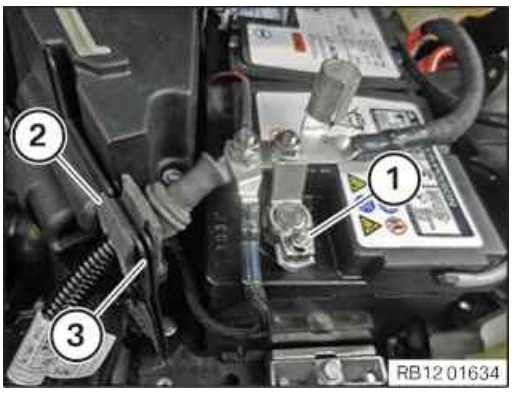
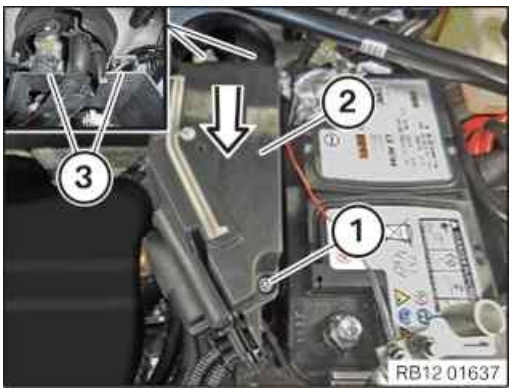
- Loosen screw (1).
- Place cover (2) of the positive battery connection point to one side.



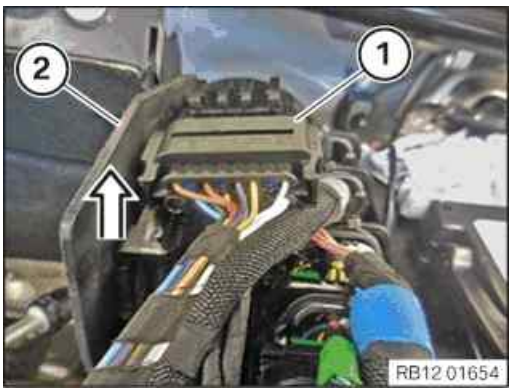
- Remove screws (arrows).
- Guide out tension strut (1) and remove.



- Undo positive battery terminal (1).
- Feed out positive battery terminal (1) and set aside.
- Guide the positive battery cable (2) out of the holder (3) and lay to one side.



- Loosen screw (1).
- Unlock cover (2) and feed out and remove from the guides (3) in the direction of arrow.



- Feed out connector (1) from the electronics box (2) and remove in the direction of arrow.
- Unlock and loosen connector (1).

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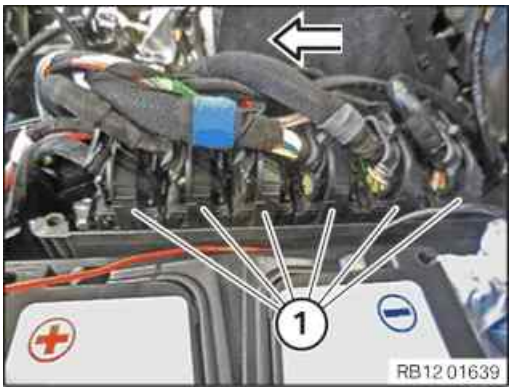
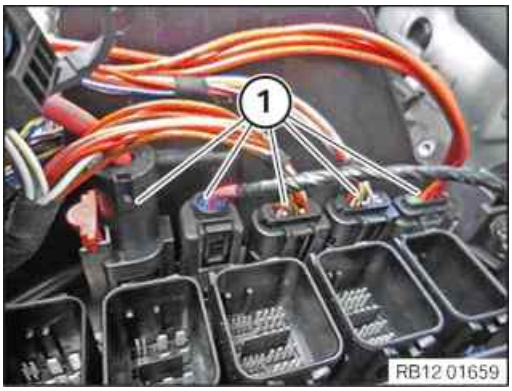
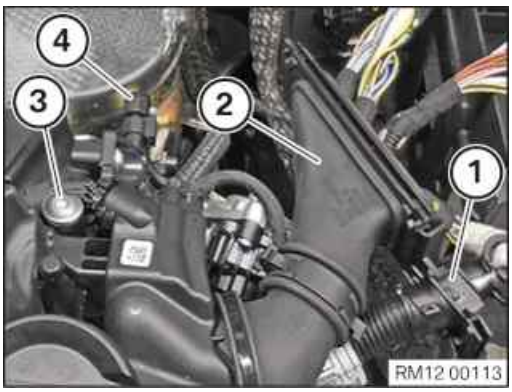


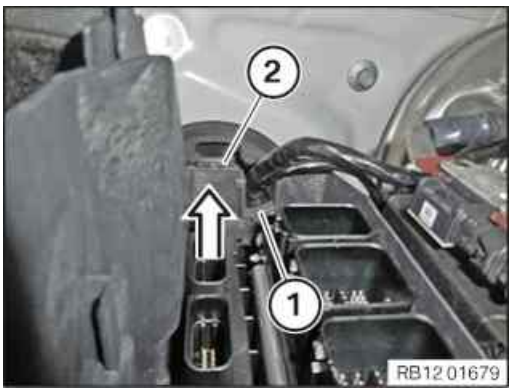
- Unlock and remove the connector (1) in the direction of the arrow.
- Feed out connector (1) and place to one side.



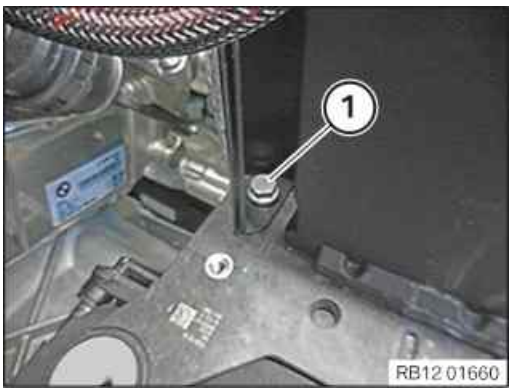
- Unlock and loosen connector (1).



- Detach the wiring harness (1) from the electronics box.
- Detach the wiring harnesses (2) from electronics box.
- Loosen screw (3).
- Set wiring harnesses (1) and (2) aside.
- Unlock the connector (4) and disconnect it from the differential pressure sensor.



- Unlock and loosen holder (1).
- Guide the holder (1) out of the electronics box (2) in direction of arrow and set it aside.



- Loosen screw (1).

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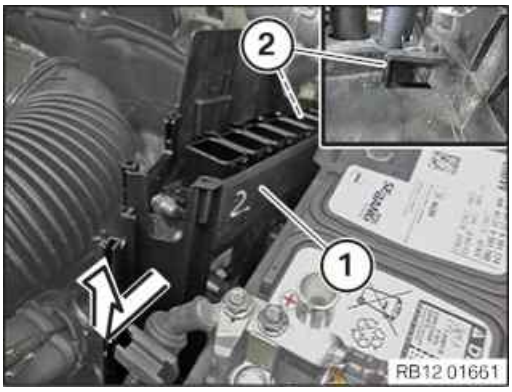
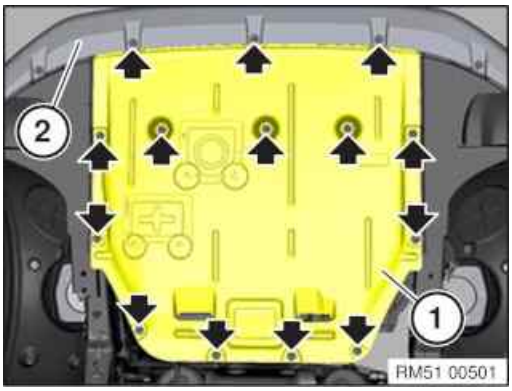


- Guide the electronics box (1) out of the guide (2) in direction of arrow and remove.

13 – Removing the front underbody protection



- Remove screws (arrows).
- Pull out and remove front underbody protection (1) under the bumper panel (2).

MAIN WORK

14 – Removing the exhaust-gas recirculation valve

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

TECHNICAL INFORMATION

Use commercially available pinch-off tools to pinch off the coolant hoses.

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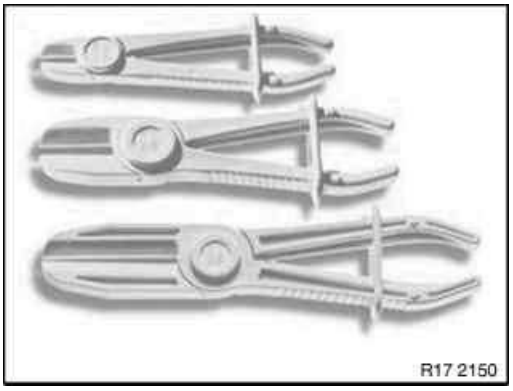
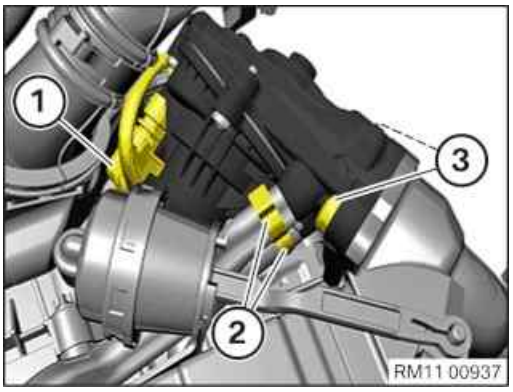
TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

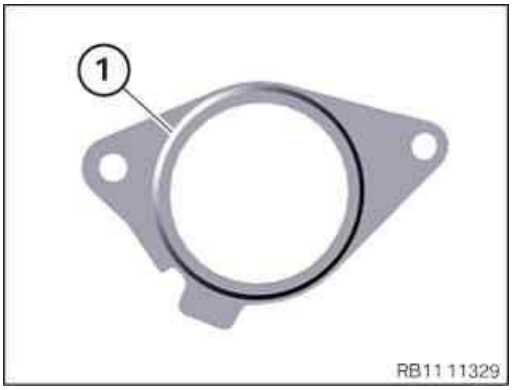


- Use commercially available disconnection tools to pinch off the coolant lines.



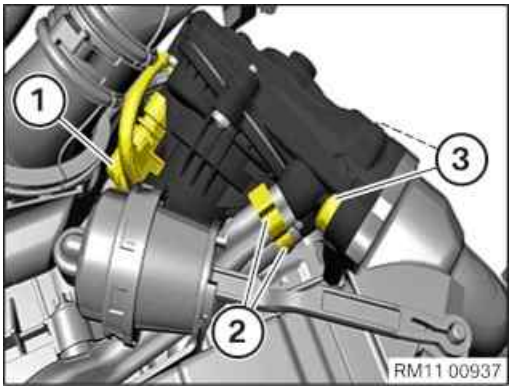
- Unlock and disconnect the plug connection (1).
- Loosen screws (3).
- Unfasten hose clamps (2).
- Detach coolant hoses.
- Remove the exhaust-gas recirculation valve .

15 – Installing the exhaust-gas recirculation valve



- Renew the gasket (1).

  Parts: Gasket
- Insert seal (1) on exhaust-gas recirculation cooler and install.



- Replace hose clamps.

  Parts: Hose clamps
- Slide coolant hoses (2) with hose clamps onto the exhaust-gas recirculation valve.
- Make sure that the coolant hoses (2) are not mounted twisted.
- Secure hose clamps.
- Ensure correct fitting of the seal on the exhaust-gas recirculation valve and on the exhaust-gas recirculation cooler.
- Install the exhaust-gas recirculation valve .
- Insert screws (3) by one turn.
- Connect and lock the connector (1).

  The connector must lock audibly.

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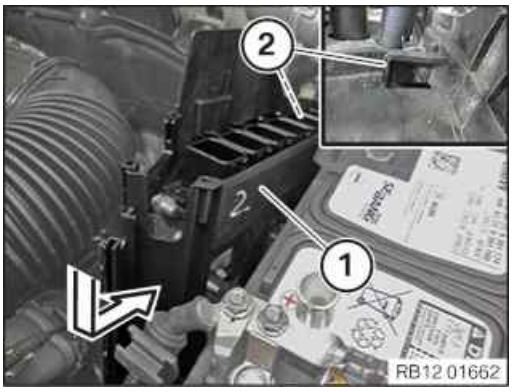
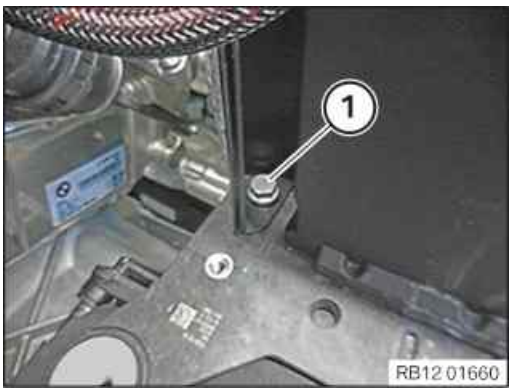


- Guide in and install the electronics box (1) into the guide (2) in direction of arrow.

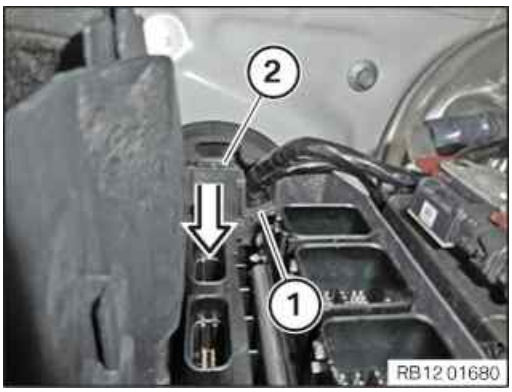
- Make sure that the electronics box (1) is positioned correctly on the bulkhead (2).



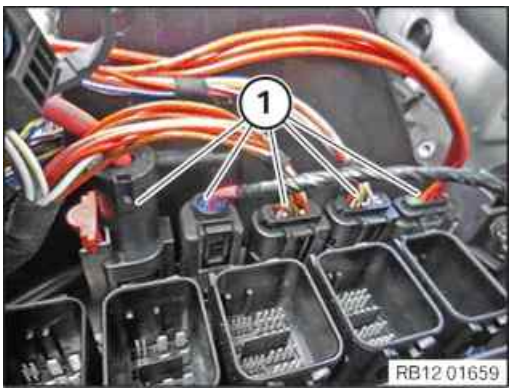
- Tighten down screw (1).

Electronics box to battery tray

M8X16		Tightening torque	15 Nm



- Guide in and install the holder (1) in the electronics box (2) in direction of arrow.
- Make sure the bracket (1) engages audibly.



- Connect and lock the connector (1).
- Make sure the connectors (1) engage audibly.

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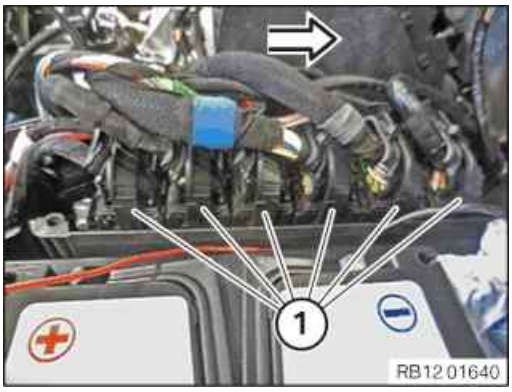
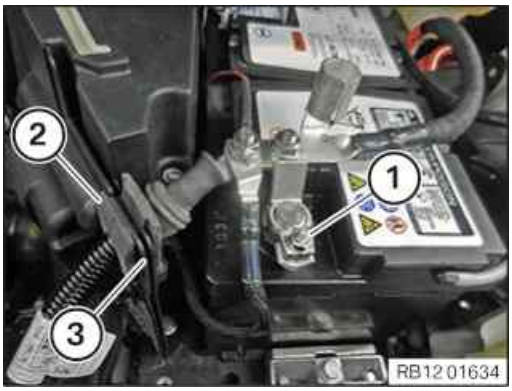


- Connect connector (1) in direction of arrow and lock.
- Make sure the connectors (1) engage audibly.

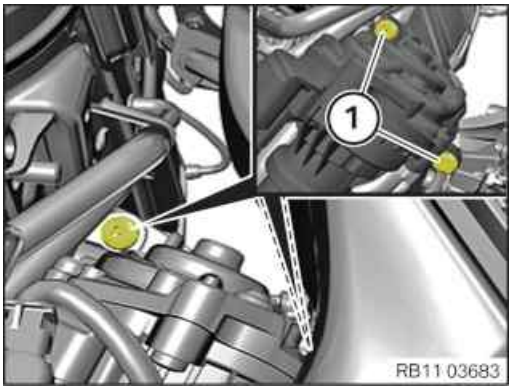


- Thread in positive battery cable (2) on holder (3) and install.
- Feed in and install positive battery terminal (1).
- Tighten positive battery terminal (1).

Positive battery terminal to battery

NutM6		Tightening torque	5 Nm

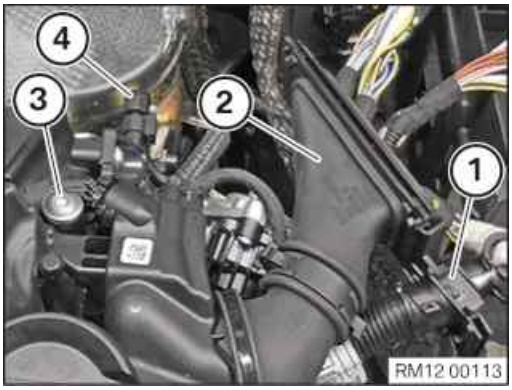
- Connect diagnosis system.
- Carry out the service function "Setting the exhaust-gas recirculation valve installation position":
  - Power train
  - Digital Diesel Electronics
  - Exchange the exhaust-gas recirculation valve
  - Exhaust-gas recirculation valve installation position



- Tighten the bolts (1) with conventional tools.
-

Exhaust-gas recirculation valve to exhaust-gas recirculation cooler

M6			10 Nm



- Lay vehicle wiring harnesses (1) and (2) and mount on electronics box.
- Tighten down screw (3).

Wiring harness to cylinder head cover

TS5x20		Tightening torque	3,5 Nm

- Attach connector (4) to the differential pressure sensor and lock it audibly.

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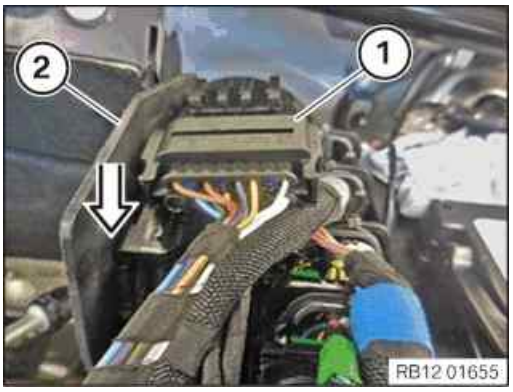
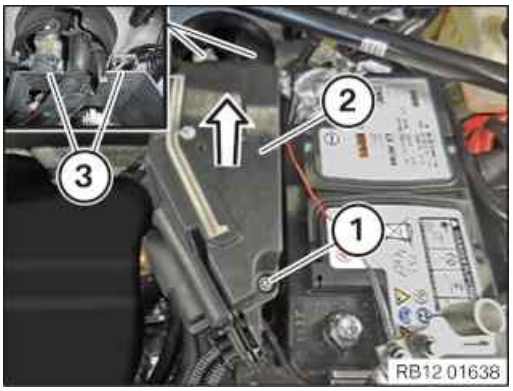


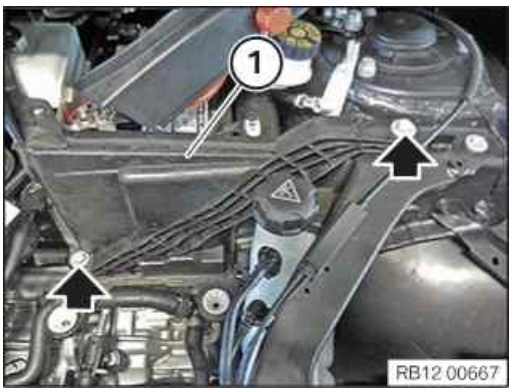
- Connect and lock the connector (1).
- Make sure the connector (1) engages audibly.
- Insert the connector (1) in the direction of arrow at the electronics box (2) and install.



- Insert the cover (2) into the guides in the direction of arrow (3) and install.
- Make sure the cover audibly engages (2) in the guides (3).
- Tighten down screw (1).

Cover to electronics box

RF5x26.5		Tightening torque	2,5 Nm



- Feed in and install tension strut (1).
- Tighten screws (arrows).

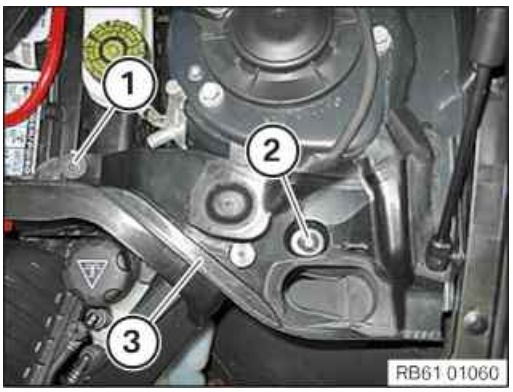
Tension strut to spring strut dome/battery tray

M8		Tightening torque	19 Nm

- Feed in and install cover (2) at the positive battery connection point.
- Tighten down screw (1).

Positive battery connection point cover to engine compartment partition wall

		Tightening torque	3 Nm



- Position the fixture for the gasket (3) and secure with the expanding rivet (2).
- Tighten down screw (1).

Battery cover

Screw		2,8 Nm

▸ **Delete adaptations**

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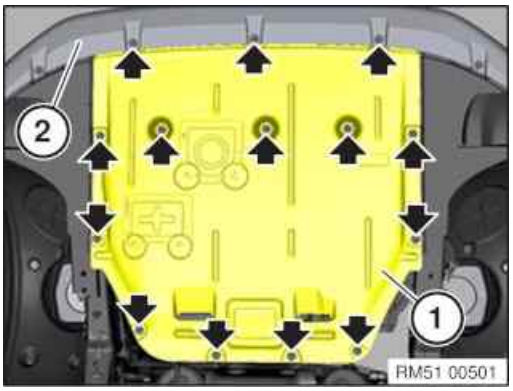
- Connect diagnosis system.
  - Power train
  - Digital Diesel Electronics
  - Reset adaptations
  - Delete adaptations

POSTPROCESSES

16 – Installing the front underbody protection

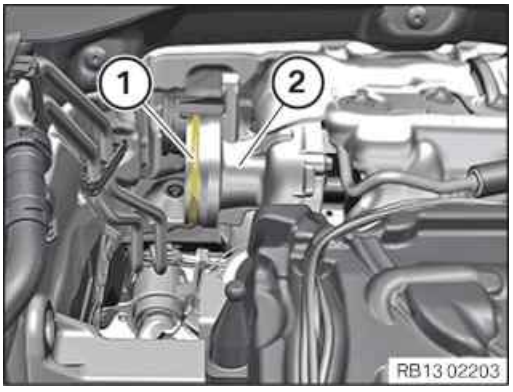


- Guide the front underbody protection (1) in under the bumper panel (2) and position it at the screw points.
- Tighten screws (arrows).

Underbody protection front

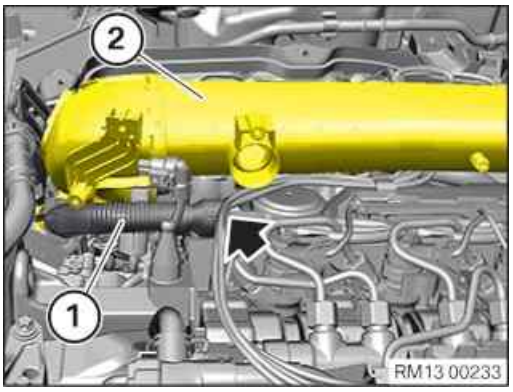
			3 Nm

17 – Partially securing clean air pipe



- Check the sealing ring (1) of the exhaust turbocharger (2) for damage and renew it if necessary.

- Feed in clean air pipe (1) and install.



- Feed in ventilation line (1) at clean air pipe (2) and install.
- Feed in ventilation line (1) at cylinder head cover (arrow) and install.

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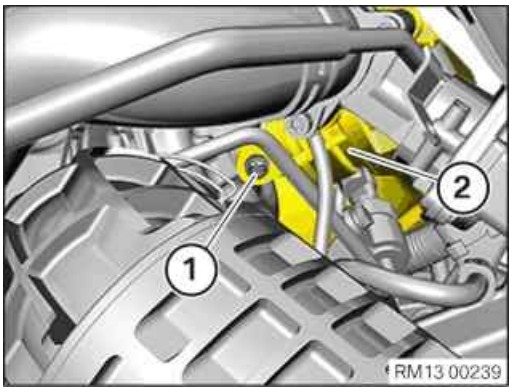
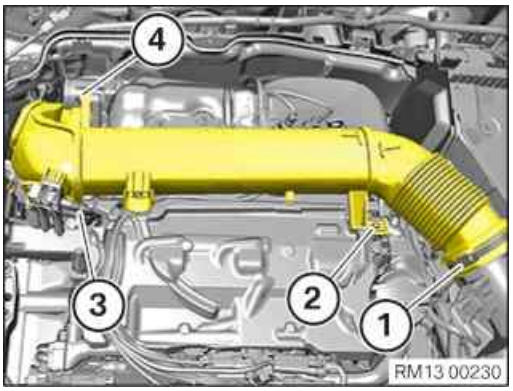


- Tighten screw (1) from clean air pipe (2).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm



- Tighten down screw (4).

Clean air pipe to exhaust turbocharger

Torx bolt BM8x25		Tightening torque	8 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Renew the screw (2).

  Parts: Screw
- Tighten down screw (2).

Clean air pipe to cylinder head cover

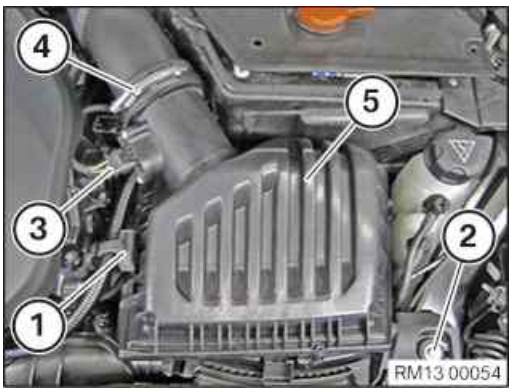
Oval-head screw	Renew screw.	Tightening torque	8 Nm

- Tighten the screw clamp (1).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

18 – Installing intake silencer housing



- Insert the intake silencer housing (5) into the rubber mounts and install it.

  Intake filter housing (5) must engage audibly.
- Tighten down screw (2).

Intake silencer housing to lock bridge

M6X30		Tightening torque	8 Nm

- Tighten clamp (4).

Clean air pipe to intake silencer housing

Clamp		Tightening torque	3 Nm

- Connect and lock the connector (3).

  The connector (3) must engage audibly.
- Insert and install the holder (1).

19 – Install the intake neck for the intake filter housing

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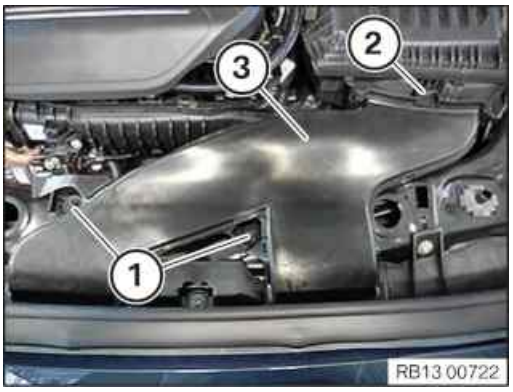


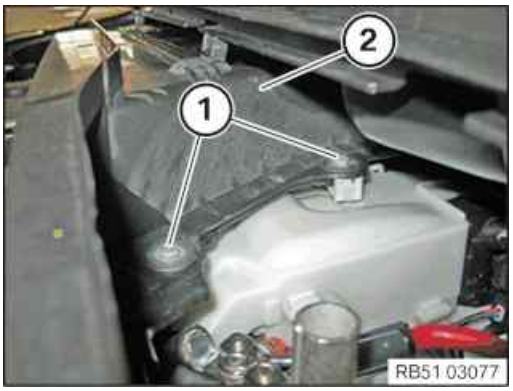
- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

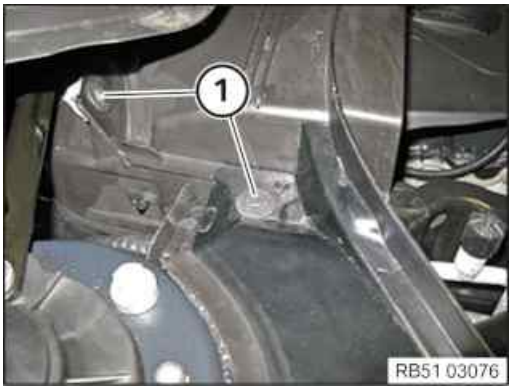
20 – Installing the upper bulkhead cover



- Feed in and install cover (2) of the bulkhead at the top.
- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm



- Tighten the screws (1).

Bulkhead cover, top

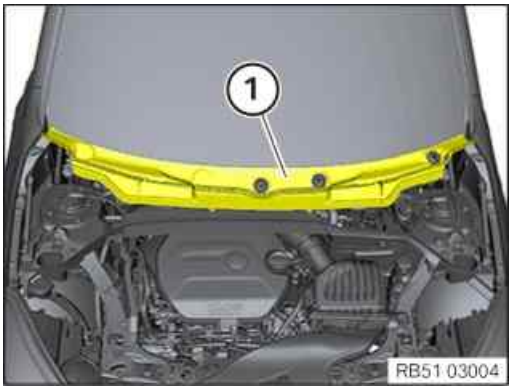
Screw		Tightening torque	3 Nm

- Tighten the screws (1).

Bulkhead cover, top

Screw		Tightening torque	3 Nm

21 – Install the rear cowl panel cover



- Feed in and engage the rear cowl panel cover (1).

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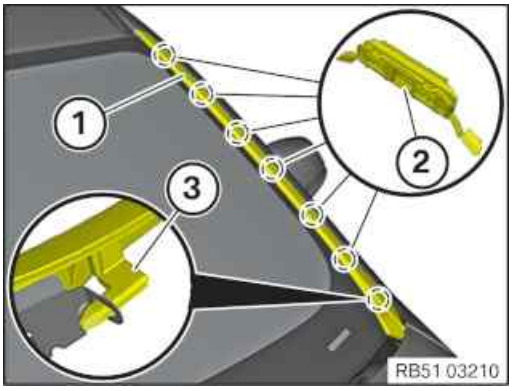
22 – Install the gutter strip on the windscreen on the left and right

NOTICE

Description is for left component only. Procedure on the right side is identical.



▸ **Install the gutter strip on the windscreen**

- Check the clamps (2) for damage and renew if necessary.
- Insert the gutter strip (1) with the guide (3).
- Align the gutter strip (1) at the roof and clip it in.

23 – Install left and right wiper arm

NOTICE

Description is for left component only. Procedure on the right side is identical.

▸ **Install the wiper arm**

TECHNICAL INFORMATION

The wiper system must be in zero position.
After installing the cowl panel cover and before fitting the wiper arm:
Activate the wiper system once to ensure that it has the correct installation position.

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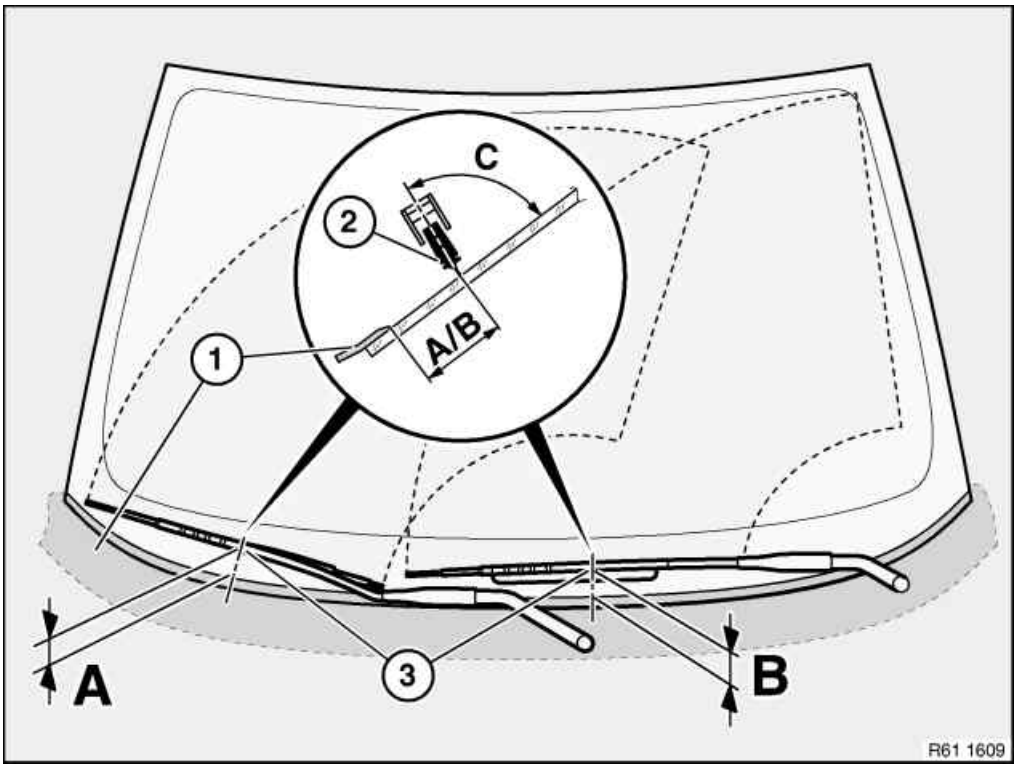
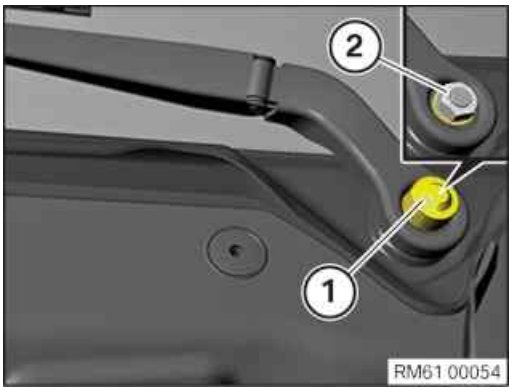


- Connect the wiper arm (3).
- Correctly position the wiper arm (2) in relation to the window edge (1).



NOTICE

Description is for left component only. Procedure on the right side is identical.

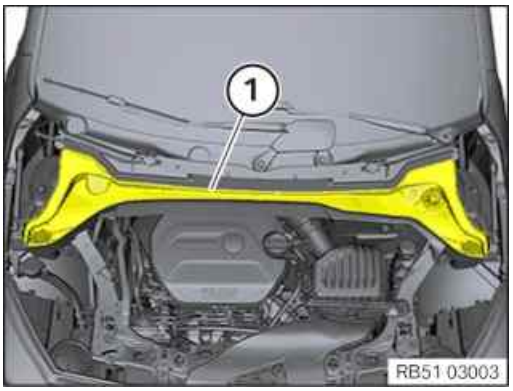
- Tighten nut (2).

Windscreen wiper arm

Combination hexagon nut		Tightening torque	35 Nm

- Connect the protective cap (1).

24 – Installing front cowl panel cover



- Insert the cowl panel cover front (1) to the rear and install.
- Check cowl panel cover at front is correctly seated (1).

25 – Install the seal for the bonnet

NOTICE

Schematic diagram is for example purposes. Some parts may differ in certain details.

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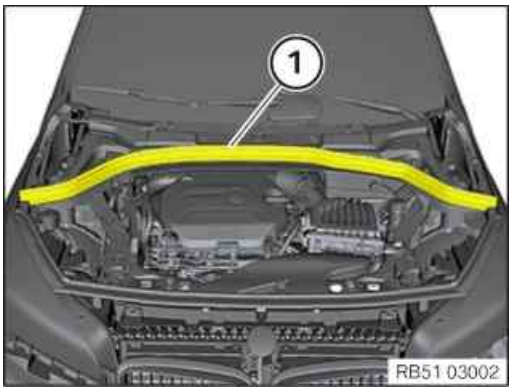

- Install bonnet seal at rear (1).
- Ensure that the rear bonnet seal (1) is fitted correctly.

26 – Checking coolant level and topping up if needed

CAUTION

Materials harmful to health.

Contact with fluids harmful to health!

- Note and follow safety information on containers.
- Conduct all work in appropriate personal protective equipment only.

TECHNICAL INFORMATION

Follow notes for repair work on the cooling system.

For additional information see:

Main group 17

17 00 ... Notes for working on the cooling system

TECHNICAL INFORMATION

Life-long fill of coolant!

Do not reuse used coolant.

When replacing and removing components which rely on the corrosion protection effect of the coolant, it is essential to change the coolant. The cooling system must therefore be emptied and refilled.

In the case of other removal work involving the draining of part quantities of coolant, the coolant level must be topped up with new coolant.

TECHNICAL INFORMATION

Collect and dispose of emerging fluids. Observe country-specific waste disposal regulations.

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- Check coolant level in coolant expansion tank (1) and adjust to the maximum if needed.

Additional Information

Overview of Tightening Torques

Electronics box to battery tray — Used in step 15

M8X16		Tightening torque	15 Nm

Positive battery terminal to battery — Used in step 15

NutM6		Tightening torque	5 Nm

Exhaust-gas recirculation valve to exhaust-gas recirculation cooler — Used in step 15

M6			10 Nm

Wiring harness to cylinder head cover — Used in step 15

TS5x20		Tightening torque	3,5 Nm

Cover to electronics box — Used in step 15

RF5x26.5		Tightening torque	2,5 Nm

Tension strut to spring strut dome/battery tray — Used in step 15

M8		Tightening torque	19 Nm

Positive battery connection point cover to engine compartment partition wall — Used in step 15

		Tightening torque	3 Nm

Battery cover — Used in step 15

Screw			2,8 Nm

Underbody protection front — Used in step 16

			3 Nm

Clean air pipe to exhaust turbocharger — Used in step 17

Torx bolt BM8x25		Tightening torque	8 Nm

Clean air pipe to cylinder head cover — Used in step 17

Oval-head screw	Renew screw.	Tightening torque	8 Nm

Clean air pipe to intake silencer housing — Used in step 17 18

Clamp		Tightening torque	3 Nm

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Intake silencer housing to lock bridge			Used in step 18
M6X30		Tightening torque	8 Nm

Intake neck to cross connection			Used in step 19
M6		Tightening torque	8 Nm

Bulkhead cover, top			Used in step 20
Screw		Tightening torque	3 Nm

Windscreen wiper arm			Used in step 23
Combination hexagon nut		Tightening torque	35 Nm

Overview of Special Tools

Overview Technical Data

Links

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Repair instructions	Used in step
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61 20 900 Disconnecting and connecting battery earth lead	1
61 20 900 Disconnecting and connecting the battery earth lead (all battery earth leads)	1
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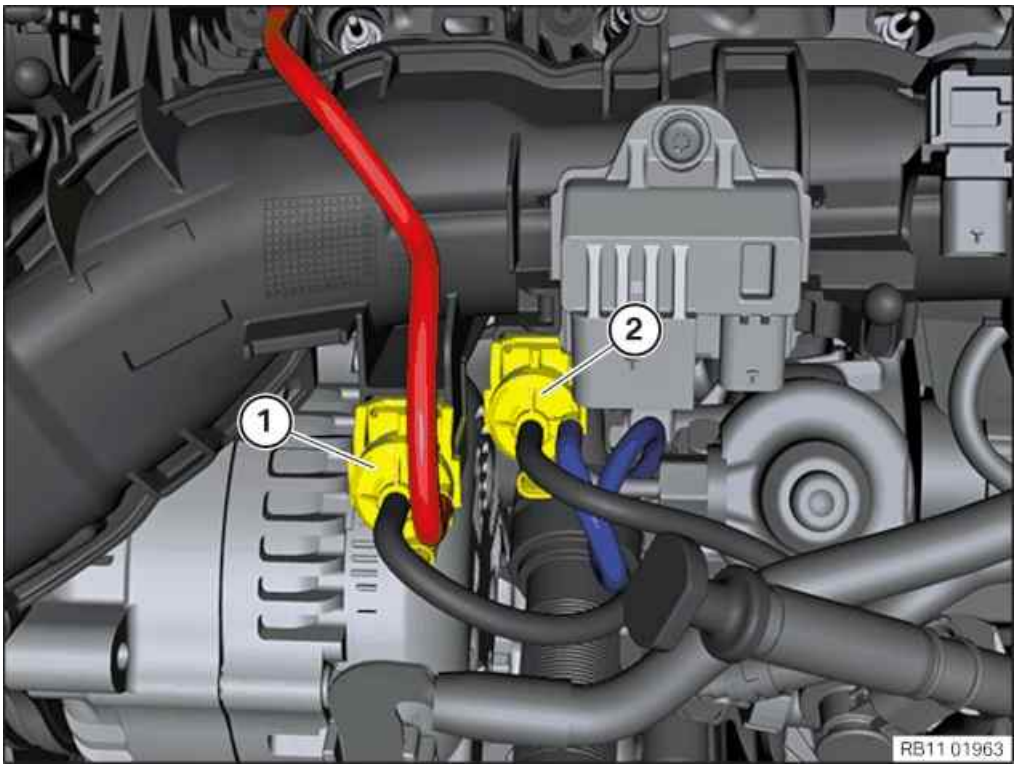
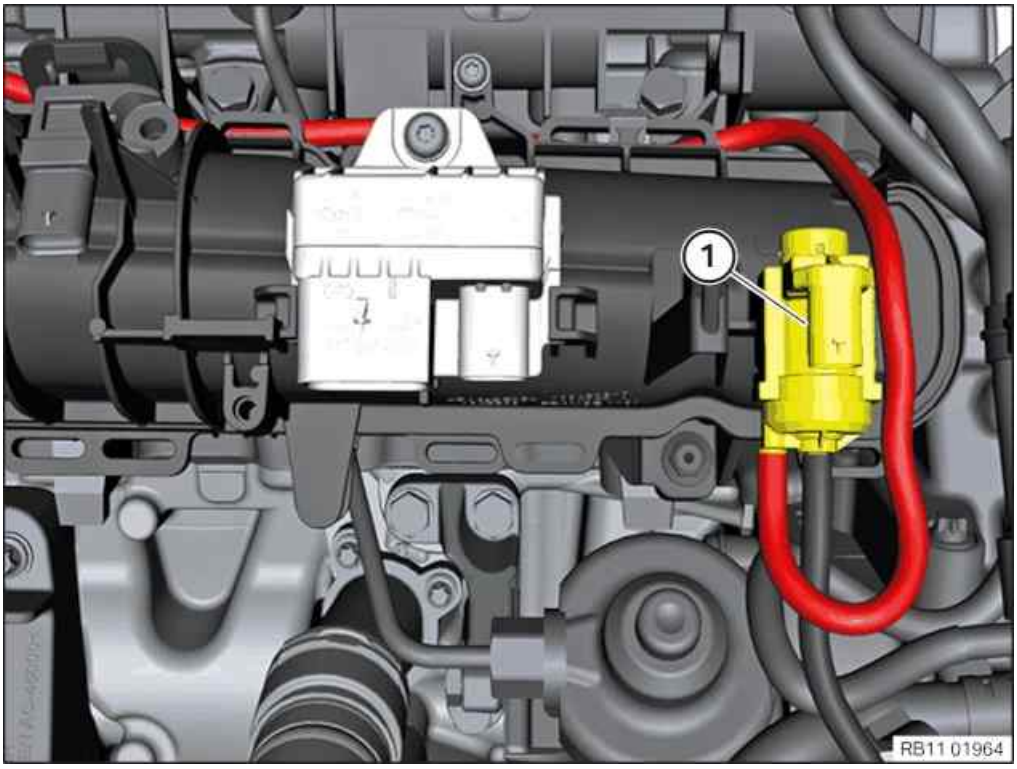
11 74 ... Overview of the B37/B47 vacuum system



B37 K/U F2x:

1. Electric changeover valve, EGR
2. Electric changeover valve for engine mounts



B47 K/U/O F2x/F3x:

1. Electric changeover valve, EGR

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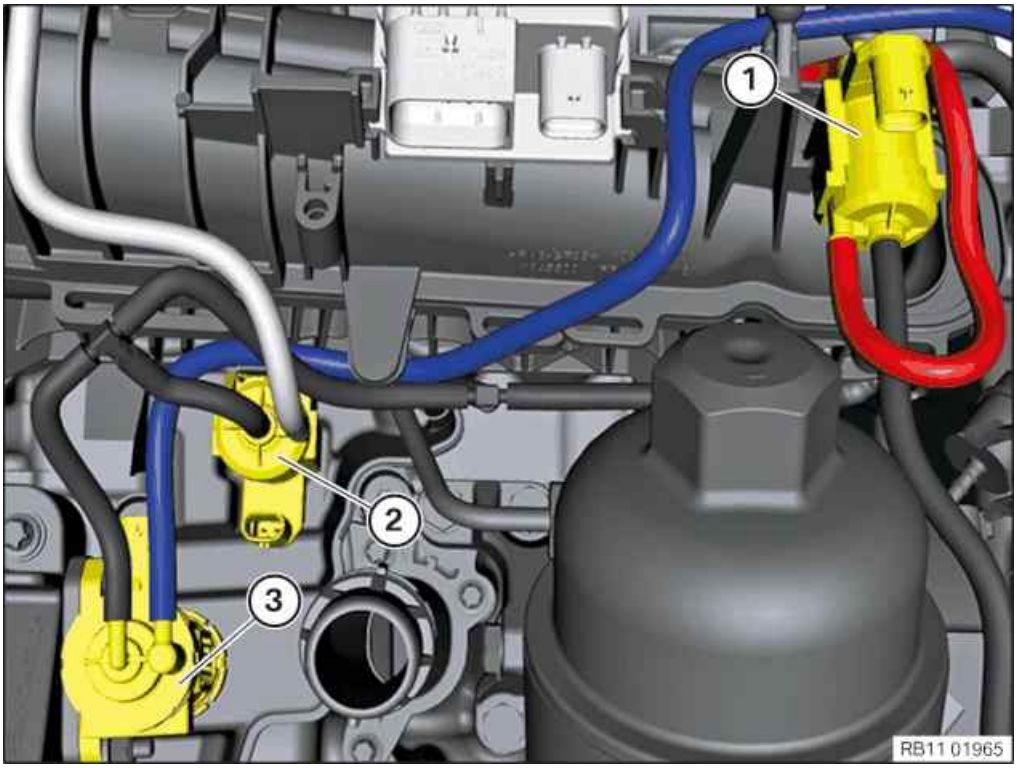

B47 T F2x/F3x:

1. Electric changeover valve, EGR
2. Electric changeover valve, compressor bypass plate
3. Pressure converter, turbine control flap

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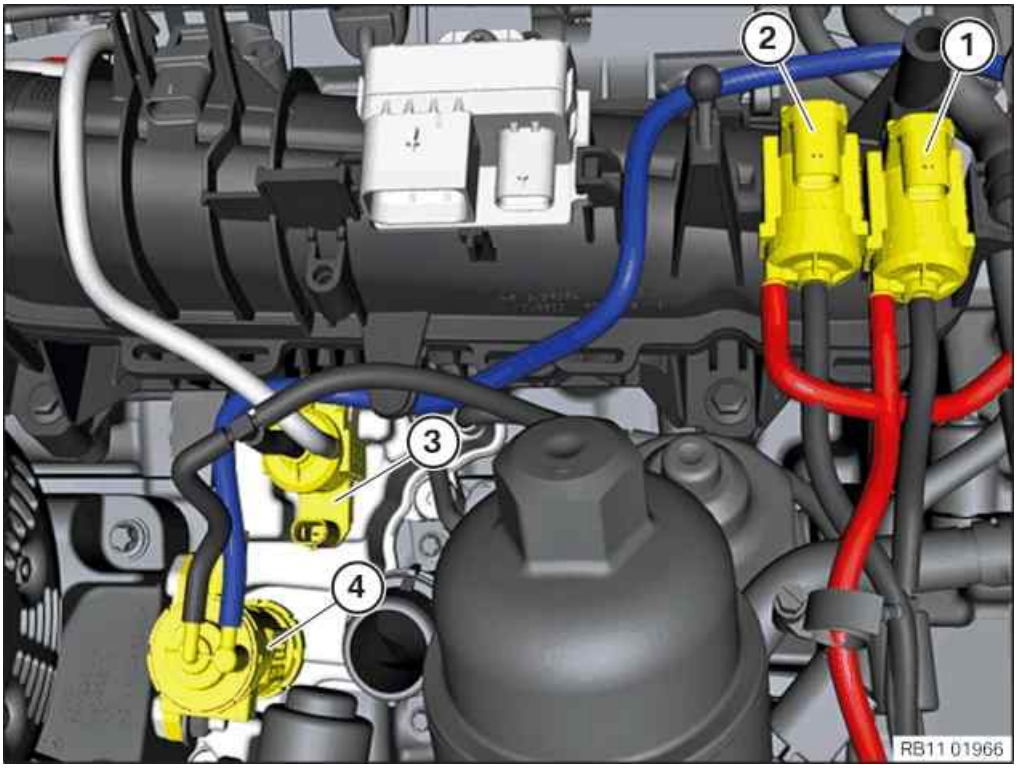

B47 T F1x:

1. Electric changeover valve for engine mounts
2. Electric changeover valve, EGR
3. Electric changeover valve, compressor bypass plate
4. Pressure converter, turbine control flap

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11 74 559 Replace electric valve for vacuum control of water pump

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

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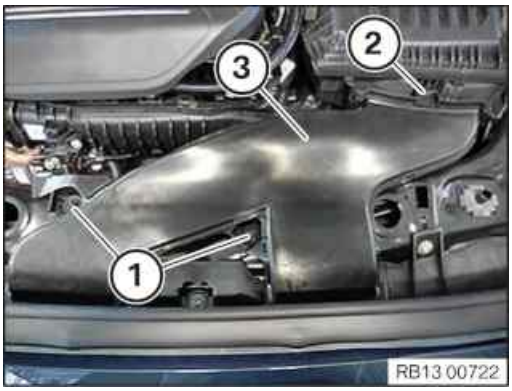
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

MAIN WORK

3 – Remove the electric changeover valve for the coolant pump vacuum control

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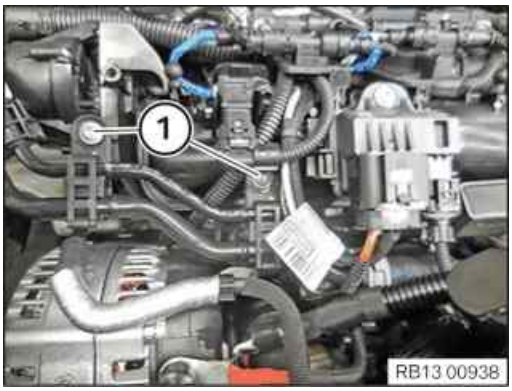
RISK OF DAMAGE

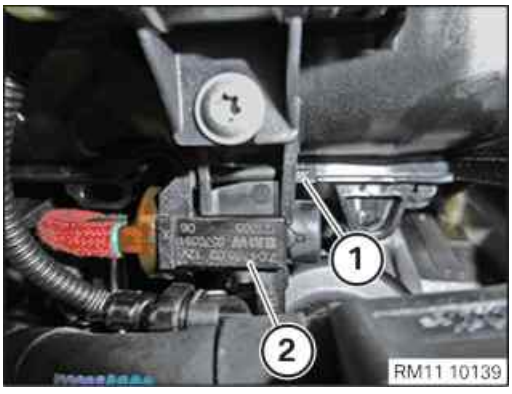
Electrostatic discharge.

Damage to or destruction of electrical components.

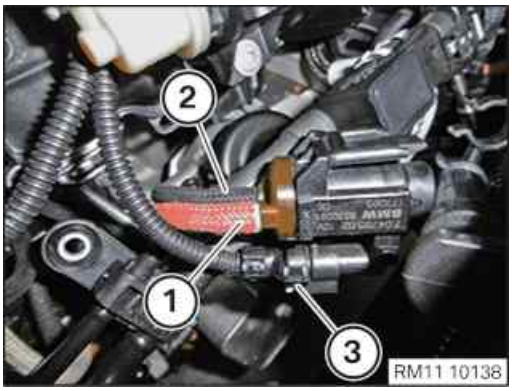
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.



- Loosen screws (1).
- Release the fuel lines from the intake plenum.



- Unlock the lock (1) on the electric changeover valve upward.
- Guide out the electric changeover valve (2) to the left and set it aside.



- Pull off vacuum hoses (1) and (2) from electric changeover valve .
- Make sure not to lose the green O-ring between the red vacuum hose (1) and the electric changeover valve.
- Unlock connector (3) and remove.

4 – Install the electric changeover valve for the vacuum control of the coolant pump

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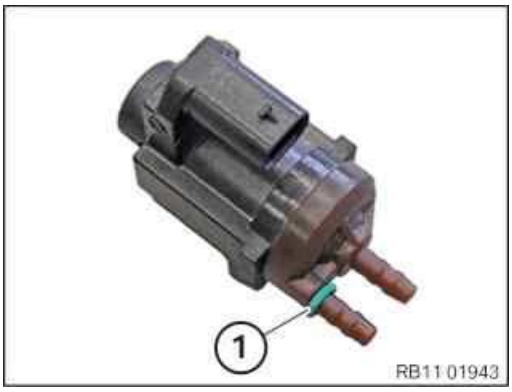
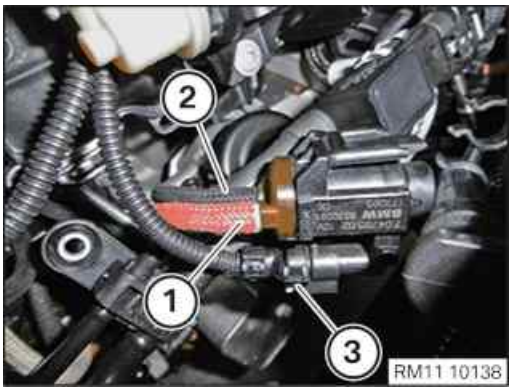


- Check whether the green O-ring (1) is present on the electric changeover valve.

  The green O-ring must **not** be missing.



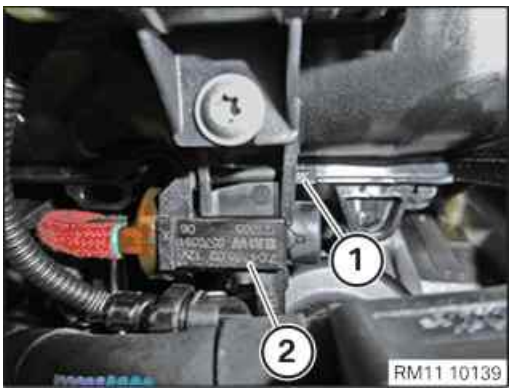
- Connect black vacuum hose (2) to the electric changeover valve.

Note: Unmarked connection.

- Connect red vacuum hose (1) to the electric changeover valve.

Note: With green connection marked on the O-ring.

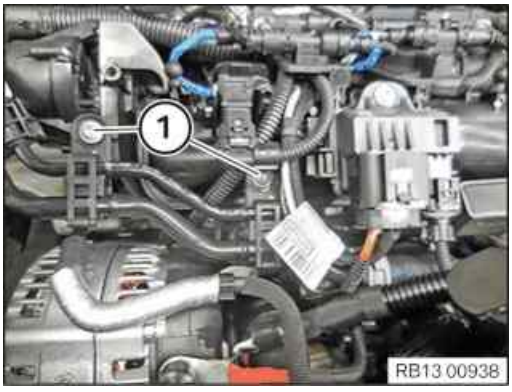
- Connect and lock the connector (3).
- Lock must snap audibly into place.



TECHNICAL INFORMATION

Latch mechanisms, guides and mounting elements must not be damaged or missing.

- Feed in electric changeover valve (2) and install in the holder from left to right.
- Lock (1) must audibly engage in the holder.



- Position fuel lines on manifold.
- Tighten the screws (1).

Fuel line to intake plenum

TS6x20		Tightening torque	5 Nm

POSTPROCESSES

5 – Install the intake neck for the intake filter housing

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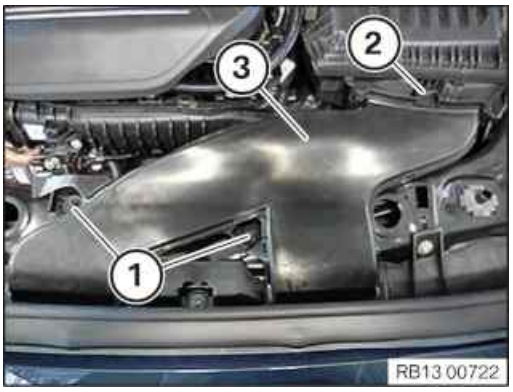

- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

6 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Fuel line to intake plenum Used in step 4

TS6x20		Tightening torque	5 Nm

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Intake neck to cross connection			Used in step 5
M6		Tightening torque	8 Nm

Links

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	3

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11 74 050 Replacing electric valve for exhaust-gas recirculation

PRELIMINARY WORK

1 – Removing the acoustic cover

WARNING

Hot surfaces.

Risk of burning!

- Perform all work only on components that have cooled down.

RISK OF DAMAGE

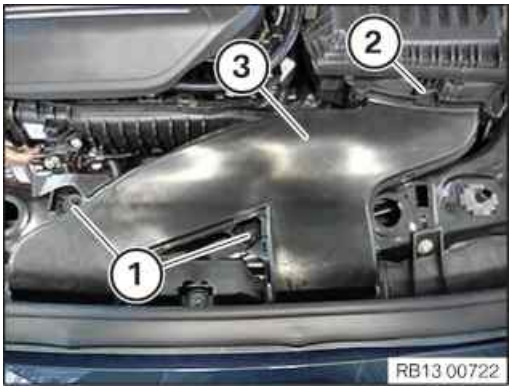
Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

- Unclip the acoustic cover from the marked areas towards the top.

2 – Remove the intake neck for intake silencer housing



- Loosen nuts (1).
- Loosen the lock (2).
- Guide the intake neck (3) out and remove it.

MAIN WORK

3 – Remove the electric changeover valve of the exhaust-gas recirculation

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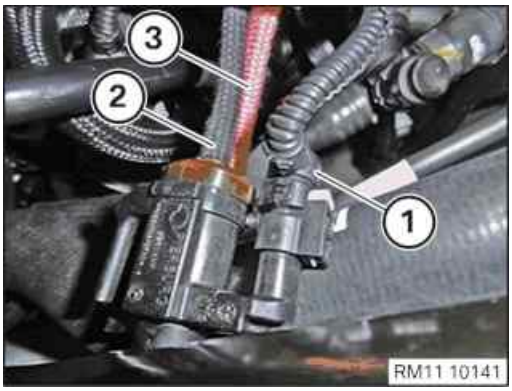
RISK OF DAMAGE

Electrostatic discharge.

Damage to or destruction of electrical components.

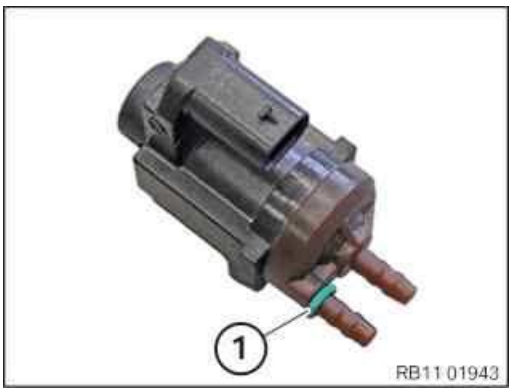
- Leave electrical components in original packaging until just before they are installed. Use the original packaging only for any return shipments. Always package removed components straight away.
- Read and comply with user information on using the associated special tool 12 7 060.
- Only touch the housings of electrical components. Do not touch pins or multi-pin connectors directly.
- Wear electrically conductive clothing and antistatic shoes (with ESD symbol).
- For additional information see: 61 35 Information on electrostatic discharge (ESD) protection.

- Unlock the lock (1).
- Guide out the electric changeover valve upwards and set it aside.



- Unlock and disconnect connector (1).
- Pull vacuum hoses (2) and (3) off the electric changeover valve **carefully**.
- Make sure the green O-ring between the red vacuum hose and the electric changeover valve is **not** lost.

4 – Install the electric changeover valve for the exhaust-gas recirculation



- Check whether the green O-ring (1) is present on the electric changeover valve.

  The green O-ring (1) must **not** be missing.

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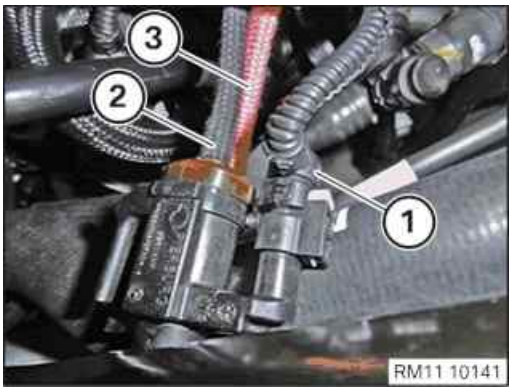


- Connect red vacuum hose (2) to the electric changeover valve.

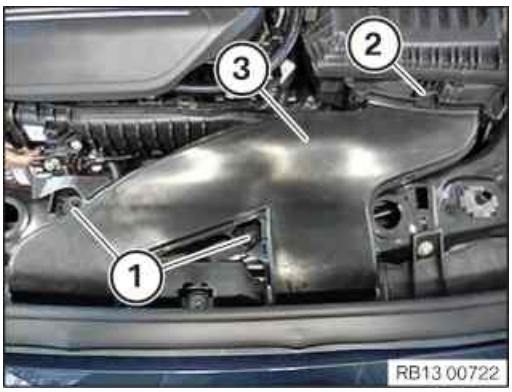
  The red vacuum hose (2) must be connected to the connection with the green O-ring.
- Connect black vacuum hose (2) to the electric changeover valve.
- Connect and lock the connector (1).

  The connector (1) must engage audibly.

- Feed in and install the electric changeover valve in the holder.
- The lock (1) must audibly engage in the holder.

POSTPROCESSES

5 – Install the intake neck for the intake filter housing



- Insert and install the intake neck (3).

  The lock (2) must audibly engage.
- Tighten nuts (1).

Intake neck to cross connection

M6		Tightening torque	8 Nm

6 – Install acoustic cover

RISK OF DAMAGE

Damage to the acoustic cover.

Jerky movements during disassembly and excessive application of force during installation may result in breakage of the acoustic cover.

- Disassemble or mount the acoustic cover carefully.
- Disassemble or mount snap-lock couplings of the ball pivots one after the other.
- Disassemble or mount acoustic cover only at temperatures >20 °C.
- Use only distilled water as an auxiliary material during installation, no lubricants.

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- Check for correct installation of all rubber mounts in the acoustic cover (1).

- Clip in the acoustic cover into the holders in the indicated areas.
- Make sure that the acoustic cover engages audibly.

Additional Information

Overview of Tightening Torques

Intake neck to cross connection			Used in step 5
M6		Tightening torque	8 Nm

Links

Repair instructions	Used in step
61 35 ... Notes on ESD protection (Electro Static Discharge)	3

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00 11 500 Checking/topping up oil level in automatic transmission (AISIN F21FT)

Caution!

Use only the approved automatic transmission oil in this automatic transmission.

Failure to comply with this requirement will result in serious damage to the automatic transmission!

Note:
Level out oil level in automatic transmission via overflow connector.

Necessary preliminary work:

- Remove front underbody protection
- Remove intake filter housing

Removal:

Move selector lever to "P" position.

The vehicle must be horizontal and secured against rolling off.

Connect diagnosis system.

Select Service function: Transmission fluid adjustment.

Release oil filler plug (1) with Torx T55.

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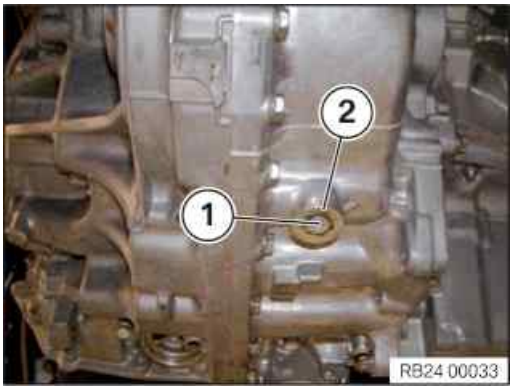

Draining transmission oil:

Release overflow plug (1) with Torx T40.

Undo oil drain plug (2) using 17 mm hexagon socket.

Tightening torque 24 11 1AZ.

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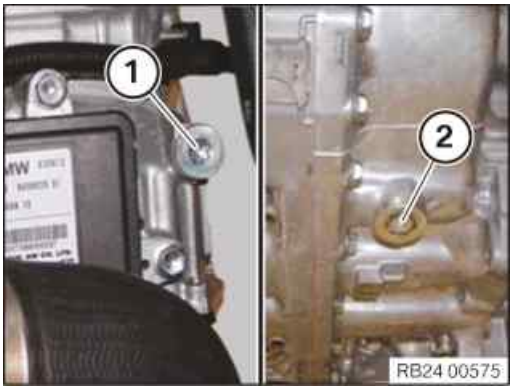

Top up transmission oil. (Transmission oil has been drained)

Release oil filler plug (1) from engine compartment.

Tightening torque 24 11 3AZ.

Loosen the overflow plug (2) below at the transmission.

Tightening torque 24 11 2AZ.

Top up automatic transmission fluid at oil filler plug (1) until oil emerges at overflow plug (2).

Start engine and run at idle speed.

Check whether automatic transmission fluid emerges at overflow plug (2).

If not, fill automatic transmission fluid at the oil filler plug (1).

Actuate footbrake and at idle shift through all gears "P" to "D" twice for more than 2 seconds.

Then set switch to "P" position.

Recheck whether automatic transmission fluid emerges at the overflow plug (2).

Check the temperature of the automatic transmission fluid with the diagnosis system.

Increase temperature of automatic transmission fluid to 35 ... 45 °C.

Top up automatic transmission fluid until it flows over.

Screw in oil filler plug (1) and overflow plug (2).

Tightening torque 24 11 2/3AZ.

Installation note:

Parts: Renew sealing rings.

Check oil level (transmission oil temperature must be between 35 and 45°C):

Undo oil filler plug (1).

Slacken overflow plug (2).

Tightening torque 24 11 2/3AZ.

Start engine and run at idle speed.

Unscrew overflow plug (2).

Check whether automatic transmission fluid emerges at overflow plug (2).

If not, fill automatic transmission fluid at the oil filler plug (1).

Top up automatic transmission fluid until it overflows at overflow plug (2).

Actuate footbrake and at idle shift through all gears "P" to "D" twice for more than 2 seconds.

Move switch to "P" position.

Check oil level again.

Seal screws when the oil emerges slightly from overflow plug (2).

Tightening torque 24 11 2/3AZ.

Installation note:

Parts: Renew sealing rings.

Required follow-up work:

- Install front underbody protection
- Install intake silencer housing
- Delete fault memory

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Delete fault memory with the diagnosis system.

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11 . . . . . Equipment recoding special tool number of the transverse member for fixing the engine in the installation location

Equipment recoding from 00 0 200 to 00 6 0 000

Designation	Special tool new	Special tool previous
Cross-member, previous	---	00 0 200
Cross-member, new	00 6 000	---
Mounting bridge	00 6 001	00 0 201
Spindle with hook	00 6 002	00 0 202
Extension	00 6 003	00 0 203
Adapter support	00 6 004	00 0 204
Extension	00 6 005	00 0 205
Chain with hook	00 6 006	00 0 209
Set of supports	00 6 010	00 0 206
Set of supports	00 6 020	00 0 207
Set of supports	00 6 030	00 0 208
Connector	00 6 031	---
Profile strip (2 x)	00 6 032	---
Supports (4 x)	00 6 033	---
Set of supports	00 6 040	---
Profile strip	00 6 041	00 0 451
Supports (2 x)	00 6 042	00 0 452
Supports, short (2 x)	00 6 043	---
Set of supports	00 6 050	---
Profile strip (2 x)	00 6 051	---
Supports, short (2 x)	00 6 052	---
Supports, long (2 x)	00 6 053	---
Support, long	00 6 060	---
Supports (2 x)	00 6 070	---

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00 11 229 Oil change in manual gearboxes (GS6-58/59 BG/DG)

Recycling:

Catch and dispose of escaping transmission oil.

Observe country-specific waste disposal regulations

Note:

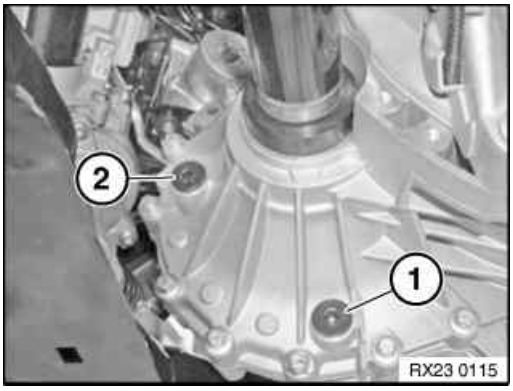
Gearbox is at normal operation temperature.

Attention!
Use only the approved transmission oil.

Failure to comply with this instruction will result in serious damage to the transmission.

Capacity, see BMW operating fluid.

The vehicle must be parked on a level surface in the workshop during transmission oil filling.



Unscrew oil drain plug (1) and allow oil to flow out completely.

Clean oil drain plug and reinstall.

Tightening torque 23 00 2AZ.

Unscrew filler/fluid level monitoring connector (2) and fill the transmission until the oil overflows. Allow excess oil to drain and screw in filler/fluid level monitoring connector again.

Tightening torque 23 00 2AZ.

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11 00 670 Securing engine in installation position

Special tools required:

- 2 358 042
- 00 6 100
- 00 6 130
- 2 365 070
- 11 0 000
- 2 357 269
- 00 0 490

Warning!

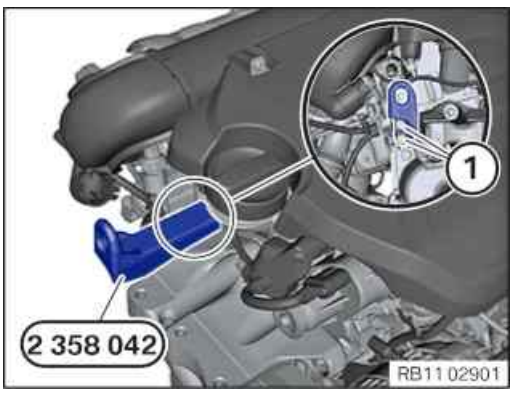
Danger of injury!

Observe following instructions relating to special tool:

1. Prior to each use, check the special tools for defects, modifications and operational reliability.
2. Damaged/modified special tools must not be used!
3. No changes or modifications may be made to the special tools!
4. Keep special tools dry, clean and free of grease.

Necessary preliminary tasks:

- Remove upper bulkhead cover



Only for B37 and B38engines:

Align special tool 2 358 042 on the engine and secure with screws (1).

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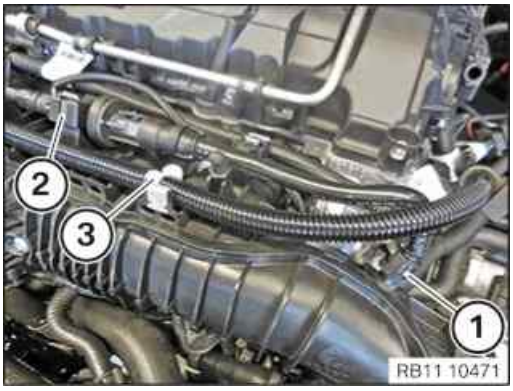
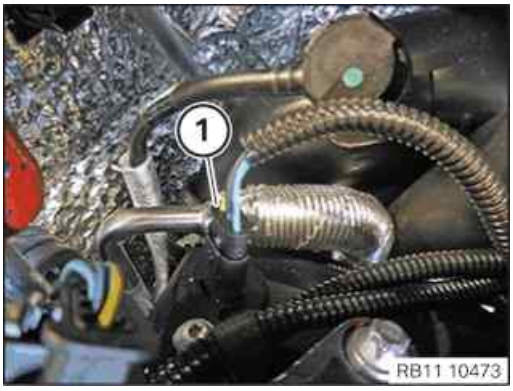
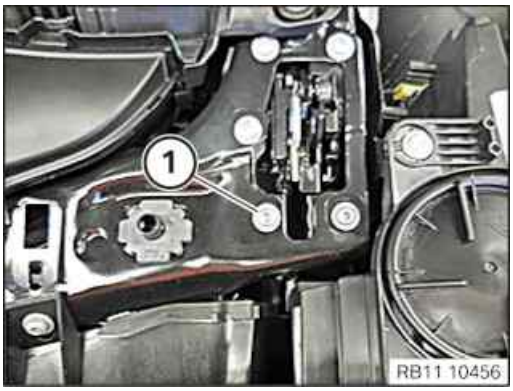


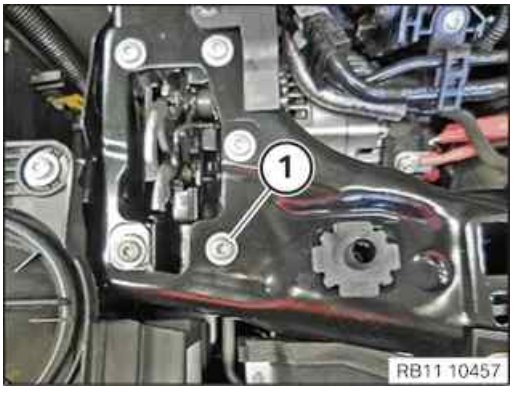
Unlock and disconnect line (1).
Pull off line from holder (2).
Release cable (3) from holder.



Unlock connector (1) and pull off.



Release screw (1) from left engine compartment lock.



Release screw (1) from right engine compartment lock.

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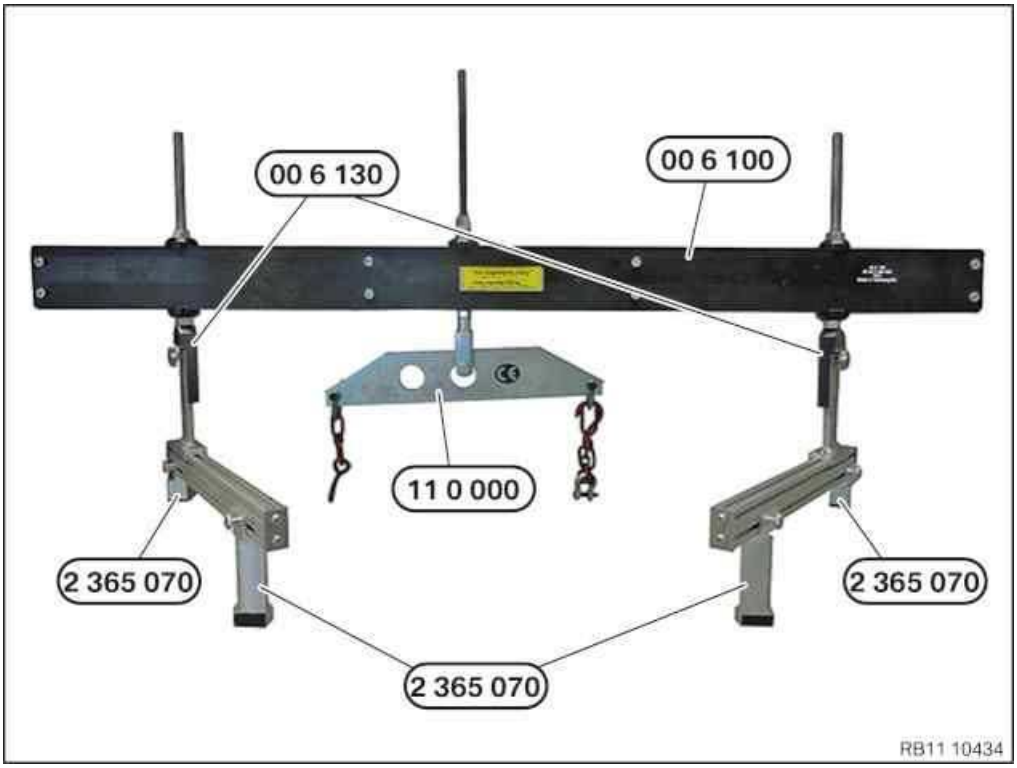

Remount engine bridges 00 6 100 with special tool 00 6 130 , 2 365 070 and 11 0 000 on the vehicle.

With the help of an assistant, fit the entire cross-member 00 6 100 onto the vehicle.

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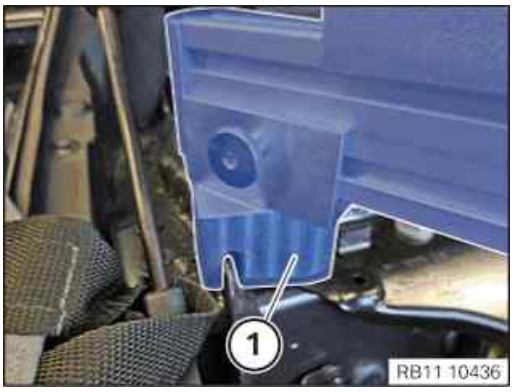
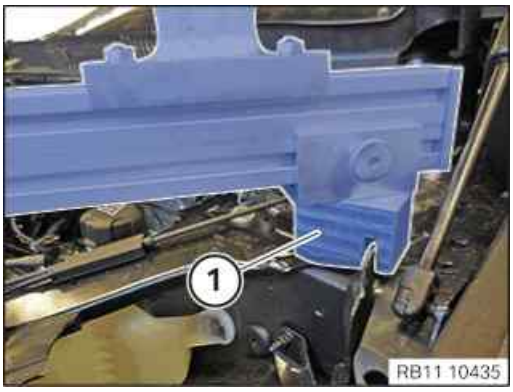


(1) = rear right support point.



(1) = rear left support point.

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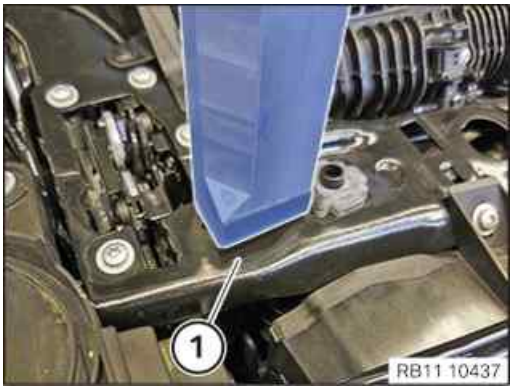
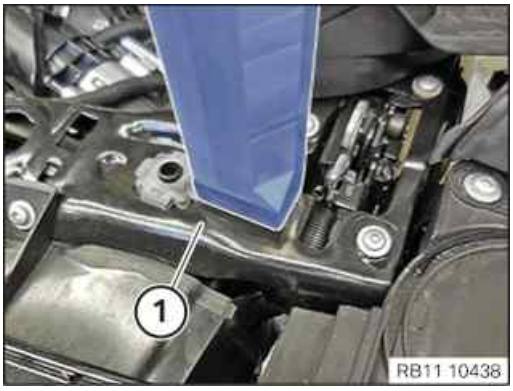
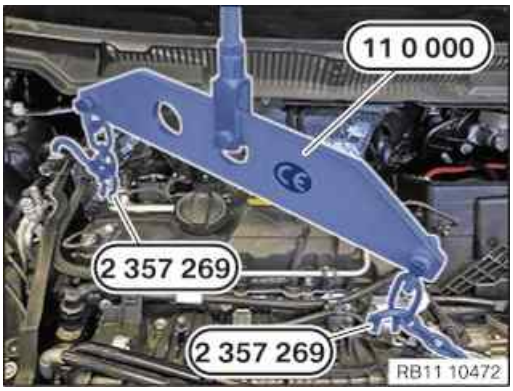


(1) = front right support point.



(1) = front left support point.



After mounting the cross-member,

Attach special tool 2 357 269 to the chains and engine mounting lugs.

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Screw in shackle screws (2 and 3).

Slightly pretension the spindle (1) of the engine support beam.

Warning!
Danger of injury!

Tighten down all adjusting screws, knurled screws and nuts on cross-member 00 6 100 and on special tool 00 0 490 .

Attention!

Avoid a change of engine position in the transverse or longitudinal direction!

Always make sure there is sufficient clearance between the engine (or its add-on parts) and the body.

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